

## PRE-ERUPTIVE INTRAMURAL RESORPTION IN UNERUPTED TEETH: A CONE-BEAM COMPUTED TOMOGRAPHY EVALUATION OF PREVALENCE AND RELATED FACTORS.

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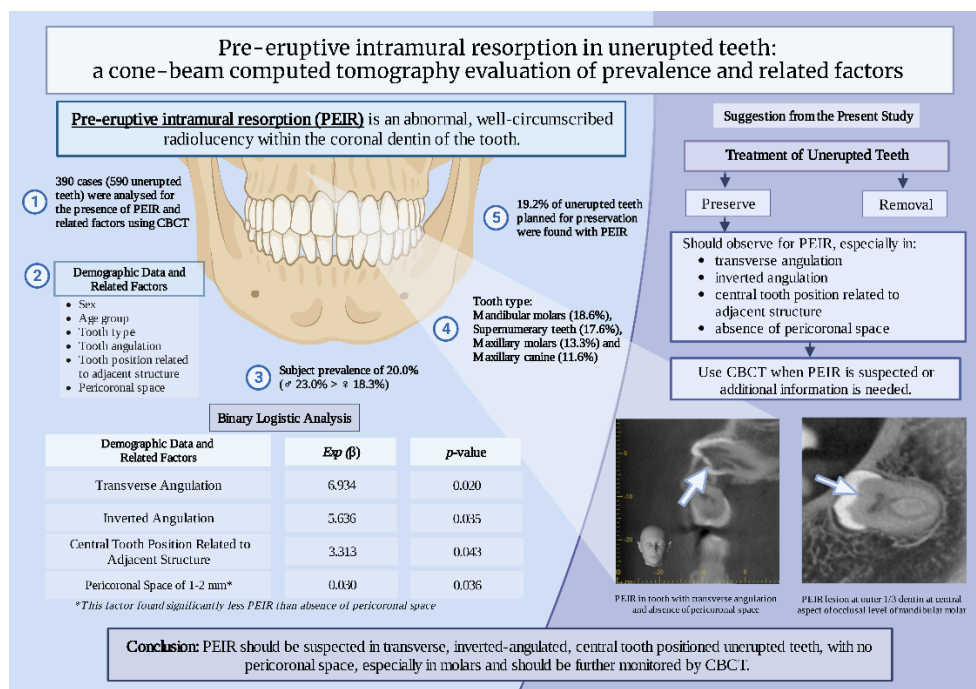
### Abstract:

**Aims:** Management of unerupted teeth is not always surgical removal. Alternatively, they could be used for artificial-eruption or tooth-transplantation. Resorptive abnormalities could be found in such teeth, where pre-eruptive intramural resorption (PEIR) was often overlooked as information and awareness was limited. PEIR was defined as an abnormal, well-circumscribed radiolucency within the coronal dentin of the tooth. It could only be detected radiographically; however, initial lesions were often unnoticed until progressed extensively in plain radiograph with no screening protocol established. Therefore, this study aimed to investigate radiographic characteristics related to the prevalence of PEIR using cone-beam computed tomography (CBCT).

**Materials and Methods:** CBCT images of 380 patients (590 unerupted teeth) were evaluated for presence of PEIR, PEIR location, number of lesions in affected tooth, PEIR score, tooth angulation, tooth position, and pericoronal space. Unerupted teeth that were planned for artificial-eruption or tooth-transplantation were recorded. Binary logistic tests were used to interpret the association between characteristics of PEIR with the patient's demographic data and related factors.

**Results:** PEIR was found in 19.2% of unerupted teeth that were planned for artificial-eruption or tooth-transplantation. It was significantly associated with transverse ( $p=0.020$ ), inverted-angulated ( $p=0.035$ ) and centrally-positioned teeth ( $p=0.043$ ). The severity of PEIR was greater in teeth with distal ( $p=0.019$ ), lingual ( $p=0.023$ ) or inverted-angulated ( $p=0.040$ ), and the absence of pericoronal space ( $p=0.036$ ).

**Conclusion:** PEIR should be suspected in transverse, inverted-angulated, central tooth positioned unerupted teeth, with no pericoronal space, especially in molars and should be further monitored by CBCT.



## DEVELOPMENT OF A DEEP NEURAL NETWORK TO REDUCE CONE-BEAM CT ARTEFACTS ARISING FROM HIGH-DENSITY MATERIALS. A PRELIMINAR STUDY

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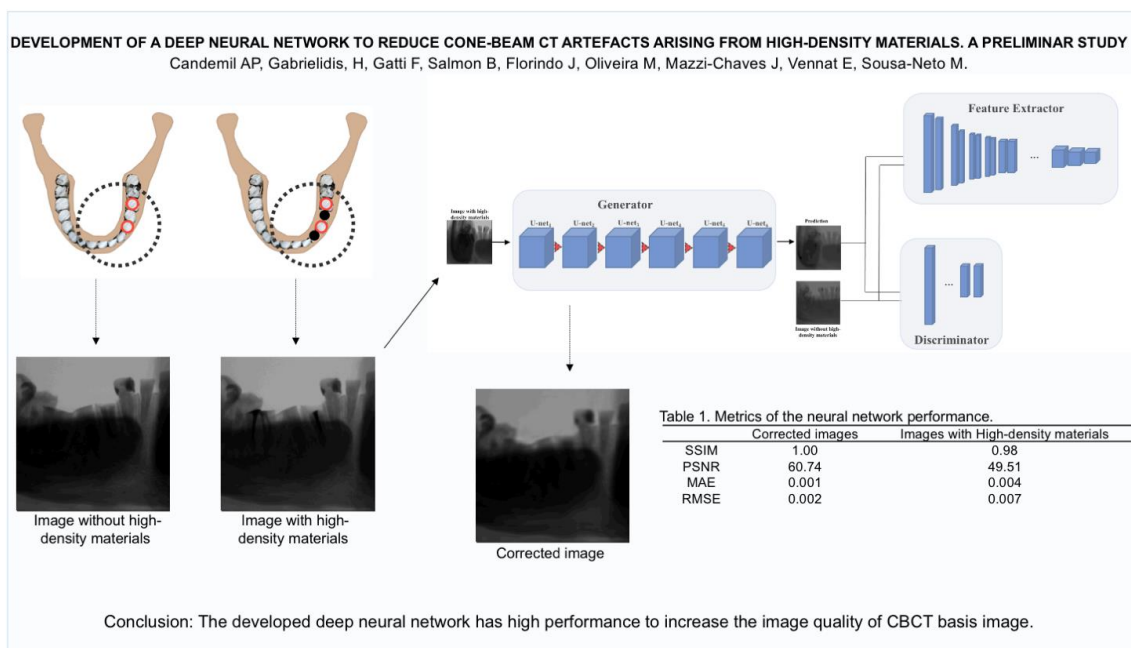
### Abstract:

**Aims:** This study aimed to evaluate the performance of a newly developed deep neural network on cone-beam computed tomography (CBCT) basis images for further application in the reduction of CBCT artefacts arising from high-density materials.

**Materials and Methods:** An imaging phantom was custom made with a dry human mandible covered with Mix-D. Forty teeth were endodontically instrumented and individually inserted in the sockets of the mandibular first left premolar and first left molar (teeth of interest). CBCT scans were obtained with a field of view of 5 × 5 cm, 90 kVp, 3 mA, 0.08 mm voxel size and 9 s. Three clinical conditions with high-density materials were simulated (I.filling material in the root canal, II.filling material + intracanal post in the root canal, and III.titanium implants adjacent of the teeth of interest) and additional CBCT scans were performed. Ad-hoc neural network was developed based on the literature of the CasNet, VGG19, and PatchGan. The neural network was tailored to use the acquired CBCT basis images for validation, training and testing. The structural similarity index (SSIM), peak signal-to-noise ratio (PSNR), mean absolute error (MAE) and root mean square error (RMSE) were calculated to evaluate the metrics of the neural network.

**Results:** The results showed an increase of SSIM and PSNR and a decrease of the MAE and RMSE values by the neural network.

**Conclusion:** In conclusion, the developed CBCT neural network has high performance to increase the image quality of CBCT basis image.



# DEEP LEARNING-BASED SEGMENTATION OF DENTAL IMPLANT RESTORATIONS WITH ARTIFACT REMOVAL ON CBCT

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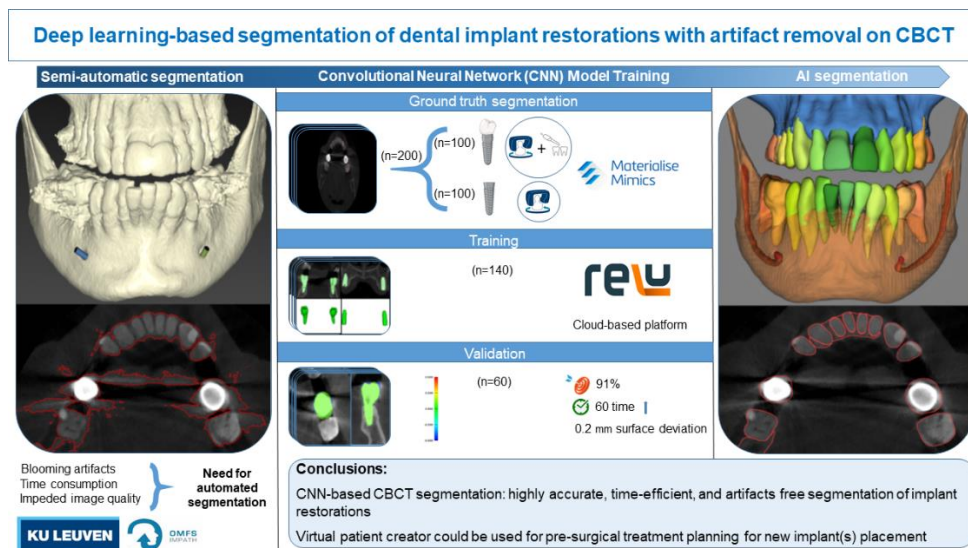
## Abstract:

**Aims:** This study aimed to train and validate a cloud-based deep learning tool for automated segmentation of dental implants and artificial coronal restorations on CBCT images.

**Materials and Methods:** A total of 200 CBCT scans with each scan having 2 to 6 implants were recruited. A deep-learning convolutional neural network model with two 3D U-Net architectures was trained using a ground-truth dataset of 140 scans which consisted of expert-based semi-automatic segmentation of implants with and without coronal restorations. Following training, the algorithm was deployed onto an online cloud-based platform. Two experts semi-automatically segmented (SS) the scans in the validation set (n=60) and compared the outcomes with corresponding automated segmentation (AS) of similar scans. Furthermore, the need for AS refinement was also evaluated. The segmentation accuracy was assessed by applying a confusion matrix and surface-based deviation analysis.

**Results:** The tool was able to achieve a fast (<30s) and blooming-free segmentation of both implant and artificial crowns and AS was significantly faster than SS approach (p<0.0001). A high DSC score (0.91±0.04) and low RMS value (0.36±0.15mm) was observed with AS in comparison to SS approach, implying high segmentation similarity between the surfaces. Furthermore, AS also showed a high DSC score of 0.97±0.2 and low RMS value of 0.01±0.073 mm in comparison with R-AS. Hence, indicating that minimal refinements were required.

**Conclusion:** Fast, precise, and artifact-free simultaneous segmentation of the existing implants and coronal restorations on CBCT images could allow for an uncompromised pre-surgical digital treatment planning in patients requiring additional implants.



# A UNIQUE ARTIFICIAL INTELLIGENCE-BASED TOOL FOR AUTOMATED MANDIBULAR AND INCISIVE CANAL SEGMENTATION ON CONE BEAM COMPUTED TOMOGRAPHY SCANS

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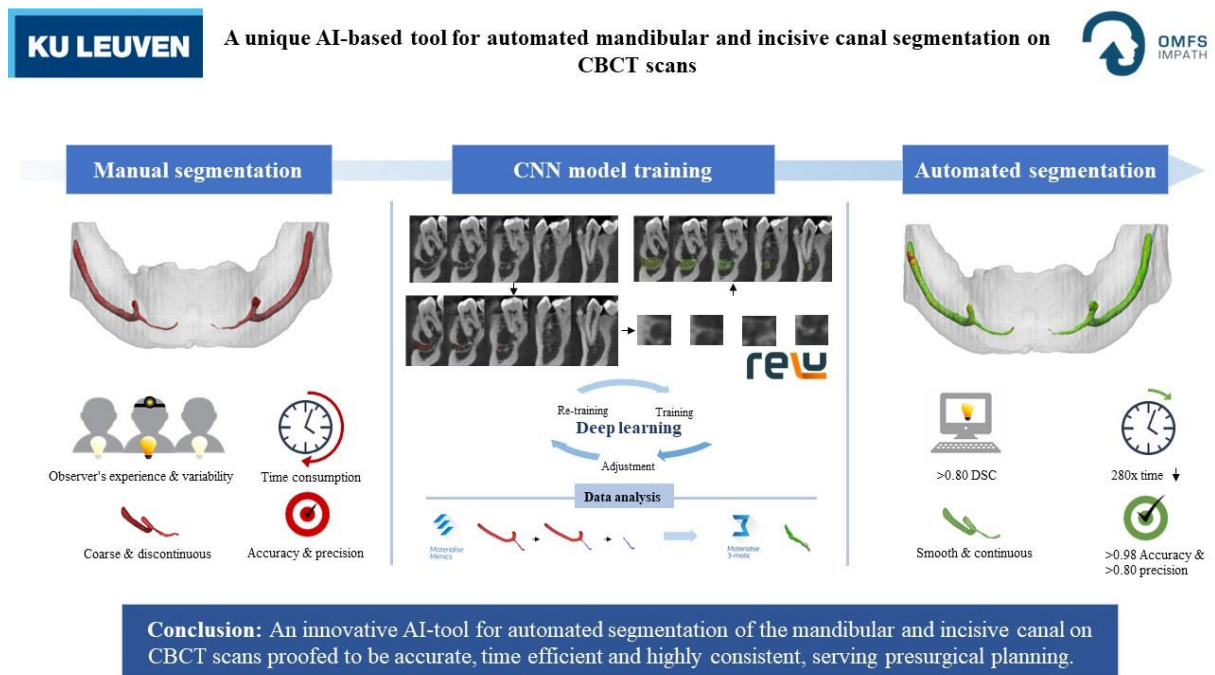
## Abstract:

**Aims:** To develop a novel artificial intelligence (AI) tool for automated segmentation of the mandibular and incisive canal in cone beam computed tomography (CBCT) scans.

**Materials and Methods:** After ethical approval, a dataset of 166 CBCT scans were selected and categorized into training (140 scans), validation (14 scans) and test (12 scans) sets. CBCT scans were imported into Virtual Patient Creator (Relu BV, Leuven, Belgium) and ground truth for training and validation were manually segmented by three oral radiologists in multiplanar reconstructions. Intra- and inter-observer analysis for human segmentation variability was performed on 10% of the dataset. Segmentations were imported into Mimics (Materialise, Leuven, Belgium) to crop the incisive canal. Resulting files were imported to 3-Matic (Materialise, Leuven, Belgium) for analysis using surface- and voxel-based methods. Analyses involved time efficiency, dice similarity coefficient (DSC), intersection over union (IoU), largest segmentation error (HD), root mean square (RMS), precision and accuracy. These values were calculated considering entire mandibular canal and incisive canal.

**Results:** Average time for AI and manual segmentation were 47.18 and 0.10 minutes (284-fold time reduction). AI tool showed values of DSC 0.89, HD 3.52 mm, IoU 0.81, RMS 0.32 mm for entire canal and DSC 0.69, HD 1.56 mm, IoU 0.53, RMS 0.34 mm for incisive canal. Precision and accuracy were 0.89 and 0.998 for entire canal with 0.64 and 0.987 for incisive canal.

**Conclusion:** An innovative AI-tool for automated segmentation of the mandibular and incisive canal on CBCT scans proofed to be accurate, time efficient and highly consistent, serving presurgical planning.





# ANALYSIS OF THE RISK FEATURES OF RADIOMICS IN CBCT IMAGES FOR CONDYLAR RESORPTION AFTER ORTHOGNATHIC SURGERY

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**Abstract:**

**Aims:** To find the specific radiomic features by analyzing the differences of feature difference-values (D-values) of condylar resorption after orthognathic surgery based on time series CBCT images.

**Materials and Methods:** In this study, the condylar resorption group and the control group of the **T1(pre-operation)** and **T2(post-operation)** images were analyzed by radiomics. The feature extraction methods used mainly included first order statistics, GLCM, GLDM, GLRLM, GLSZM and NGTDM. A total of 107 original feature values were extracted. The differences of the D-values of **T1** and **T2** features and the differences of **T1** between the two groups were analyzed by using the Mann-Whitney U test.

**Results:** A total of 107 original feature values were extracted. There were 8 feature D-values with statistical differences (P<0.05). Also, we compared all the features of **T1** between the two groups, 47 of which had statistical differences, including the 8 characteristic features with significant differences, which indicated that the 8 features were specific features that had differences before orthognathic surgery.

**Conclusion:** The characteristic features which were highly related to the condylar resorption after orthognathic surgery could be found by the D-values between the **T1** and **T2** features. The selected characteristic features could be used to build up the risk prediction model of the condylar resorption after orthognathic surgery in the future.

## Analysis of the risk features of radiomics in CBCT images for condylar resorption after orthognathic surgery

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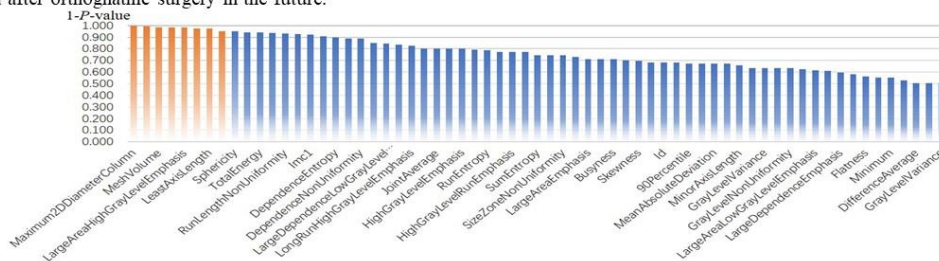


Figure 1. Statistical results of D-values of features between condylar resorption group and control group after orthognathic surgery.

# A DENTAL CBCT VIRTUAL IMAGING TRIAL PLATFORM FOR INDICATION- AND PATIENT-SPECIFIC OPTIMIZATION AS WELL AS EDUCATIONAL PURPOSES

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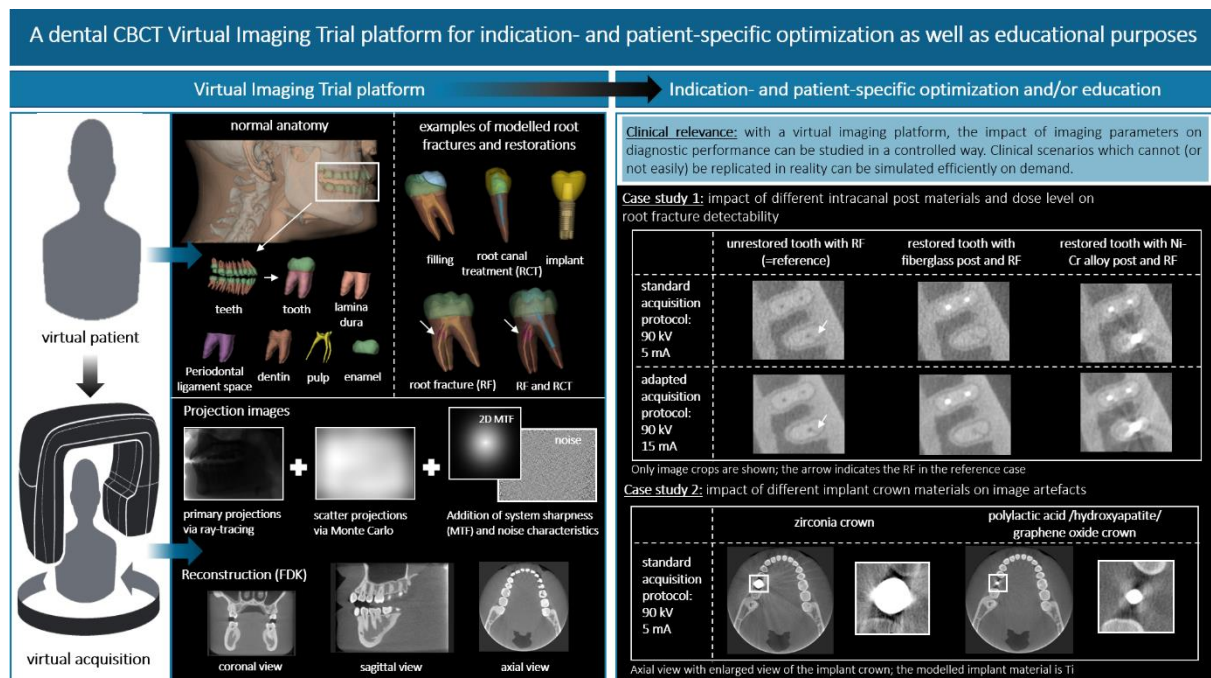
## Abstract:

**Aims:** To develop a Virtual Imaging Trial (VIT) platform for dental CBCT imaging and illustrate its potential as an optimization and additionally an educational tool, focusing on studying the effect of different parameters on image artefacts and root fracture (RF) visibility.

**Materials and Methods:** A model of a virtual patient as well as a computational model of a dental CBCT scanner were developed. The basis for the virtual patient was segmentations from CBCT scans. Detailed models of RFs and dental restorations (implants, fillings, root canal treatments (RCTs)) were developed which could be inserted into the phantom in any desired configuration. CBCT images of the model were generated using an in-house developed simulation framework. To demonstrate the framework's use, clinical scenarios that are difficult or impossible to replicate in reality were simulated. The impact of a change in dose level and RCT post material on RF visibility, and the effect of implant crown material and rigid motion on image artefacts were illustrated.

**Results:** The simulations showed the influence of different restorative materials, dose levels as well as rigid motion on RF visibility and/or image artefacts. The results were consistent with results from literature. Furthermore, the platform proved to be practical for simulating scenarios that cannot (or not easily) be replicated in reality.

**Conclusion:** A dental CBCT VIT framework has been developed with the potential to serve as an optimization and/or educational tool. The effect of different imaging parameters on diagnostic performance can be studied in a controlled way. Challenging clinical scenarios can be simulated on demand.



# INFLUENCE OF ENDODONTIC PLANNING SOFTWARE ON CBCT DIAGNOSIS AND ENDODONTIC TREATMENT: AN IN-VITRO PILOT STUDY

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**Abstract:**

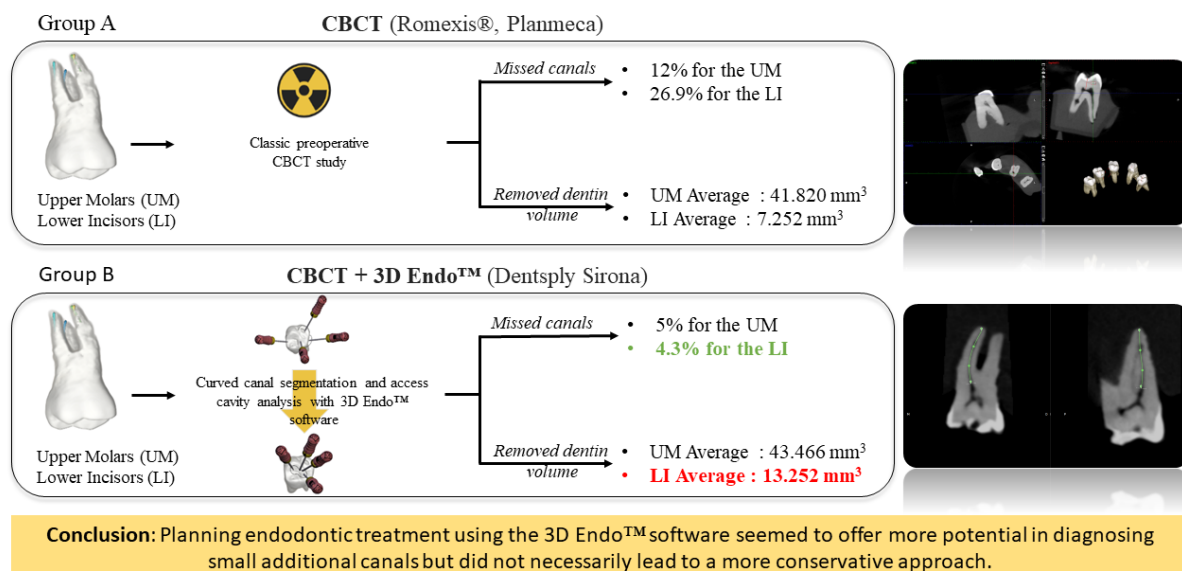
**Aims:** The aim of this study was to compare the diagnostic value (missed canals) and the clinically removed dentin volume from the access cavity using two different treatment plans: one based on the complementary Cone Beam Computed Tomography (CBCT) software (Romexis®, Planmeca) and the other one based on the same CBCT data analyzed in a dedicated endodontic planning software (3D Endo™, Dentsply Sirona).

**Materials and Methods:** 30 upper molars and 30 lower incisors were randomly distributed into two groups: Group A = analysis using the CBCT software, group B = planning using the endodontic planning software. The number of canals were diagnosed by two observers for each group. Endodontic treatment using a classic chamber opening (group A) and transposed one (group B) was conducted. Pre- and post-operative volumes were compared to determine eliminated volume.

**Results:** With the help of the dedicated endodontic software, 5% (group B) of canals were left untreated compared to 12% (group A), and respectively 4.3% compared to 26,9% for the incisor groups. The Mann-Whitney test showed a significant difference in the removed dentin volume between group A and B for the incisors, with slightly more removal for the latter; but not significantly for the molars.

**Conclusion:** Planning endodontic treatment using the 3D Endo™ software seemed to offer more potential in diagnosing small additional canals but did not necessarily lead to a more conservative approach.

## Influence of endodontic planning software on CBCT diagnosis and endodontic treatment An in-vitro pilot study



## HOW DOES THE RADIOGRAPHIC APPEARANCE OF MRONJ INFLUENCE ITS CONSERVATIVE AND SURGICAL PROGNOSIS?

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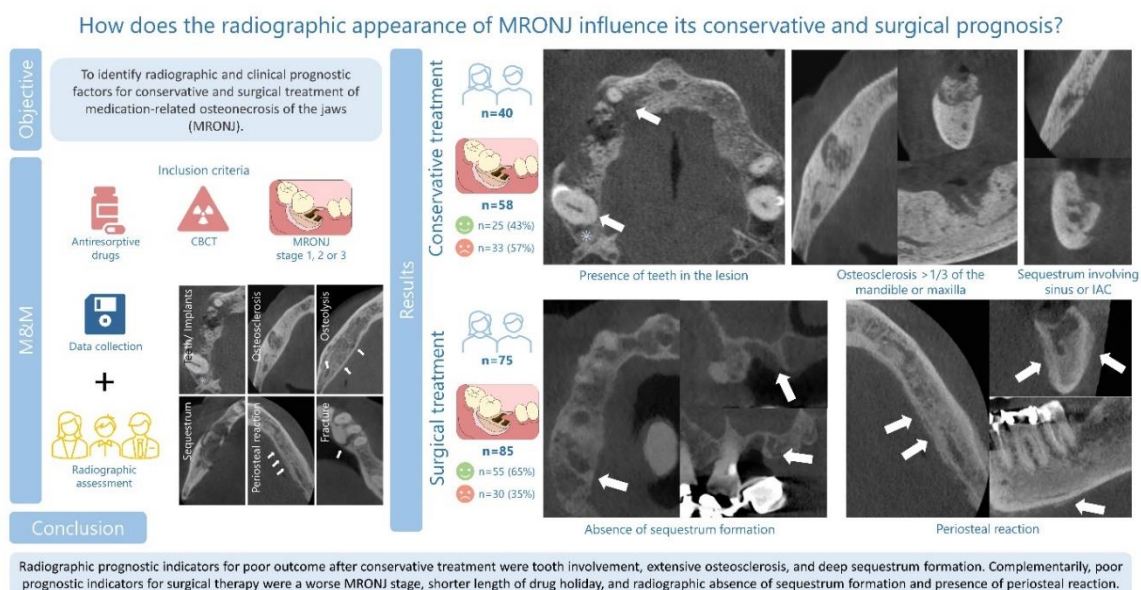
### Abstract:

**Aims:** To identify radiographic and clinical prognostic factors for conservative and surgical treatment of medication-related osteonecrosis of the jaws (MRONJ).

**Materials and Methods:** A retrospective search identified patients treated with at least one administration of antiresorptive drugs (ARDs), diagnosed with stage 1, 2 or 3 MRONJ, and having a CBCT. Following data collection, radiographic examination on each MRONJ site was performed. Evaluation included, involvement of teeth and/or implants, presence of pathological fractures, periosteal reaction, osteosclerosis, osteolysis, and sequestrum formation. For statistical analysis, patients and lesions were divided into conservative and surgical treatment. Comparisons were made between successful and unsuccessful outcomes. Significance was set at  $p \leq 0.05$ .

**Results:** A total of 115 ARD-treated patients who developed 143 osteonecrosis lesions were selected. Forty patients and 58 lesions received conservative treatment, of which 14 patients (35%) and 25 lesions (43%) healed. Additionally, 75 patients and 85 lesions underwent surgery, with 48 patients (64%) and 55 lesions (65%) that healed. Clinical and radiographic risk factors for conservative treatment were MRONJ staging ( $p=0.022$ ), tooth involvement ( $p=0.029$ ), extensive osteosclerosis ( $p=0.01$ ), and deep sequestrum formation ( $p=0.036$ ). Complementarily, poor prognostic indicators for surgical therapy were, MRONJ staging ( $p=0.042$ ), length of drug holiday ( $p=0.051$ ), absence of sequestrum formation ( $p=0.02$ ), and presence of periosteal reaction ( $p=0.008$ ).

**Conclusion:** Lesions at stage 3 MRONJ, with tooth involvement, or sequestrum formation showed poor outcomes when conservative treatment is chosen. Alternatively, surgical treatment is most effective for stage 1 lesions, when ARDs are discontinued, and radiographic presence of sequestrum formation and absence of periosteal reaction.





## Qualitative And Quantitative Analysis Of Alveolar Bone In Different Vertical Skeletal Patterns Using Different Third-Party Software

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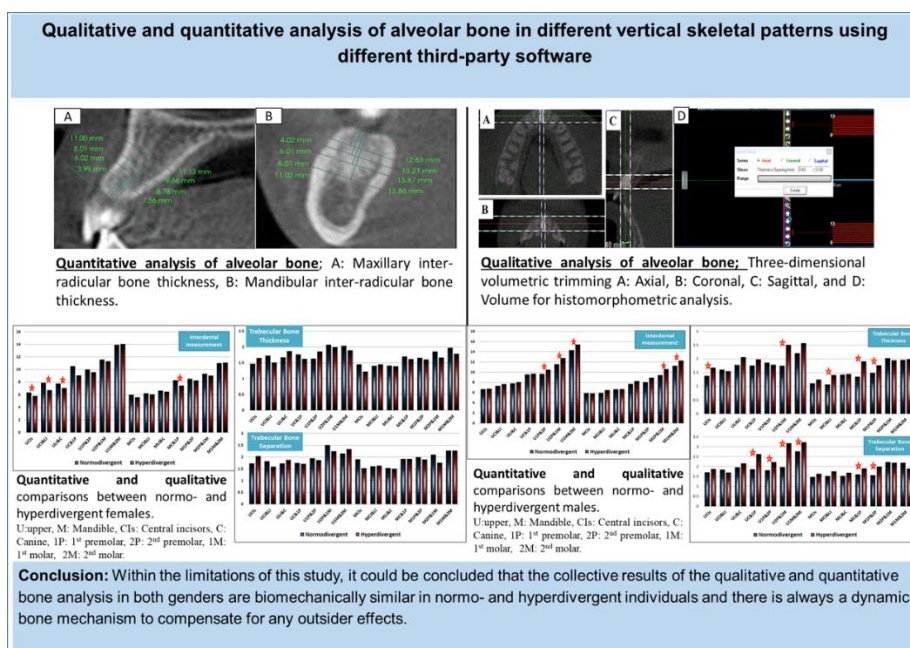
### Abstract:

**Aims:** The general concept is that the stronger the oro-facial muscles, as in the hypo- and normodivergent facial skeleton, the more compact and denser the trabecular bone pattern. Accordingly, this study aimed to analyze the quality and quantity of the alveolar bone in adults with different vertical skeletal patterns to explore this concept.

**Materials and Methods:** This retrospective cross-sectional study retrieved 120 CBCT scans and divided them into four equal groups; normo- and hyperdivergent skeletal patterns of both genders. The following measurements were performed A) Qualitative bone measurements: bone cuboids from CBCT scans were obtained for each inter-radicular area using WhiteFox software. Then the histomorphometric bone analyses, which included trabecular bone thickness and separation, were analyzed using ImageJ software; B) Quantitative bone measurements: complete set of inter-radicular bone thickness at 4, 6, 8, and 11 mm for both arches were measured using InvivoDental software. All group comparisons were conducted using an independent t-test ( $P < 0.05$ ).

**Results:** The quantitative analysis was significantly higher in hyperdivergent males distal to the 1st premolars in both arches and significantly lesser in the upper anterior region in normodivergent females. For qualitative analysis, the hyperdivergent males showed significantly higher trabecular bone thickness, mainly in the mandibular premolars area, and trabecular bone separation in the maxillary premolars and molars areas. None of the qualitative variables showed significant differences in female groups.

**Conclusion:** Collective results show that alveolar bone in both genders is biomechanically similar in normo- and hyper-divergent individuals. There is always a dynamic bone mechanism to compensate for any outsider effects.



# Accuracy Of Dental Model And Surgical Guide Derived From CBCT 3D Compared With Desktop Scanner

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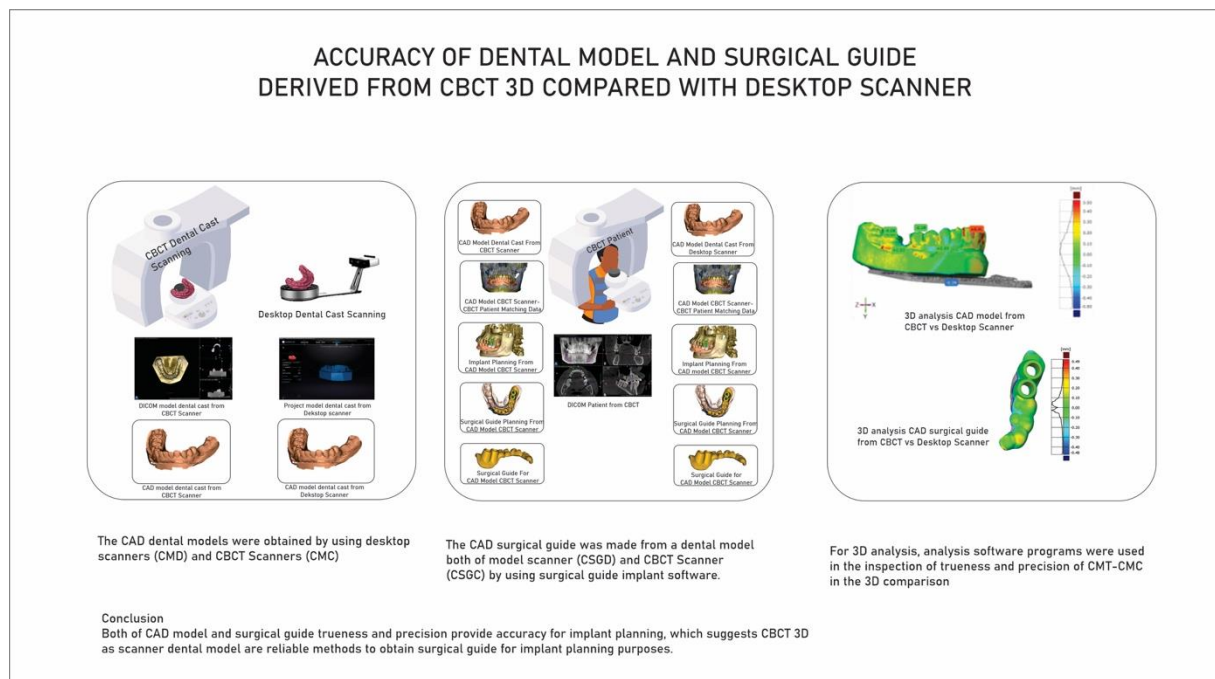
## Abstract:

**Aims:** This study was designed to evaluate the 3D analysis accuracy of CAD model and surgical guide implant from CBCT 3D scan, these were compared with a desktop optical scanners for trueness and precision. This study aimed to evaluate the 3D analysis for tooth, edentulous, and surgical guide regions by using analysis software programs.

**Materials and Methods:** The 2 types of CAD dental models and surgical guides were made from 12 dental cast models within 15 edentulous areas. The CAD dental models were obtained by using desktop scanner (Einscan SE, shining 3D) and CBCT (OP300 Maxio, Kavo). The CAD surgical guide was made from a dental model both of desktop scanner and CBCT Scanner by using surgical guide implant software (AIS, Acteon). For 3D analysis, analysis software programs (GOM Inspect, Zeiss) were used in the inspection of trueness and precision of CMT-CMC in the 3D comparison.

**Results:** Root mean square (RMS) was regarded as the result of the 3D comparison. One-way analysis of variance and Tukey honestly significant difference tests were performed for statistical comparison of deviation ( $\alpha = 0.05$ ). In the tooth-edentulous region, deviation showed no significant difference in RMS values. The results suggest, there was neither statistically significant nor clinically relevant difference regarding the trueness and precision of 2 types of CAD models and surgical guides.

**Conclusion:** Both CAD model and surgical guide trueness and precision provide accuracy for implant planning, which suggests CBCT 3D as scanner dental model are reliable methods to obtain surgical guide for implant planning purposes.



# A Subjective Analysis Of The Dynamic Range And Enhancement Ability Of Contemporary Digital Systems

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## Abstract:

**Aims:** To evaluate the subjective image quality of original and manually enhanced radiographs acquired at ten X-ray exposure times and using five digital systems.

**Materials and Methods:** The same region of a human jaw was radiographed under ten exposure parameters, five digital systems, and two enhancement conditions. Five observers were asked to rate all images as acceptable or unacceptable; a radiograph was considered to be acceptable when at least four out of five observers found it acceptable. Quantitative descriptive analysis was used to summarize the outcomes and compare the subjective image quality of original and manually enhanced digital radiographs among different X-ray exposure times and digital systems.

**Results:** Express had 6 exposure times producing acceptable original images within a range from 0.063 s to 0.4 s, followed by Digora Toto, which had 5 within a range from 0.063 s to 0.32 s, Digora Optime, which had 4 within a range from 0.063 s to 0.2 s, and SnapShot and VistaScan, which had 2 from 0.2 to 0.32 s and 1 at 0.63 s, respectively. Image enhancement turned unacceptable images into acceptable ones in four digital systems: SnapShot at 3 exposure times, Digora Toto at 2 exposure times, Express at 1 exposure time, and VistaScan at 4 exposure times.

**Conclusion:** Appropriate image enhancement may be necessary to reveal the useful dynamic range of some digital radiographic systems, PSP-based digital radiographic systems may not necessarily have a wider range than sensor-based systems, and contemporary digital radiographic systems have different dynamic ranges.

## A subjective analysis of the dynamic range and enhancement ability of contemporary digital systems

### AIM

To evaluate the subjective image quality of original and manually enhanced radiographs acquired at ten X-ray exposure times and using five digital systems.

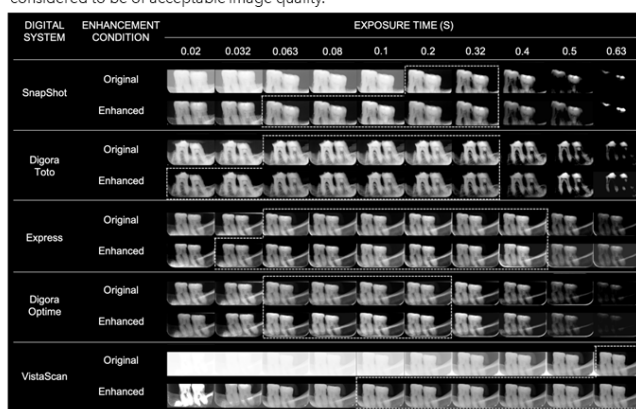
### METHODS

- Five observers rated all images as acceptable or unacceptable;
- A radiograph was considered to be acceptable when at least four out of five observers found it acceptable.

### CONCLUSION

Appropriate image enhancement may be necessary to reveal the useful dynamic range of some digital radiographic systems, PSP-based digital radiographic systems may not necessarily have a wider range than sensor-based systems, and contemporary digital radiographic systems have different dynamic ranges.

Figure 1: Radiographic images obtained with different exposure times (in seconds), digital systems, and enhancement conditions. The radiographs inside the dotted shapes are those considered to be of acceptable image quality.



## A Novel 3-Dimensionally Printed Paranasal Sinus Surgical Model

*D. Pişla, S. Mureşanu<sup>2</sup>, C. Vaida<sup>1</sup>, D. Rădeanu<sup>3</sup>, M. Hedeşiu<sup>2</sup>*

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### **Abstract:**

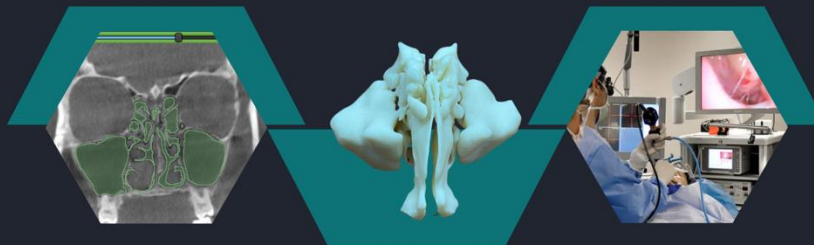
**Aims:** Construct a novel three-dimensional model of the paranasal sinuses for the purpose of training in functional endoscopic sinus surgery.

**Materials and Methods:** The data from the CBCT scan was exported as an STL (stereolithography) file and then processed for 3D printing. An industrial-grade printer was selected, using ABS for the actual model and a soluble material for the support and anchor walls, with a layer thickness of 0.1778 mm and a tolerance of 0.01 mm. The use of soluble support material is critical for the quality of the part as it allows the final processing and removal of support without any mechanical stress which allows the preservation of small details and complex surfaces.

**Results:** A high-fidelity functional model of the sinuses was successfully obtained and tested in an educational setting.

**Conclusion:** The acquisition of surgical skills is moving from the operating room to the laboratory. Our method resulted in a precision three-dimensional endoscopic sinus model ideal for surgical training and educational purposes.

## A novel 3-dimensionally printed paranasal sinus surgical model



The acquisition of surgical skills is moving from the operating room to the laboratory. Our method resulted in a precision three-dimensional endoscopic sinus model ideal for surgical training and educational purposes.



# A Meta-Analysis Of The Correlation Between Bone Density And Primary Implant Stability

R.H. Putra<sup>1</sup>, U. Cooray<sup>2</sup>, A.S. Nurrachman<sup>1</sup>, N. Yoda<sup>3</sup>, D.K. Putri<sup>1</sup>, E.R. Astuti<sup>1</sup>

<sup>1</sup>Universitas Airlangga, Department of Oral and Maxillofacial Radiology, Surabaya, Indonesia, <sup>2</sup>Tohoku University, Division of International and Community Oral Health, Sendai, Japan, <sup>3</sup>Tohoku University, Division of Advanced Prosthetic Dentistry, Sendai, Japan

**Abstract:**

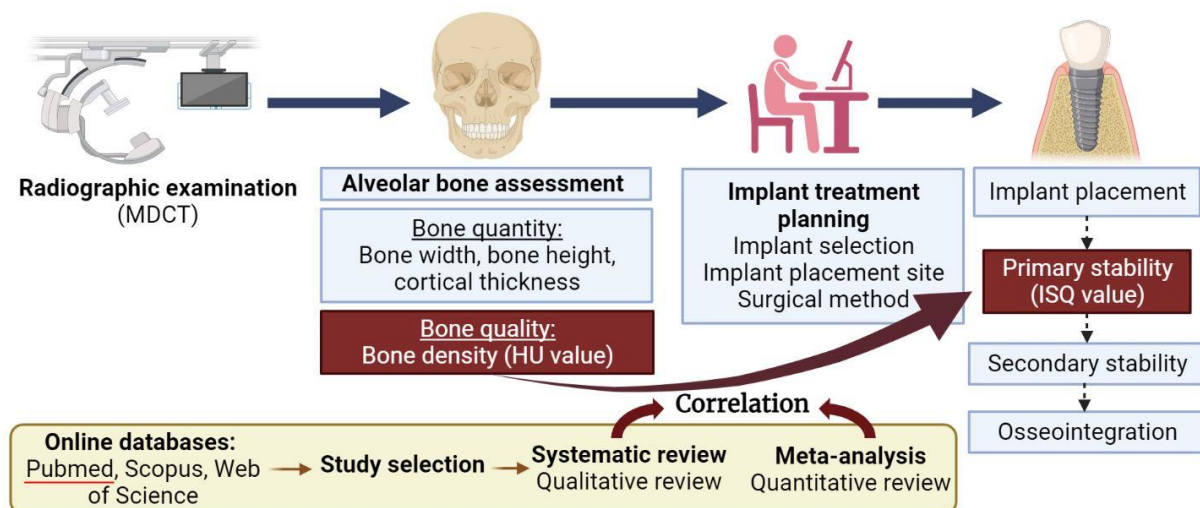
**Aims:** To systematically review and quantitatively analyze the correlation between alveolar bone density at implantation site and the primary implant stability using meta-analysis.

**Materials and Methods:** An electronic literature search was conducted on the PubMed, SCOPUS, and Web of Science databases for papers published between January 2011 and February 2022. The Quality Assessment in Prognostic Studies (QUIPS) tool was used to assess the risk of bias. Meta-analyses were conducted to calculate the estimated average correlation coefficient based on a multilevel random-effects model. The alveolar bone density was determined by bone density assessment using MDCT in Hounsfield unit (HU) as a predictive factor, whereas Implant Stability Quotient (ISQ) was used for PIS as the outcome variable.

**Results:** Six studies, consisting of three prospective cohort studies and three retrospective cohort studies, were included in this review. These studies showed medium to high risk of bias. A total of 877 implants placed in 299 subjects were analyzed. All of the included studies were evaluated using meta-analysis. The bone density in HU was significantly correlated with the ISQ ( $r=0.34$ ; CI 95% 0.22 – 0.44;  $P<0.001$ ).

**Conclusion:** Bone density is significantly associated with PIS. This indicates that implant placement in poor bone density can lead to low PIS. The modification of treatment planning and surgical procedures might be needed to avoid poor osseointegration.

## A Meta-analysis of the correlation between bone density and primary implant stability



# Efficacy Of Cone-Beam Computed Tomography-Derived Skull Models Fabricated By Three-Dimensional Printers At Different Cost Levels

X. Wang<sup>1</sup>, S. Shujaat<sup>1</sup>, E. Shaheen<sup>1</sup>, E. Ferraris<sup>1</sup>, R. Jacobs<sup>1</sup>

<sup>1</sup>KU Leuven, Leuven, Belgium

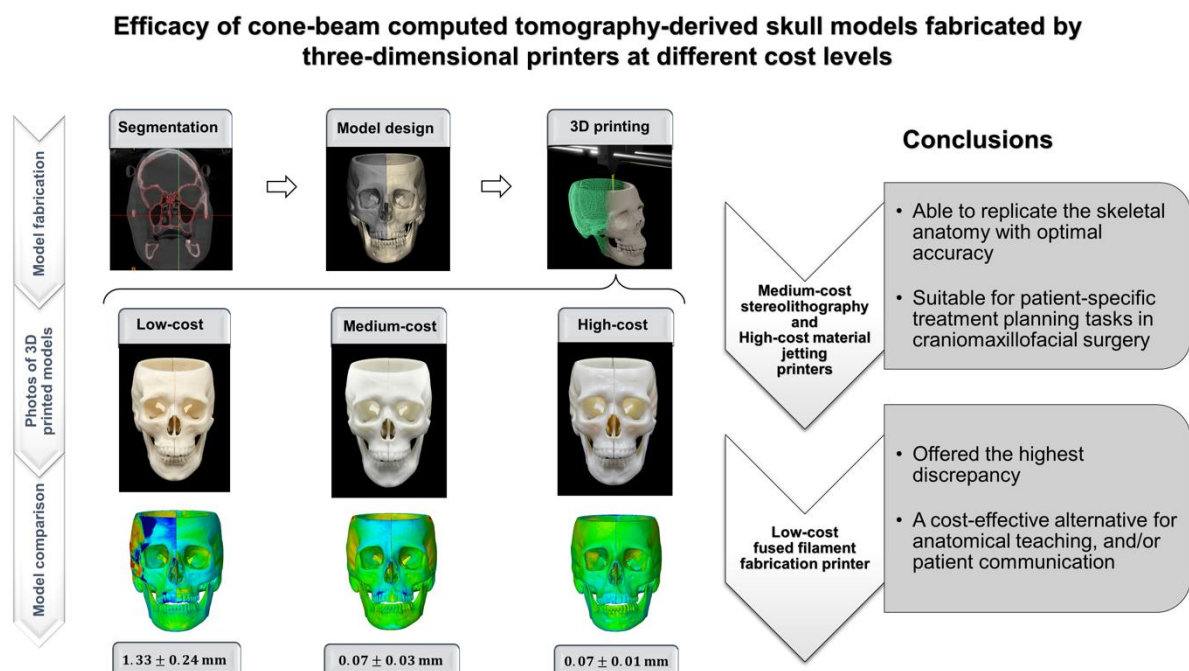
## Abstract:

**Aims:** Three-dimensional (3D) printing is a novel innovation in the field of craniomaxillofacial surgery, however, lack of evidence exists related to the comparison of the efficacy of skull models fabricated using printers belonging to different cost segments. A study was performed to investigate the efficacy of cone-beam computed tomography (CBCT)-derived skull models fabricated using different technology based low-, medium-, and high-cost 3D printers.

**Materials and Methods:** Following the segmentation of a patient's skull, the model was printed by: i) a high-cost material jetting printer; ii) a medium-cost stereolithography printer; and iii) a low-cost fused filament fabrication printer. The fabricated models were later scanned by industrial CT and superimposed onto the reference model by applying surface-based registration. A part comparison color-coded analysis was conducted for assessing the difference between the reference and scanned models.

**Results:** The model printed with the low-cost fused filament fabrication printer showed the highest mean absolute error ( $1.33 \pm 0.24$  mm), whereas both medium-cost stereolithography-based and the high-cost material jetting models had an overall similar dimensional error of  $0.07 \pm 0.03$  mm and  $0.07 \pm 0.01$  mm, respectively. Overall, the models printed with medium- and high-cost printers showed a significantly ( $p < 0.01$ ) lower error compared to the low-cost printer.

**Conclusion:** Both medium-cost stereolithography and high-cost material jetting based printers, were able to replicate the skeletal anatomy with optimal accuracy, which might be suitable for patient-specific treatment planning tasks in craniomaxillofacial surgery. In contrast, the low-cost fused filament fabrication printer could act as a cost-effective alternative for anatomical teaching, and/or patient communication.



## Maxillofacial Inflammations Visualised With Ultrasonography. Description Of The Imaging Features And Characteristics

A. Delantoni<sup>1</sup>, V. Rafailidis<sup>2</sup>, A. Sarafopoulos<sup>2</sup>, N. Giannouli<sup>2</sup>

<sup>1</sup>Aristotle University of Thessaloniki, Dentoalveolar Surgery, Implant Surgery and Radiology, Thessaloniki, Greece,

<sup>2</sup>AHEPA University Hospital, Department of Clinical Radiology, Thessaloniki, Greece

### Abstract:

**Aims:** Inflammations of the maxillofacial regions are a frequent occurrence. They are usually of odontogenic origin, but a maxillofacial swelling could also be of non odontogenic origin. Their clinical presentation is worrisome for the patient, present as swellings of the region with rapid and significant expansion to adjacent areas, due to the thin and delicate nature of the regional soft tissues.

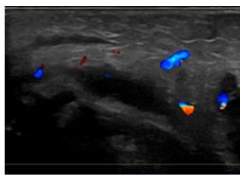
**Materials and Methods:** The characteristic features are discussed upon the presentation of a case series of most types of inflammations seen in the region.

**Results:** In most emergency departments, ultrasound is readily accessible, and typically constitutes the first-line imaging modality for this entity. Nevertheless, the role of ultrasound is limited in cases with deep extension of the inflammation, in which cases cross-sectional imaging with CT or MRI will be opted. This manuscript aims to present the characteristic features of various inflammatory conditions of the maxillofacial area on ultrasonography.

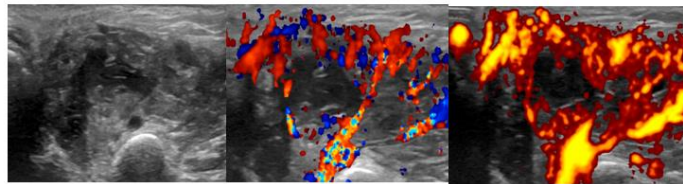
**Conclusion:** Though maxillofacial inflammations are often treated without imaging in their initial phase, ultrasound can provide a cheap and easy to use and readily available alternative to best visualize the characteristics and expansion patterns of the lesions based on their origin and area of initial presentation.

### Maxillofacial inflammations visualized with ultrasonography. Description of the imaging features and characteristics

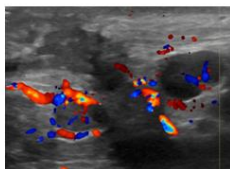
The aim of this study is to review the literature on the use of ultrasonography in the assessment of the differential diagnosis of odontogenic infections and their imaging characteristics in the facial region. The typical and non typical features will be presented. This is of high significance since in many cases they expand to facial structures and tissues and can be easily misdiagnosed by doctors of many specialties.



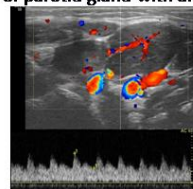
**Periapical Abscess.** A well-defined avascular anechoic cavity, with thickened hypoechoic wall can be seen adjacent to mandible.



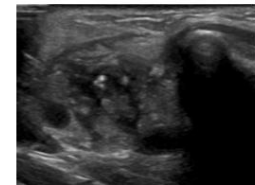
**Intraparotid abscess.** Enlargement and heterogeneity of parotid gland with an avascular anechoic area.



**Odontogenic abscess in the submandibular region.** Hypoechoic heterogeneous avascular lesion extending from the surface of the mandible to the surface of skin. Note the peripheral hyperaemia.



**Reactive lymphadenopathy.** Enlarged lymph nodes with fatty hilum and hypervascularity.



**Intraparotid abscess with sialolithiasis.** Hyperechoic foci represent sialoliths.

# Can Smartphone Applications Become The Standard In Future Facial Scanning? An Accuracy Comparison Study.

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<sup>1</sup>KU Leuven, Oral and Maxillo-facial Surgery - Imaging & Pathology (OMFS-IMPATh), Leuven, Belgium, <sup>2</sup>University Hospitals Leuven, Department of Oral and Maxillofacial Surgery, Leuven, Belgium

## Abstract:

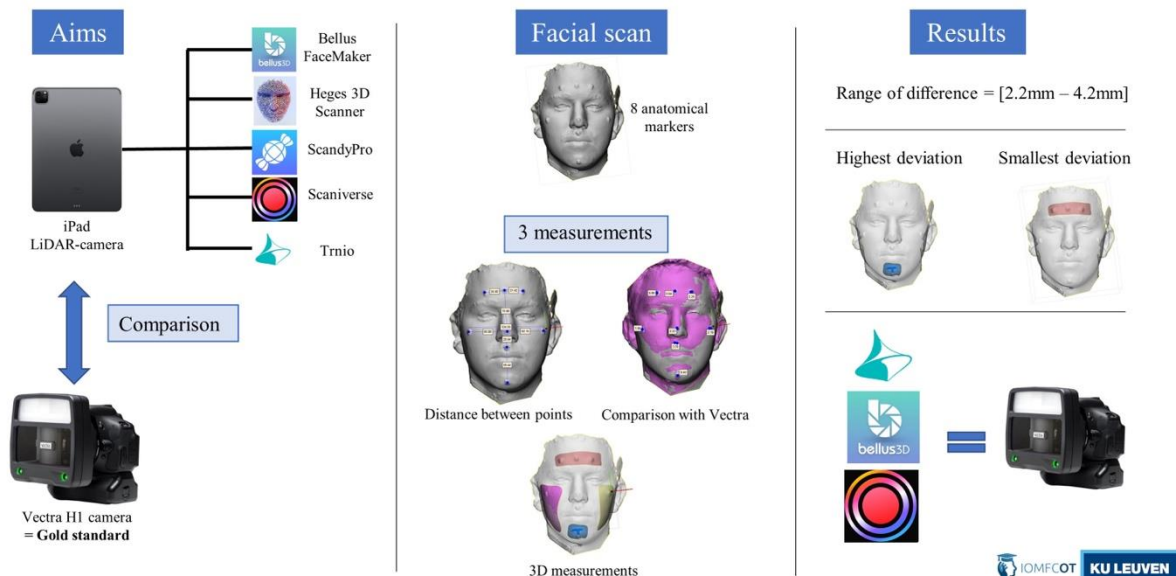
**Aims:** To compare the accuracy of three-dimensional (3D) facial scans captured by a smartphone applications with a clinically approved portable stereophotogrammetry device.

**Materials and Methods:** Morphometric markers were placed on 8 points on the face of fifty participants. Facial 3D scans were captured with a LiDAR camera on a iPad Pro using 5 smartphone applications (Heges 3D Scanner, Bellus FaceMaker, ScandyPro, Scaniverse and Trnio) and a stereophotogrammetric 3D Vectra H1 camera. The standard triangle language (stl.) format of the smartphone facial scans were automatically surface-based spatially aligned on the 3D Vectra H1 stl. of the corresponding participant. Linear and 3D measurements were performed in 3-Matic software.

**Results:** A significant difference in the linear distance was found between the morphometric points of the Heges 3D scanner ( $3.4 \pm 1.5$  mm) and ScanyPro ( $4.4 \pm 2.1$  mm), and Vectra H1. The Bellus FaceMaker ( $2.2 \pm 1.2$  mm) and Trnio ( $2.9 \pm 1.5$  mm) obtained the smallest linear differences compared with the gold standard. Similar findings were obtained for the 3D analysis, only the Hedges 3D scanner and ScandyPro showed a significantly ( $p < 0.001$ ) larger volume compared to Vectra H1 for all measured anatomical regions. The smallest deviation was seen for the chin and forehead in all applications.

**Conclusion:** From the five tested smartphone applications , three are not statistical significantly different from the gold standard stereophotogrammetry in healthy subjects. This provides opportunities for bedside 3D facial scanning of patients.

## Can smartphone applications become the standard in future facial scanning? An accuracy comparison study





## Qualitative Comparison Of 3D Face Scanners

L. Xu<sup>1,2,3,4</sup>, T. Jindani<sup>1,2</sup>, R. Ponbuddhich<sup>1,2</sup>, C. Massant<sup>1,2</sup>, R. Jacobs<sup>1,2,5</sup>

<sup>1</sup>KU Leuven, OMFS IMPATH Research Group, Department of Imaging and Pathology, Faculty of Medicine, Leuven, Belgium, <sup>2</sup>University Hospitals Leuven, Department of Oral and Maxillofacial Surgery, Leuven, Belgium, <sup>3</sup>Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Department of Stomatology, Wuhan, China, <sup>4</sup>Hubei Province Key Laboratory of Oral and Maxillofacial Development and Regeneration Wuhan, Wuhan, China, <sup>5</sup>Karolinska Institute, Department of Dental Medicine, Stockholm, Sweden.

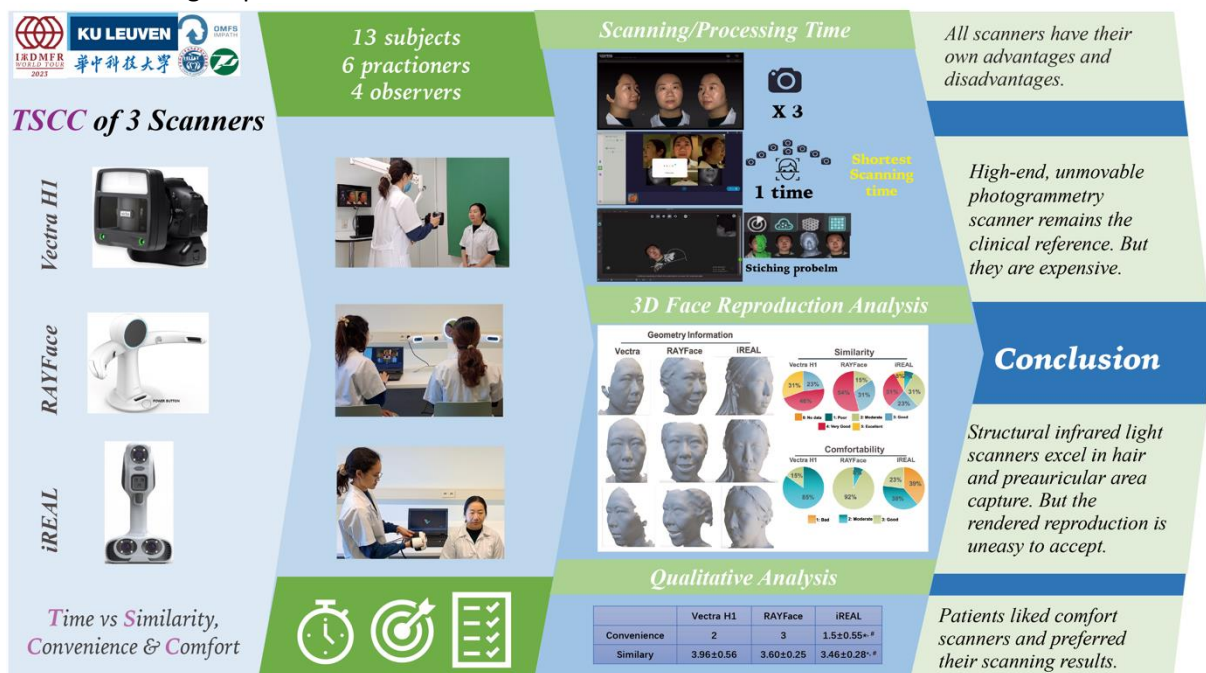
### Abstract:

**Aims:** Facial morphology and analysis are very critical in various disciplines of dentistry. Modern technologies overcame the limitations of direct anthropometry and 2D photography. Here, we focused on three kinds of professional-level facial scanners and evaluated their working time, similarity, convenience, and comfort.

**Materials and Methods:** Inclusion: Participants with an adult age range of 18-50 years. Exclusion: Participants who have facial deformities and have less compliance to be able to sit still. Face scan obtained by Vectra H1 (Canfield, New Jersey, USA), RAYFace (Raymedical, Gyeonggi-do, South Korea) and iReal 2E color 3D scanner (3D-scantech, Hangzhou, China). Seven practitioners received hands-on training of three scanners by one expert, and completed 3 times scanning of the same volunteer as well as a questionnaire related to convenience. Volunteers completed a questionnaire related to similarity and comfortability after the scanning. One-way ANOVA and Turkey test were adopted to evaluate.

**Results:** Thirteen volunteers were enrolled. The scanning/processing time was within 3 minutes for all scanners. The scanning time for RAYFace is the shortest. Vectra H1 might have a stitching problem that prolonged the processing time. The most accurate scanner for both subjects and observers was Vectra H1. RAYFace was recognized as the most comfortable. Volunteers' acceptance of iREAL varied obviously. RAYFace was recognized as the most convenient scanner.

**Conclusion:** Photogrammetry technology is convenient and comfortable while limiting hair and preauricular area capture. Structure light excels in details but needs longer scanning time. Our results offer clinicians an integrated understanding of the current face-scanning methods during the clinical decision-making step.



## Detection Of Carotid Calcifications In Cone Beam Computed Tomography Utilizing deep Learning Convolutional Neural Network Image Segmentation Approach

S. Alajaji<sup>1</sup>, R. Amarin<sup>1</sup>, R. Masri<sup>1</sup>, T. Tavares<sup>2</sup>, V. Kumar<sup>1</sup>, J.B Price<sup>1</sup>, A.S Sultan<sup>1</sup>

<sup>1</sup>University of Maryland Baltimore, Baltimore, United States, <sup>2</sup>UT Health San Antonio, San Antonio, United States

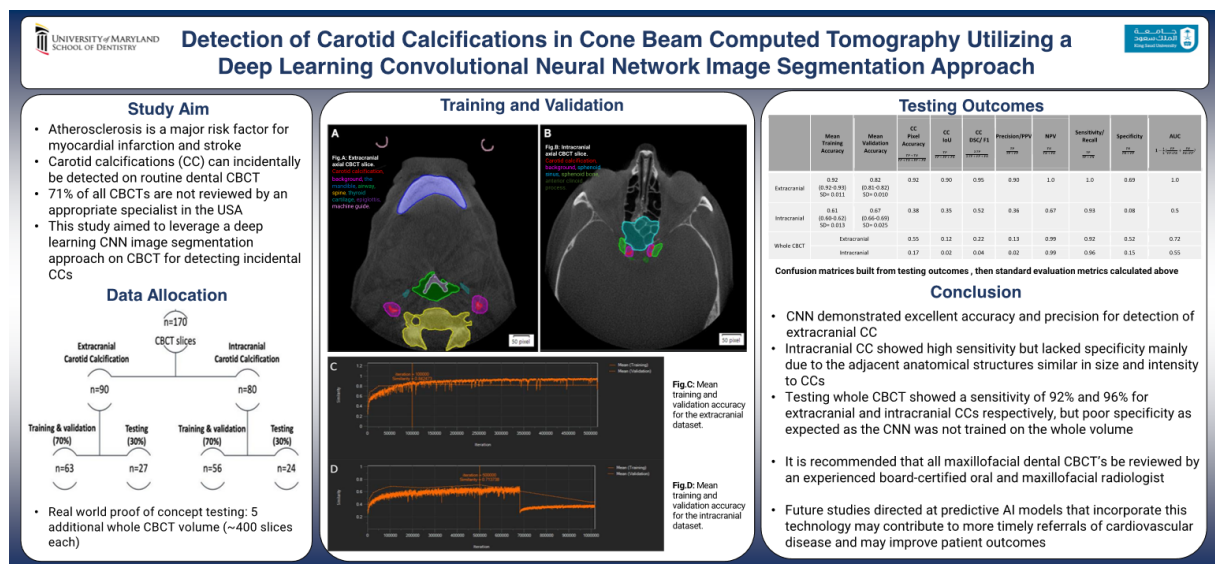
### Abstract:

**Aims:** Atherosclerosis is a major risk factor for myocardial infarction and stroke. Carotid calcifications (CC), a reliable indicator of future myocardial infarction and stroke, can incidentally be detected on head and neck cone beam computed tomography (CBCT) during routine dental visits. CBCT can identify and quantify calcifications as small as 1mm<sup>3</sup> and even mild calcifications are proven to be associated with significant coronary artery disease. This study aimed to leverage an artificial intelligence (AI) deep learning convolutional neural network image segmentation approach to detect incidental CC on CBCT images.

**Materials and Methods:** Transfer learning via a U-Net based neural network architecture was utilized. A total of 138 axial CBCT images were included and distributed as 60% training, 10% validation, and 30% testing.

**Results:** Mean training and validation accuracy for extracranial image segmentation was 92% and 82%, respectively. Pixel testing accuracy for extracranial CC was 92%, with an area under the curve (AUC) of 1.0, a sensitivity of 100%, and a specificity of 69%. Intracranial CC detection had a sensitivity of 93%, AUC of 0.5, and a specificity of 8%.

**Conclusion:** The deep learning model showed excellent sensitivity for the detection of extracranial and intracranial CC. The findings of this study highlight the potential to utilize AI methods for medical image analysis. The findings also demonstrate how AI can alert the clinician to discovery of serious incidental pathology and the potential to enhance early detection of future cardiovascular complications.



# Deep Learning Algorithm For Detecting And Classifying Ductopenic Salivary Parotid Glands In Sialo-CBCT Images

T. Amiel<sup>1</sup>, E. Halle<sup>2</sup>, T. Segal<sup>2</sup>, A. Prives<sup>2</sup>, T. Yeshua<sup>2</sup>, N. Keshet<sup>1</sup>, M. Alterman<sup>3</sup>, A. Rettman<sup>1</sup>, D.J. Aframian<sup>1</sup>, C. Nadler<sup>1</sup>

<sup>1</sup>Faculty of Dental Medicine, Hebrew University of Jerusalem, Israel, Department of Oral Medicine, Sedation and Imaging, Hadassah Medical Centre, Jerusalem, Israel, <sup>2</sup>Jerusalem College of Technology, Department of Applied Physics, Jerusalem, Israel, <sup>3</sup>Faculty of Dental Medicine, Hebrew University of Jerusalem, Israel, Department of Oral and Maxillofacial Surgery, Hadassah Medical Center, Jerusalem, Israel

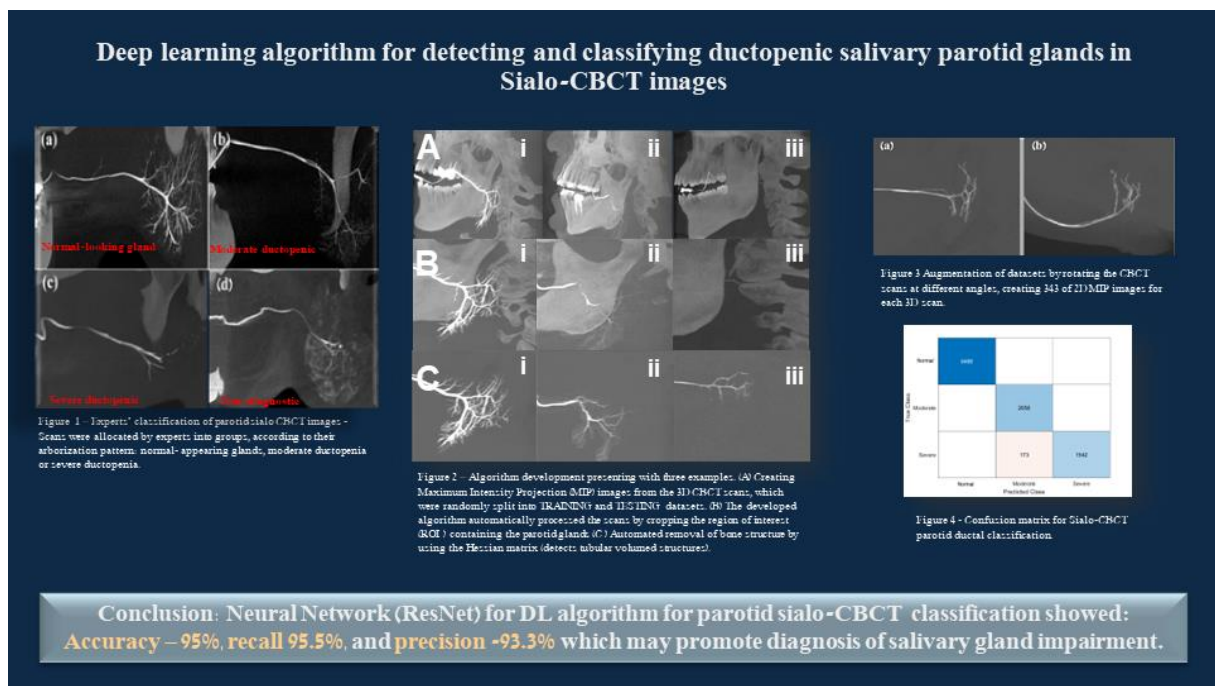
## Abstract:

**Aims:** Ductopenia, manifested as diminished number of glandular ducts in parotid Sialo-CBCT scans, is considered to be a radiographic pattern related to salivary gland impairment. The aim of this study was to develop a deep learning (DL) approach for classifying ductopenic versus normal parotid glands architecture in Sialo-CBCT imaging.

**Materials and Methods:** This retrospective study included Sialo-CBCT scans of 70 parotid glands of patients with symptoms of dry mouth. All scans were allocated by maxillofacial experts according to their arborization pattern into three groups: normal-appearing glands (n=30), moderate ductopenia (n=25) or severe ductopenia (n=15). For training the DL algorithm, scans were randomly split into training (n=45) and testing (n=25) datasets. The developed algorithm automatically cropped the volume containing the parotid glands and removed the adjacent bone structures. Then, the datasets were augmented by rotating the CBCT scans at different angles, creating hundreds of 2D maximum intensity projection images for each 3D scan. For classifying the parotid glands, a residual neural network (ResNet) was trained and tested on the datasets.

**Results:** The algorithm was able to remove the adjacent bone structures in 93% of the cases. The accuracy, recall, and precision of the DL algorithm for classifying sialo-CBCT parotid gland images, were 95%, 95.4% and 93.3%, respectively.

**Conclusion:** We developed highly accurate DL-based algorithm for detecting and classifying ductopenic parotid gland which may have a prognostic impact on the diagnosis of salivary gland impairment.



# Pediatric Temporomandibular Joint Segmentation In Magnetic Resonance Images With Machine Learning

R. Azma<sup>1</sup>, M. Li<sup>2</sup>, A. Harendranathan<sup>1</sup>, J. Jaremko<sup>1</sup>, F. T. Almeida<sup>1</sup>

<sup>1</sup>University of Alberta, Edmonton, Canada, <sup>2</sup>Wuhan University, Wuhan, China

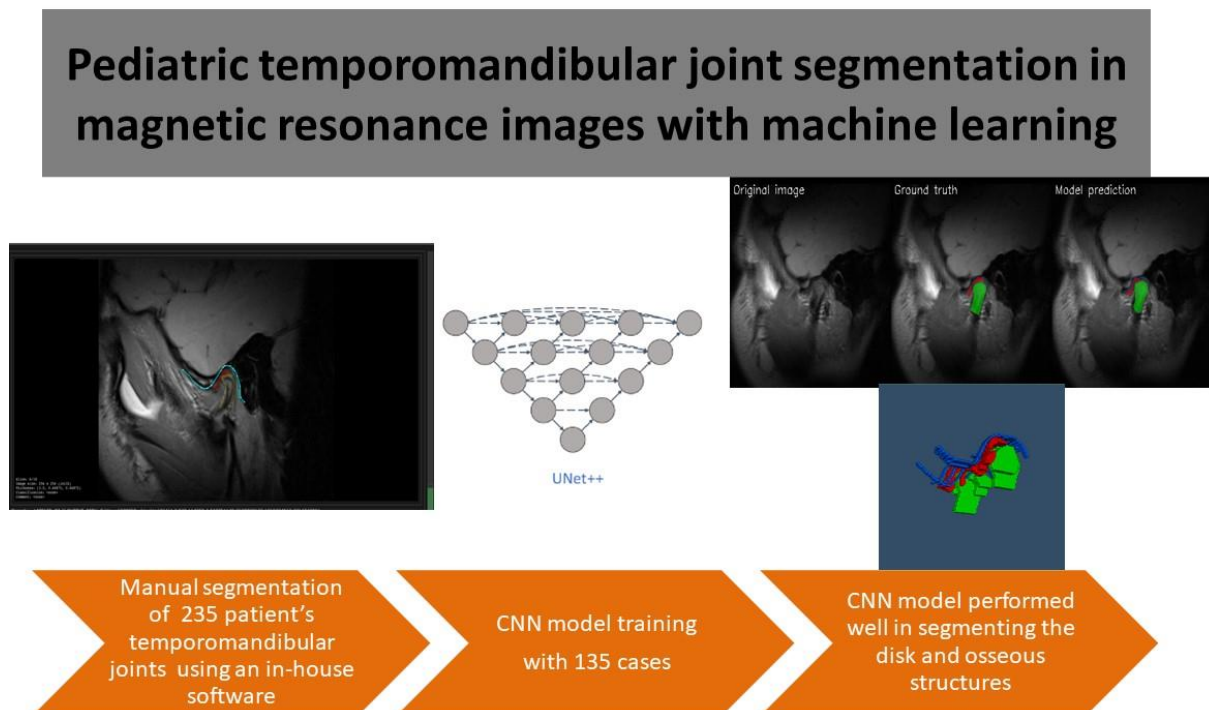
## Abstract:

**Aims:** Temporomandibular joint disorders are functional disorders that affect the components of TMJ. It affects around 7-11% of healthy adolescents and 39-78% of juvenile rheumatoid arthritis children. MRI, which is considered the standard imaging diagnosis suffer from poor spatial resolution and poor definition of osseous structures contour and disk, requiring expert interpretation of the images. In this study, we applied a convolutional neural networks (CNN) to delineate mandibular condyle, articular eminence, and TMJ disc in MRI images.

**Material and Methods:** After segmentation of 235 pediatric patients (470 joints) by a pediatric radiologist and classifying them as dislocated and non dislocated disk, the Unet ++ CNN model was trained on MRI images from 135 patients and tested on images from 100 patients using 2D slices and 3D volume as input, respectively. The accuracy of the model was then compared with that of the rater (pediatric radiologist) to evaluate the performance of the model.

**Results:** The mean age was  $14.6 \pm 0.13$  SD (Female: 58%). 19% of 470 disks were anteriorly dislocated. Unet++ CNN model performed well in segmenting the 3 anatomical structures. A Dice coefficient of about 0.67 for the articular disc, 0.91 for the mandibular condyle, and a Hausdorff distance of about 2.8 mm for the articular eminence were achieved.

**Conclusion:** This study demonstrated the reliability of CNN-based segmentation model for identification of disk and osseous structures in pediatric TMJ. Further automatic diagnosis development would help clinicians in accurate diagnosis.





# Can Machine-Learning Predict The Likelihood Of Surgical Intervention And Post-Traumatic Complications In Patients With Orbital Fractures?

R. Bhattacharjee<sup>1</sup>, B. Namazi<sup>2</sup>, M. Nair<sup>3</sup>, M. Kesterke<sup>3</sup>, N. Mascarenhas<sup>3</sup>, L. Reddy<sup>3</sup>, G. Sankaranarayanan<sup>2</sup>, A. Read-Fuller<sup>3</sup>

<sup>1</sup>Alcon, Fort Worth, United States, <sup>2</sup>University of Texas Southwestern Medical Center, Surgery, Dallas, United States, <sup>3</sup>Texas A&M University School of Dentistry, Diagnostic Sciences, Dallas, United States

## Abstract:

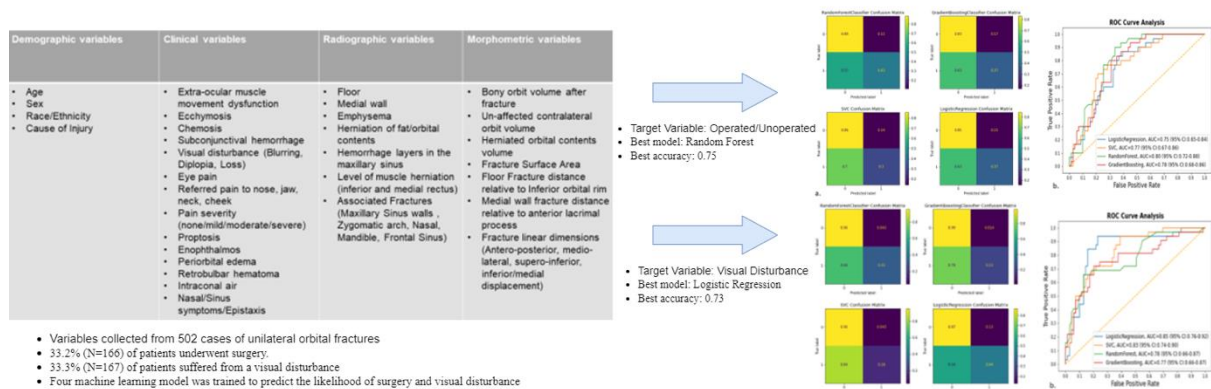
**Aims:** Management and the decision to surgically intervene in orbital fractures relies extensively on the individual judgement and experience of a craniomaxillofacial surgeon under the current standard of care. The objective of this study is to use machine learning to create a decision-making model for the likelihood of operating on orbital fractures and the likelihood of a patient experiencing visual disturbance.

**Materials and Methods:** This study retrospectively identified patients presenting to Baylor University Medical Center at Dallas for orbital fractures. Data collected from patient charts were classified into four broad categories: demographic, clinical, radiographic, and morphometric. The binary outcome operated/not-operated was one of the designated classification labels. Visual disturbances based on patient experiencing diplopia or blurring was the additional classification variable. Four classifiers were trained and compared based on accuracy and F1 score: logistic regression, support vector machine, random forest, and gradient boosting decision tree.

**Results:** We found that random forest outperformed other classifiers in predicting the likelihood of operation with the accuracy of the best classifier was 0.75 and the F1 was 0.51. In predicting visual disturbance, logistic regression outperformed others with accuracy of 0.73 and F1 of 0.51.

**Conclusion:** By utilizing 50 unique features associated with orbital fractures, the models were able to make predictions on the likelihood of patients undergoing surgery or having adverse symptoms with relative success. This approach has the potential to not only limit variability in craniofacial surgery decision-making but also limit the possible complications associated with over corrective surgery in orbital fracture repair.

## Can machine-learning predict the likelihood surgical intervention and post-traumatic complications in patients with orbital fractures?



## Ai-Assisted Radiographic Prediction Of Mandibular Third Molar Eruption

*S. Chopra<sup>1</sup>, M. Vranckx<sup>2,3</sup>, A. Ockerman<sup>2,3</sup>, P. Östgren<sup>4</sup>, C. Kruger-Weiner<sup>5,1</sup>, B. Lund<sup>1</sup>, D. Benchimol<sup>1</sup>, R. Jacobs<sup>3,2,1</sup>*

<sup>1</sup>Karolinska Institutet, Section of Oral Diagnostics and Surgery, Division Diagnostics and Rehabilitation, Department of Dental Medicine, Huddinge, Sweden, <sup>2</sup>University of Leuven, Department of Imaging and Pathology, Leuven, Belgium, <sup>3</sup>University hospital Leuven, Department of Oral and Maxillofacial Surgery, Leuven, Belgium, <sup>4</sup>Folktandvården Stockholm AB, Department of Oral and Maxillofacial Radiology, Stockholm, Sweden, <sup>5</sup>Folktandvården Stockholm AB, Department of Oral and Maxillofacial Surgery, Stockholm, Sweden

### Abstract:

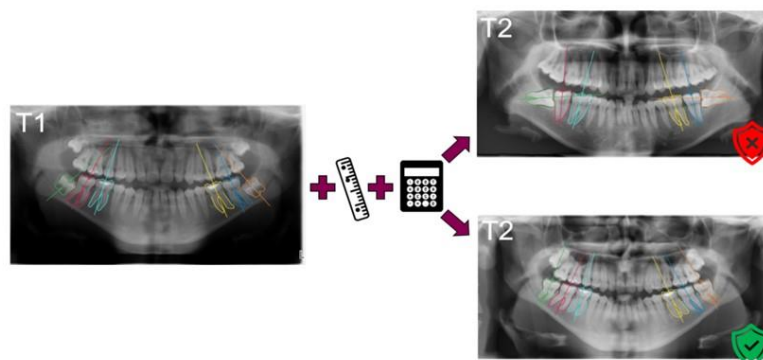
**Aims:** The study aimed to provide AI-assisted radiographic prediction of mandibular third molar eruption. A secondary aim was to study the incidence of full eruption of mandibular third molars with and without hygienic cleansability.

**Materials and Methods:** Panoramic images from a total of 771 patients fitted the inclusion criteria in a longitudinal follow-up (two time-points; T1 and T2) resulting in a total of 1542 analyzed panoramic radiographs. Apart from AI-based radiographic assessment of molar angulation, third molar eruption level, developmental stage and retromolar space were also assessed. Generalized linear mixed models with stepwise selection were applied to investigate the predictive value of retromolar space and molar angulations for third molar eruption. Descriptive statistics served to report the incidence of third molar eruption.

**Results:** Very few lower third molar fully erupt (14 %) and even less erupt with hygienic cleansability (< 2 %). A large retromolar space seems required to allow full third molar eruption with hygienic cleansability, but even in two third of the cases with sufficient retromolar space, the majority of third molars fail to erupt. Accurate models for predicting lower third molar uprighting based on its angulation and available retromolar space could be drawn.

**Conclusion:** The accurate models for predicting lower third molar uprighting based on its angulation and available retromolar space could assist clinicians and patients in their decision-making concerning early lower third molar removal.

## Radiographic prediction of lower third molar eruption



# Convolutional Neural Network-Driven Tool For Automated Segmentation Of Maxillary Alveolar Bone On Cone-Beam Computed Tomography Images

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<sup>1</sup>Katholieke Universiteit Leuven, Department of Imaging and Pathology, Leuven, Belgium, <sup>2</sup>University of Campinas, Department of Oral Diagnosis, Piracicaba, Brazil, <sup>3</sup>Pontifical Catholic University of Rio Grande do Sul, Department of Dentistry, Porto Alegre, Brazil, <sup>4</sup>Federal University of Goiás, Department of Dentistry, Goiânia, Brazil, <sup>5</sup>Relu BV, Leuven, Belgium, <sup>6</sup>Karolinska Institutet, Department of Dental Medicine, Stockholm, Sweden

## Abstract:

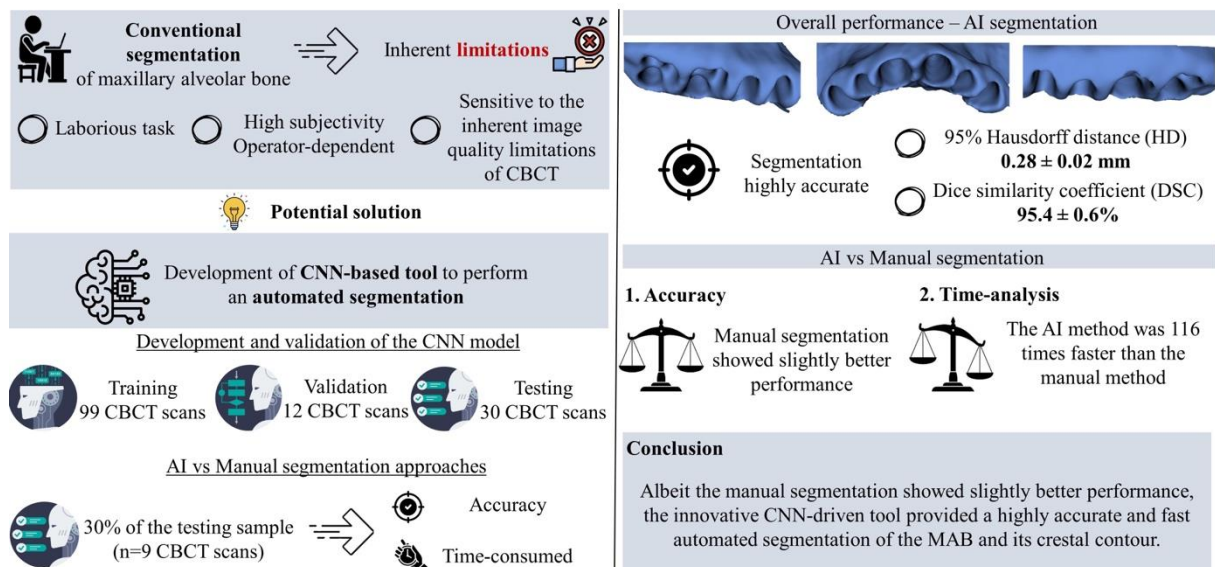
**Aims:** To investigate the accuracy and time-efficiency of an innovative convolutional neural network (CNN)-driven tool for automated segmentation of the maxillary alveolar bone (MAB) and its crestal contour on cone-beam computed tomography (CBCT) images.

**Materials and Methods:** A dataset of 141 CBCT scans was collected and randomly divided into the different development steps of the CNN model: training (n=99), validation (n=12) and testing (n=30). After the automated segmentation, the three-dimensional (3D) models with under or over-estimated segmentations were adjusted by an expert to generate a refined-AI (R-AI) 3D model. Then, the overall accuracy of CNN models was assessed by comparing the AI and R-AI models. Besides, 30% of the testing set was randomly selected, and the manual segmentation of the MAB was performed to compare its accuracy and time-consumed to the AI method.

**Results:** The CNN model provided a highly accurate segmentation of the MAB with low value of 95% Hausdorff distance (HD) ( $0.28 \pm 0.02$  mm) and high values of dice similarity coefficient (DSC) ( $95.4 \pm 0.6\%$ ). Nonetheless, the manual method (95% HD:  $0.20 \pm 0.05$  mm; DSC:  $97 \pm 2.0\%$ ) showed slightly better performance than the AI method (95% HD:  $0.27 \pm 0.03$  mm; DSC:  $96\% \pm 1.0\%$ ) ( $p < 0.05$ ). Regarding the timing analysis, the time consumed for the automated approach was  $51.5 \pm 10.9$  seconds (s), with a 116-fold decrease in time spent compared to the manual method ( $5973.3 \pm 623.6$ s) ( $p < 0.001$ ).

**Conclusion:** Albeit the manual segmentation showed slightly better performance, the innovative CNN-driven tool provided a highly accurate and fast automated segmentation of the MAB and its crestal contour.

## Convolutional neural network-driven tool for automated segmentation of maxillary alveolar bone on cone-beam computed tomography images



## Micro-Ct To Radiograph: Generating Top-Tier Carious Lesion Annotations

R. Gonzalez<sup>1</sup>, H. Marquering<sup>2</sup>, P. Mettes<sup>3</sup>, D. Vu<sup>1</sup>, L. Elenbaas<sup>1</sup>, B. Loos<sup>4</sup>, E. Berkhout<sup>1</sup>

<sup>1</sup>Academic Center for Dentistry Amsterdam (ACTA), Oral Radiology, Amsterdam, Netherlands, <sup>2</sup>Academic Medical Center - University of Amsterdam, Biomedical Engineering and Physics, Amsterdam, Netherlands, <sup>3</sup>University of Amsterdam, Faculty of Science - Informatic Institute, Amsterdam, Netherlands, <sup>4</sup>Academic Center for Dentistry Amsterdam (ACTA), Periodontology, Amsterdam, Netherlands

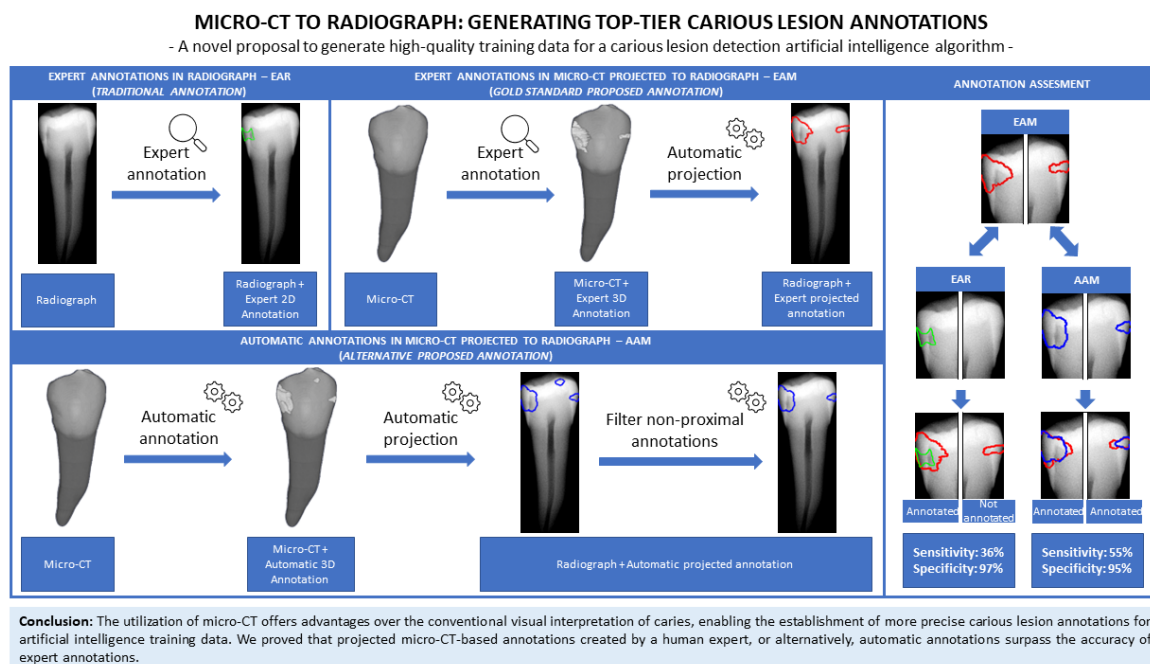
### Abstract:

**Aims:** Generate high-quality training data for a carious lesion detection artificial intelligence algorithm.

**Materials and Methods:** We generated carious lesion annotations by (1) obtaining a tooth micro-CT scan and conventional radiograph, (2) performing expert and automatic micro-CT carious lesion annotations, (3) projecting the micro-CT into a 2D simulated radiograph that matches the conventional radiograph, and (4) project the micro-CT annotations into carious lesion annotations on the radiograph. Our basic dataset consists of a sample of 62 teeth. In order to validate our processes we: (1) performed a qualitative assessment, by 3 experts, for our projection algorithm output; (2) measured the Jaccard coefficient similarity between our expert and automatic lesion annotations; and, (3) compared the sensitivity of expert annotations and automatic annotations, taking as reference the annotations coming from the expert micro-CT annotation.

**Results:** For the projection algorithm, the experts assessed that 85% of the simulated radiographs and conventional radiographs presented convenient similarity. Additionally, the Jaccard coefficient showed an average similarity of 46% between the automatic and expert annotations, with the automatic annotations mostly appearing within their corresponding expert annotations. Finally, our automatic annotation resulted in a sensitivity of 55%, whereas the dentists' annotations in radiographs resulted in a sensitivity of 36%.

**Conclusion:** The utilization of micro-CT offers advantages over the conventional visual interpretation of caries, enabling the establishment of more precise carious lesion annotations for artificial intelligence training data. We proved that projected micro-CT-based annotations created by a human expert, or alternatively, automatic annotations surpass the accuracy of expert annotations.





# Deep Learning Architecture For Radiographic Bone Loss

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<sup>1</sup>Universidad Nacional Mayor de San Marcos, Medico Surgical Stomatology, Lima, Peru, <sup>2</sup>Universidad San Martin de Porres, Master of Periodontology, Lima, Peru, <sup>3</sup>Universidad Nacional Mayor de San Marcos, Rehabilitation Stomatology, Lima, Peru, <sup>4</sup>Universidad San Martin de Porres, Specialty Oral and Maxillofacial Radiology, Lima, Peru, <sup>5</sup>Instituto de Diagnóstico Maxilofacial, Lima, Peru, <sup>6</sup>Universidad Nacional Mayor de San Marcos, Analysis and Design of Processes, Lima, Peru

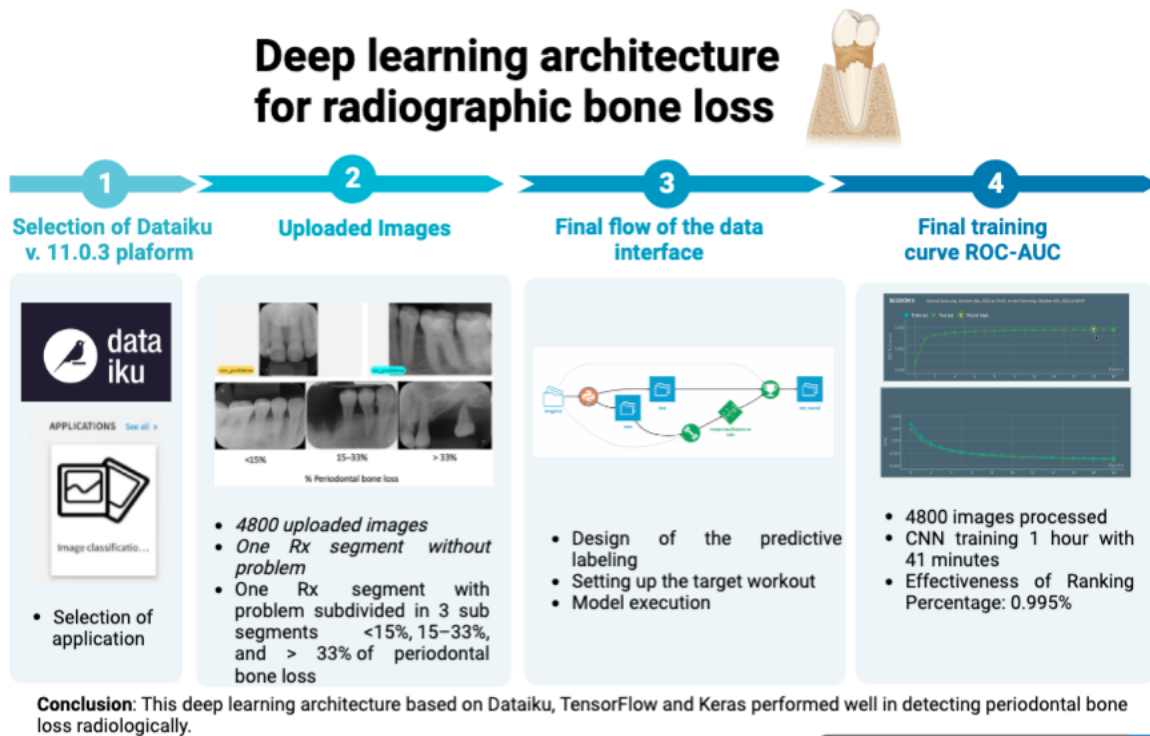
## Abstract:

**Aims:** The aim of this study was to establish a comprehensive and accurate radiological periodontal bone loss model based on digital intraoral radiographs.

**Materials and Methods:** A total of 4800 intraoral images were included, and 2 periodontists marked the key points needed to calculate the periodontal bone loss and the specific location and shape of the alveolar bone loss. A three-stage deep learning architecture based on Dataiku, TensorFlow and Keras was proposed and the percentage of periodontal alveolar bone loss was accurately calculated. The ability of the model to recognize these feature was evaluated.

**Results:** The model showed perfect accuracy for the validation data with ROC-AUC values of 0.995%.

**Conclusion:** This deep learning architecture based on Dataiku, TensorFlow and Keras performed well in detecting periodontal bone loss.



# Numbering Of Impacted Mandibular Third Molars Using Artificial Intelligence On Panoramic Radiographs

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<sup>1</sup>Bezmialem Vakif University Faculty of Dentistry, Oral and Maxillofacial Radiology, Istanbul, Turkey, <sup>2</sup>Eskisehir Osmangazi University Faculty of Dentistry, Oral and Maxillofacial Radiology, Eskişehir, Turkey, <sup>3</sup>Eskisehir Osmangazi University, Department of Mathematics and Computer Science, Faculty of Science, Eskişehir, Turkey

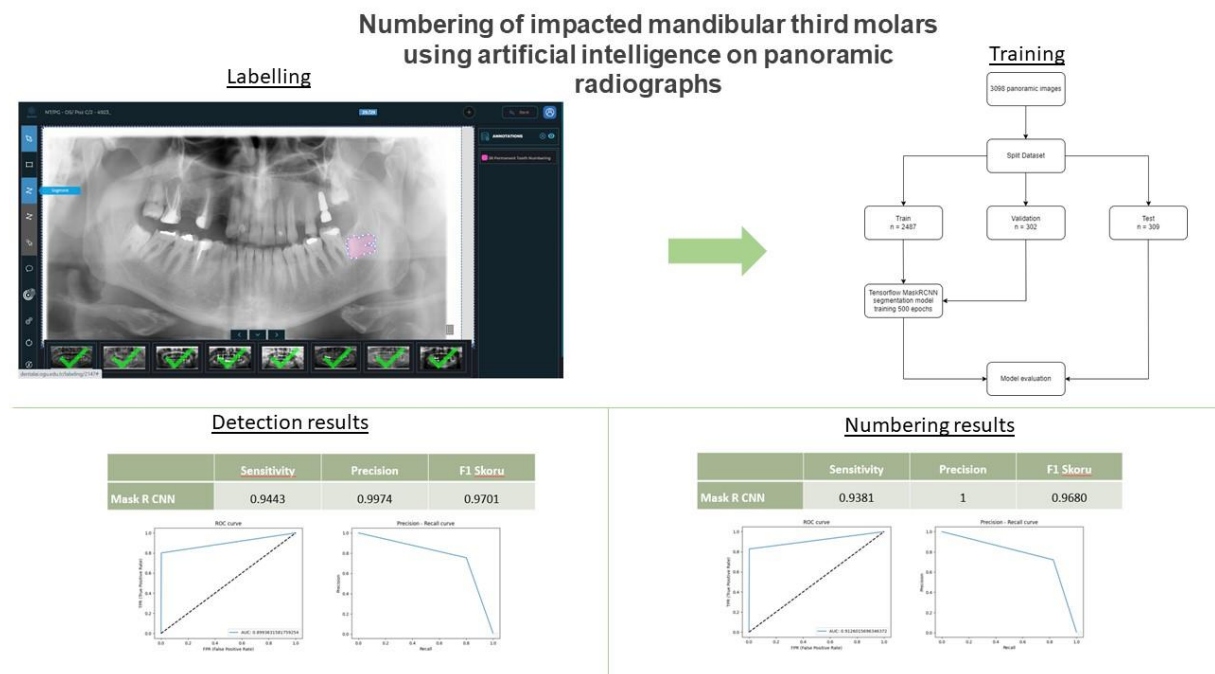
## Abstract:

**Aims:** Artificial intelligence technologies have started to play significant roles in our lives with an increasing impact within the last few years. In this regard, new developments are also experienced rapidly in the fields of dentistry and maxillofacial radiology. In our study, it was aimed to automatically detection and numbering the mandibular third molar teeth, which is the most frequently impacted tooth, with a model based on artificial intelligence and deep learning.

**Materials and Methods:** Labeling of teeth on images was done using CranioCatch labeling software (CranioCatch, Eskişehir, Turkey). Models were developed for the impacted tooth detection and numbering. Teeth 38 and 48 were labeled on 3098 panoramic images for detection and numbering. Labeled data were used for impacted tooth detection and numbering studies. The achievements of the Mask R CNN models developed for these tasks were calculated using the confusion matrix.

**Results:** The sensitivity, precision and F1 score values of the Mask R CNN model are consecutively; in detection 0.9443, 0.9974, 0.9701 and in impacted tooth numbering 0.9381, 1, 0.9680 was found.

**Conclusion:** Deep learning models have been developed based on the results of our study; their performances detecting and numbering impacted teeth seem promising. Thanks to increasing number of the studies in this field, artificial intelligence applications based on deep learning can play a role in clinical practice and support physicians.



# Artificial Intelligence-Assisted Design Of Removable Partial Dentures

H. Ma<sup>1</sup>, Q. Chen<sup>2</sup>, H. Bai<sup>2</sup>

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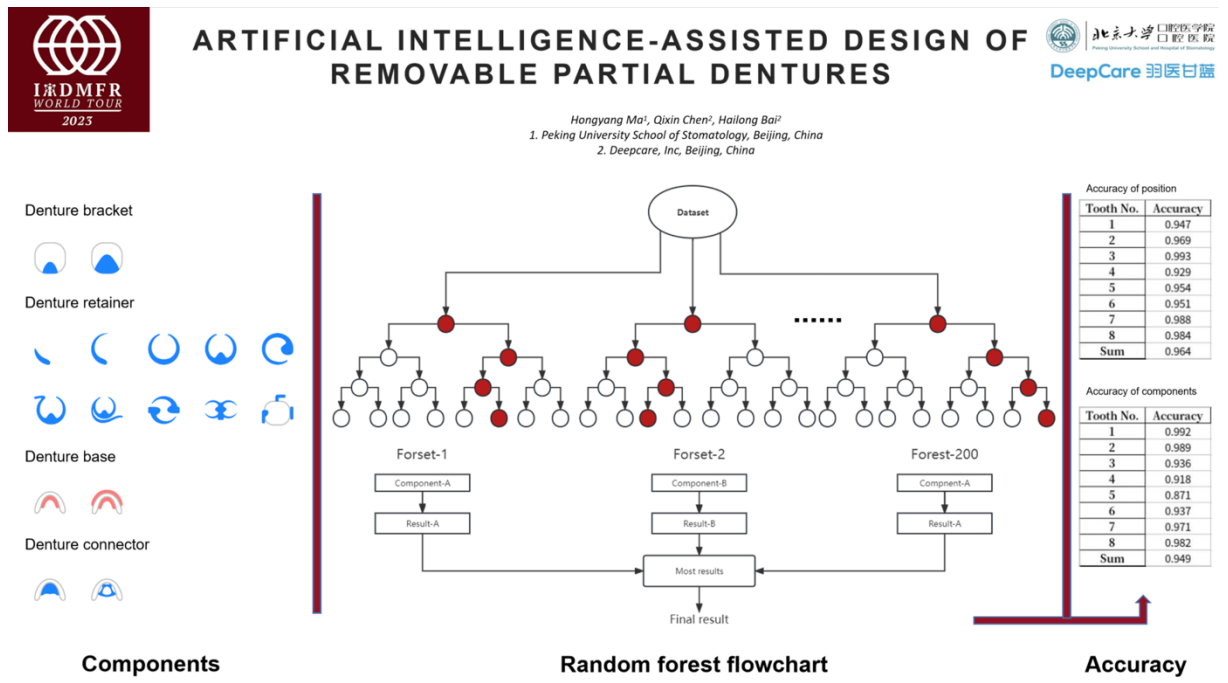
## Abstract:

**Aims:** This project aims at the design of a removable partial denture, constructs a digital removable partial denture design scheme data set, develops an artificial intelligence algorithm based on deep learning, and automatically generates a removable partial denture design scheme to fit the patient according to the oral condition of the patient with tooth loss.

**Materials and Methods:** The data set is based on 2681(4331 cases) patients from Peking University School of Stomatology (Training set: 2206 patients, 3,561 cases; Validation set: 240 patients, 390 cases; Test set: 235 patients, 380 cases). The health condition of each tooth of the patient, including healthy, missing, or disease condition. The removable denture components installed on each tooth of the patient, including 11 types of retainers and 2 types of brackets, and the orientation of the components on each tooth. The health condition of each tooth is quantified and divided into 5 groups. The trained random forest models were used separately to predict the information of the mounted components on each tooth individually. The trained random forest models were then used to predict the mounting orientation of each predicted component individually.

**Results:** For consistency verification performance, the accuracy of component characteristics and component position prediction is 0.949 and 0.964 separately.

**Conclusion:** This research successfully developed the AI-assisted design system for removable partial dentures, which can automatically generate a removable partial denture design for a patient with a dental defect based on the oral condition and multimodal information, and built the data set of the digital removable partial denture design scheme.



# Classification Model Optimization For Dental Pathology Recognition On Small Panoramic Radiography Datasets

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<sup>1</sup>Iuliu Hațieganu University of Medicine and Pharmacy, Department of Oral and Maxillofacial Surgery and Radiology, Cluj-Napoca, Romania, <sup>2</sup>Babes-Bolyai University, Faculty of Mathematics and Computer Science, Department of Computer Science, Cluj-Napoca, Romania

## Abstract:

**Aims:** Develop an artificial intelligence model for the purpose of automated tooth segmentation and lesion detection on panoramic x-rays images and investigate strategies for dealing with small datasets.

**Materials and Methods:** The anonymized panoramic radiographs were labeled by two examiners for several dental situations: prosthetic restoration (crown or pontic), implant, dental filling, endodontic treatment, caries, apical periodontitis, bone loss, impacted tooth, and root fragment. A bi-model approach was developed by combining tooth segmentation and tissue classification models. For the segmentation step, a custom U-Net model was trained. After producing segmentation masks for all samples, the bounding boxes of individual teeth were identified by applying a binary threshold. Knowing the bounding box coordinates for all teeth, the corresponding patches were extracted from the original panoramic image and the annotated lesion mask and used to classify the tissue corresponding to that patch only.

**Results:** The results were aggregated and a prediction for the entire panoramic radiograph was provided. Our classification model predicted lesion tissue with an overall accuracy of 98.82% and a precision of 75.17%.

**Conclusion:** The preliminary results of our study show a promising approach for training artificial intelligence models on smaller medical imaging datasets. More research is needed to validate the model for individual dental situations.

**CLASSIFICATION MODEL OPTIMIZATION FOR DENTAL PATHOLOGY RECOGNITION ON SMALL PANORAMIC RADIOGRAPHY DATASETS**

**Bi-Model approach**

- Segmentation model
- Classification model

- Accuracy 98.82%
- Precision 75.17%

The preliminary results of our study show a promising approach for training artificial intelligence models on smaller medical imaging datasets.



# A Tissue Segmentation System For Us Facial Images Combining Crowdsourcing And Machine Learning

L. Oliveira<sup>1</sup>, M. Moran<sup>1,2</sup>, C. Canella<sup>2</sup>, L. Bastos<sup>1</sup>, G. Giraldi<sup>3</sup>, A. Conci<sup>2</sup>

<sup>1</sup>Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil, <sup>2</sup>Universidade Federal Fluminense, Niterói, Brazil, <sup>3</sup>Laboratório Nacional de Computação Científica, Petrópolis, Brazil

## Abstract:

**Aims:** Ultrasonography (US) has demonstrated many advantages in the detection, characterization, and monitoring of oral-facial diseases. Through high-frequency probes, it is possible to visualize and characterize the facial anatomical layers, which can help in several facial and oral procedures. However, the visual identification of tissues in this type of image is still a challenge for some professionals. In this work, we developed a tissue segmentation system for US facial images combining crowdsourcing and machine learning (ML).

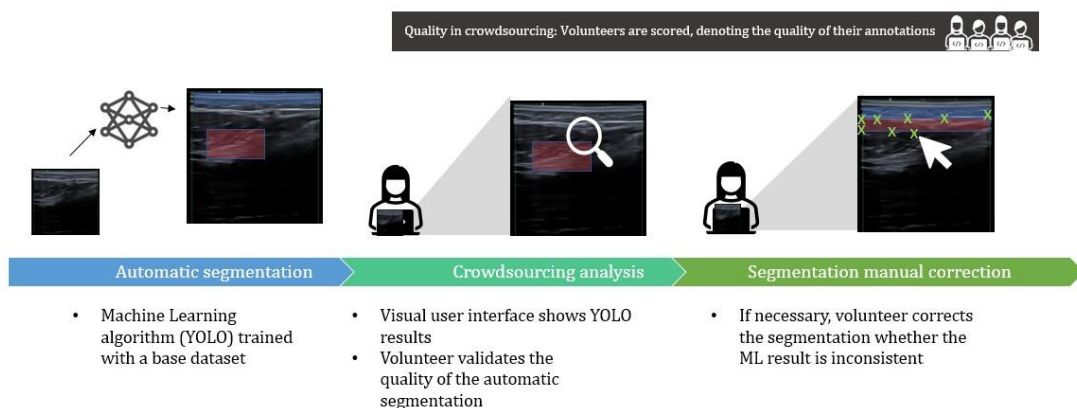
**Materials and Methods:** The proposed approach is composed of the following steps: 1- automatic segmentation using the ML algorithm; 2 - crowd evaluation of the results. In order to perform step 1, a YOLO model is trained. The second step includes a visual interface where users can: a) validate the quality of the automatic segmentation; or b) correct the segmentation whether the ML result is inconsistent. All users are scored, denoting the quality of their annotations, considering the manual annotations provided by an expert for a small group of images. In order to evaluate the method and compare it to the ML algorithm alone, a total of 20 US images were used.

**Results:** Our experiments show that the inclusion of crowdsourcing significantly improved the performance of the tissue segmentation task compared to using the YOLO model alone.

**Conclusion:** The performance of our method demonstrated the feasibility of applying this type of solution for the considered problem of segmenting tissues in US facial images. Moreover, the results suggest that this tool can be employed as an auxiliary tool in oral procedures.

## A tissue segmentation system for US facial images combining crowdsourcing and machine learning

M. Moran, L. Oliveira, M. Faria, L. Bastos, G. Giraldi, A. Conci



**Conclusion:** The performance of our method demonstrated the feasibility of applying this type of solution for the considered problem of segmenting tissues in US facial images (evaluation with 20 US images).

# Minimum Number Of Images Required For The Convolutional Neural Network In Classifying Contact Between The Mandibular Third Molar And Mandibular Canal

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<sup>1</sup>Mahidol University, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Bangkok, Thailand, <sup>2</sup>Mahidol University, Department of Physics, Faculty of Science, Bangkok, Thailand

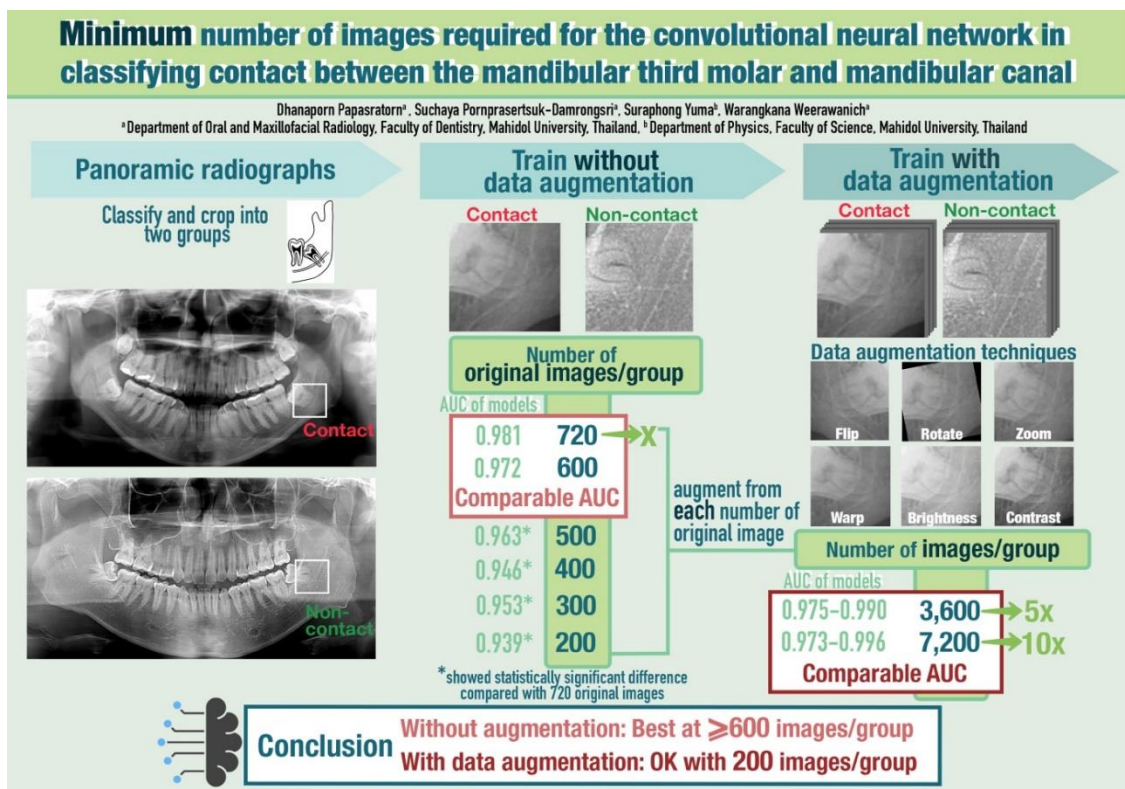
## Abstract:

**Aims:** To determine the minimum number of training images for the convolutional neural network in classifying the contact between the mandibular third molar (M3) and mandibular canal on panoramic radiographs.

**Materials and Methods:** The images of M3s used for training using VGG-16 were obtained by cropping panoramic radiographs and sorted into contact and non-contact groups according to the contiguity with the mandibular canal. To train models without data augmentation, 720, 600, 500, 400, 300, and 200 original images/group were used as training sets. To train models with data augmentation, the images in each training set were increased to 3,600 images/group [A] and 7,200 images/group [B]. The number of images in validation and test sets was constant for all training—90 images/group for each set. The minimum number of training images was determined by assessing the area under the receiver operating characteristic curve (AUC) of models.

**Results:** AUCs of 720, 600, 500, 400, 300, and 200 original images/group were 0.981, 0.972, 0.963, 0.946, 0.953, and 0.939, respectively. The AUCs started to differ significantly from 720 original images/group when the number decreased to 500 images/group. However, the models trained using augmentation with ≥600 original images/group ([A]: 0.975-0.984 and [B]: 0.973-0.995) were not statistically different from those using 720 original images/group ([A]: 0.990 and [B]: 0.996).

**Conclusion:** The number of training images should be at least 600 original images/group for training a model without augmentation, while it can be reduced to 200 original images/group when training a model using augmentation.



# Evaluation Of Panoramic Radiographs For Age Determination Using The Kvaal Method And Machine Learning

R. Pequeno Reis Sousa<sup>1</sup>, D. Pereira de Sousa<sup>1</sup>, E. Diniz Lima<sup>1</sup>, J.A. Souza Paulino<sup>2</sup>, M.L. dos Anjos Pontual<sup>3</sup>, P. Meira Bento<sup>1</sup>, D. Pita de Melo<sup>1</sup>

<sup>1</sup>State University of Paraíba, Dentistry Department, Campina Grande, Brazil, <sup>2</sup>Federal University of Campina Grande, Campina Grande, Brazil, <sup>3</sup>Federal University of Pernambuco, Recife, Brazil

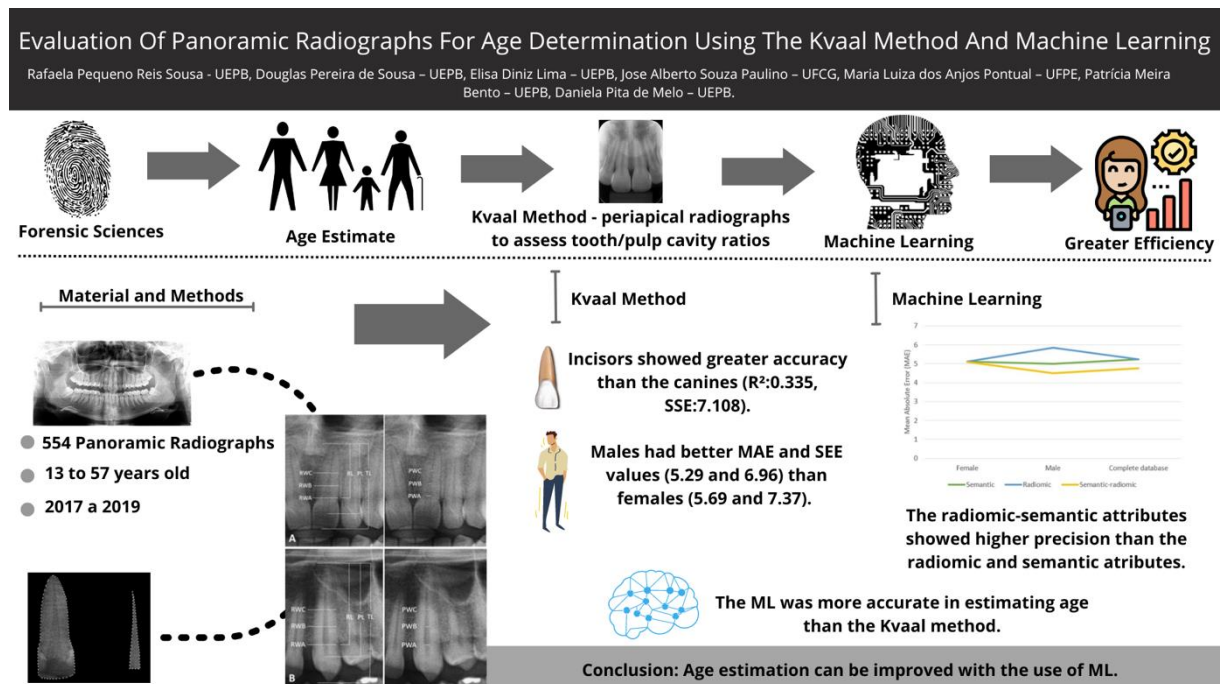
## Abstract:

**Aims:** This study evaluated and compared panoramic radiographs for age estimation using the Kvaal method and machine learning (ML).

**Materials and Methods:** 554 panoramic radiographs from a private practice were used. For the Kvaal method, the following measurements were performed on the left upper central incisors and canines: length of the tooth, pulp and root; root and pulp width at three different levels: at the cementum-enamel junction (ECJ); midpoint between the ECJ and at the mid-root level. Subsequently, the Mann-Whitney test, Spearman's correlation coefficient, Student's t test and linear regression with their respective coefficient of determination were used to estimate age and assess data variability ( $p < 0,05$ ). In ML, the extractions of radiomic, semantic and radiomic-semantic attributes were evaluated. Nineteen semantic and fourteen radiomic attributes and a single set of thirty-three semantic-radiomic attributes were extracted. For ML classification Logistic Regression, Linear Regression, KNN, SVR, Decision Tree Reg, Random Forest Reg, Gradient Boost Reg and XG Boosting Reg. Mean absolute error (MAE) and standard error estimate (SEE) were assessed.

**Results:** For the Kvaal method, the upper incisors showed greater accuracy than the canines ( $R^2:0.335$ ,  $SSE:7.108$ ). Males had better MAE and SEE values (5.29, 6.96) than females (5.69, 7.37). The radiomic-semantic attributes showed higher precision (MAE:4.77) than the radiomic and semantic attributes (MAE:5.23). The XG Boosting Reg classifier performed better than the other 6 classifiers evaluated (MAE:4.65). The ML (MAE: 4.77) was more accurate in estimating age than the Kvaal method (MAE:5.68).

**Conclusion:** Age estimation can be improved with the use of ML.



# Age Estimation Based On 3D Pulp Segmentation Of First Molars From Cbct Images Using U-Net

Y. Song<sup>1</sup>, H. Yang<sup>1</sup>, Z. Ge<sup>2</sup>, H. Du<sup>3</sup>, G. Li<sup>1</sup>

<sup>1</sup>Peking University School and Hospital of Stomatology, Beijing, China, <sup>2</sup>Qingdao Stomatological Hospital Affiliated to Qingdao University, Qingdao, China, <sup>3</sup>Shanghai Stomatological Hospital & School of Stomatology, Shanghai, China

## Abstract:

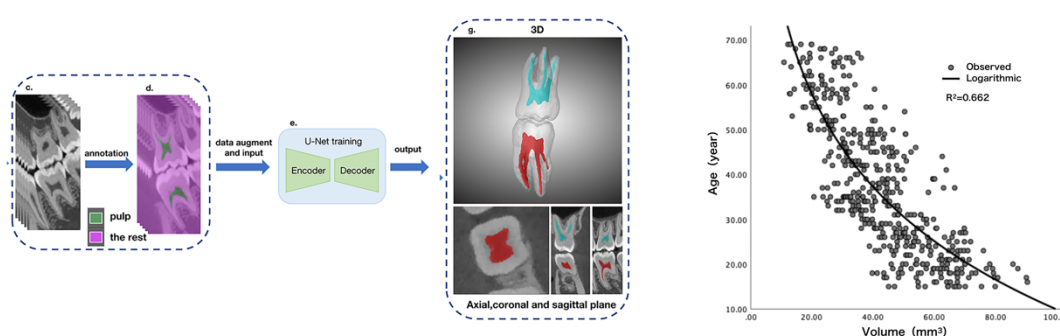
**Aims:** To apply U-Net to segment the intact pulp cavity of first molars and establish a reliable mathematical formula for age estimation.

**Materials and Methods:** CBCT samples were input into a U-Net model and trained to be able to segment the intact pulp cavity of first molars. CBCT images of 239 maxillary first molars and 234 mandibular first molars from 142 males and 135 females aged 15-69 years old were segmented and the intact pulp cavity volumes were calculated by combining with manual correction, followed by logarithmic regression analysis to establish the mathematical model with age as the dependent variable and pulp cavity volume as the independent variable. Another 128 maxillary first molars and 128 mandibular first molars from 42 female and 54 male patients aged 15-69 years old were collected and used to estimate ages with the established model. MAE and RMSE between the actual and the estimated ages were used to assess the precision and accuracy of the model.

**Results:** The DSC of the U-Net model is 98.6%. The pulp cavity volumes of first molars were from 10.89 mm<sup>3</sup> to 90.48 mm<sup>3</sup> (Mean 43.09mm<sup>3</sup>, SD =16.03). The established age estimation formula was  $Age=148.671-30.262 \times \ln V$  (V is the intact pulp cavity volume of the first molars). The coefficient of determination (R<sup>2</sup>), MAE and RMSE were 0.662, 6.72 and 8.26, respectively.

**Conclusion:** The trained U-net model could accurately segment pulp cavity of the first molars from 3D CBCT images, and the segmented pulp cavity volumes could be used to estimate the human ages accurately.

## Age estimation based on 3D pulp segmentation of first molars from CBCT images using U-Net



20 sets of CBCT images was annotated and input into U-Net for training after data augmentation. The left picture is an application example.

$$Age = 148.671 - 30.262 \times \ln V$$

V is the pulp cavity volume

**Conclusion:** The trained U-net model could accurately segment pulp cavity of the first molars from 3D CBCT images, and the segmented pulp cavity volumes could be used to estimate the human ages accurately.



# A Deep Learning Approach For Radiological Detection And Classification Of Radicular Cysts And Periapical Granulomas Enhancing Clinical Decision Making

J. Ver Berne<sup>1,2</sup>, S.B. Saadi<sup>1</sup>, C. Politis<sup>1,2</sup>, R. Jacobs<sup>1,2,3</sup>

<sup>1</sup>Catholic University Leuven, Imaging and Pathology, Leuven, Belgium, <sup>2</sup>University Hospitals Leuven, Oral and Maxillofacial Surgery, Leuven, Belgium, <sup>3</sup>Karolinska Institutet, Dental Medicine, Stockholm, Sweden

## Abstract:

**Aims:** Differentiating between radicular cysts and periapical granulomas on panoramic imaging is challenging for dentists and oral surgeons. Since radicular cysts require surgical intervention, as opposed to the periapical granuloma that can be treated with a root canal treatment, an automatic tool aiding clinical decision making is needed.

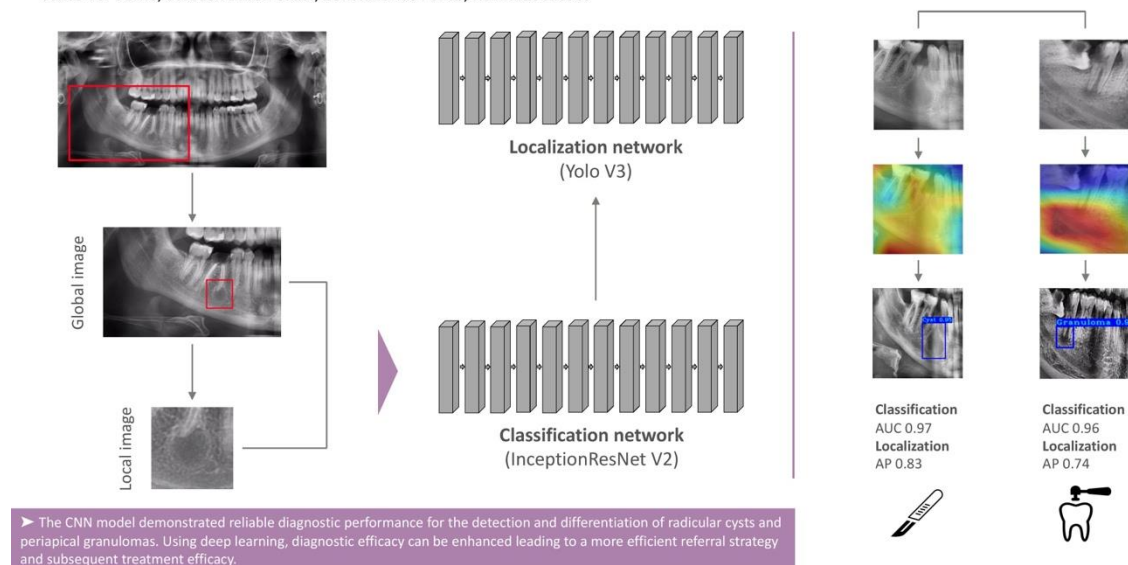
**Materials and Methods:** A retrospective analysis was performed using 80 radicular cysts, 72 periapical granulomas, 197 negative controls (normal panoramic x-rays), and 58 positive controls (radiolucent lesions other than radicular cysts and periapical granulomas). Regions of interest were cropped into global and local images and then the dataset was split into 70% training, 20% validation, and 10% testing sets. Data augmentation was performed to increase the size of dataset to prevent overfitting. A two-route convolutional neural network (CNN) using global and local features was constructed for classification and localization of radicular cysts, periapical granulomas, positive controls, and negative controls.

**Results:** The classification network achieved an accuracy of 0.96, precision of 0.92, recall of 0.96, and F1-score of 0.94 on the test set. The area under the receiver-operating curve (AUC) for radicular cysts and periapical granulomas was 0.97 and 0.96, respectively. Average precision for the localization network was 0.83 for radicular cysts and 0.74 for periapical granulomas.

**Conclusion:** The CNN model demonstrated reliable diagnostic performance for the detection and differentiation of radicular cysts and periapical granulomas. Using deep learning, diagnostic efficacy can be enhanced leading to a more efficient referral strategy and subsequent treatment efficacy.

## A deep learning approach for radiological detection and classification of radicular cysts and periapical granulomas enhancing clinical decision making

Jonas Ver Berne, Soroush Baseri Saadi, Constantinus Politis, Reinhilde Jacobs



# A Novel Cnn-Lstm Network With Spatial Relationship Mapping As A Screening Tool For Radiolucent Jawbone Lesions On Panoramic Imaging

J. Ver Berne<sup>1,2</sup>, S. Baseri Saadi<sup>1</sup>, N.O. Santos<sup>1,3</sup>, L.E. Marinho-Vieira<sup>1,3</sup>, R. Jacobs<sup>1,2,4</sup>

<sup>1</sup>Catholic University Leuven, Imaging and Pathology, Leuven, Belgium, <sup>2</sup>University Hospitals Leuven, Oral and Maxillofacial Surgery, Leuven, Belgium, <sup>3</sup>University of Campinas (UNICAMP), Division of Oral Radiology, Department of Oral Diagnosis, Piracicaba Dental School, Piracicaba- SP, Brazil, <sup>4</sup>Karolinska Institutet, Dental Medicine, Stockholm, Sweden

## Abstract:

**Aims:** Convolutional neural networks have been widely applied to oral radiology for jawbone lesion detection and classification but face difficulties in real-life situations. Due to the complexity of panoramic images (e.g., overlap, anatomical variation, positional artefacts), the rarity of individual lesions and their variable appearance, huge datasets are required to develop usable models. We propose a new framework using spatial relationship mapping to improve analysis of complex panoramic images and aim to classify images with and without radiolucent lesions.

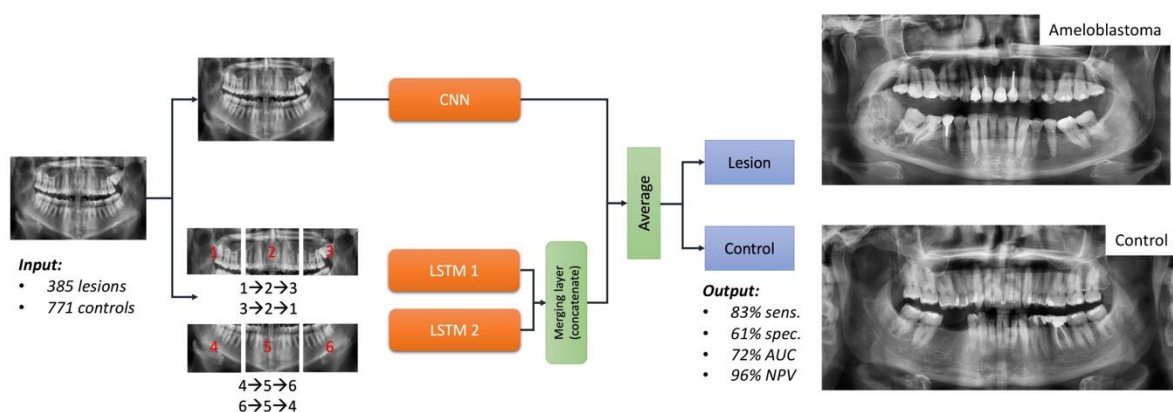
**Materials and Methods:** This retrospective study analyzed 385 radiolucent jawbone lesions and 771 control images with a 70-20-10% training-validation-testing split. A novel combined Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM) architecture running in parallel was constructed. The CNN network took the full panoramic images, while the LSTM network ran on images divided in 6 patches. This method allowed explicit mapping of spatial relationships in lesion and control images. Final classification was obtained by averaging the outputs from both networks.

**Results:** The proposed model had a sensitivity of 83%, specificity of 61%, and an AUC of 72%. The training and validation loss curves indicated a robust performance without overfitting. With a real-life lesion prevalence of 11% our model had a negative predictive value (NPV) of 96%.

**Conclusion:** The proposed CNN-LSTM network provides an excellent framework for ruling out radiolucent lesions on panoramic images. However, future research should focus on combining models for screening and classification of lesions to achieve optimal overall performance in real-life settings.

## A novel CNN-LSTM network with spatial relationship mapping as a screening tool for radiolucent jawbone lesions on panoramic imaging.

Jonas Ver Berne, Soroush Baseri Saadi, Nicolly Oliveira Santos, Luiz Eduardo Marinho, Reinhilde Jacobs



**Conclusion:** The proposed CNN-LSTM network achieved a NPV of 96% making it a robust screening tool for ruling out lesions on panoramic imaging.

# Development And Assessment Of Diagnostic Models Of Periapical Lesions In cone-Beam Computed Tomography Using Deep Learning

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<sup>1</sup>The Affiliated Stomatological Hospital of Nanjing Medical University, Department of Oral and Maxillofacial Imaging, Nanjing, China

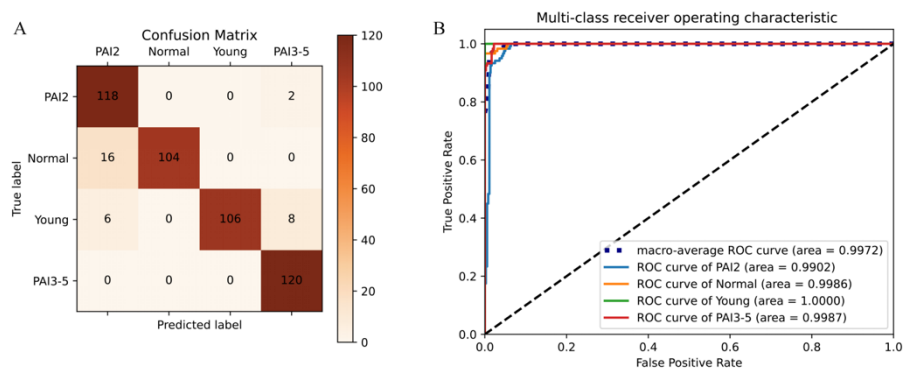
## Abstract:

**Aims:** To classify and diagnose periapical lesions in cone-beam computed tomography (CBCT) data using deep learning and evaluate the effectiveness of the models.

**Materials and Methods:** 120 patients with CBCT data were included, consisting of normal apical, young permanent teeth, periapical lesions (1-2 mm), and periapical lesions (>2 mm). The region of interest was chosen, and the models were built using five algorithms: VGG16, GoogLeNet, ResNet50, ResNet101 and ResNet152. The best model was chosen based on the confusion matrix, ROC, accuracy, precision, recall, and F1-score, and the sixth model was generated by including a convolutional block attention module (CBAM).

**Results:** ResNet101 was deemed to be the best classification model among the five built by VGG16, GoogLeNet, ResNet50, ResNet101, and ResNet152, as demonstrated by its accuracy of 0.812 in the validation cohort. Its accuracy, precision, recall, and F1-score in the test cohort were, respectively, 0.8083, 0.8092, 0.8083, and 0.8067. The CBAM-ResNet101 model was further obtained, and each assessment indicator showed a considerable improvement in the model. The model's accuracy in the validation cohort was 0.950, and the accuracy, precision, recall, and F1-score in the test cohort were 0.9333, 0.9415, 0.9333, and 0.9336, respectively. Additionally, the test cohort's class activation map naturally and clearly illustrates the essential regions of CBAM-ResNet101.

**Conclusion:** Five models of periapical lesions in CBCT images and one optimization model CBAM-ResNet101 were constructed based on deep learning, which initially explored the feasibility of applying deep learning to CBCT images.



## The Usefulness Of Readout Segmentation Of Long Variable Echo Strain (Resolve) For Bio-Phantom Imaging

*B. Bamgbose<sup>1,2</sup>, Y. Yoshimura<sup>3</sup>, M. Kuroda<sup>3</sup>, K. Kuroda<sup>3</sup>, I. Sugianto<sup>4</sup>, J. Asami<sup>4</sup>*

<sup>1</sup>Faculty of Dentistry, Bayero University, Kano, Oral Diagnostic Sciences Department, Kano, Nigeria, <sup>2</sup>Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Oral and Maxillofacial Radiology and Radiology, Okayama, Japan, <sup>3</sup>Graduate School of Health Sciences, Okayama University, Radiological Technology, Okayama, Japan, <sup>4</sup>Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Oral and Maxillofacial Radiology, Okayama, Japan

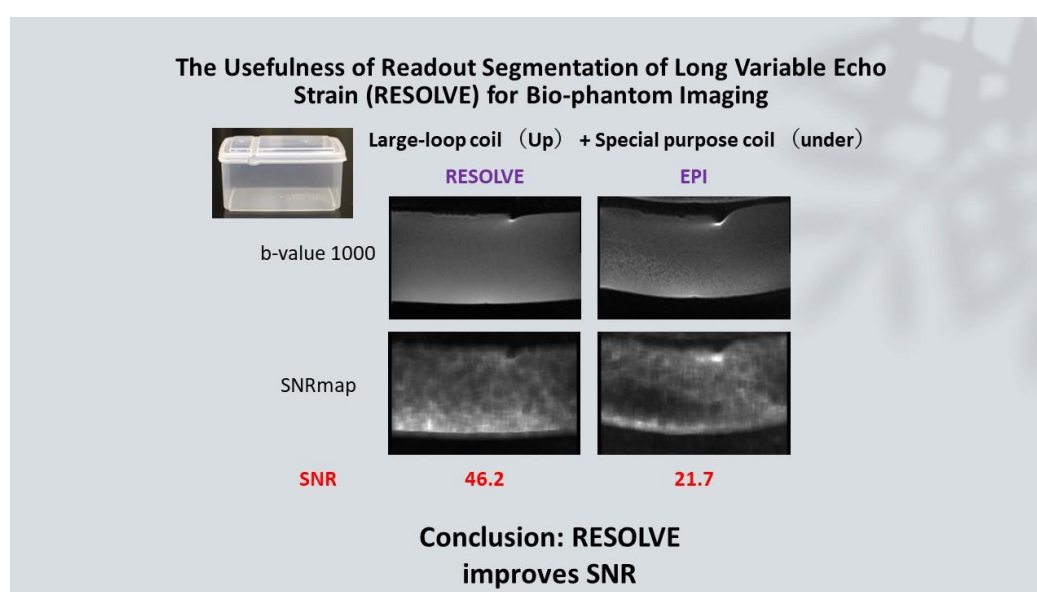
### Abstract:

**Aims:** The aim of the study was to investigate whether read out segmented echo planar imaging (RESOLVE) will decrease distortion and artifact in phase direction and increase signal to noise ratio (SNR) in the bio-phantom image taken with 3 tesla MRI apparatus for clinical practice, compared to the conventional EPI.

**Materials and Methods:** To examine the SNR and distortion, physiological saline was used for the phantom and imaging was performed at room temperature. The difference of SNR was evaluated using subtraction mapping method indicating that the SNR of RESOLVE was higher than EPI. The combination of Special Purpose Coil and Large Loop Coil had higher SNR than Head/Neck Coil using RESOLVE sequence. To investigate the phase direction artifact, 120 mM polyethylene glycol was used for the phantom and the image was taken at 37°C. The range where the phase direction artifact appeared in the apparent diffusion coefficient (ADC) image was shorter with RESOLVE compared to EPI. The RESOLVE image of bio-phantom using Jurkat cells was taken at 37°C. The ADC value of the cell region and the surrounding physiological saline region was calculated.

**Results:** The artifact range of RESOLVE was 4.82 mm and that of EPI was 11.00 mm. The degree of distortion was visually evaluated, and the image distortion of RESOLVE was less than EPI. The ADC value of the cell area was  $856 \times 10^{-6}$  mm<sup>2</sup>/sec, and the surrounding physiological saline was  $2951 \times 10^{-6}$  mm<sup>2</sup>/sec.

**Conclusion:** This combination reduced image distortion and is useful for measuring the accurate ADC value of bio-phantom.





# Repeatability Of Density Measurement In Hounsfield Units In Cone-Beam Computed Tomography

L.A. Cano Martins<sup>1</sup>, L. Szalewski<sup>1</sup>, P. Kalinowski<sup>2</sup>, I. Rozylo-Kalinowska<sup>1</sup>

<sup>1</sup>Medical University of Lublin, Department of Dental and Maxillofacial Radiodiagnostics, Lublin, Poland, <sup>2</sup>Medical University of Lublin, Department of Hygiene and Epidemiology, Lublin, Poland

## Abstract:

**Aims:** To investigate the repeatability of density measurement in Hounsfield units (HU) in Cone-Beam Computed Tomography (CBCT) in different type of materials under different acquisition protocols.

**Materials and Methods:** Three blocks (3x3x5cm) of five different materials and physical densities (pine, beech, plaster, acrylic and wax) were custom-made and had their physical densities calculated. Each block was scanned using the VistaVoxS 3D CBCT device at 4 acquisition protocols varying the field-of-view size (5x5 and 13x5), kVp (98, 94 and 79), mA (11, 9 and 6) and voxel size (0.08 and 0.2 mm). After acquisitions, a virtual implant measuring 16 mm x 5.2 mm was centred in the image of each block and HU along the three thirds of the implant were measured by using the bone density tool available in the software AIS3DAPP 5.0 (De Götzen s.r.l. – Oligate Olona VA-Italy). The mean HU of the most anterior, posterior, left and right values for each implant third and material were used for statistical analysis and evaluated by Friedman’s test with Kendall agreement coefficient and Chi-square of variance.

**Results:** HU values of all materials were statistically increased among the 4 acquisition protocols. Lower HU values were found for pine and beech indicating poor and fair agreement among the protocols (0.22 and 0.10). Plaster, acrylic and wax presented the higher grey values and with a very good agreement (0.89-0.83).

**Conclusion:** The CBCT HU units were repeatable and significantly higher in high density materials despite of the field-of-view, voxel size and acquisition parameters.

## Repeatability of density measurement in Hounsfield units in Cone-Beam Computed Tomography

### AIM

To investigate the repeatability of density measurement in Hounsfield units in Cone-Beam Computed Tomography in different type of materials under different acquisition protocols.

VistaVoxS3D (Dürr Dental – Germany)

Resolution	kV	mA	s	FOV
HQ(0.08mm)	98	11	11	5x5
SQ(0.08mm)	94	9	11	5x5
HQ(0.2mm)	94	9	16	13x8
SQ(0.2mm)	79	6	16	13x8

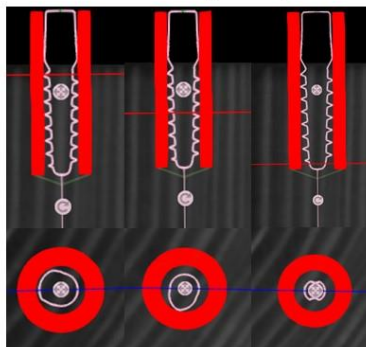


Fig. 1: A virtual implant was used as a reference for HU measurement levels.

### CONCLUSION

The CBCT HU units were repeatable and significantly higher in high density materials despite of the field-of-view, voxel size and acquisition parameters.



# Symmetry Recovery In Zygomaticomaxillary Complex Fractures Compared To Normal Unfractured Population: A New Reliable Three-Dimensional Evaluation

K. Dubron<sup>1,2</sup>, L.H. Yang<sup>3</sup>, R. Jacobs<sup>2,4</sup>, C. Politis<sup>1,2</sup>, R. Willaert<sup>1,2</sup>, E. Shaheen<sup>1,2</sup>

<sup>1</sup>University Hospitals Leuven, Department of Oral and Maxillofacial Surgery, Leuven, Belgium, <sup>2</sup>University Hospitals Leuven, OMFS IMPATH Research Group, Department of Imaging & Pathology, Leuven, Belgium, <sup>3</sup>University Hospitals Leuven, Department of Oral Health Sciences, Leuven, Belgium, <sup>4</sup>Karolinska Institutet, Department of Dental Medicine, Stockholm, Sweden

## Abstract:

**Aims:** This study aims to quantify facial symmetry of surgically treated zygomaticomaxillary complex (ZMC) fractures through a new reliable three-dimensional evaluation method.

**Materials and Methods:** Healthy patients and patients with surgically treated ZMC fractures were retrospectively reviewed. Using Brainlab Elements™ (Brainlab AG, Munich, Germany), the zygomatic bone and the orbit of each patient was segmented and mirrored. Subsequently, the mirrored side was matched on the other side via volume-based registration, using the segmented orbit as reference. Volumetric asymmetry was measured using 3-Matic software (Materialise, Leuven, Belgium), and a surface-based matching technique was used to calculate the mean absolute differences (MAD) between the surfaces of the two sides of the ZMC. The reliability of this novel method using volume-based registration were tested, and intra-class correlation coefficient was assessed.

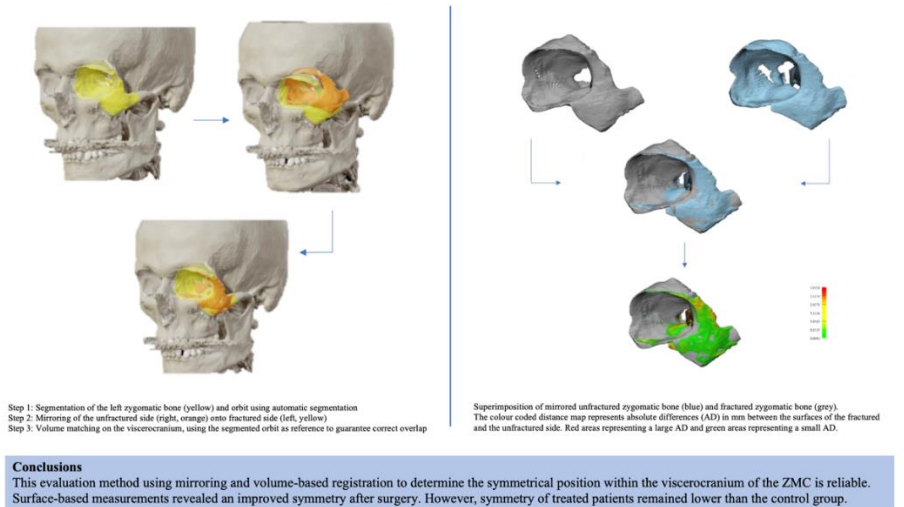
**Results:** No statistically significant differences were found for volumetric measurements of asymmetry between control and ZMC fracture groups (both pre- and post-operatively) ( $p > .05$ ). The MAD between surfaces of left and right sides in the control group was 0.51mm ( $\pm 0.09$ ). As for the ZMC fracture group, MAD was 0.78mm ( $\pm 0.20$ ) and 0.72mm ( $\pm 0.15$ ) for pre- and post-operatively, respectively. The MAD showed statistically significant differences between pre- and post-operative groups ( $p = .005$ ) and between control and post-operative groups ( $p < .001$ ). The intra-class correlation coefficient was high ( $\geq .99$ ).

**Conclusion:** This evaluation method using mirroring and volume-based registration to determine the symmetrical position within the viscerocranium of the ZMC is reliable. Surface-based measurements revealed an improved symmetry after surgery. However, symmetry of treated patients remained lower than the control group.

## Symmetry recovery in zygomaticomaxillary complex fractures compared to normal unfractured population

- A new reliable three-dimensional evaluation

K. Dubron, L.H. Yang, R. Jacobs, C. Politis, R. Willaert, E. Shaheen



# The Accuracy Of Dental X-Ray Images From Artificial Intelligence

Huey-er Lee, J.-H. Wu<sup>2</sup>, P.-S. Lin<sup>3</sup>, C.-H. Chen<sup>3</sup>, K.-W. Leung<sup>3</sup>

<sup>1</sup>Kaohsiung Medical University, School of Dentistry, Kaohsiung, Taiwan, <sup>2</sup>Kaohsiung Medical University, Dental Department, Kaohsiung, Taiwan, <sup>3</sup>Yuan's General Hospital, Dental Department, Kaohsiung, Taiwan

## Abstract:

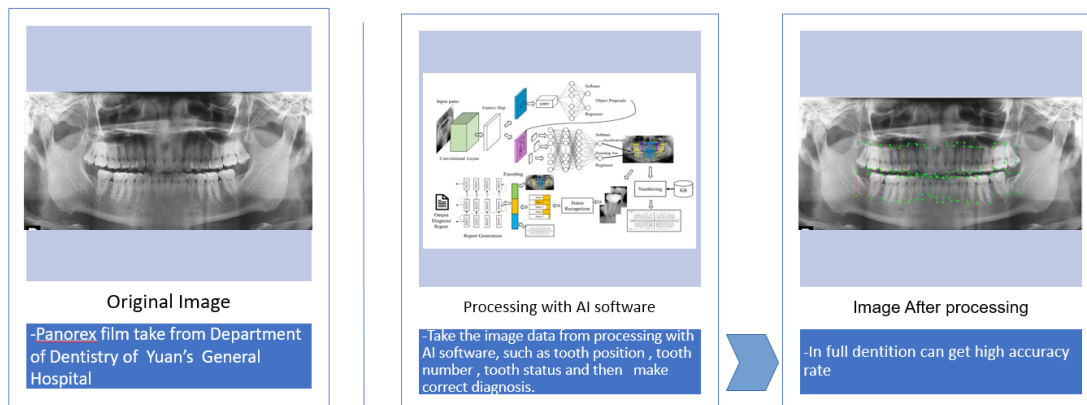
**Aims:** investigate automatic tooth detection and numbering in panoramic radiographs to identify tooth condition

**Materials and Methods:** Materials: over a thousand of panoramic images were chosen from a large pool of patients for designated analytical investigations from the dental department at a local hospital in the southern district of Kaohsiung city in Taiwan in 2019. Methods: 1. data collection of panoramic images 2. tooth identification and expert labeling 3. automatic diagnostic report 4. model training 5. validation, performance evaluation

**Results:** This study was intended to demonstrate the use of such deep learning computer algorithms to assist in determining clinical diagnosis in general dental practice.

**Conclusion:** This study should be able to improve the quality of oral health inspection and maintenance and can greatly save time and reduce the workload and pay more attention to dental diagnosis and treatment.

## The accuracy of dental x - ray images from artificial intelligence



Conclusion: 1. Use AI software Labelimg and deep learning can get correct tooth condition and tooth arrangement, can improve dentist's diagnosis and save time.

2. When patient has full dentition, the accuracy of AI is high, but it gradually reduced as the No. of natural teeth was reduced, or implant, Cr/Br, tooth crowding, overlapping etc.

## Micro-Ct And Histopathological Microstructural Analysis Of Dental Implant Osseointegration In Animal Model

*F. Pramanik<sup>1</sup>, A. Azhari<sup>1</sup>, M.S. Hemiawan<sup>2</sup>, F.D. Eljabbar<sup>3</sup>*

<sup>1</sup>Universitas Padjadjaran, Dentomaxillofacial Radiology, Bandung, Indonesia, <sup>2</sup>Universitas Padjadjaran, Oral Biology, Bandung, Indonesia, <sup>3</sup>Institut Teknologi Bandung, Physics, Bandung, Indonesia

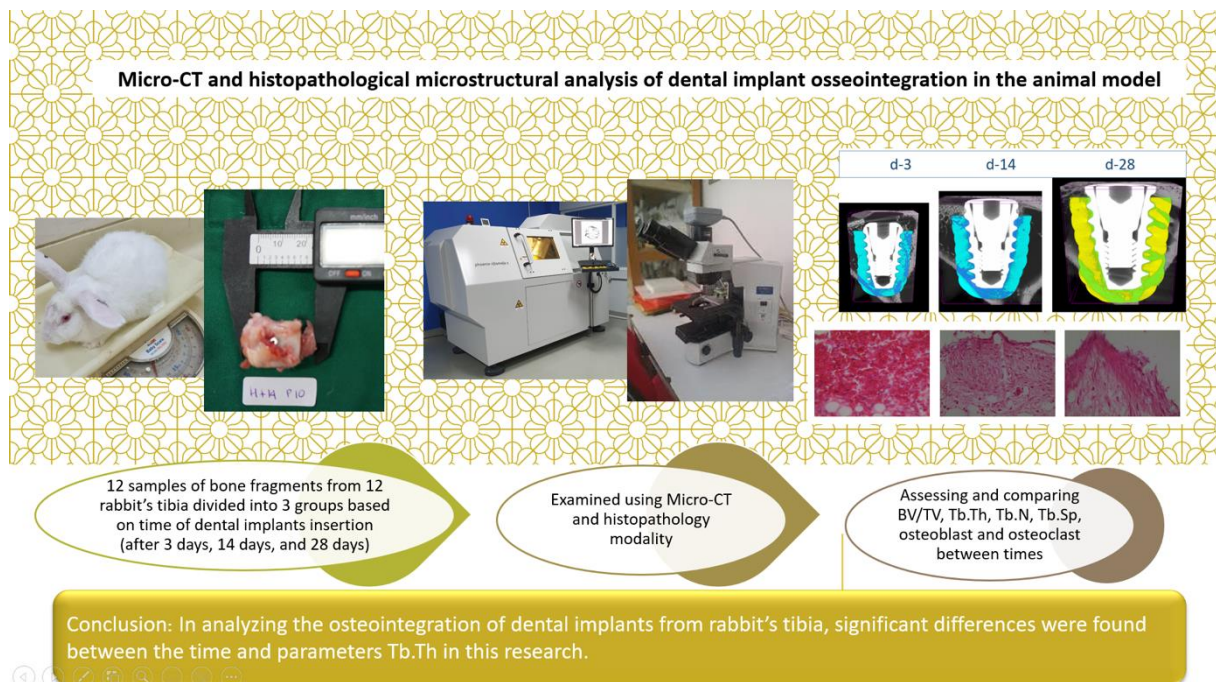
**Abstract:**

**Aims:** This study aims to analyze the differences in microstructure from the osseointegration process of dental implants by histopathological and Micro-CT assessments.

**Materials and Methods:** Twelve bone fragments from 12 rabbit tibia were separated into 3 groups based on the time of dental implant insertion, namely 3 days, 14 days, and 28 days. These samples were examined using micro-CT radiography and histology examination. The parameters for micro-CT analysis were BV/TV, Tb.Th, Tb.Sp, Tb.N while osteoblast and osteoclast for the histology analysis. The analysis used CT Analyzer and Image-J software for imaging and histopathological assessment respectively. The ANOVA and T-test were used for statistical analysis.

**Results:** The variables of BV/TV, Tb.Th, and Osteoblast showed an increment in mean value as time passed. There was a significant difference ( $p \leq 0.05$ ) between the 3 days and 28 days for the Tb.Th variable. It was also found in Tb.Th between 14 days and 28 days. The mean of Tb.Th is 0.08, 0.097, and 0.188 at the 3 days, 14 days, and 28 days after implant placement respectively.

**Conclusion:** In analyzing the osteointegration of dental implants from rabbit's tibia, significant differences were found between the time and parameters Tb.Th in this research.





# Analysis Of trabecular patterns between periapical radiographs And CBCT in dental implant osseointegration

F.R. Ramadhan<sup>1</sup>, A. Azhari<sup>1</sup>, F. Pramanik<sup>1</sup>, R.N Firman<sup>1</sup>

<sup>1</sup>Universitas Padjadjaran, Bandung, Indonesia

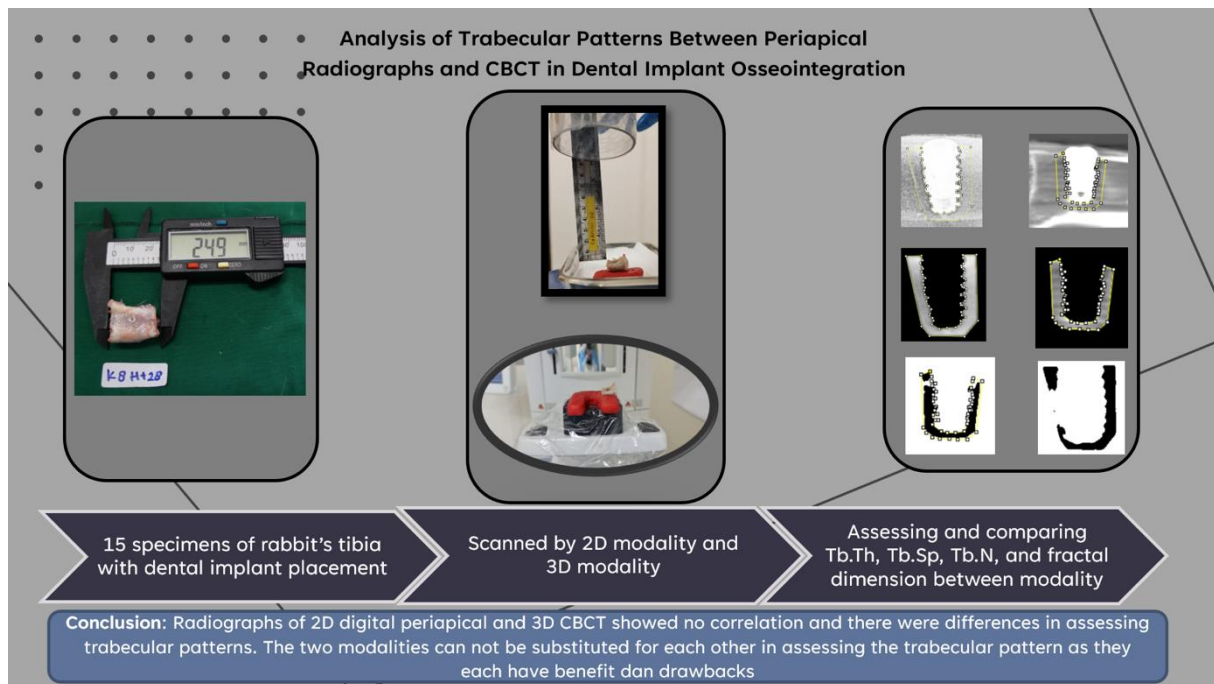
## Abstract:

**Aims:** This study aims to analyze the correlation and differences of trabecular patterns in the osseointegration process of dental implants between periapical radiographs and CBCT.

**Materials and Methods:** A total 15 digital periapical and 15 CBCT radiographs of dental implants on the 15 rabbit tibias were evaluated for the trabecular pattern using Tb.Th, Tb.Sp, Tb.N, and FD parameters with the ImageJ software through the BoneJ plugin. Statistical tests were performed using Intraclass and Pearson correlation, as well as paired T-test.

**Results:** The results showed that parameters Tb.Th, Tb.N and FD or the 3D CBCT obtained greater values than 2D digital periapical radiographs. For the Tb.Sp parameter, the 2D periapical modality value was greater than that of the 3D CBCT. Pearson's test showed that each parameter's correlation between periapical radiograph and CBCT was very low and insignificant (with  $p > 0.05$ ). Meanwhile, based on the Paired T-test, each parameter between periapical radiograph and CBCT had a significant difference ( $p < 0.05$ ).

**Conclusion:** Radiographs of 2D digital periapical and 3D CBCT showed no correlation and there were differences in assessing trabecular patterns. The two modalities can not be substituted for each other in assessing the trabecular pattern as they each have benefit and drawbacks.



# The Role Of Radio-Morphological Development Of Teeth In Determining Bone Age And Pubertal Growth Curve Stages: A Retrospective Study

Z.M. Semerci<sup>1</sup>, S. Günen Yılmaz<sup>1</sup>, E. Bolat<sup>2</sup>

<sup>1</sup>Akdeniz University Faculty of Dentistry, Oral and Maxillofacial Radiology Department, Antalya, Turkey, <sup>2</sup>Akdeniz University Faculty of Dentistry, Orthodontics, Antalya, Turkey

## Abstract:

**Aims:** The aim of this study was to investigate the detectability of bone age and pubertal growth curve stages by looking at the radiomorphological developmental stages of the teeth.

**Materials and Methods:** In this retrospective study, 1162 children at the age of 9-16 years; the chronological age, the evaluation of the left wrist radiograms according to the Greulich-Pyle Atlas, the bone ages and the evaluation of the panoramic radiograms according to the dental ages (Demirjian (DM), Willeim and Nolla methods) were calculated. Statistical analysis was performed using SPSS Windows 22.0 version. Conformity of continuous variables to normal distribution was examined by Kolmogorov Smirnov test. Mann-Whitney U test and ROC analyzes were applied.

**Results:** The effect of premolars, second and third molars on bony age in females and males was statistically significant ( $p < 0.0001$ ). According to onset, peak and end stages; in the onset stage, by looking at the canine, 1st premolar, 2nd premolar, 2nd molar and 3rd molar teeth in females and males; at the peak stage, by looking at the canine, 1st premolar, 2nd premolar and 2nd molar teeth in females and males and at the end stage, by looking at the 1st premolar and 2nd premolar in females and 2nd premolar and 3rd molars in males; it was determined that pubertal growth curve can be evaluated separately.

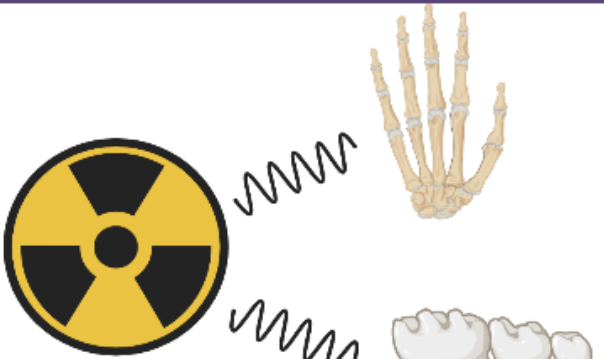
**Conclusion:** With this study, it was determined that the pubertal growth curve could be evaluated by looking at the radiomorphological development stages of the teeth in a certain age range.


## The Role of Radio-Morphological Development of Teeth in Determining Bone Age and Pubertal Growth Curve Stages (PGS): A Retrospective Study


✓ The aim of this study was to investigate the detectability of bone age and pubertal growth curve stages by looking at the radiomorphological developmental stages of the teeth.

✓ 1162 children at the age of 9-16 years; the chronological age, the evaluation of the left wrist radiograms according to the Greulich-Pyle Atlas, the bone ages and the evaluation of the panoramic radiograms according to the dental ages (Demirjian (DM), Willeim and Nolla methods) were calculated.


According to onset, peak and end stages;

 in the onset stage, by looking at the canine, 1st premolar, 2nd premolar, 2nd molar and 3rd molar teeth in females and males;

 at the peak stage, by looking at the canine, 1st premolar, 2nd premolar and 2nd molar teeth in females and males

 and at the end stage, by looking at the 1st premolar and 2nd premolar in females and 2nd premolar and 3rd molars in males; it was determined that pubertal growth curve can be evaluated separately.

✓ With this study, it was determined that the pubertal growth curve could be evaluated by looking at the radiomorphological development stages of the teeth in a certain age range.

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# Arthroguide: A Guide For Minimally Invasive Surgery Approach Of Temporomandibular Joint

*P.J.I. Yokoyama<sup>1</sup>, E.H. Shinohara<sup>2</sup>, F.K. Horikawa<sup>2</sup>, J.L.C. Junqueira<sup>1</sup>, M.d.C.C. Nascimento<sup>1</sup>, A.C.C Oenning<sup>1</sup>*

<sup>1</sup>Faculdade Sao Leopoldo Mandic, Campinas, Brazil, <sup>2</sup>Hospital Regional de Osasco, Osasco, Brazil

## Abstract:

**Aims:** Arthrocentesis is widely used as a surgical alternative for the treatment of temporomandibular joint (TMJ) disorders. However, surgeons often face difficulty in locating the supra-articular space, which generates greater operative trauma. The aim of this study was to propose a device for guided arthrocentesis based on cone-beam CT scan, virtual planning and 3D print.

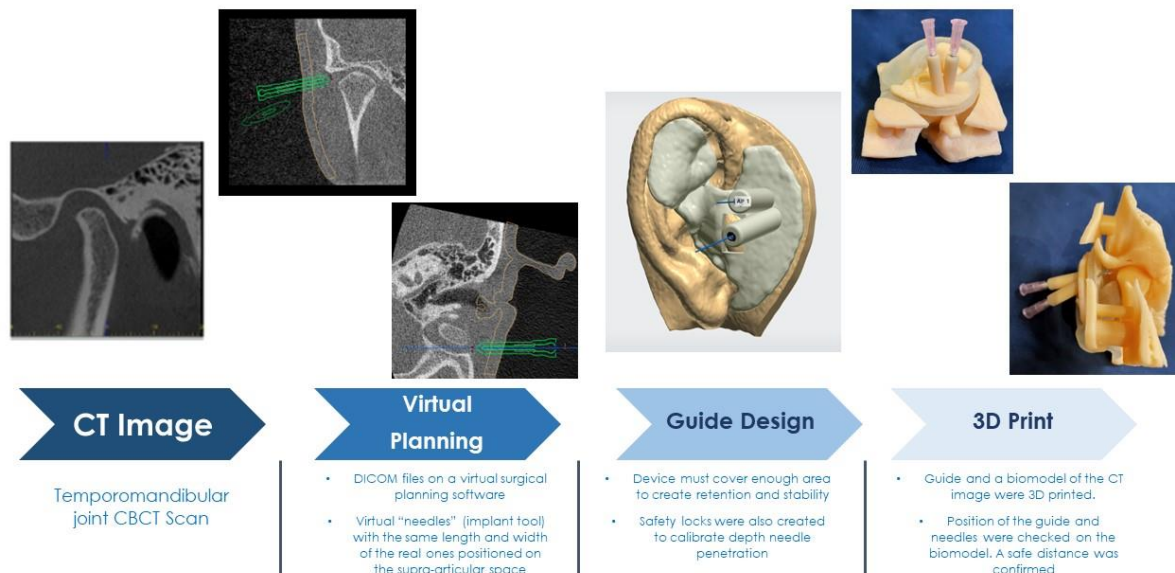
**Materials and Methods:** A cone-beam CT volume of a TMJ – a man (33 years-old) complaining of pain and clicking during mandibular opening – was imported into the Implant Studio software (3 Shape, Copenhagen, Denmark). Two virtual dental implants, with the same width and length of the needles used on arthrocentesis, were virtually positioned on the supra-articular space considering straight access without impediments and preventing any touch on the mandible head. The device was drawn using the tool for dental implants surgical guides, encompassing a surface sufficient to produce retention and stability. “Safety locks” were developed to calibrate deep needle penetration. Finally, the device was 3D printed in resin.

**Results:** A tridimensional biomodel of the ear, temporal bone and mandible head was printed to check the device adaptation. Once the guide was in the right place, two needles were inserted to check their position and depth. A safe distance from the condyle was confirmed.

**Conclusion:** Based on this experiment preliminarily validated, we conclude that the arthroguide might work for the arthrocentesis of TMJ. Future studies involving humans must be carefully designed to become possible the widespread and safe use of guided arthrocentesis in the clinical practice.

## Arthroguide

A guide for minimally invasive surgery approach of temporomandibular joint



# Image Quality And Absorbed Dose Evaluation For A Novel Dental X-Ray Machine With Graphene Cathode Field Emission X-Ray Tube.

M. You<sup>1</sup>, Z. Ye<sup>2</sup>, F. Yang<sup>3</sup>, Y. Shi<sup>1</sup>

<sup>1</sup>West China Hospital of Stomatology, Sichuan University, Department of Medical Imaging, Chengdu, China, <sup>2</sup>West China School of Stomatology, Sichuan University, Chengdu, China, <sup>3</sup>Chengdu Center for Disease Control and Prevention, Chengdu, China

## Abstract:

**Aims:** To evaluate the image quality and absorbed dose of a dental X-ray unit assembled with the graphene cathode field emission (GCFE) X-ray tube, using the conventional thermionic emission (TE) X-ray unit as control.

**Materials and Methods:** A set of jaw specimens with teeth were imaged using both the GCFE X-ray unit (65kVp, 0.5mA) and the TE X-ray unit (60kVp, 7mA). A series of dental images were taken for 4 regions with various exposure time. Based on visual inspection of anatomical structures, clinical image quality was evaluated by 4 investigators independently to judge the performance and select the optimal exposure time of each region for both X-ray units. A high-resolution line-pair test phantom was used to evaluate the spatial resolution of images captured by each X-ray unit with same mAs. The absorbed dose was measured by thermoluminescent dosimeter using a PMMA phantom for both X-ray units using the optimal exposure time selected in the clinical image quality test.

**Results:** The two X-ray units providing comparable clinical image quality, with the optimal exposure time of 400-560ms and 125-200ms for GCFE and TE X-ray unit respectively. As for the spatial resolution test, the GCFE X-ray unit obtained line-pair value of 20 LP/mm, which was larger than the value of 16 LP/mm obtained by TE X-ray unit. The absorbed dose was 459.2±6.81μGy in the GCFE group, which was 80.79% of the TE group (568.4±4.255μGy,  $p<0.001$ ).

**Conclusion:** The GCFE X-ray tube had good performance in clinical image quality, high-spatial resolution, and relatively low radiation dose.



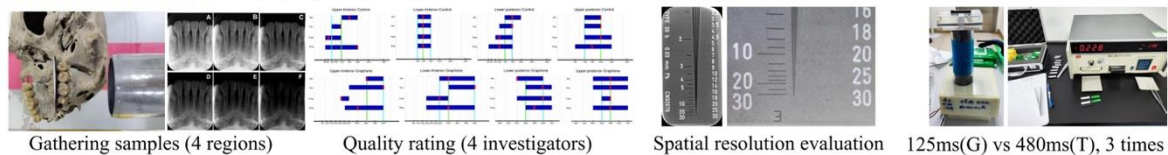
## Image Quality and Absorbed Dose Evaluation for a Novel Dental X-ray Machine with Graphene Cathode Field Emission X-Ray Tube.

You Meng<sup>1\*</sup>, Ye Zelin<sup>1</sup>, Yang Fei<sup>2</sup>, Shi Yuchao<sup>1</sup>

<sup>1</sup>West China School & Hospital of Stomatology, Sichuan University, Chengdu, China (\*presenter & corresponding author)

<sup>2</sup>Chengdu Center for disease control & prevention, Chengdu, China

### Aims & Methods:



### Results:

Optimal exposure time(ms)	Graphene	Thermionic
Upper Anterior region	480	125
Lower Anterior region	400	125
Lower Posterior region	480	125
Upper Posterior region	560	200

Tube	line-pair values(lp/mm)	Nyquist frequency
Graphene	≈16~20	≈25
Thermionic	≈14~16	20~25

### Conclusion:

1. The graphene cathode field emission (GCFE) X-ray tube produced **similar clinical image quality** as the thermionic emission X-ray tube.
2. The GCFE X-ray tube produced **higher spatial resolution** than the thermionic emission X-ray tube.
3. The X-ray generated by GCFE X-ray tube caused **lower absorbed dose** than that of the thermionic emission X-ray tube.



# A Prototype Multisource Cbct With Enhanced Image Quality And Improved Accuracy Of Ct Hu Value And Bone Mineral Density For Maxillofacial Imaging

O. Zhou<sup>1</sup>, Y. Hu<sup>1</sup>, S. Xu<sup>1</sup>, B. Li<sup>1</sup>, C. Inscoc<sup>1</sup>, D. Tyndall<sup>1</sup>, Y. Lee<sup>1</sup>, J. Lu<sup>1</sup>

<sup>1</sup>University of North Carolina at Chapel Hill, Chapel Hill, United States

## Abstract:

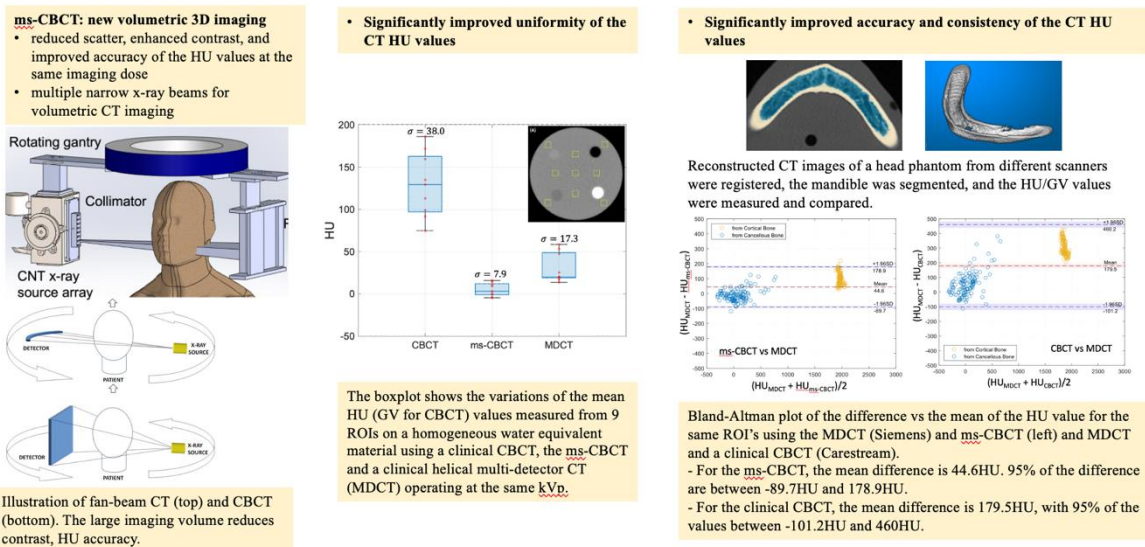
**Aims:** To develop a new volumetric CT scanner to overcome the limitations of the current clinical CBCT for maxillofacial imaging, including low soft tissue contrast resolution, cone beam artifacts, inaccurate and inconsistent CT HU value.

**Materials and Methods:** A prototype multisource CBCT (ms-CBCT) has been developed. It replaces the x-ray tube used in the conventional CBCT with multiple narrowly collimated x-ray beams. The image quality of the ms-CBCT was characterized using physical and anthropomorphic adult head phantoms. The accuracy and consistency of the CT Hounsfield Unit (HU) values were evaluated using a clinical helical CT as the reference. The performance of the ms-CBCT was also compared with that of clinical dental CBCT scanners.

**Results:** Phantom studies show the prototype scanner increased the soft tissue resolution, essentially eliminated the cone-beam artifacts, significantly improved the consistency and accuracy of the CT numbers and bone mineral density measurement.

**Conclusion:** The new ms-CBCT has the potential to overcome some of the known and fundamental limitations of the current CBCT scanners for maxillofacial imaging.

## A prototype multisource CBCT with enhanced image quality and improved accuracy of CT HU value and bone mineral density for maxillofacial imaging



**The Current Status Of Oral And Maxillofacial Radiology In West Africa**

*B. Bamgbose<sup>1,2</sup>, Y. Yoshimura<sup>3</sup>, M. Kuroda<sup>3</sup>, K. Kuroda<sup>3</sup>, I. Sugianto<sup>4</sup>, J. Asami<sup>4</sup>*

<sup>1</sup>Bayero University, Kano, Oral Diagnostic Sciences, Kano, Nigeria, <sup>2</sup>Okayama University, Okayama, Japan, Oral and Maxillofacial Radiology, Okayama, Japan, <sup>3</sup>Graduate School of Health Sciences, Okayama University, Radiological Technology, Okayama, Japan, <sup>4</sup>Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Oral and Maxillofacial Radiology and Radiology, Okayama, Japan

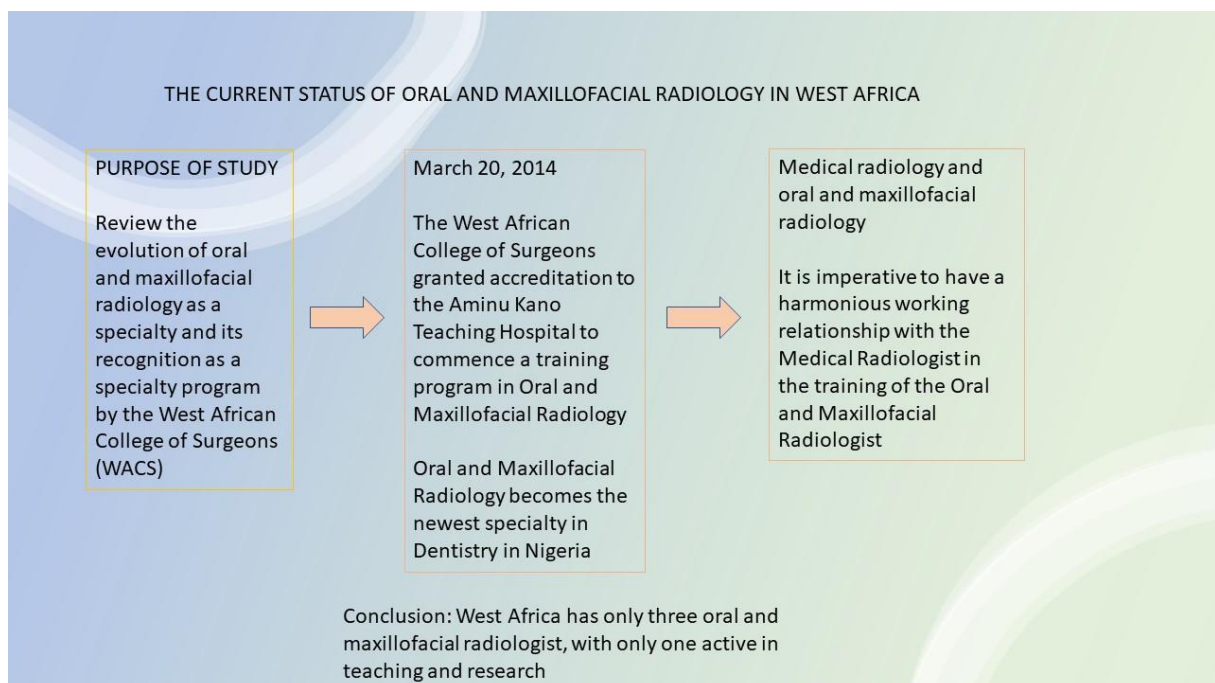
**Abstract:**

**Aims:** The purpose of this narrative study was to review the evolution of oral and maxillofacial radiology as a specialty in the United States and its recognition as a program of training by the West African College of Surgeon.

**Materials and Methods:** This study was conceptualized as a narrative review of the focal literature focusing on the history and development of oral and maxillofacial radiology in the United States and built a synthesis that describes the recognition of oral and maxillofacial radiology as a specialty of dentistry in West Africa, United Kingdom, Japan and Australia.

**Results:** The main finding was that the oral and maxillofacial radiology became the ninth specialty recognized by the American Dental Association, ADA, in October 13, 1999. On March 20, 2014, the West African College of Surgeons recognized the specialty and granted accreditation for postgraduate training. In the United Kingdom, Japan and Australia, the postgraduate education in oral and maxillofacial radiology has two patterns, namely, professional training and academic training.

**Conclusion:** The primary goal of the postgraduate training curriculum in West Africa is to train radiologists who are competent to deliver care to patients in any clinical setting, including the dental school, hospital radiology practice or private practice.



# Evaluation Of Maxillary Sinus Anatomical Variations And Pathology In Patients Using Cone Beam Computed Tomography (CBCT)

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<sup>1</sup>National and Kapodistrian University of Athens, Dental School, Athens, Greece

## Abstract:

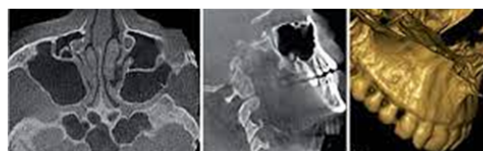
**Aims:** The evaluation of the incidence of specific maxillary sinus anatomical variations and pathology and their correlation to patients' age and gender of CBCT scans made for various indications.

**Materials and Methods:** We analyzed 660 CBCT scans (1320 sinuses) of adult patients involving both sinuses to their full extent performed at our Department between 2017 and 2023. CBCT scans of patients with genetic syndromes, cleft palate, general diseases affecting the size of sinuses, history of injury or surgical intervention in the region of interest and artifacts degrading the image quality were excluded. The following anatomical variations and pathologic findings were assessed from a panel of three experts in the field of Oral and Maxillofacial Radiology: antral septa, posterior superior alveolar artery (PSAA), sinus hypoplasia, sinusitis, odontogenic cysts, retention cysts, dystrophic calcifications and various less common entities (benign fibrous dysplastic entities, neoplasms etc.).

**Results:** We found that antral septa were present in 25,38% of sinuses. PSAA was identifiable in 79,92% of sinuses with a mean distance of 6,44 mm from the floor of the sinus. 2,35% of sinuses were hypoplastic, 9,7% presented sinusitis, 1,44% odontogenic cysts, 8,86% retention cysts, 4,77% dystrophic calcifications and 1,44% more uncommon entities like malignant neoplasms and fibrous dysplasia.

**Conclusion:** Maxillary sinuses present a wide spectrum of anatomical variations and pathology. CBCT is a diagnostic tool of great importance in the identification of the aforementioned findings especially prior to any surgical intervention in the area.

## Evaluation of maxillary sinus anatomical variations and pathology in patients using Cone Beam Computed Tomography (CBCT)



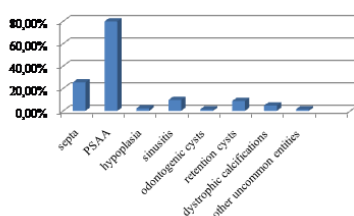
•Maxillary sinuses may present a great spectrum of anatomical variations and pathology  
 •Knowledge of the aforementioned parameters are of great importance to the clinician, especially prior to surgical interventions in the area

•Cone Beam Computed Tomography is nowadays a diagnostic tool that has greatly facilitated 3D imaging of maxillary sinuses



Our retrospective study aims to evaluate the incidence of some common anatomical variations and pathology of maxillary sinuses through the analysis of 660 CBCT scans (1320 sinuses)

Summary of our findings



### CONCLUSION

Maxillary sinuses present a wide spectrum of anatomical variations and pathology. CBCT is a diagnostic tool of great importance in the identification of the aforementioned findings especially prior to any surgical intervention in the area.

## Third Molar Maturity Index In Latvian Population Within 14-23 Year Age Group.

Z. Bokvalde<sup>1</sup>, L. Neimane<sup>1</sup>

<sup>1</sup>Riga Stradins University, Riga, Latvia

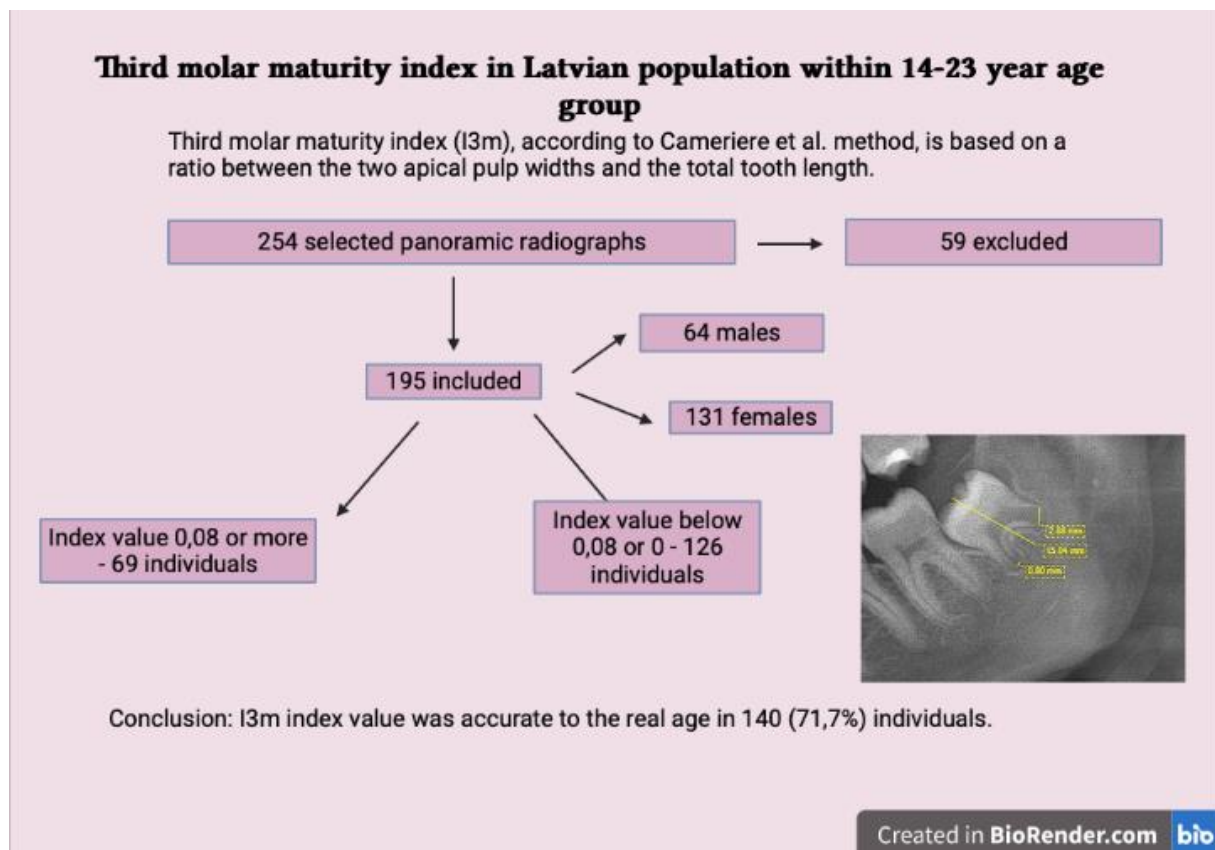
### Abstract:

**Aims:** In the forensic context third molar development is accepted as a reliable measurement of chronological age. Third molar maturity index (I3m), proposed according to Cameriere et al. Method, is based on a ratio between the two apical pulp widths and the total tooth length. The cut-off value of 0.08 was found to be reliable in assessing the threshold of 18 years of age. The aim of this study is to assess and evaluate the accuracy of third molar maturity index (I3m) in relation to the real age in 14-23 year old individuals in Latvian population.

**Materials and Methods:** Methods: cross-sectional retrospective analysing of dental panoramic x-rays of 14-23-year-old individuals was performed.

**Results:** A total of 254 panoramic radiographs were analysed, 195 radiographs met the inclusion criteria and were included, with 64 (32.8%) males and 131(67.2%) females. Third molar maturity index 0,08 or more was for 69 (35.3%) individuals, but below 0,08 or 0 was for 126 (64.7%) individuals.

**Conclusion:** I3m index value was accurate to the real age in 140 (71,7%) individuals.





# Location And Morfology Of Mental Foramen Analyzed In Cone Beam Computed Tomography

A. Bordonas-Santander<sup>1</sup>, R. Venegas-Gomez<sup>1</sup>, M. Rodriguez-Luengo<sup>2</sup>, S. Niklander-Ebensperger<sup>3</sup>, P. Melendez-Rojas<sup>1</sup>

<sup>1</sup>Universidad Andres Bello, School of Dentistry, Viña del Mar, Chile, <sup>2</sup>Universidad Andres Bello, Department of Morphology, School of Medicine, Viña del Mar, Chile, <sup>3</sup>Universidad Andres Bello, Unit of Oral Pathology and Medicine, School of Dentistry, Viña del Mar, Chile

## Abstract:

**Aims:** The mental foramen is the emergence site of the mental nerve, a sensory terminal branch of the inferior alveolar nerve. The aim of this study was to determine variations in location and morphology of the mental foramen using cone beam computed tomography (CBCT).

**Materials and Methods:** A cross-sectional observational descriptive study was carried out. 317 CBCT images from the database of the Oral and Maxillofacial Imaging Service of the School of Dentistry of Andres Bello University, Viña del Mar, Chile, were analyzed. The morphology and distance from the center of the foramen to the mandibular basilar border and to the midline were determined, as well as the most frequent horizontal and vertical position. Statistical analysis was performed using the chi-square test, considering  $p < 0.5$ . This study was approved by the Research and Ethics Committee of School of Dentistry of Andres Bello University.

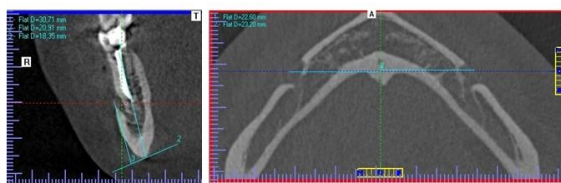
**Results:** The distance from the foramen to the basilar edge had an average of 14.7 and 14.5 mm for the right and left sides, respectively. The mean distance between the foramen and the midline was 23.0 mm ( $p < 0.01$ ). The most frequent horizontal location on the right and left side was type III, as well as the vertical location. The most common morphology on the right side was horizontal oval and circular on the left ( $p < 0.01$ ).

**Conclusion:** Distance from the foramen to the basilar border and midline is gender-dependent, probably explained due to larger jaw size in men.



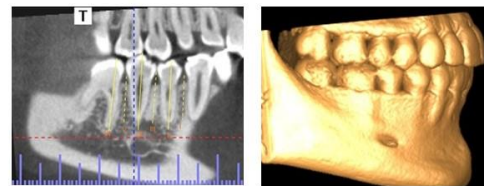
## Location and morfology of mental foramen analyzed in cone beam computed tomography

Comparison among people who assist to Oral and Maxillofacial Imaging Service of the School of Dentistry of Andres Bello University, Viña del Mar, Chile



Quantitative parameters

1. Mesurment from the center of the mental foramen to the basilar border.
2. Mesurment from the center of the mental foramen to the midline guided by lingual foramen



Qualitative parameters

1. Horizontal location of mental foramen mesured from a lateral view.
2. Morfology of mental foramen by a 3D image.
3. Vertical location of mental foramen mesured from a lateral view.

Conclusion: Distance from the foramen to the basilar border and midline is gender-dependent, probably explained due to larger jaw size in men.

## Pericanal Resorption-Resistant Sheet (PrRS) In Invasive Cervical Resorption (Icr): Description Of CBCT Findings.

*J. Briner<sup>1,2</sup>, S. Mazzei<sup>2,3</sup>, B. Ladron-de-Guevara<sup>4</sup>, C. Lagunas<sup>2</sup>, N. Elsaca<sup>2,3</sup>, M. Briner<sup>5</sup>, T. Mackenney<sup>2,1</sup>, A. Briner<sup>2</sup>*

<sup>1</sup>Finis Terrae University, Oral and Maxillofacial Radiology, Santiago, Chile, <sup>2</sup>Brinmax Radiología, Oral and Maxillofacial Radiology, Santiago, Chile, <sup>3</sup>Los Andes University, Oral and Maxillofacial Radiology, Santiago, Chile, <sup>4</sup>Turo Clinic, Dentistry, Santiago, Chile, <sup>5</sup>University of Missouri-Kansas City, Oral Pathology, Radiology and Medicine, Kansas City, United States

### Abstract:

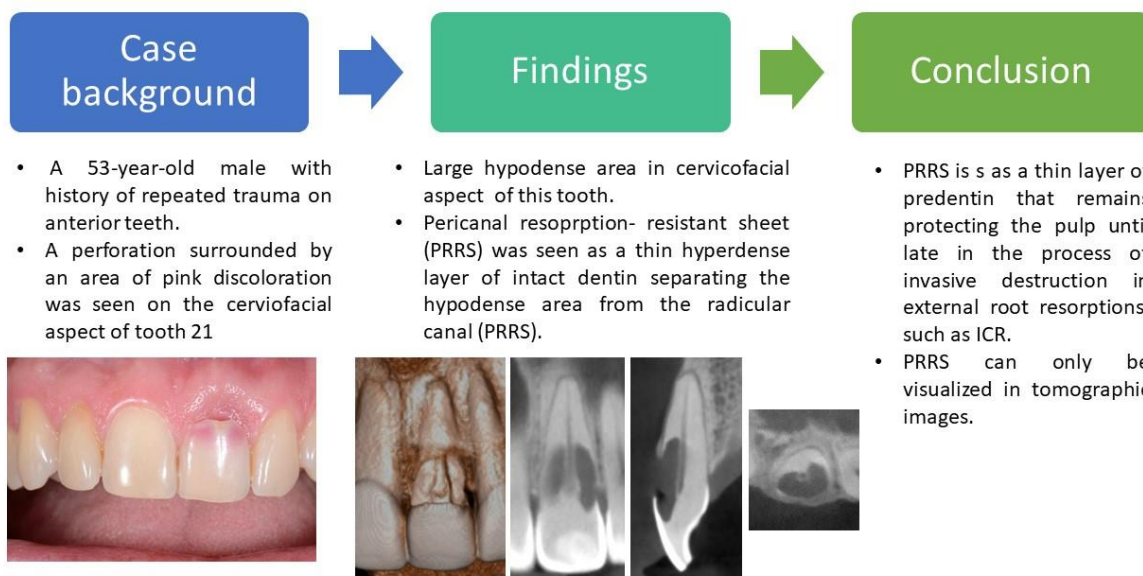
**Aims:** To show and describe the CBCT appearance of the pericanal resorption-resistant sheet (PRRS) in a case of invasive cervical root resorption (ICR).

**Materials and Methods:** A CBCT exam was performed in a 53 year-old-male with history of repeated trauma on the anterior teeth, and pink discoloration and discontinuity on the cervicofacial aspect of tooth 21. The scan was obtained using a Morita X800 CBCT Machine, with a small field of view and voxel size. The images were analyzed in detail by three oral and maxillofacial radiologists.

**Results:** The key findings to determine the diagnosis of ICR was the sum of clinical and tomographic findings. In the periapical radiograph, a radiolucent area was noted in the cervical area of tooth 21. The tomographic images showed a large hypodense area in the cervicofacial aspect of this tooth, extending from the middle third of the root to the apical half of its crown, affecting the dentin, and less so the enamel, only on its facial aspect. Separating this hypodense area from the radicular canal, on its entirety, a thin hyperdense layer of intact dentin (PRRS) was seen.

**Conclusion:** PRRS presents as a thin layer of predentin that protects the pulp until late in the process of invasive destruction. ICR affects enamel and dentin, starting on the cervical aspect on the root surface, below the epithelial attachment, and coronal to the supporting alveolar process. Although ICR has been described many years ago, PRRS sign in ICR has been less mentioned, as it can only be distinguished in CBCT images.

### Pericanal resorption-resistant sheet (PRRS) in Invasive cervical resorption (ICR): description of CBCT findings.



# A Digital Dismay: An Audit On The Display Quality Of Computer Monitors For Digital Dental Radiographs

M. Butt<sup>1</sup>, A. Amin<sup>1</sup>, R. Ngu<sup>1</sup>

<sup>1</sup>King's College London, Dental and Maxillofacial Radiology, London, United Kingdom

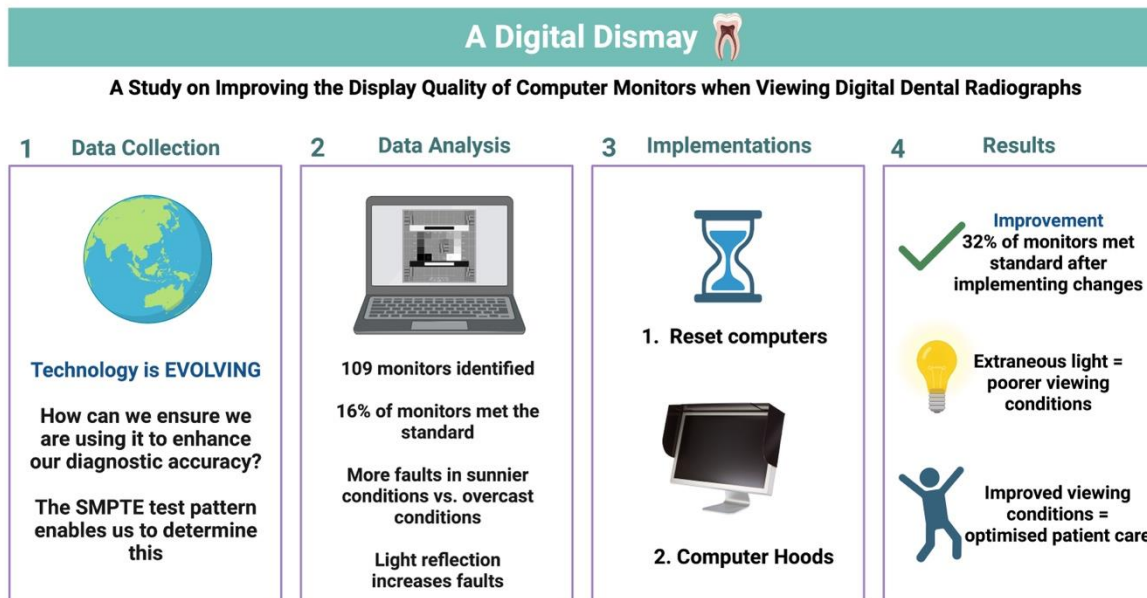
## Abstract:

**Aims:** With the continual evolution of digital technology, it is imperative that display monitors used to view digital radiographs are optimised, enabling clinicians to accurately diagnose and treat dental pathology. There are various factors which affect clinicians' ability to accurately interpret radiographs, including ambient lighting and monitor quality. The aim of this audit is to determine the percentage of computer monitors with optimal contrast and spatial resolution when viewing dental radiographs, by assessing the Society of Motion Picture and Television Engineer (SMPTE) test pattern at King's College London Dental Institute.

**Materials and Methods:** A prospective data collection was undertaken of 109 computer monitors, assessing the viewing conditions of the SMPTE test pattern. Faults in viewing the pattern were recorded using a standardised form. A re-audit was completed after implementing computer hoods and optimally recalibrating monitors.

**Results:** 16% of monitors met the set standard. More spatial resolution faults (55%) were documented than contrast faults (45%). Increased faults were documented on days with sunny weather (63.89%) than to cloudy weather (16.67%). Interestingly, monitors that demonstrated full light reflection recorded greater faults (26.1%), than those showing no light reflection (8.78%). Encouragingly, the re-audit demonstrated improvement, with 32% of monitors meeting the set standard.

**Conclusion:** Reducing extraneous light sources is critical to improving radiograph viewing conditions. Despite improvement in computer monitor quality, lack of calibration of monitors highlights the importance of optimising viewing conditions. The intention is to continue to integrate methods to improve display quality, which will help facilitate the goal of optimising patient care.



*Let's continue to integrate methods to improve display quality, to facilitate providing gold standard care to every patient*

# Reliability And Accuracy Of A Newly Developed Intraoral Ultrasound To Evaluate Alveolar Bone

C. Corbea<sup>1</sup>, G. Heo<sup>1</sup>, L. Le<sup>1</sup>, K. Nguyen<sup>1</sup>, M. Li<sup>1</sup>, N. Kaipatur<sup>1</sup>, F. T Almeida<sup>1</sup>, P. Major<sup>1</sup>

<sup>1</sup>University of Alberta, Edmonton, Canada

## Abstract:

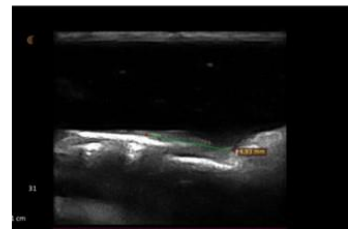
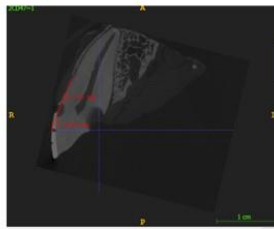
**Aim:** The purpose of this study was to evaluate the reliability and accuracy of a newly developed intraoral ultrasound (US) device to evaluate the facial alveolar bone height in cadavers.

**Materials and Methods:** 38 cadaver teeth distributed across 3 human cadavers were prepared by having placed two notches on the facial enamel surface. The maxillary and mandibular teeth were imaged with a custom designed intra-oral 20 MHz ultrasound probe. Micro-CT ( $\mu$ CT) with 0,03mm voxel size was considered the reference standard. For each sample, the distance from the inferior border of the notch to the tip of the alveolar bone crest on the facial aspect of the teeth was measured from the US and  $\mu$ CT images using Radiant and ITKsnap software. Intra-rater and inter-rater reliability and the accuracy of US compared to  $\mu$ CT were calculated. ICC and standard deviation were used.

**Results:** The intra examiner and inter examiner reliability for both the  $\mu$ CT and US alveolar bone crest measurements were found to be excellent (intra examiner ICC is 0.998 for  $\mu$ CT and 0.997 for US, inter examiner ICC is 0.996 for  $\mu$ CT and in between 0.947 and 0.950 for US). The accuracy of the US was found to be good compared to  $\mu$ CT (ICC in between 0.885 and 0.894).

**Conclusion:** the study demonstrated that intraoral ultrasound has excellent reliability and good accuracy compared to the  $\mu$ CT reference standard to evaluate facial alveolar bone height.

## Reliability and Accuracy of a Newly Developed Intraoral Ultrasound to Evaluate Alveolar Bone



38 teeth from 3 cadavers were scanned with both intraoral US and MicroCT

2 evaluators measured the distance from the notch to the alveolar bone crest in both US and MicroCT

US has excellent reliability and good accuracy compared to the  $\mu$ CT when evaluating alveolar bone height.



# Comparison Of The Cervical Vertebrae Curvature Parameters In Lateral Cephalometric Radiographs Of Orthodontic Patients In 2002-2012 And 2017 Onwards

Z. Dalili Kajan<sup>1</sup>, N. Kariminasab<sup>2</sup>, A. Bozorgi<sup>3</sup>

<sup>1</sup>Guilan University of Medical Sciences, Maxillofacial Radiology, Rasht, Iran, Islamic Republic of, <sup>2</sup>Guilan University of Medical Sciences, Orthodontics, Rasht, Iran, Islamic Republic of, <sup>3</sup>Guilan University of Medical Sciences, Rasht, Iran, Islamic Republic of

## Abstract:

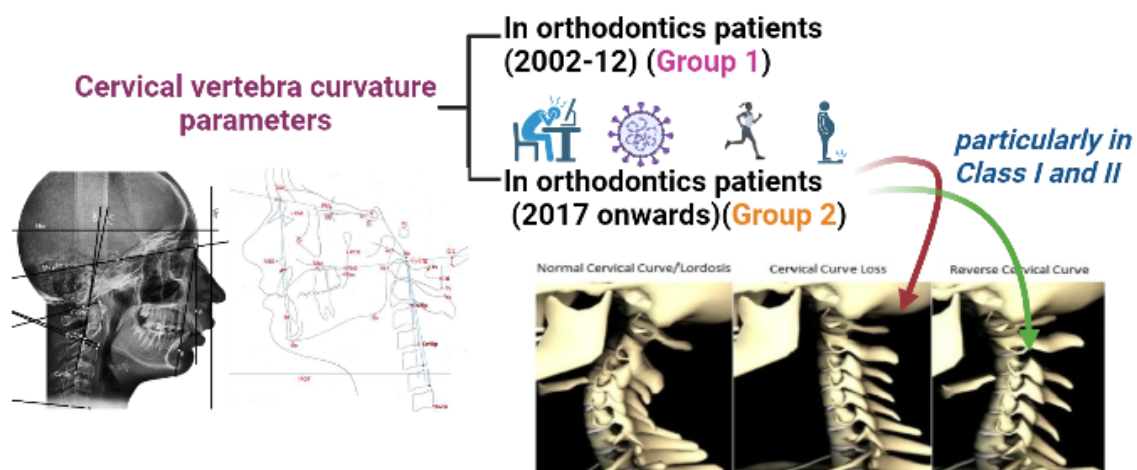
**Aims:** to compare the lateral cephalograms of orthodontic patients in 2001-2011 and from 2016 onwards.

**Materials and Methods:** In this comparative study, cervical spine curvature and head position were evaluated in lateral cephalograms of 120 orthodontic patients (78 women, 42 men) with the age range of (12-25) in two time periods: 2001-2011 (group 1) and 2016 onwards (group 2). Each group had lateral cephalograms of 60 patients (30 class I, 20 class II, 10 class III). SN-Ver, OPT-Hor, CVT-Hor, and MCA angles were used for head position evaluation, and UCL, LCL, and TCL angles were used for cervical spine curvature evaluation. Data were evaluated by Independent Samples Test, Chi-Square Pearson, Mann-Whitney, and Linear Regression analysis.

**Results:** Without considering sex, age, and skeletal classes, SN-Ver, OPT-Hor, and CVT-hor angles showed a statistically significant increase in group 2 compared to group 1. LCL and TCL angles showed a statistically significant decrease. Comparing group 2 with group 1, the SN-Ver angle in class I and II and CVT-Hor angle in class II had increased. ( $p < 0.05$ ) UCL decreased in class I and increased in class II. ( $p < 0.05$ ) LCL and TCL decreased in class I and II. ( $p < 0.05$ ).

**Conclusion:** Skeletal class I and class II showed flexion in group 2 compared to group 1. In group 2, overall lordosis in the cervical spine had decreased and tended toward a straight position and kyphosis. Upper cervical spine curvature, in group 2, in class I, showed less lordosis and tended toward straight position and kyphosis, while in class II, it tended toward lordosis.

## Comparison of the cervical vertebrae curvature parameters in lateral cephalometric radiographs of orthodontic patients in 2002-2012 and 2017 onwards



**Conclusion:** skeletal class I and class II showed flexion in group 2 when compared with group 1. Also, in group 2, overall Lordosis in cervical spine had decreased and tended toward straight position and kyphosis. Upper cervical spine curvature, in group 2, in class I showed less Lordosis and tended toward staright position and kyphosis, while in class II it tended toward Lordosis.

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# Accuracy And Effect Of An Artifact Reducing Filter On The Measurement Of The Thickness Of The Root Canal Walls In The Presence Of Radiodense Materials

D.L. de Souza<sup>1</sup>, E.F. Bauer<sup>2</sup>, L.C. de Lima Dias Júnior<sup>1</sup>, E. Antunes Botoluzzi<sup>1</sup>, L. da Fonseca Roberti Garcia<sup>1</sup>

<sup>1</sup>Federal University of Santa Catarina, Odontology, Florianópolis, Brazil, <sup>2</sup>Orofacial Institute of the Americas, Radiology, Blumenau, Brazil

## Abstract:

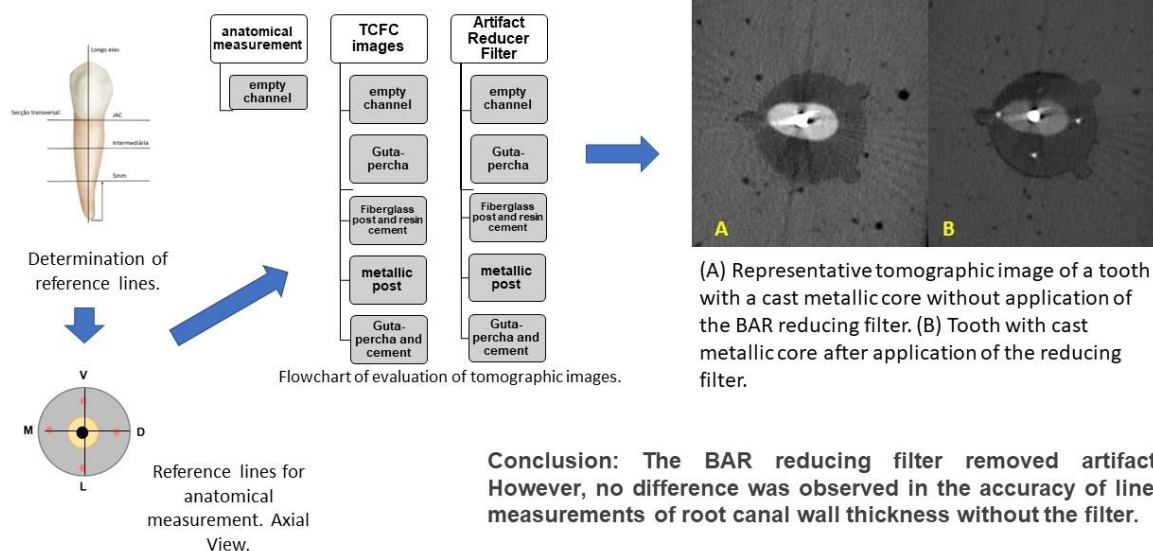
**Aims:** to evaluate the effect of the artifact-reducing filter BAR of the e-Vol DX software on the accuracy of measurements of the thickness of root canal walls filled with radiodense materials.

**Materials and Methods:** Human teeth were selected. After the chemical-mechanical preparation, three lines were drawn perpendicularly on the surface of the roots. Axial cuts were performed with a double-sided diamond disc. The measurement of dentin thickness was performed on the upper surface of each section with a digital caliper, with the aid of a surgical microscope. Images of all specimens were obtained with empty canals, filled with a gutta-percha cone, with and without endodontic cement, and with different intraradicular retainers. The tomographic images were exported to the e-Vol DX software, where the thickness of the dentin walls was again measured. A comparative analysis between the measurements of the reference standard and the tomographic images was carried out. The one-way ANOVA statistical test and Dunnet's post-hoc test were applied to the data. The significance level adopted was 5%.

**Results:** The group with gutta-percha and endodontic sealer showed a statistical difference in relation to the reference standard ( $p < 0.05$ ). However, there was no significant difference after the application of the BAR reducing filter ( $p > 0.05$ ). The group with cast metallic core showed statistical difference in the overall averages of the cervical and middle thirds, as well as in the mesial portion after application of the reducing filter ( $p < 0.05$ ).

**Conclusion:** The BAR reducing filter removed most of the artifacts.

## ACCURACY AND EFFECT OF AN ARTIFACT REDUCING FILTER ON THE MEASUREMENT OF THE THICKNESS OF THE ROOT CANAL WALLS IN THE PRESENCE OF RADIODENSE MATERIALS



# Large Sialolith In The Submandibular Gland With Radiological Findings Case Report And Literature Review

R. Şendişçi<sup>1</sup>, B. Stevanovic Sancar<sup>1</sup>, S. Günen Yılmaz<sup>1</sup>

<sup>1</sup>Akdeniz University, Oral ve Maxillofacial Radyology, Antalya, Turkey

## Abstract:

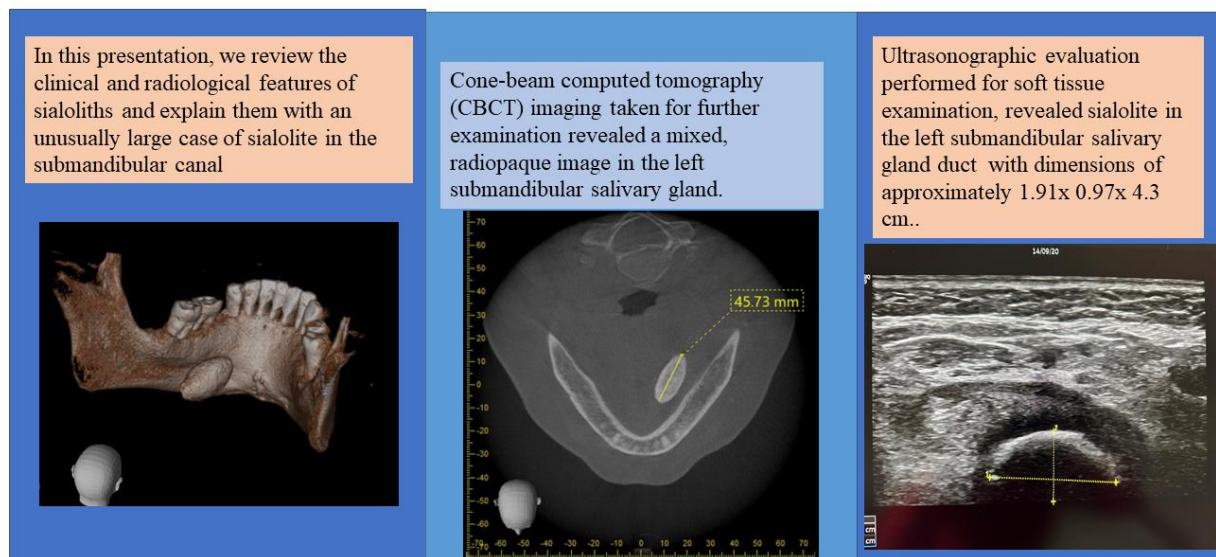
**Aims:** Sialolithiasis is one of the most common calcifications in the maxillofacial region. The size of the sialolith can vary from less than 1 mm to several cm in greatest diameter. Stones larger than 15 mm are classified as giant sialoliths and are found in most submandibular glands or ducts. In this presentation, we review the clinical and radiological features of sialoliths and explain them with an unusually large case of sialolite in the submandibular canal.

**Materials and Methods:** A 68-year-old female patient was admitted to our clinic with the complaint of painful swelling in the floor of the mouth. In the panoramic radiograph taken from the patient, a radiopaque focus was observed in the left angulus region. Cone-beam computed tomography (CBCT) imaging taken for further examination revealed a mixed, radiopaque image in the left submandibular salivary gland. In addition, in the ultrasonography evaluation performed for soft tissue examination, it was determined that the sialolite was in the left submandibular salivary gland duct and with dimensions of approximately 1.91x 0.97x 4.3 cm.

**Results:** The patient, who was diagnosed with sialolite in the submandibular gland based on anamnesis, clinical and radiographic findings, was referred to the oral, dental and maxillofacial surgery department for treatment.

**Conclusion:** It is important to make the differential diagnosis of salivary gland stones from other calcified structures. Today, advanced imaging methods are preferred in order to determine the localization and size of sialoliths in the submandibular salivary gland.

## Large Sialolith in the Submandibular Gland with Radiological Findings Case Report and Literature Review



# How Small Bone Resorption Can Be Differentiated And Diagnosed By Fusion Cbct Images: An Exploratory Quantitative Study

J. Feng<sup>1</sup>, G. Li<sup>1</sup>, R. Ma<sup>1</sup>, L. Sun<sup>1</sup>, J. Zhao<sup>1</sup>, Y. Zhao<sup>1</sup>, J. Meng<sup>1</sup>

<sup>1</sup>Peking University School and Hospital of Stomatology, Beijing, China

**Abstract:**

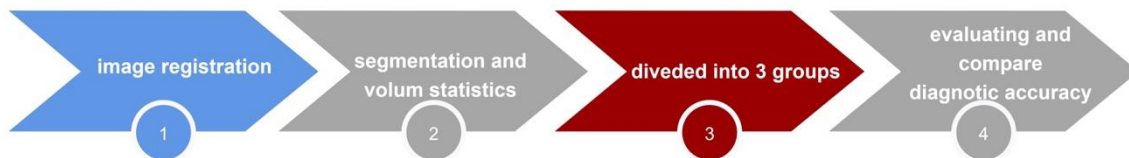
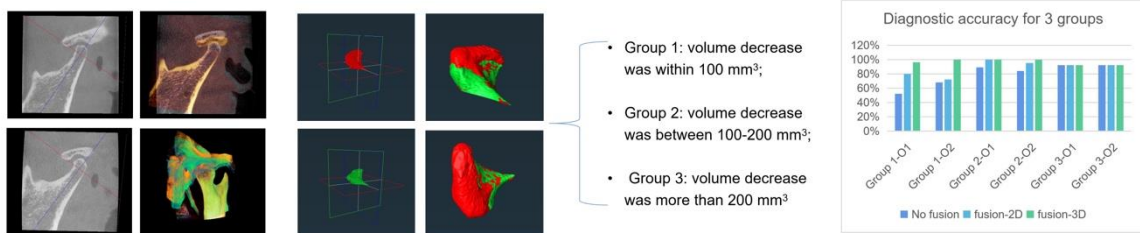
**Aims:** To explore whether the methods proposed in this research can be used to diagnose condylar bone resorption accurately when the decreased volume was in a small range.

**Materials and Methods:** Ninety-two TMJs from sixty-three patients were included. The condyle volume was calculated by segmenting after registration and resampling. Two residents evaluated the resorption of condyles with a five-point scale for the three image sets (two consecutive CBCT images without fusion, fused 2D cross-sectional images, and fused 3D images) randomly and independently. The samples determined as bone resorption by the expert panel were divided into three groups (Group 1: the volume decrease was within 100 mm<sup>3</sup>; Group 2: the volume decrease was between 100-200 mm<sup>3</sup>; Group 3: the volume decrease was more than 200 mm<sup>3</sup>). Diagnostic accuracy was calculated to assess the difference among the three groups.

**Results:** Thirty-six TMJs were determined as having no bone resorption, twenty-four condyles' volume decreased within 100 mm<sup>3</sup>; nineteen condyles' volume decreased between 100-200 mm<sup>3</sup>; thirteen condyles' volume decreased more than 200 mm<sup>3</sup>. The diagnostic accuracy for group 1 was higher in fused 2D (0.72-0.80) and 3D (0.96-1) image sets than in the image sets without fusion (0.52-0.68). In contrast, for group 2, the diagnostic accuracy was slightly higher in fused image sets (0.95-1) than in the image sets without fusion (0.84-0.89). For group 3, the diagnostic accuracy was the same (0.92) in the three image sets.

**Conclusion:** Fused CBCT images can significantly improve the diagnostic accuracy for bone resorption especially when the condyle volume decreased within 100 mm<sup>3</sup>.

## How small bone resorption can be differentiated and diagnosed by fusion CBCT images an exploratory quantitative study



**conclusion:** Fused CBCT images can significantly improve the diagnostic accuracy for bone resorption especially when the condyle volume decreased within 100 mm<sup>3</sup>.



## Panoramic Errors In Pediatric Patients With Special Needs

A. Fux-Noy<sup>1</sup>, R. Rohana<sup>1</sup>, A. Rettman<sup>2</sup>, M. Moskovitz<sup>1</sup>, C. Nadler<sup>2</sup>

<sup>1</sup>Hebrew University of Jerusalem, Faculty of Dental Medicine, Hadassah Medical Center, Department of Pediatric Dentistry, Jerusalem, Israel, <sup>2</sup>Hebrew University of Jerusalem, Faculty of Dental Medicine, Hadassah Medical Center, Oral Maxillofacial Imaging Unit, Department of Oral Medicine, Sedation and Imaging, Jerusalem, Israel

### Abstract:

**Aims:** Panoramic imaging is a valuable diagnostic tool in pediatric dentistry. Imaging paediatric patients, especially those with special needs, is challenging and may result in technical errors which deem the image non-diagnostic, leading to re-takes and unnecessary radiation exposure to the patient. This study aimed to analyze the types and frequencies of panoramic technical errors in pediatric patients with special needs, compared to matching images of patients with normal developmental patterns.

**Materials and Methods:** Panoramic images of 100 pediatric patients with an equal number of either special needs or healthy controls referred to the Oral Maxillofacial Imaging unit, were retrospectively examined for the presence of four common technical errors: palatoglossal air space, movement, positioning errors and foreign bodies appearance by four blinded observers. In addition, they subjectively determine the image quality on an ordinal scale. The statistical examination included inter-observer correlation and correlations between demographic (age, gender, developmental status) and the number and types of errors.

**Results:** The frequencies of demonstrated errors were, in descending order: movement, positioning, palatoglossal air space and then foreign bodies' appearance. The special needs group images showed significantly more errors and were rated as low-quality radiographs. Younger patients in both groups showed more movement and positioning errors.

**Conclusion:** Technical errors in panoramic images of patients with special needs were more frequently found. Therefore, increased awareness and pre-imaging instructions are required when imaging pediatric patients, especially those with special needs.

## PANORAMIC ERRORS IN PEDIATRIC PATIENTS WITH SPECIAL NEEDS

Figure 1

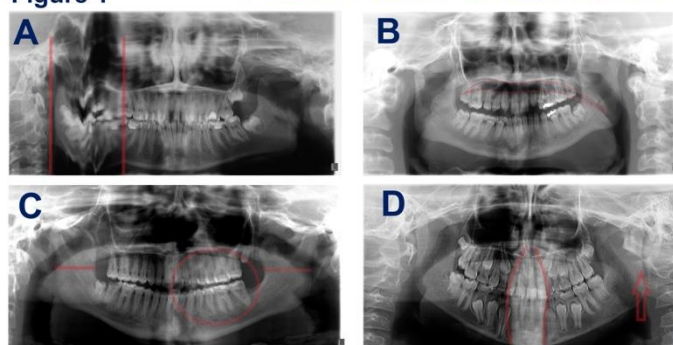


Figure 1: Examples of panoramic technical errors (A) Movement (B) Palatoglossal airway superimposed on the maxilla (C) Horizontal misalignment causing ;left dentition overlap (D) Anterior-posterior misalignment causing demonstration of the vertebral ghost image as well as vertebral superimposition on left ramus

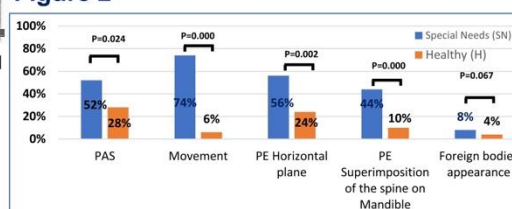
Table 1: Demographic of study and control groups

Figure 2: Distribution of panoramic technical errors The special needs (SN) group displayed more errors when compared to the healthy (H) group.

Table 1

Characteristic	Healthy No. (%)	Special needs No. (%)	Mean age (years)
<b>Gender</b>			
Female	15 (30%)	15 (30%)	11.33
Male	35 (70%)	35 (70%)	12.37
Total	50 (100%)	50 (100%)	12.06
<b>Age</b>			
< 12 years	19 (38%)	19 (38%)	7.8
≥ 12 years	31 (62%)	31 (62%)	14.16
Total	50 (100%)	50 (100%)	11.76

Figure 2



**Conclusions:** Increased awareness and pre-imaging instructions are required when imaging pediatric patients, especially those with special needs, due to the increased risk of technical errors in panoramic imaging.

# Primordial Odontogenic Tumor: A Systematic Review With A Focus On Clinicoradiological Characteristics

X.-L. Guo<sup>1</sup>, B. Li<sup>1</sup>, Y. Cheng<sup>1</sup>, S.-D. Yang<sup>2</sup>

<sup>1</sup>Wuhan University, School & Hospital of Stomatology, Department of Oral Radiology, Wuhan, China, <sup>2</sup>Wuhan University, School & Hospital of Stomatology, Department of Pathology, Wuhan, China

## Abstract:

**Aims:** Primordial odontogenic tumor (POT) is a rare entity. Evidence on clinical and radiological characteristics of POT is lacking. The aim of this study was to identify the demographic, clinical, and radiological features that might facilitate the diagnosis of POT.

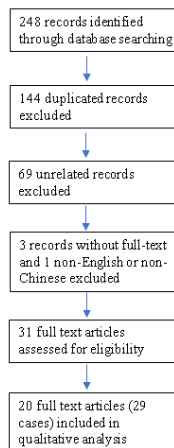
**Materials and Methods:** A systematic review of literature was conducted using 6 main English and 3 main Chinese databases. Publications reporting cases with enough clinical and radiological information were included. Age, sex, symptoms and signs, radiological features were analyzed. Descriptive statistics were computed.

**Results:** Twenty publications with 29 (19 males and 10 females) cases of POT were included. The subject's mean age was 12 years, ranging from 2 to 26 years. Seventy-two percent of the POT lesions were located in posterior mandible. All but one cases were asymptomatic and about 80% of the cases presented with a sign of jawbone expansion. The typical radiological characteristics of the POT were a well-defined uni- or multi-locular radiolucency, always associated with an unerupted tooth; root resorption was observed in more than 40% of the POT cases. Variable amount of calcification was noted in four cases (14%). One case recurred after enucleation together with extraction of the involved tooth.

**Conclusion:** POT mostly occurs in the first and second decade of life, and has a predilection for males and the posterior mandible. The typical radiological features of POT may mimic that of odontogenic cysts or benign odontogenic tumors that need regional resection of the jawbone, highlighting the importance of differential diagnosis of POT.

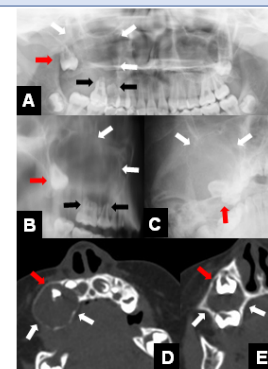
## Primordial odontogenic tumor: a systematic review with a focus on clinicoradiological characteristics

### Study selection flowchart



### Results

Demographic and Clinical Features	The Number of Cases (%)	Radiological Features	The Number of Cases (%)
Age (years)		Peripheral, well-defined	29 (100%)
<10	8 (27.6%)	Internal structure	
≥10, <20	20 (69%)	radiolucency	25 (86.2%)
Sex		radiolucent background with radiopaque calcification	4 (13.8%)
male	19 (65.5%)	Effects on surrounding structures	
female	10 (34.5%)	associated with unerupted tooth	29 (100%)
Location		root resorption	12 (41.3%)
anterior maxilla	3 (10.4%)	jawbone expansion	23 (79.3%)
posterior maxilla	5 (17.2%)	perforation of cortical bone	7 (24.1%)
posterior mandible	21 (72.4%)		
Symptom and sign			
asymptomatic	28 (96.6%)		
swelling or facial asymmetry	23 (79.3%)		



Radiological images of two cases with primordial odontogenic tumor. (A-C: case 1; D and E: case 2) showing two unilocular, well-defined, radiolucent lesions of the right posterior maxilla with expansion or perforation of cortical bones (white arrows), associated with an unerupted tooth (red arrows), and root resorption (black arrows).

**Conclusion:** Primordial odontogenic tumor (POT) mostly occurs in the first and second decade of life, and has a predilection for females and the posterior mandible. The typical radiological features of POT may mimic that of odontogenic cysts or benign odontogenic tumors that need regional resection of the jawbone, highlighting the importance of differential diagnosis of POT.

# Survey Of Dental Practitioners In New South Wales, Australia About The Knowledge And Perceptions Of Errors In Interpretations Of Dental Radiographs

S. Hegde<sup>1</sup>, J. Gao<sup>1</sup>, S. Cox<sup>1</sup>, S. Nanayakkara<sup>1</sup>, R. Vasa<sup>2</sup>

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## Abstract:

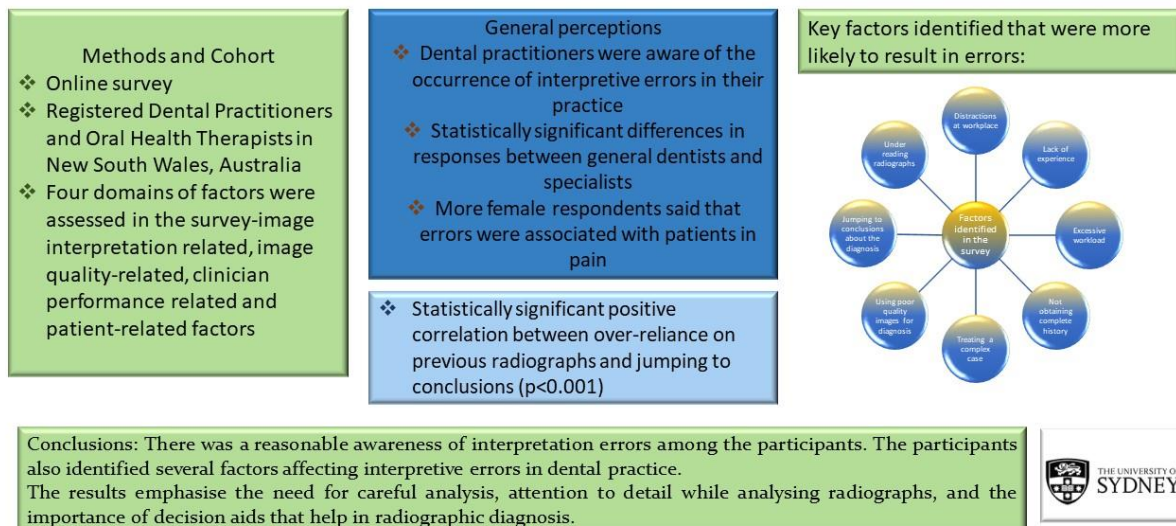
**Aims:** To evaluate the dental practitioner’s knowledge and perceptions about errors in the interpretation of dental radiographs and the factors affecting them.

**Materials and Methods:** An anonymised online questionnaire was designed using Qualtrics. This project received ethics approval from the University of Sydney (approval number 2020/336). The survey was distributed via social media, dental newsletter and through known networks of the research team. Only dentists, dental specialists and oral health therapists registered to practice in New South Wales, Australia, were invited to participate. The survey was distributed between September 2020 and March 2022, and 83 valid responses were received.

**Results:** The survey found that the majority of respondents were aware of the occurrence of errors of interpretation in their practice. Errors of omission where a diagnosis was missed were identified as the most common type of error to occur, with general practitioners reporting a higher incidence of omission errors compared to specialist dentists (  $p<.05$ ). Regarding the factors affecting interpretive errors, the participants identified that factors such as reading a poor quality image, distractions at the workplace, treating a patient with complex problems and jumping to conclusions with a diagnosis were more likely to result in errors of interpretation. A significant positive correlation was seen between over-relying on previous radiographic diagnoses and jumping to conclusions on diagnosis ( $p<.001$ ).

**Conclusion:** Dental practitioners consider errors of interpretation to occur in dental practice, and the cause of the errors is multifactorial. Commonly occurring factors from clinician-related, image interpretation-related, and patient-related factors were identified to result in interpretation errors.

## Knowledge And Perception Of Errors Of Interpretation ( EOI) Of Dental Radiographs: A Survey



# Radiographic Features Of Calcifying Odontogenic Cysts On Cone Beam Computed Tomography: A Retrospective Study

H. Hu<sup>1</sup>, M. You<sup>1</sup>, Y. Liu<sup>1</sup>, L. Liu<sup>1</sup>, J. Ren<sup>1</sup>, B. Tang<sup>1</sup>

<sup>1</sup>West China Hospital of Stomatology, Sichuan University, Department of Medical Imaging, Chengdu, China

## Abstract:

**Aims:** The aim of this study was to evaluate the radiographic features of calcifying odontogenic cysts (COCs) using cone beam computed tomography (CBCT).

**Materials and Methods:** A retrospective analysis from January 2012 to December 2022 in the West China Hospital of Stomatology was performed. All cases were histopathologically confirmed, and the radiographic features on CBCT were assessed.

**Results:** Nineteen consecutive COCs were reviewed. Nine females and ten males, aged 5-65 years, with a median of 18 years. The maxilla and mandible were affected in 14 and 5 cases, respectively. Most of the COCs were confined to the anterior region of both jaws (89.5%). All cases were presented with a well-defined unilocular cystic lesion. The internal architecture of the COCs was heterogeneous in 68.4% of the cases, with 42.1% of the case showing calcifications and 26.3% of the cases associated with odontoma. The bony expansion was found in 94.7% of the cases, and most of the COCs caused perforation of the buccal cortical plate (73.7%). Other effects on surrounding structures included tooth displacement (78.9%) and root resorption (47.4%).

**Conclusion:** CBCT is an effective imaging modality for evaluating the radiographic features of COCs. The characteristic features of COCs on CBCT include a unilocular shape, well-defined border, heterogeneous internal architecture, and significant bony expansion.

## Radiographic features of calcifying odontogenic cysts on cone beam computed tomography: a retrospective study.

**Table 1 Radiographic features of COCs on CBCT**

Feature	Female (n)	Male (n)	Total (n)
Gender	9	10	19
Age	11-65 (years)	5-49 (years)	5-65 (years)
Position			
Maxilla			
Anterior	5	7	12
Anterior-posterior	2	0	2
Mandibular			
Anterior	2	3	5
Border	9	10	19
Well-defined			
Shape	9	10	19
Unilocular			
Internal structures			
Calcification	2	6	8
Odontoma	2	3	5
Bony expansion			
Buccal	7	3	10
Palatal/Lingual	0	1	1
Buccal & Palatal/Lingual	2	5	7
Cortical perforation	8	7	15
Tooth displacement	6	9	15
Root resorption	5	4	9



Representative case of COC on CBCT (arrow: internal calcification)

**Conclusions:** CBCT is an effective imaging modality for evaluating the radiographic features of COCs. The characteristic features of COCs on CBCT include a unilocular shape, well-defined border, heterogeneous internal architecture, and significant bony expansion.



# Influence Of Orthodontic Appliances On The Detectability Of Pathologies In Cbct Images With And Without Dose Reduction

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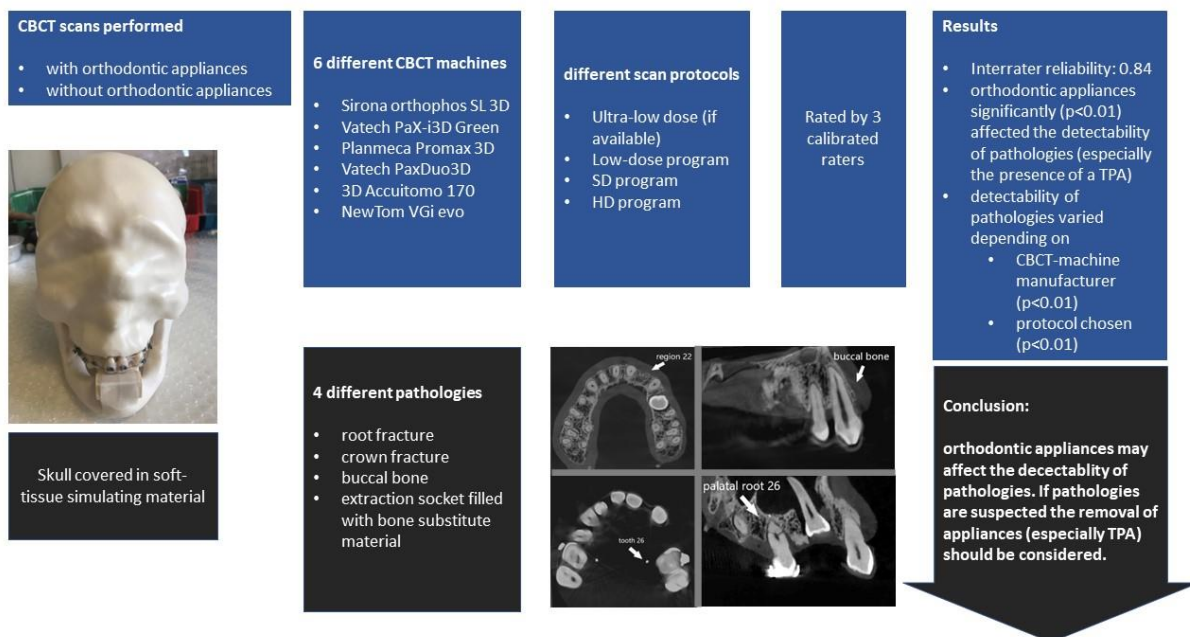
**Abstract:**

**Aims:** It is not yet clear whether orthodontic appliances can produce artefacts in CBCT images that impede the detectability of pathologies. Therefore, the study aimed to assess the impact of artefacts caused by orthodontic appliances on the detectability of pathologies in CBCT images with and without dose reduction.

**Materials and Methods:** A human cadaver exhibiting different oral pathologies was covered by means of a soft tissue emulation material. Orthodontic appliances and brackets were temporarily inserted. Radiographs were taken using 6 different CBCT machines at different settings, i.e. (ultra)-low dose, standard dose, and HD programs (if available). All CBCT images were registered and corresponding slices were extracted. Detectability of pathologies was scored by 3 calibrated raters utilizing diagnostic monitors. Statistical analysis (ANOVA, Tukey test) was performed using SPSS.

**Results:** The ICC amounted to 0.84. Orthodontic appliances significantly ( $p < 0.01$ ) affected the detectability of pathologies regardless of the CBCT setting/ dose reduction. Especially the presence of a transpalatal arch impeded detectability of pathologies. Additionally, the detectability of pathologies varied depending on the CBCT-machine manufacturer ( $p < 0.01$ ) and on the protocol chosen ( $p < 0.01$ ), especially discreet pathologies (e.g. crown fracture) were less visible in dose saving protocols.

**Conclusion:** Within the limitations of a cadaver study, the present data suggest that orthodontic appliances in the field-of-view might impede the detectability of oral pathologies. Removal of a transpalatal arches or archwires should be considered especially when the presence of pathologies (e.g. root or crown fracture) is suspected.



# Evaluation Of Knowledge, Behavior And Attitude About Radiation Safety And Radiation Protection In Dentistry

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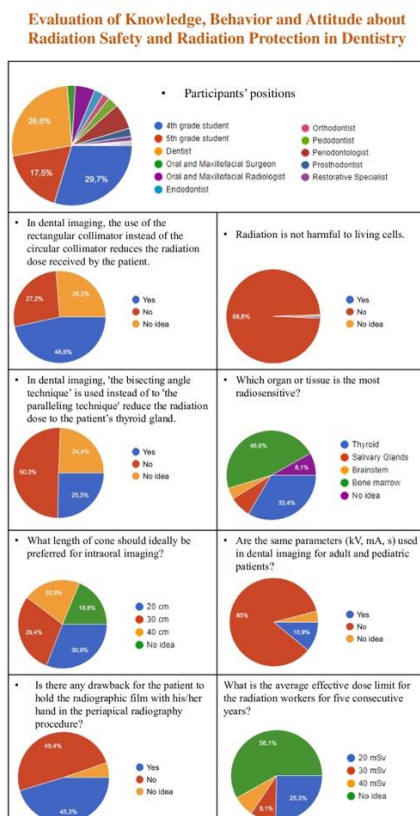
## Abstract:

**Aims:** Dental imaging is done frequently by x-ray in dentistry practice. Dentists should have knowledge about radiation protection in order to protect themselves, the patients, and the environment from the possible damage of radiation. The purpose of this study is to evaluate radiation security knowledge and behavior and create awareness of these issues among intern dentistry students and dentists.

**Materials and Methods:** 151 intern dentists, 86 dentists, and 83 specialist dentists participated in the survey. The survey was prepared through Google forms. The questionnaire includes questions about the demographic characteristics of the participants, their level of knowledge about radiation safety, and their attitudes and behaviors. Statistical analysis was performed using IBM SPSS Statistics version 28.0(IBM, Chicago, IL).

**Results:** From the participants of the survey; 46.6%(149) chose the rectangular collimator, 20.9%(67) used a 40 cm cone, and 50.3%(161) of them used a parallel technique and preferred to reduce the radiation dose. 46.6%(149) of the participants chose bone marrow as the most radiosensitive tissue. Of the participants, 9.1%(29) of them did not know about the As-Low-As-Reasonably-Achievable(ALARA) principle. It was learned that 33.4%(107) of the participants wanted their patients to hold the film with their own hands during the periapical radiographs.

**Conclusion:** According to the results of the survey, it has been observed that intern dentists and specialist radiologists have a higher awareness of radiation safety compared to dentists and other specialist dentists. However, considering the damage of x-rays to vital tissues, it is found that, this awareness is not sufficient and needs to be increased.



# Morphological Effects Of Low-Dose Ionising Radiation Exposure From A Diagnostic Dental X-Ray Unit On Zebrafish Embryos

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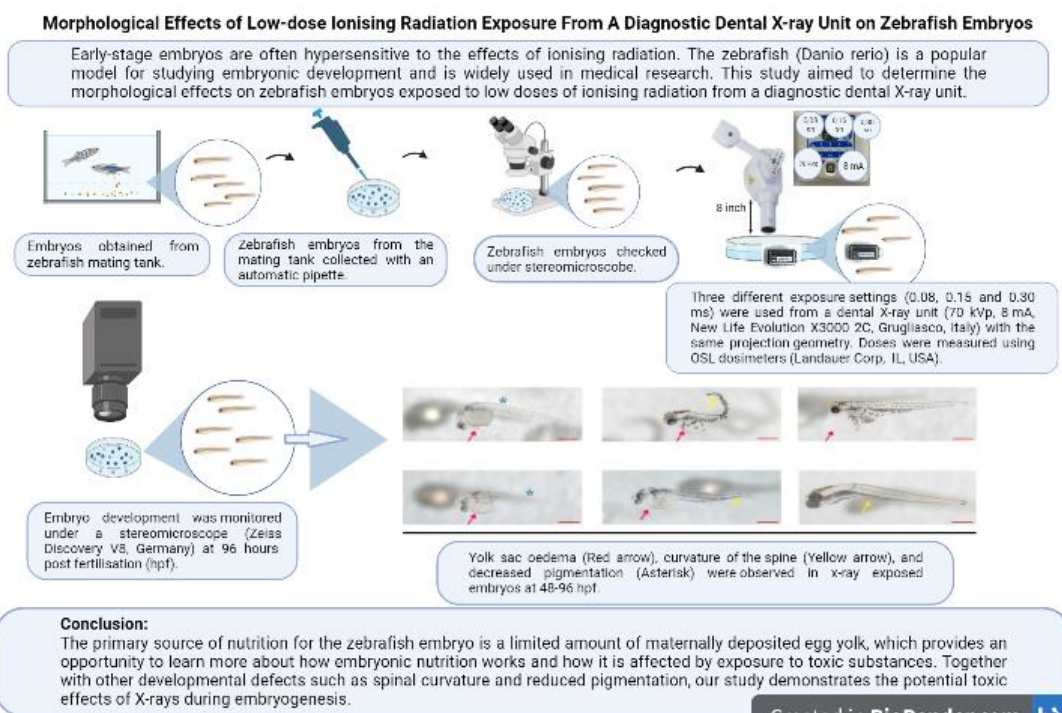
## Abstract:

**Aims:** Early-stage embryos are often hypersensitive to the effects of ionising radiation. The zebrafish (*Danio rerio*) is a popular model for studying embryonic development and is widely used in medical research. This study aimed to determine the morphological effects on zebrafish embryos exposed to low doses of ionising radiation from a diagnostic dental X-ray unit.

**Materials and Methods:** Zebrafish embryos of the AB/AB strain, selected under the stereomicroscope after fertilisation and divided into four groups. Three different exposure settings (0.08, 0.15 and 0.30 ms) were used from a dental X-ray unit (70 kVp, 8 mA, New Life Evolution X3000 2C, Grugliasco, Italy) with the same projection geometry. Doses were measured using OSL dosimeters (Landauer Corp, Glenwood, IL, USA). The control group was not exposed. Embryo development was monitored under a stereomicroscope (Zeiss Discovery V8, Germany) at 96 hours post fertilisation (hpf).

**Results:** The measured skin doses ranged from 8.33 to 78 mSv depending on the exposure time. Embryos in the control group showed healthy development, whereas yolk sac oedema, curvature of the spine, and decreased pigmentation were observed in x-ray exposed embryos.

**Conclusion:** The primary source of nutrition for the zebrafish embryo is a limited amount of maternally deposited egg yolk, which provides an opportunity to learn more about how embryonic nutrition works and how it is affected by exposure to toxic substances. Together with other developmental defects such as spinal curvature and reduced pigmentation, our study demonstrates the potential toxic effects of X-rays during embryogenesis.



# Metastatic Tumors To The Jawbones: A Retrospective Study From A Single Institution Of China

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## Abstract:

**Aim:** Metastatic tumor to the jawbones are rare, and misdiagnosis is commonly. The purpose of this study was to evaluate the clinical and radiological features of metastatic tumors to the jawbone to facilitate the differential diagnosis.

**Material and Methods:** A retrospective case series was performed. Clinical and imaging data of patients with metastatic lesions in the jawbones at Wuhan University Hospital of Stomatology were reviewed. Age, sex, medical history, symptoms and signs, and computed tomography (CT) or cone beam CT (CBCT) imaging features were analyzed. Descriptive statistics were computed.

**Results:** Fourteen patients (8 males and 6 females) were included. The subject's mean age was 58 years, ranging from 23 to 81 years. Seven cases presented with a history of primary tumor. The most common primary sites of the metastatic tumors were the lung and kidney. Most (64.3%) cases metastasized to multiple secondary sites, namely, including other sites of the body than the jawbone. Ten cases (9 mandibles and 1 maxilla) involved a single site of the jawbone, while 5 cases involved 2 sites of the jawbone simultaneously. The radiological characteristics of the jawbone metastases were osteolytic or mixed radiopaque-radiolucent lesions with ill-defined margins.

**Conclusion:** Metastatic tumor to the jawbones should be included in the differential diagnosis of a jawbone mass when aggressive imaging features are present on CT or CBCT images. Our results highlight the significance of medical history and presence of multi-site lesions, through careful physical examination and watchful interpretation of (CB)CT images, for the diagnosis of this rare entity.

## Metastatic tumor to the jawbones: A retrospective study from a single institution of China

Results			
Demographic and Clinical Features	The Number of Cases (%) <sup>*</sup>	Radiological Features	The Number of Cases (%) <sup>*</sup>
Mean Age (range) (years)	57.5 (23-81)	Peripheral, ill-defined	14 (100)
≥50	10 (71.4)	Internal structure radiolucency	10 (71.4)
Sex		mixed radiopaque-radiolucent	5 (35.7)
female	6 (42.9)	radiopaque	1 (7.1)
History of Primary Tumor	7 (50)	Effects on surrounding structures	
Multi-site Metastasis	9 (64.3)	floating teeth	4 (28.6)
involving 2 sites of the jawbone	5 (35.7)	tooth loss	7 (50)
Location		jawbone expansion	5 (35.7)
mandible	12 (85.7)	cortical bone erosion	12 (85.7)
posterior	9 (64.3)	Radiological diagnosis	
Symptoms and signs		malignancy	12 (85.7)
swelling	11 (78.6)	metastasis to jawbone	2 (14.3)
pain or numbness	6 (42.9)	osteosarcoma or sclerosing osteomyelitis	4 (28.6)

<sup>\*</sup>The total number (frequency) of cases for some clinical and radiological features may be greater than 100 (%) in that two or more features might occur simultaneously in the same case.

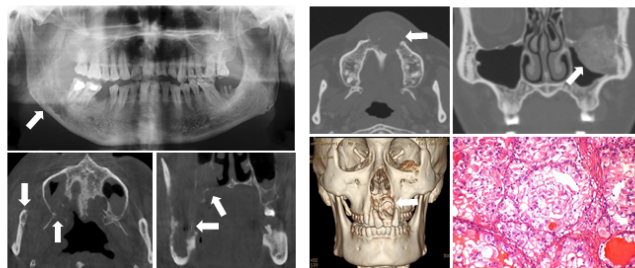


Figure 1. Radiological images of a 66 years old male with metastatic lesions to both the right maxilla, the right mandible and the liver. (A) Panoramic radiograph showing osteolytic lesion with a 'moth-eaten' appearance in the right mandible (arrow); axial (B) and coronal (C) CBCT images demonstrating radiolucent lesions with ill-defined margin in both the right posterior maxilla and mandible, with erosion of the cortical bone.

Figure 2. Radiological and histopathological findings of a 23 years old male with metastatic lesions to two different sites of the maxilla. Axial (A), coronal (B) CT images and 3D view (C) showing an osteolytic lesion in the anterior maxilla and an ill-defined, mixed radiolucent-radiopaque mass in the left posterior maxilla infiltrating superiorly into the left orbital floor and medially into the right maxillary sinus. Histologic examination (D) demonstrating features typical of clear cell renal cell carcinoma (H&E, original magnification ×200).

**Conclusion:** Metastatic tumor to the jawbones should be included in the differential diagnosis of a jawbone mass when aggressive imaging features are present on CT or CBCT images. Our results highlight the significance of medical history and presence of multi-site lesions, through careful physical examination and watchful interpretation of (CB)CT images, for the diagnosis of this rare entity.



## Infrared Thermographic Analysis Of Tooth Temperature During Various Obturation Techniques

J.C. Lima Neto<sup>1</sup>, F.C.M. Suassuna<sup>2</sup>, D.B. da Silva<sup>1</sup>, R.T. Firmino<sup>1</sup>, S.L. Sousa Melo<sup>3</sup>, P.M. Bento<sup>1</sup>, D. Pita de Melo<sup>1</sup>

<sup>1</sup>State University of Paraiba, Campina Grande, Brazil, <sup>2</sup>FACEME/FACENE, Joao Pessoa, Brazil, <sup>3</sup>Oregon Health and Science University, Oral and Craniofacial Sciences, Portland, United States

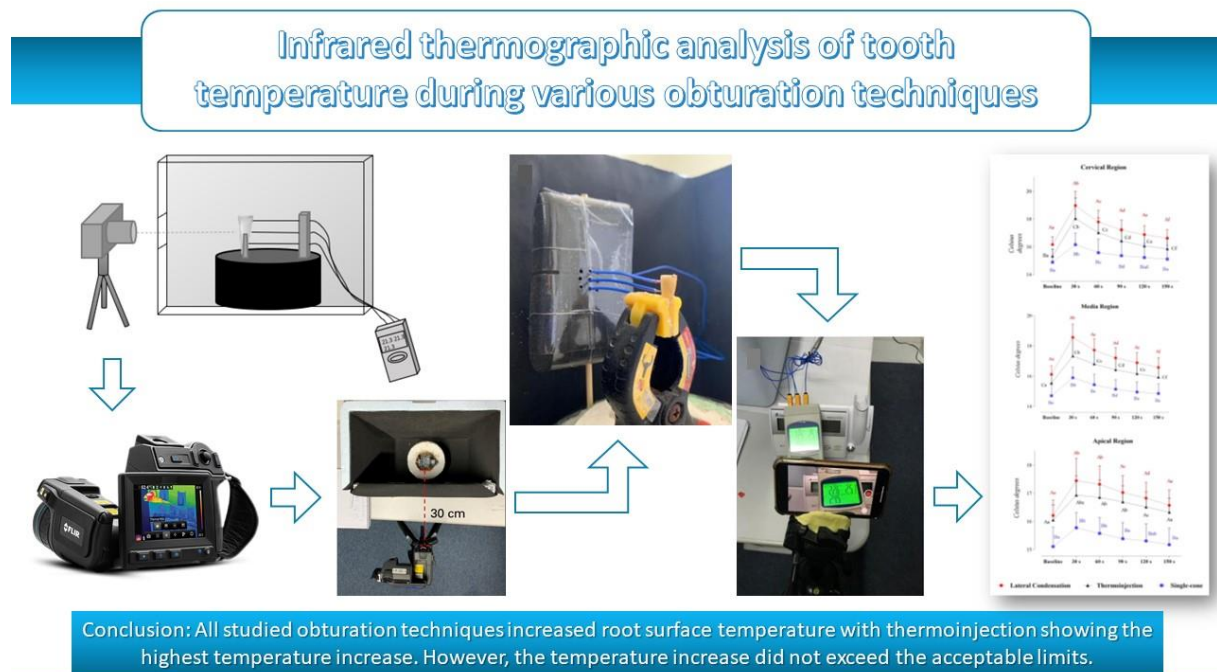
### Abstract:

**Aims:** To assess the external root surface thermal behavior when submitted to three different obturation techniques.

**Materials and Methods:** Forty-five single-rooted premolars were selected, prepared and randomly divided into three groups according to the studied obturation techniques: lateral condensation (LC), single cone technique (SCT) and thermoplasticized injectable technique (TI). Each tooth was placed in a customized apparatus and connected to a thermocouple. A FLIR T650sc infrared thermal camera was used to assess root temperature in a room under controlled temperature and humidity. Temperature values were recorded using the thermal camera and thermocouples before, during and 30, 60, 90, 120, 150s after obturation. Shapiro-Wilk, QQ-plot, Levene's, ANOVA-three-way, Mauchly's sphericity, Box's M and Bonferroni tests were used to assess data. The significance level was set at 5%.

**Results:** Infrared assessment showed significant temperature changes between time intervals, obturation techniques and root thirds. Temperature increase was observed 30s after obturation for STL, LC and TI, followed by a gradual temperature decline, with temperature values similar to the initial temperature at 150s for LC and TI. SCT temperature values only returned to normal 60s after obturation in the apical third and 90s in the middle and cervical thirds. In all techniques, the temperature did not rise above the critical limit of 10°C.

**Conclusion:** All studied obturation techniques increased root surface temperature with TI showing the highest temperature increase. However, the temperature increase did not exceed the acceptable limits.



## Diagnostic Accuracy Of 3 Radiographic Techniques In The Detection Of Misfits At The Abutment-Prosthesis Interface In The Esthetic Region

S. Lins de-Azevedo-Vaz<sup>1</sup>, V. Pacheco de Oliveira Mota<sup>1</sup>, M. Soussa Braga<sup>1</sup>, A. Alves Loss<sup>1</sup>, H. Nogueira Mello<sup>1</sup>, E. Pimentel Rosetti<sup>1</sup>

<sup>1</sup>Federal University of Espírito Santo, Dental Sciences Graduate Program, Vitória, Brazil

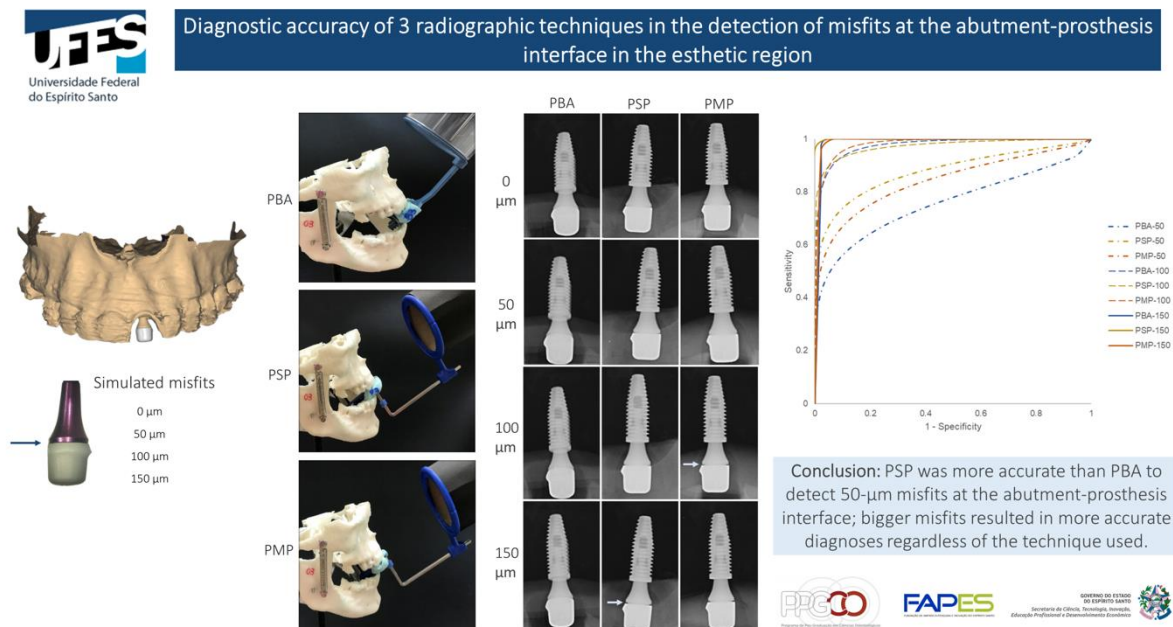
### Abstract:

**Aims:** To assess the diagnostic accuracy of 3 periapical radiographic techniques in the detection of misfits at the abutment-prosthesis interface in the esthetic region.

**Materials and Methods:** 15 implants with an internal conical connection were installed in the central incisor region in polyamide jaws and customized ceramic copings for cemented crowns were made using CAD-CAM. Misfits of 50, 100, and 150  $\mu$ m were simulated by interposing 1, 2, or 3 50- $\mu$ m-thick polyester strips at the abutment-prosthesis interface, respectively; the absence of the strip represented the control group. Digital radiographs were obtained using film-holders for the following periapical techniques: bisecting angle (PBA), standard paralleling (PSP) and modified paralleling (PMP). 2 radiologists and 1 prosthodontist evaluated a total of 180 radiographs. The values of the area under the receiver operating characteristic curve (Az) were submitted to the Friedman test with post-hoc Durbin-Conover ( $\alpha = 5\%$ ).

**Results:** The PSP (Az = 0.873) had higher Az values than the PBA (Az = 0.753) for the 50- $\mu$ m misfits ( $p < 0.05$ ). Bigger misfits resulted in greater accuracy than smaller misfits ( $p < 0.05$ ). Interactions between the factors radiographic technique and misfits' magnitude resulted in statistically significant differences for all comparisons ( $p < 0.05$ ), except that between the PSP for the 100- $\mu$ m misfits (Az = 0.976) and the PMP for the 150- $\mu$ m misfits (Az = 0.998).

**Conclusion:** The PSP was more accurate than the PBA to detect the 50- $\mu$ m misfits at the abutment-prosthesis interface; bigger misfits resulted in more accurate diagnoses regardless of the technique used.



# Chronology And Eruptive Sequence Of Permanent Dentition In Patients From Viña Del Mar, Chile.

S. Mac-Lean<sup>1</sup>, I. Valencia-Vicencio<sup>1</sup>, M. Rodriguez-Luengo<sup>2</sup>, S. Niklander-Ebensperger<sup>3</sup>, P. Melendez-Rojas<sup>1</sup>

<sup>1</sup>Universidad Andres Bello, School of Dentistry, Viña del Mar, Chile, <sup>2</sup>Universidad Andres Bello, Department of Morphology, School of Medicine, Viña del Mar, Chile, <sup>3</sup>Universidad Andres Bello, Unit of Oral Pathology and Medicine, School of Dentistry, Viña del Mar, Chile

## Abstract:

**Aims:** Tooth eruption sequence and chronology are processes that may differ among different populations, with little data available from the Chilean population. This study aimed to determine the eruption chronology and sequence of the permanent dentition of a Chilean cohort of patients.

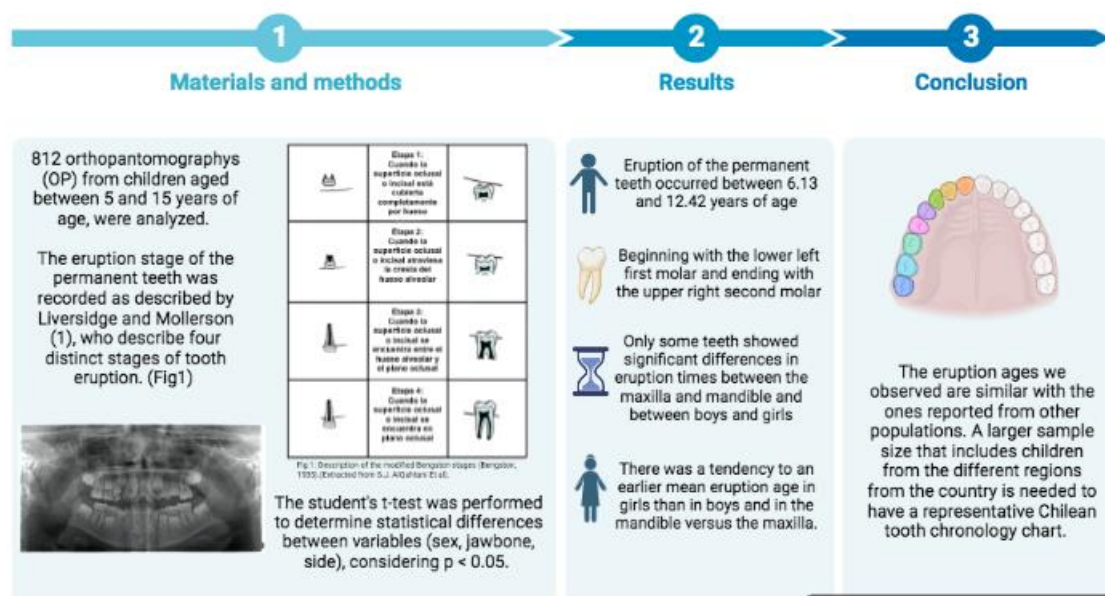
**Materials and Methods:** In this cross-sectional study, 812 orthopantomographs (OP) from children aged between 5 and 15 years of age, were analyzed. OPs were obtained from the database of the Oral and Maxillofacial Imaging Service of Andrés Bello University, Viña del Mar, Chile. Data was analyzed using descriptive statistics. The student's t-test was performed to determine statistical differences between variables (sex, jawbone, side), considering  $p < 0.05$ . This study was approved by the Research and Ethics Committee of the Faculty of Dentistry of Andrés Bello University.

**Results:** Eruption of permanent teeth occurred between the ages of 6.13 and 12.42 years, beginning with the lower left first molar, ending with the upper right second molar. Mandibular teeth erupted earlier than their maxillary counterparts, but this is not statistically significant. Compared to boys, girls have a younger mean age of appearance of permanent teeth, but this was not statistically significant. Except for the right maxillary canine, both second maxillary premolars, both canines and mandibular second premolars and the left mandibular second molar ( $p < 0.05$ ).

**Conclusion:** The eruption ages we observed are similar with the ones reported from other populations. A larger sample size that includes children from the different regions from the country is needed to have a representative Chilean tooth chronology chart.



## Chronology and eruptive sequence of permanent dentition in patients from Viña del Mar, Chile.



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# Incidental Findings In The Paranasal Sinuses And Airway Regions And Their Potential Impacts On Dental Management: A Cbct Retrospective Study

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<sup>1</sup>University of Nevada Las Vegas School of Dental Medicine, Las Vegas, United States

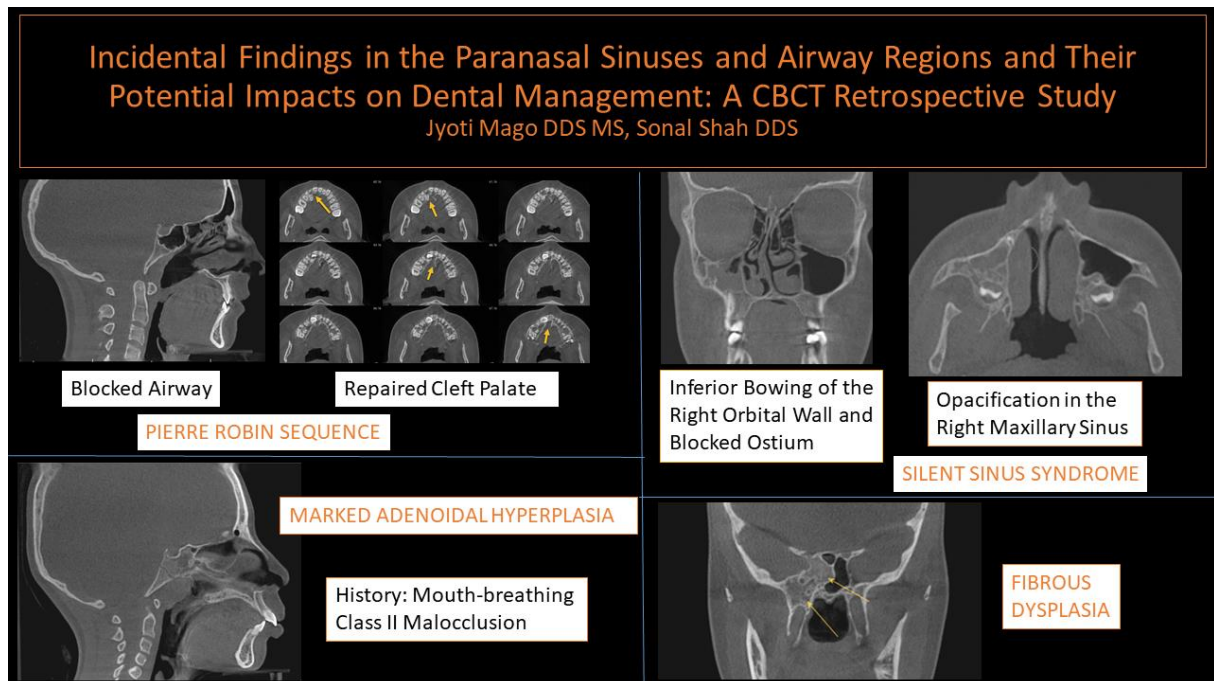
## Abstract:

**Objectives:** To report the prevalence of incidental findings in the paranasal sinuses and in the airway region in patients who visited the Department of Orthodontics at University of Nevada Las Vegas School of Dental Medicine

**Material and Methods:** A random 300 CBCT scans of patients that were imaged at UNLV SDM for their orthodontic treatment were included in this study. All the CBCT scans were evaluated by an Oral and Maxillofacial Radiologist and the findings were recorded. A data and statistical analysis will be performed.

**Results:** There were significant incidental findings in both the region of the paranasal sinuses and the airways. The most common incidental findings to be reported in the paranasal sinuses was localized mucosal thickening and tonsillar hyperplasia in the airways that may be associated with the narrowing of the airway. Our data showed that 20% of the cases needed further referral for medical management for sino-nasal pathologies and evaluation of sleep apnea. In 3% of our cases, the findings in the paranasal sinuses and the airway region were associated with craniofacial syndromes.

**Conclusions:** Most of the incidental findings do not require any further treatment or follow-up; however, some of these findings may require collaboration with medical providers or lead to modifications to the dental treatment plan. Knowledge and awareness of the anatomy, variation in anatomy, and pathologies in the paranasal sinuses and airway regions is crucial for dental practitioners to formulate appropriate treatment plans.





# Study Of The Degree Knowledge And Ability To Visualize The Canalis Sinuosus And Its Variants On A Cbct Scan.

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<sup>1</sup>Universitat Internacional de Catalunya, Facultat d'Odontologia, Sant Cugat del Vallés, Spain

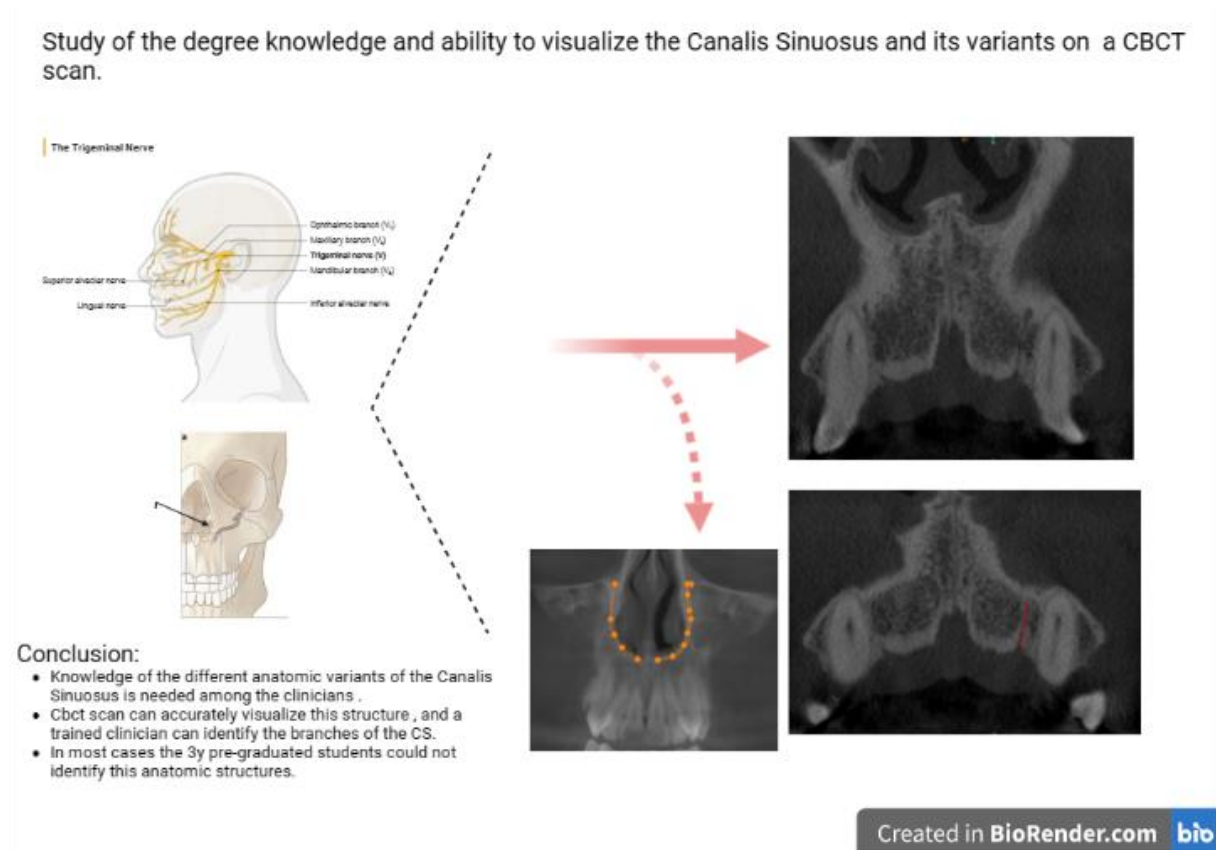
## Abstract:

**Aims:** "Canalis Sinuosus" (C.S.) is an intra-osseous duct through which a neuro-vascular bundle runs. There is a lack of knowledge among dental professionals about its existence, different morphology, and its clinical importance. The invasion of the C.S. accessories branches during surgery can lead to treatment failure, intraoperative hemorrhage, and the appearance of intense postoperative pain. C.S. is difficult to identify on periapical radiographs and orthopantomography, CBCT scan can accurately identify this structure by a trained clinician.

**Materials and Methods:** We have studied the presence of C.S. in 50 CBCT scans of the maxilla at our database, with a random selection criterion, to determine its frequency of appearance and the presence of variants in its route, at the same time we conducted a survey among under graduated dental students of the third year to determine their degree of knowledge of this anatomical structure.

**Results:** In most cases the third year pre-graduated students could not identify this anatomic structures.

**Conclusion:** More studies are needed in different populations to determine with certainty the frequency of occurrence of C.S. and its variants. We recommend for the need to highlight the dento-maxillo-facial anatomy when diagnosing radiological images , specially with 3D images.



# Reliability Of Digital Periapical Radiographs As A Predictor Of Nonsurgical Endodontic Case Difficulty

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## Abstract:

**Aims:** The preoperative radiographic assessment is an essential component of endodontic treatment planning for assessing case difficulty. Having sufficient and accurate information is critical in this decision-making process. The purpose of this study was to evaluate the reliability of digital periapical radiographs (PA) as a predictor of the level of case difficulty while using cone-beam computed tomography (CBCT) as the gold standard.

**Materials and Methods:** This retrospective study assessed 100 maxillary first and second premolars and molars from 89 patients with a limited field-of-view (LFOV) CBCT and corresponding periapical radiograph. Two calibrated, independent reviewers utilized a customized case difficulty assessment form to record minimal, moderate, and high categories of case difficulty for each imaging modality. Both reviewers were board-certified endodontists. Intrarater agreement was determined for CBCT using Kappa analysis. PA accuracy was calculated using McNemar analysis and compared to the No Information Rate (NIR) due to the wide variation in determinant prevalence. A P value < .05% was considered statistically significant.

**Results:** All case determinants except for molar's having >3 canals had poor agreement between CBCT and PA. Most of the determinants performed poorly by PA. Intra-rater agreement on CBCT ranged from Fair to Excellent (0.483-0.843).

**Conclusion:** Significant differences in case difficulty agreement were noted depending on the imaging modality with PA performing poorly relative to CBCT. Many more instances of minimal case difficulty were identified using CBCT as opposed to PA radiographs. Hence, CBCT may provide a clearer and more accurate assessment of case difficulty.

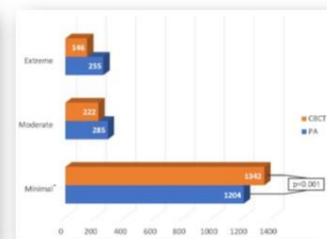
## Reliability of Digital Periapical Radiographs as a Predictor of Nonsurgical Endodontic Case Difficulty

Tooth inclination	Tooth rotation	Crown morphology
Canal curvature	Apical diameter	Number of canals
Canal visibility	Pulp stones	Resorption

Case difficulty determinants based on a modified version of the American Association of Endodontists (AAE) Assessment Form. Each determinant corresponded to minimal, moderate, or high levels of case difficulty.



Sample of a case included in the study. (A) Periapical radiograph, (B) LFOV CBCT axial slice, (C) LFOV CBCT sagittal slice, and (D) LFOV CBCT coronal slice. The region of interest (maxillary left first molar) is highlighted in (A), (B), and (C).



Case difficult distribution between CBCT and PA.

**Conclusion:** Significant differences in case difficulty agreement were noted depending on the imaging modality with PA performing poorly relative to CBCT. Many more instances of minimal case difficulty were identified using CBCT as opposed to PA radiographs. Hence, CBCT may provide a clearer and more accurate assessment of case difficulty.

## Characteristics Of Hypodontia In 11-14-Year-Old Latvian Adolescent Population

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<sup>1</sup>Rīga Stradiņš University, Department of Conservative Dentistry and Oral Health, Riga, Latvia, <sup>2</sup>Rīga Technical University, Baltic Biomaterials Centre of Excellence, Riga, Latvia

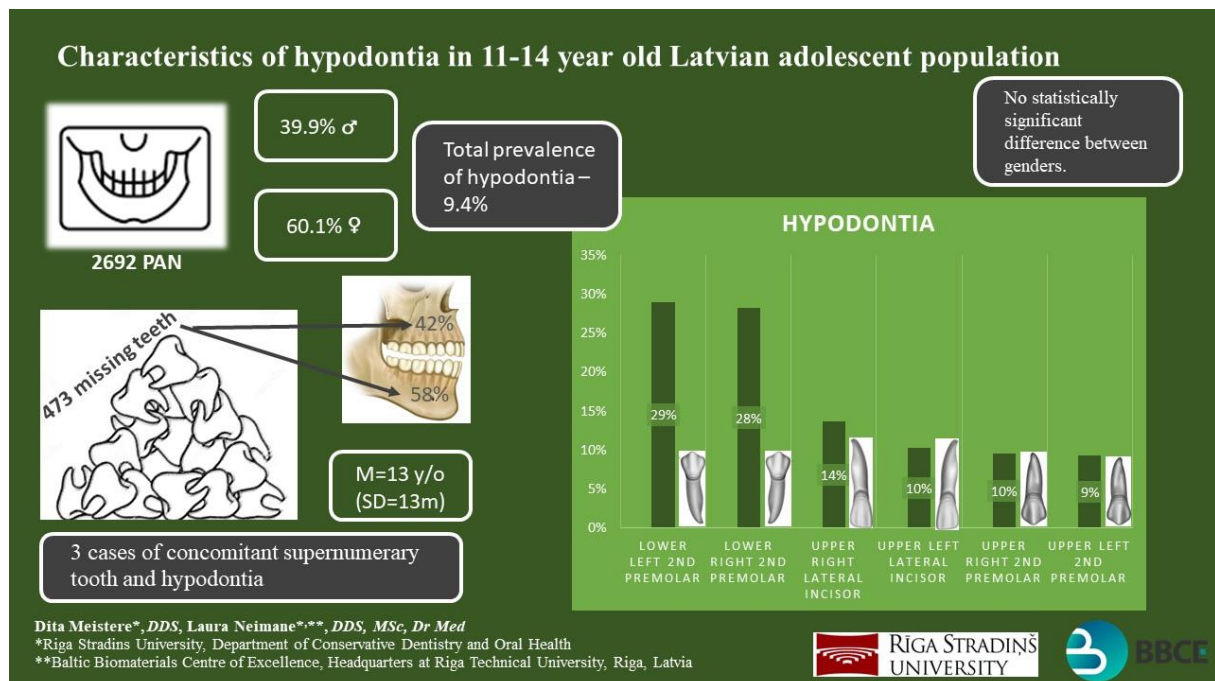
### Abstract:

**Aims:** To investigate the prevalence of hypodontia among 11-14 year old Latvian adolescents attending Riga Stradins University Institute of Stomatology.

**Materials and Methods:** A cross-sectional study of panoramic X-rays of 11-14 year old adolescents taken between August, 2020 and September, 2021 was performed. Data of congenitally missing teeth were registered. Jamovi 2.3.18. was used for statistical analysis. Chi square tests were performed to assess association between hypodontia and gender.

**Results:** A total of 2717 patients were analysed; 2692 met inclusion criteria (M=13 years (SD=13 months)) with 1074 males (39.9%) and 1618 females (60.1%). Total prevalence of hypodontia was 9.4% (3.5% males, 5.9% females). No statistically significant difference was found between genders. A total of 473 congenitally missing teeth were identified with slight mandibular predominance (58%). Most commonly missing tooth was lower left 2nd premolar (N=119) and lower right 2nd premolar (N=116) followed by upper right lateral incisor (N=56), upper left lateral incisor (N=42), upper right 2nd premolar (N=39) and upper left 2nd premolar (N=38). Out of all hypodontia patients 48% had 1 missing tooth, 34.4% - 2, 9.2% - 3 and 3.6% - 4 missing teeth. Severe hypodontia was found in 2.8% of all patients. There were 3 cases of concomitant supernumerary tooth and hypodontia.

**Conclusion:** Prevalence of hypodontia in our sample was 9.4 %. Most common missing teeth were lower 2nd premolars. There was no statistically significant difference between genders.



# Discriminant Function Of Nasion-Sella-Glabella And Glabella-Nasion-Sella Angles For Sex Determination Of Indonesian Adult In Yogyakarta

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<sup>1</sup>Universitas Gadjah Mada, Dentistry Study Program, Faculty of Dentistry, Yogyakarta, Indonesia, <sup>2</sup>Universitas Gadjah Mada, Dentomaxillofacial Radiology, Faculty of Dentistry, Yogyakarta, Indonesia, <sup>3</sup>Universitas Airlangga, Oral and Maxillofacial Radiology Specialist Study Program, Faculty of Dental Medicine, Surabaya, Indonesia, <sup>4</sup>Universitas Gadjah Mada, Dentomaxillofacial Radiology, Yogyakarta, Indonesia

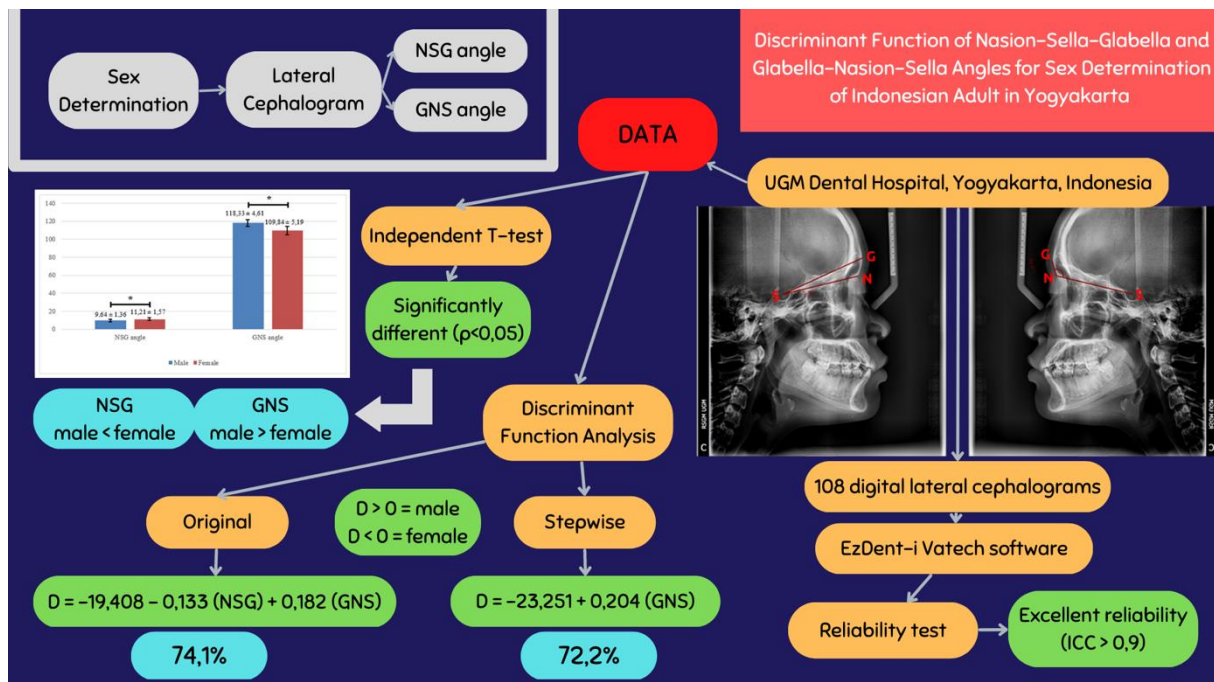
## Abstract:

**Aims:** Sex determination gives probability in which someone is classified as a male or a female. Lateral cephalogram analysis can be used due to the resistance and dimorphism of the skull. The Nasion-Sella-Glabella (NSG) and Glabella-Nasion-Sella (GNS) angles have been used with high accuracy as parameters for sex determination in the Caucasoid population. The study's goal is to develop an equation for sex determination of Indonesian adults in Yogyakarta, Indonesia.

**Materials and Methods:** A total of 108 digital lateral cephalograms (54 males, 54 females) aged 20-40 years were taken from patient database at Universitas Gadjah Mada Dental Hospital and the parameters were measured with EzDent-I Vatech software. Independent t-Test was used to analyze the difference of the angles between male and female. The equation for sex determination was determined by using discriminant function analysis.

**Results:** The average measurements of NSG angle in male and female were  $9,64^\circ \pm 1,36^\circ$  and  $11,21^\circ \pm 1,57^\circ$  respectively, while GNS angle in male and female are  $118,33^\circ \pm 4,61^\circ$  and  $109,84^\circ \pm 5,19^\circ$  respectively. The independent t-test revealed a significant difference ( $p < 0,05$ ) between male and female groups. Based on the findings of this study, males have lower value of NSG angle than females, as well as higher value of GNS angle than females.

**Conclusion:** The angular measurements in the lateral cephalogram can be used for sex determination with an accuracy up to 74,1% without stepwise method and 72,2% through stepwise method.





# Evaluation The Knowledge Of Portable Handheld Dental X-Ray Devices Utilization In Dentists: An Indonesian Survey

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## Abstract:

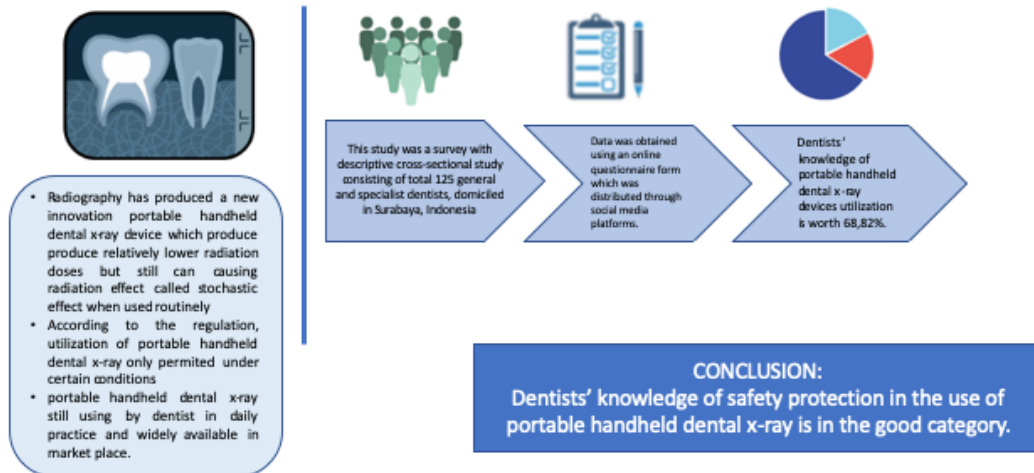
**Aims:** In this current era, radiography has produced a new innovation namely portable handheld dental x-ray device. This research is aimed to evaluate the knowledge of portable handheld dental x-ray devices utilization between dentists in Surabaya, Indonesia.

**Materials and Methods:** This research is a survey with descriptive cross-sectional study consisting of total 125 general and specialist dentists, domiciled in Surabaya, Indonesia registered on the dental national association database of PDGI, and still actively practicing in private clinics or hospitals. Data was obtained using an online questionnaire form which was distributed through social media platforms.

**Results:** The result showed dentists' knowledge of portable handheld dental x-ray devices utilization is worth 68,82%.

**Conclusion:** Dentists' knowledge of safety protection in the use of portable handheld dental x-ray is in the good category.

## Evaluation The Knowledge Of Portable Handheld Dental X-Ray Devices Utilization In Dentists : An Indonesian Survey



# Cone Beam Computer Tomography And 3D Segmentation Used In Morphometric Analysis Of Pterygopalatine Fossa

R. Roman<sup>1</sup>, E. Iacob<sup>2</sup>, O. Almasan<sup>3</sup>, A. Ban<sup>1</sup>, E. Crasnean<sup>1</sup>, S. Muresanu<sup>1</sup>, S. Roman<sup>4</sup>, C. Faur<sup>1</sup>, M. Hedesiu<sup>1</sup>

<sup>1</sup>Iuliu Hatieganu University of Medicine and Pharmacy, Maxillofacial Surgery and Radiology, Cluj-Napoca, Romania, <sup>2</sup>Iuliu Hatieganu University of Medicine and Pharmacy, Dental Medicine, Cluj-Napoca, Romania, <sup>3</sup>Iuliu Hatieganu University of Medicine and Pharmacy, Department of Prosthodontics, Cluj-Napoca, Romania, <sup>4</sup>Iuliu Hatieganu University of Medicine and Pharmacy, Medicine, Cluj-Napoca, Romania

## Abstract:

**Aims:** To assess the volumetric morphometry and variation of the pterygopalatine fossa (PPF), by using CBCT and segmentation tools, considering its hard exploratory accessibility aside from imaging.

**Materials and Methods:** 100 PPF in 50 large FOV CBCT scans were analyzed (28 men and 22 women, aged 16 to 70 years) by 2 examiners, a maxillofacial radiologist and an undergraduate. Along with conventional planes, axial, coronal and sagittal, a semi-automated segmentation software was used for approaching the PPF volume. Postoperative cases, patients with trauma or tumor pathology involving the region were excluded from the study.

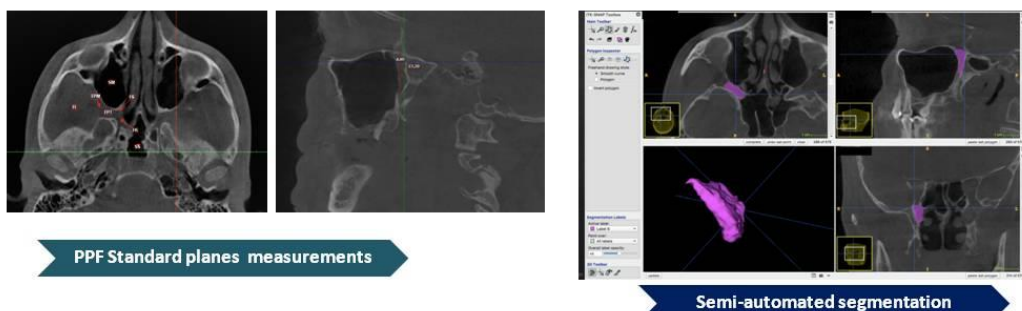
**Results:** Both genders presented PPF volumetric asymmetry between sides, with right side being 7.5% larger in women and 5% in men, p .0016 (medium volume in women 0.75cmc and 0.86cmc in men). The asymmetric values were more obvious in patients with lower PPF volumes. Both CC and AP diameters were larger in men (medium values of 5.05-5.34 in men versus 4.37-4.71mm in women), the differences between sides being similar with right side larger (3-7% larger in men and 5-7% in women). The difference between men and women values was produced by higher CC diameter values, 21.09-24.76mm in men, compared to the 19.52-20.65mm in women.

**Conclusion:** 3D segmentation by volumetric CT represents an optimal tool to investigate spaces of clinical importance, such as PPF. Not only it provides data regarding the morphology of the area, but also volume values of the space, which can be used in optimally adjusting the dosage of anaesthetic and in surgical planning.

## Cone Beam Computer Tomography and 3D segmentation used in morphometric analysis of pterygopalatine fossa



Raluca Roman<sup>1</sup>, Elena Iacob<sup>1</sup>, Oana Almasan<sup>2</sup>, Alina Ban<sup>1</sup>, Emil Crasnean<sup>1</sup>, Sorana Muresanu<sup>1</sup>, Sara Roman<sup>3</sup>, Cosmin Faur<sup>1</sup>, Mihaela Hedesiu<sup>1</sup>



### Results

	Right	Left	Difference
women volume	0.759 cmc [621-1102]	0.703 cmc [573-1031]	7.48% [6.4-7.7]
men Volume	0.868 cmc [402-1171]	0.836 cmc [358-1093]	3.71% [6.7-10.9]
diam CC women	20.65 mm [16.78-24.7]	19.52 mm [15.2-23.54]	5.47% [4.7-9.35]
diam CC men	21.76 mm [13.3-26.02]	21.09 mm [12.5-025.14]	3.07% [3.38-6.01]
diam AP women	4.71 mm [3.6-5.9]	4.37 mm [3.22-5.76]	7.21% [2.3-10.5]
diam AP men	5.34 mm [3.6-6.78]	5.05 mm [3.36-6.48]	5.4% [4.42-7.18]

### Conclusion

Pterygopalatine fossa showed variable diameters and volume, with higher values on the right side, both in male and females. 3D CBCT segmentation represents an optimal tool to investigate spaces of clinical importance, such as PPF.

# Identification Of Osteoporosis Using Panoramic Mandibular Index And Mandibular Cortical Index At Nala Husada Hospital Patients In Surabaya, Indonesia

S. Sarianoferni<sup>1</sup>, E.R. Astuti<sup>2</sup>, A.S. Nurrachman<sup>2</sup>

<sup>1</sup>Universitas Airlangga, Oral and Maxillofacial Radiology Specialist Study Program Dental Medicine, Surabaya, Indonesia, <sup>2</sup>Universitas Airlangga, Oral and Maxillofacial Radiology Dental Medicine, Surabaya, Indonesia

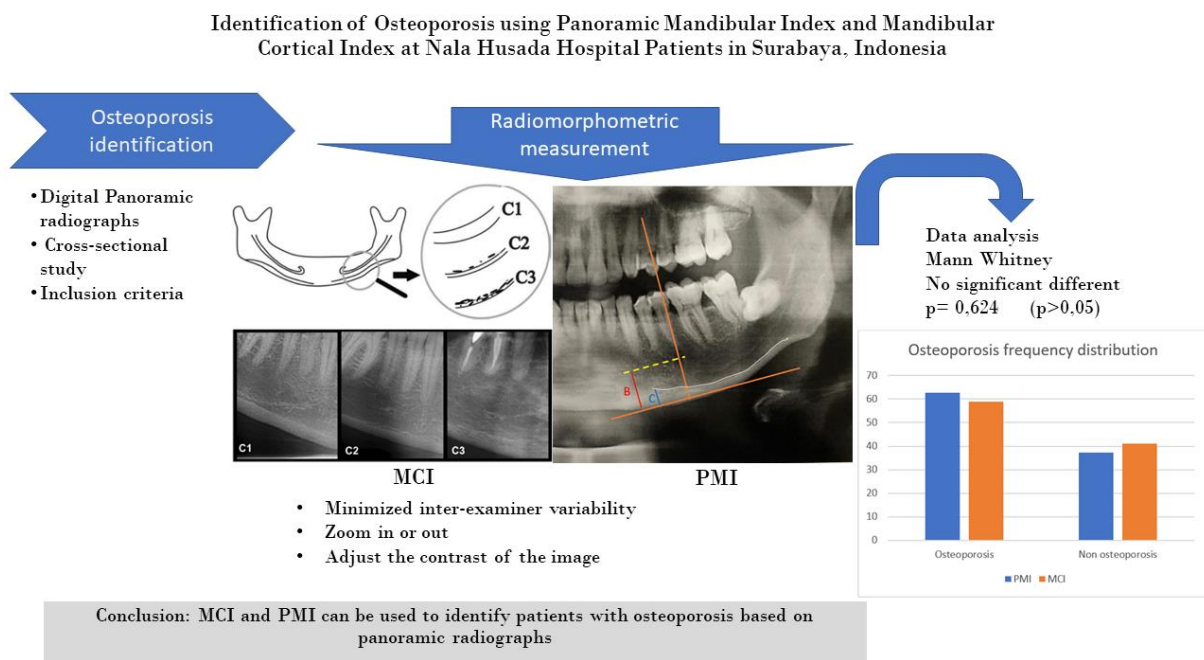
## Abstract:

**Aims:** The aim of his study was to compare the results of the identification of osteoporosis based on Panoramic Mandibular Index and Mandibular Cortical Index at Nala Husada Hospital patients in Surabaya, Indonesia.

**Materials and Methods:** Two observers measured using Panoramic Mandibular Index and Mandibular Cortical Index on both sides of the jaw. This study was cross-sectional with an analytic observational design. Samples are Panoramic radiographic data from female patients over the age of 35 years obtained a total of 78 samples. Inclusion criteria were the patient's age, not having systemic disease, and good quality of panoramic radiographs.

**Results:** The test used was non-parametric using the Mann-Whitney test with a significant degree of  $p = 0.05$  indicating no significant difference with a value of  $p = 0.624$  ( $p > 0.05$ ). This means that there is no significant difference in the results of osteoporosis based on radiomorphometry between the Panoramic Mandibular Index and the Mandibular Cortical Index.

**Conclusion:** Panoramic Mandibular Index and Mandibular Cortical Index can be used to identify patients with osteoporosis based on panoramic radiographs.



# Risk Of Healing Impairment Following Tooth Extraction In Patients Administered With Antiresorptive And Non-Antiresorptive Polypharmacy

I.R. Suryani<sup>1</sup>, S. Shujaat<sup>2</sup>, U. Ivković<sup>1</sup>, W. Coucke<sup>3</sup>, R. Jacobs<sup>1</sup>

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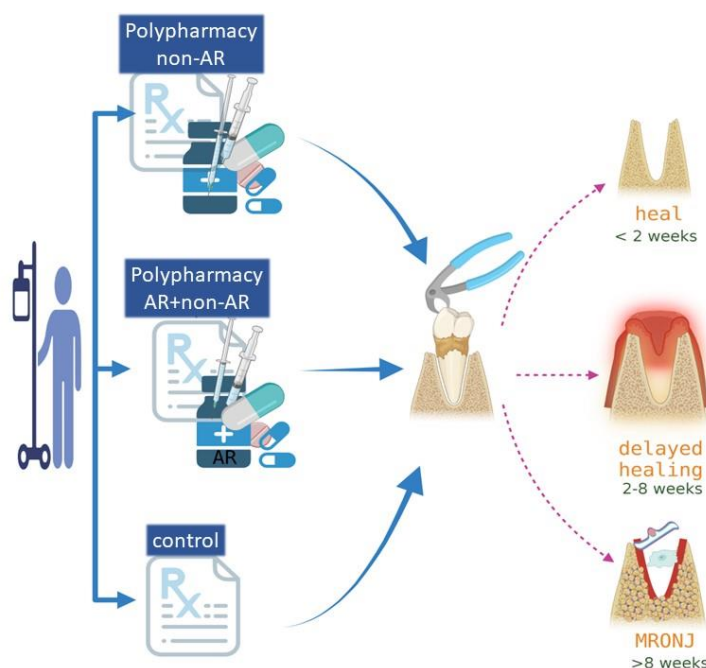
## Abstract:

**Aims:** The primary aim of the following study was to investigate the impact of AR and non-AR polypharmacy on wound healing and occurrence of MRONJ following tooth extraction. The secondary aim was to identify patient-related risk factors which might influence the healing status.

**Materials and Methods:** A total of 353 patients (age range: 40-90 years, average age: 67.4 years, have radiological follow-up) were recruited. All the patients were divided into three groups, which included, patients used polypharmacy with non-AR drugs, polypharmacy with a combination of AR + non-AR drugs, and the control group. Healing outcome of a patient was set based on radiological appearance post extraction and defined as, normal healing, delayed healing, and MRONJ. The polypharmacy score was categorized depending on the sum of the number of administered medications.

**Results:** The odds of delayed healing were significantly higher in 80+ years old patients (OR=6.98, 95%CI:2.45-19.88,  $p<0.001$ ) administered with AR+ non-AR drugs (OR=14.68, 95%CI:4.67-46.14,  $p<0.001$ ), having a major polypharmacy score (OR= 15.37, 95%CI:4.83-48.91,  $p<0.001$ ). On the contrary, patient administered with non-AR drugs (OR=11.52, 95%CI: 4.45-29.83,  $p<0.001$ ) with hyper polypharmacy (OR=58.86, 95%CI:25.03-138.40,  $p<0.001$ ) were significantly more likely to develop MRONJ. Smoking and extraction sites showed no significant impact on wound healing impairment.

**Conclusion:** Wound healing status in patients administered with both non-AR and AR+ non-AR polypharmacy was significantly impaired following tooth extraction. Other risk factors, such as increased age and high polypharmacy scoring also significantly contributed towards the occurrence of delayed healing and MRONJ.





# Is Use Of Cone Beam Computed Tomography Without Proper Training Justified In Paediatric Dental Traumatology? An Exploratory Study

G. van Gorp<sup>1</sup>, D. Declerck<sup>1</sup>, R. Jacobs<sup>1,2</sup>, A. Maes<sup>3</sup>, M. Lambrechts<sup>1</sup>

<sup>1</sup>KU Leuven, Department of Oral Health Sciences and Department of Dentistry, Unit of Paediatric Dentistry and Special Dental Care, University Hospitals Leuven, Leuven, Belgium, <sup>2</sup>KU Leuven, OMFS IMPATH Research Group, Department of Imaging and Pathology, Faculty of Medicine, University of Leuven and Oral & Maxillofacial Surgery, University Hospitals Leuven, Leuven, Belgium, <sup>3</sup>KU Leuven, Department of Oral Health Sciences, Master in Dentistry, Leuven, Belgium

## Abstract:

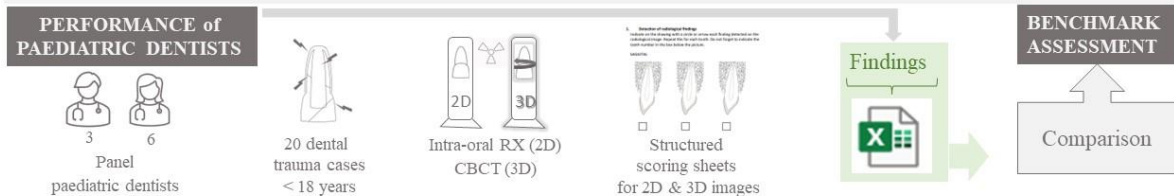
**Aims:** To assess diagnostic accuracy obtained by paediatric dentists using Cone Beam Computed Tomography (CBCT) without specific training and to compare this with their performance using intraoral radiographs.

**Materials and Methods:** Intraoral and CBCT images of 89 teeth, spread over twenty dental trauma cases were presented in random order to nine paediatric dentists. Diagnostic findings were compared with those of a benchmark reference. Sensitivity and specificity were calculated and compared using paired t-tests.

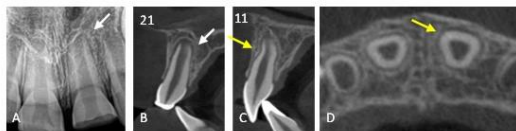
**Results:** Overall, observers' diagnostic performance was rather poor with significantly higher sensitivity when using 2D images ( $P=0.017$ ). Performance differed considerably according to the type of pathology. Using either imaging modality, sensitivity for diagnosing apical pathology and root fractures was high while the opposite was seen for inflammatory root resorption, root cracks and subluxations. Statistically significant differences between imaging modalities were seen for root fractures ( $P=0.013$ ) and apical pathology ( $P=0.001$ ), in favor of 3D, and for crown fractures ( $P=0.009$ ) in favor of 2D.

**Conclusion:** Overall poor performance of paediatric dentists indicates that additional training in radiographic diagnosis is required. In order to justify the use of CBCT to increase diagnostic performance, proper training of the paediatric dentist is mandatory.

## Is use of Cone beam computed tomography without proper training justified in paediatric dental traumatology? An exploratory study



Examples of clinical cases, illustrating benchmark diagnoses



Case 1: A Periapical radiograph. B-D CBCT images.  
*BM findings visible both on 2D & 3D images:* A, B, D immature tooth 21 with widening of the periodontal ligament, indicating **subluxation** (white arrow), missed on 2D by 5 PD & on 3D by 3 PD; **subluxation** was misdiagnosed as **apical pathology** by 2 PD, both on 2D & on 3D.  
*BM findings additionally detected on 3D images:* C immature tooth 11: dilacerated root, probably because of an earlier dental trauma (yellow arrow); D immature tooth 21: **root crack** (yellow arrow), missed by 7 out of 9 PD.

Abbreviations: BM=Benchmark; PD=Paediatric Dentists



Case 2: A, B Periapical radiographs. C-E CBCT images.  
*BM findings visible both on 2D & 3D images:* A, C immature tooth 11 with **apical pathology** (white arrow), missed by 2 PD on 2D & by 4 PD on 3D; B, E immature tooth 21 with limited widening of the periodontal ligament space, indicating **subluxation** (white arrow), **apical pathology**, although not present, was scored on tooth 21 by 4 PD on 2D and by 1 PD on 3D.  
*BM findings additionally detected on 3D images:* C immature tooth 11: no apical lamina dura or periodontal ligament space, indicating **apical pathology** (yellow arrow); D immature tooth 21: discrete interruption in the apical lamina dura (yellow arrow); E immature tooth 11: **apical external inflammatory root resorption** (yellow arrow), correctly diagnosed by only 1 PD on 3D.

## Conclusion:

In order to justify the use of CBCT to increase diagnostic performance in specific situations, proper training of the paediatric dentist is mandatory.

# Associated Fracture Patterns Of Infraorbital Nerve Injuries Following Zygomaticomaxillary Complex Fractures: A Retrospective Analysis Of 272 Patients

M. Verbist<sup>1</sup>, K. Dubron<sup>1</sup>, E. Shaheen<sup>1</sup>, T. Dormaar<sup>1</sup>, R. Jacobs<sup>1</sup>, C. Politis<sup>1</sup>

<sup>1</sup>KULeuven, Leuven, Belgium

## Abstract:

**Aims:** The aim of this presentation is to discuss associations between aetiologies, fracture types, and neurological complications. Additionally, treatment methods in relation to the recovery time will be discussed.

**Materials and Methods:** Medical files and radiological files of 272 patients with unilateral and bilateral ZMC fractures were reviewed, whose cases were managed from January 2014 to January 2019 at the Department of Oral and Maxillofacial Surgery, University hospitals Leuven, Belgium. History of ION sensory dysfunction and facial nerve motoric dysfunction were noted during follow-up.

**Results:** ION hypoaesthesia incidence was 37.3%, with the main causes being fall accidents, road traffic accidents, and interpersonal violence. Significant predictors of ION hypoaesthesia were Zingg type B fractures ( $P = 0.003$ ), fracture line course through the infraorbital canal ( $P < .001$ ), orbital floor fracture ( $P < 0.001$ ), and ZMC dislocation or mobility ( $P = 0.001$ ).

**Conclusion:** Of all ZMC fractures, 37.3% exhibited ION hypoaesthesia. Only ZMC Zingg type B fractures (74.0%) were significantly more associated with ION hypoaesthesia. ION hypoaesthesia was more likely ( $OR = 2.707$ ) when the fracture line course ran through the infraorbital canal and was less dependent on the degree of displacement. Neuropathic pain symptoms developed after ZMC fractures in 2.2% patients, posing a treatment challenge. Neuropathic pain symptoms were slightly more common among women and were associated only with type B or C fractures. No other parameters were found to predict the outcome of this post-traumatic neuropathic pain condition.

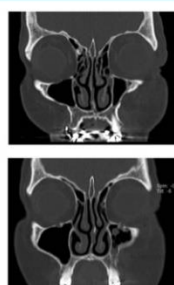
## Incidence, Aetiology, and Associated Fracture Patterns of Infraorbital Nerve Injuries Following Zygomaticomaxillary Complex Fractures: A Retrospective Analysis of 272 Patients

Maarten Verbist, DDS, Kathia Dubron, MD, Eman Shaheen, PhD, Titiaan Jacob Dormaar, MD, Reinhilde Jacobs, PhD, and Constantinus Politis, PhD

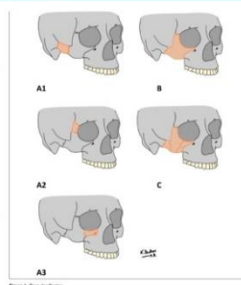
### AIM

Association between aetiologies, fracture types, and neurological complications based on 3D CT image?

### MATERIAL AND METHODS



Evaluation and classification of radiological images



Relationship between nerve damage and fracture pattern

### RESULTS

Infraorbital nerve hypoaesthesia				
Variable	Size (n)	OR	95% CI	P value
<b>Gender</b>				
Male	67	0.179	0.713-1.949	.532
Female	37	0.848	0.333-1.403	.522
Age	1.002	0.979-1.025		.885
<b>Fracture Type</b>				
A1	0	-	-	-
A2	4 (0.8%)	0.372	0.122-1.137	.883
A3	13 (2.5%)	1.173	0.533-2.486	.477
B	77 (74.0%)	2.241	1.318-3.808	.003
C	19 (9.6%)	2.523	0.930-6.847	.069

Anatomic features				
Variable	Size (n)	OR	95% CI	P value
Fracture line through IOC	78	2.707	1.387-4.816	<.001
Fracture line adjacent IOC	15	0.968	0.486-1.921	.931
Orbit floor fracture	91	4.342	2.253-8.379	<.001
Dislocation or mobility	84	2.543	1.430-4.522	.001

Logistic regression is used to evaluate significant associations between explanatory variables and outcome. Results are reported as odds ratio (OR) and 95% confidence interval (CI). IOC, infraorbital canal.

### CONCLUSION

1. Higher ION hypoaesthesia after type B fractures
2. Fracture line involvement of the infraorbital canal or orbit floor dislocation: predictors of ION hypoaesthesia.
3. Radiological and clinical evaluations could be useful in predicting ION hypoaesthesia.

# Genome-Wide Dna Methylation And $\gamma$ -H2AX Foci Change In Peripheral Blood After Maxillofacial Ct

S. Wang<sup>1</sup>, G. Li<sup>1</sup>

<sup>1</sup>Peking University School and Hospital of Stomatology & National Engineering Laboratory for Digital and Material Technology of Stomatology & Beijing Key Laboratory of Digital Stomatology, Department of Oral and Maxillofacial Radiology, Beijing, China

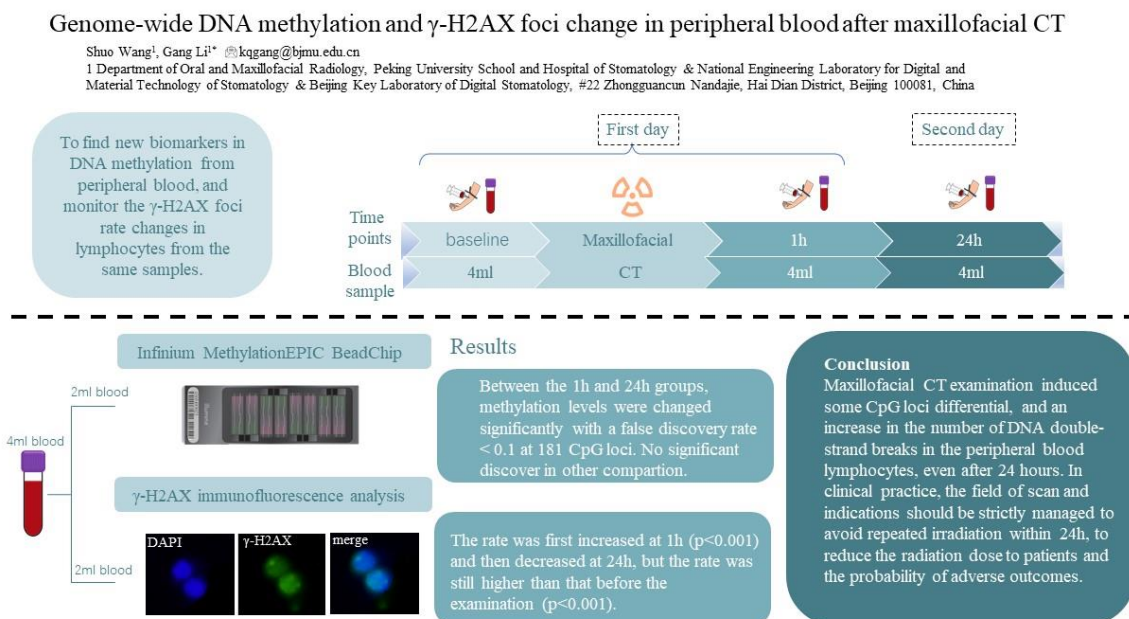
## Abstract:

**Aims:** To find new biomarkers in DNA methylation from peripheral blood, and monitor the  $\gamma$ -H2AX foci rate changes in lymphocytes from the same samples.

**Materials and Methods:** Maxillofacial CT examinations were performed in 20 healthy volunteers. We collected 4ml peripheral blood before (as a baseline sample) and after 1h and 24h of each examination. Each sample was divided into two pieces: 2ml was used for methylation analysis by Infinium MethylationEPIC BeadChip; 2ml was used for  $\gamma$ -H2AX immunofluorescence analysis. Linear mixed-effect models were used to evaluate the changes of methylation level in CpG loci. Wilcoxon test and Friedman test for pairwise comparison was used to analyze the changes of  $\gamma$ -H2Ax foci rate (foci/cell) at the three time points.

**Results:** Between the 1h and 24h groups, methylation levels were changed significantly with a false discovery rate < 0.1 at 181 CpG loci. No significant changes were found in other comparisons. The  $\gamma$ -H2Ax foci analysis was performed in 14 volunteers whose data were complete. The rate was first increased at 1h ( $p < 0.001$ ) and then decreased at 24h, but the rate was still higher than that before the examination ( $p < 0.001$ ).

**Conclusion:** Maxillofacial CT examination induced some CpG loci differential, and an increase in the number of DNA double-strand breaks in the peripheral blood lymphocytes, even after 24 hours. In clinical practice, the field of scan and indications should be strictly managed to avoid repeated irradiation within 24h, to reduce the radiation dose to patients and the probability of adverse outcomes.



## Two Cases Report Of Anterior Stafne Bone Defect And Review Of The Literature

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<sup>1</sup>Kaohsiung Medical University, School of Dentistry, Kaohsiung, Taiwan, <sup>2</sup>Kaohsiung Medical University, Oral & Maxillofacial Image Center, Kaohsiung, Taiwan, <sup>3</sup>Kaohsiung Medical University Hospital, Division of Oral Pathology and Oral & Maxillofacial Radiology, Kaohsiung, Taiwan

### Abstract:

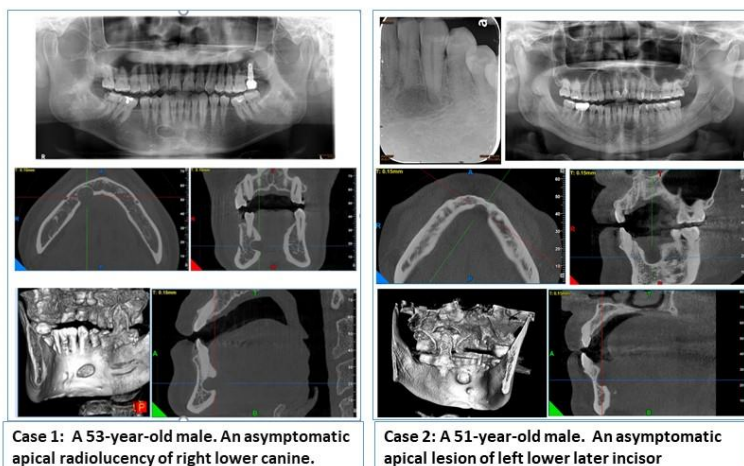
**Aims:** The anterior Stafne bone defect (SBD) is extremely rare to be estimated about 0.009% in incidence. We reported 2 cases of apical radiolucency diagnosed by cone-beam computed tomography(CBCT).

**Materials and Methods:** Case 1 is a 53-year-old healthy male referred from a local dental clinic for an asymptomatic apical radiolucency of right lower canine, which was found during his implant treatment procedures with unknown duration. Case 2 is a 51-year-old male consulted for an asymptomatic apical lesion of left lower later incisor by a periodontologist.

**Results:** Both cases revealed positive vitality of teeth with normal pocket depth in their oral examinations. There are no any caries, palpation pain, local gum swelling or palpable local lesion clinically. The differential diagnosis includes Stafne bone defect, odontogenic cysts or tumors, benign salivary gland tumors, early fibro-osseous lesions, central giant cell lesions, and benign mesenchymal tumors. In the CBCT examination, both cases showed a well-defined lingual depression in anterior mandible with a corticated border, measuring 12.2x7.5x7.4mm and 11.1x9.4x5.5mm in dimension respectively. Both are diagnosed as Stafne bone defect in anterior mandible.

**Conclusion:** To our best knowledge, there are only 72 patients with 73 anterior lingual SBD lesions published in English literature, including a bilateral case. It is a little male predilection and elder in male. In the 46 biopsied cases, only 3 (6.5%)were not salivary gland tissue(sublingual). It is now believed that the clinical evidences and image especially CBCT information are sufficient to diagnose SBD, SBD lesions should be conservatively followed up rather than aggressively surgical exploration.

## Two Cases Report of Anterior Stafne Bone Defect and Review of the Literature



### Conclusion

The clinical evidences and image especially CBCT information are sufficient to diagnose SBD, SBD lesions should be conservatively followed up rather than aggressively surgical exploration.

A list of 72 patients with anterior mandibular lingual depressions

Authors	Case numbers	Year	Age/Sex	Contents
Turkoglu K et al	51 (50 reviewed cases)	1957~2010	Age 18~68, 35M, 12F, 4NM	11 no biopsy, 40 biopsy(38SG, 1 FCT, 1 empty)
Sisman Y et al	1	2010	62/M	no biopsy
Krafft T et al	1	2010	46/M	FCT, SG, fatty tissue, muscle, bony fragments
Sisman Y et al	1	2012	64/F	no biopsy
Dereci O et al	1	2012	46/M	no biopsy
Friedrich RE et al	1	2012	11/F	no biopsy
Mourão CF et al	2	2013	52/F, 52/M	no biopsy
Taysi M et al	1	2014	56/M	SG
Kim H et al	1 (left and right)	2014	44/F	SG
Griffa A et al	1	2014	71/M	SG
Ozaki H et al	1	2015	76/M	SG
Deyhimi P et al	1	2016	45/M	SG
Pires FR et al	1	2018	43/M	no biopsy
Hisatomi M et al	2	2019	NM	no biopsy
Altwaim M et al	1	2019	17/M	no biopsy
Asgary S et al	1	2020	40/M	no biopsy
Friedrich RE et al	1	2020	19/F	no biopsy
Hayashi K et al	1	2020	68/M	no biopsy
Wang WC et al (present cases)	2	2023	53/M, 51/M	no biopsy



# Pattern Of Periosteal Reaction Of The Jaw Diseases Interpreted On Cbct

S.-J. Yoon<sup>1</sup>, J.-S. Lee<sup>1</sup>, S. Yoon<sup>2</sup>

<sup>1</sup>Chonnam National University, Dept. of Oral and Maxillofacial Radiology, Gwangju, Korea, Republic of, <sup>2</sup>Chonnam National University, School of Dentistry, Gwangju, Korea, Republic of

## Abstract:

**Aims:** This study aimed to investigate the pattern of periosteal reaction on jaw diseases utilizing cone-beam computed tomography (CBCT).

**Materials and Methods:** CBCT images from 146 patients with PR recorded in the interpretation were reviewed. Among them, it was found at the reviewing axial images, that in 26 cases (14.1 %), artifacts had been misinterpreted as PR, one of which had squamous cell carcinoma. From the rest of 120 (42 male, 78 female, mean age 56.51 yrs ± 25.15 yrs), the pattern of PR was classified into solid, interrupted, Codman's triangle, sunburst, and spicule.

**Results:** Among 120 patients, solid pattern was in 111 (92.50 %), interrupted pattern in 7 (5.83 %), sunburst pattern in 1 (0.83 %), and spicule pattern in 1 (0.83 %). Solid pattern occurred in 58 (52.25%) of osteomyelitis, in 35 (31.53 %) of medication-related osteonecrosis of the jaw, in 3 (2.70 %) of abscess, in 12 (10.81 %) of postoperative state, in 2 (1.80 %) of Garré's osteomyelitis, and in 1 (0.90 %) of fracture. Interrupted pattern occurred in 3 (42.86 %) of Garré's osteomyelitis, in 2 (28.57 %) of infected cyst, in 1 (14.29 %) of postoperative state, and in 1 (14.29%) of eosinophilic granuloma. Sunburst pattern occurred in a osteogenic sarcoma, and spicule pattern in a hemangioma.

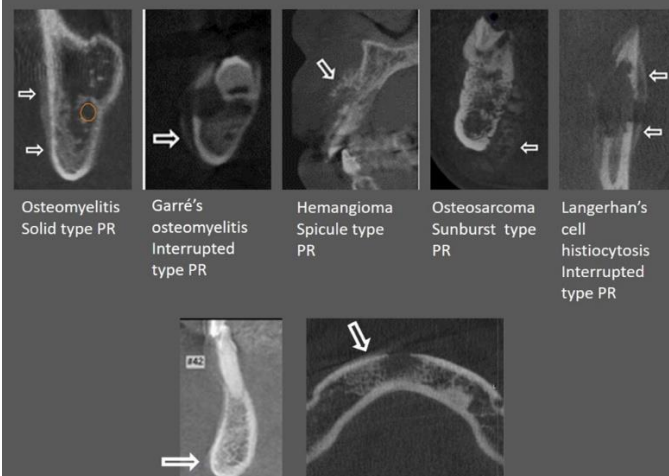
**Conclusion:** Interpreting the pattern of PR is important in diagnosing jaw diseases. In interpreting PR on CBCT, artifacts should be ruled out.

AS-ICDMFR-2023-00043

## Pattern of periosteal reaction of the jaw diseases interpreted on CBCT

Suk-Ja Yoon\*, Jae-Seo Lee  
Dept. of Oral and Maxillofacial Radiology, School of Dentistry,  
Chonnam National Univ. Gwangju, Republic of Korea

Objectives : This study aimed to investigate the pattern of periosteal reaction (PR) on jaw diseases utilizing cone-beam computed tomography (CBCT) taken from 2009 to 2020.



Osteomyelitis  
Solid type PR

Garré's  
osteomyelitis  
Interrupted  
type PR

Hemangioma  
Spicule type  
PR

Osteosarcoma  
Sunburst type  
PR

Langerhan's  
cell  
histiocytosis  
Interrupted  
type PR

Solid type PR was interpreted near bone sclerosing caused by abscess on the reconstructed sectional image; however, it was found that at the review of axial image, artifacts (streaks) had been misinterpreted as PR.

Conclusion : Interpreting the pattern of PR is important in diagnosing jaw diseases. In interpreting PR on CBCT, artifacts should be ruled out.

## Sexual Dimorphism Of Maxillary Sinuses In An Adult Dental Population Using Cone Beam Computed Tomography

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<sup>1</sup>Universidad Nacional Federico Villareal, Dentomaxillofacial Radiology, Lima, Peru, <sup>2</sup>Universidad Nacional Mayor de San Marcos, Medico Surgical Stomatology, Lima, Peru

### Abstract:

**Aims:** To evaluate the sexual dimorphism and the morphometry of the maxillary sinuses (MS) using cone beam computed tomography (CBCT).

**Materials and Methods:** A total of 80 CBCTs of Peruvian patients aged between 20-70 years-old were examined. After locating the maxillary sinus, measurements of the width, length and height of both maxillary sinuses were evaluated. For the statistical analysis, the MannWhitney U-test was used with a significance level of  $p < 0.05$ .

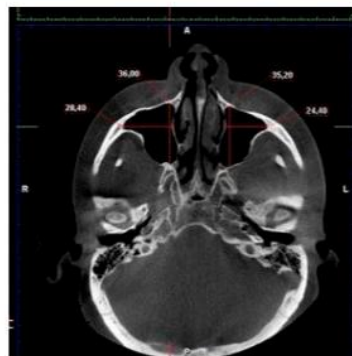
**Results:** On the right site, the mean of the MS width was lower than on the left side whereas the mean of the MS length was slightly greater than on the left side. Statistically significant differences were also found in the height on the right ( $p = 0.003$ ) and left ( $p = 0.044$ ) sides according to sex. A greater height of the right and left MS was found in the groups of 30-39 and 40-49 years-old, and in the group of 60-70 years-old, lower dimensions of the height of the right and left MS were found. When analyzing the height of the right MS, statistically significant differences were found according to sex in the dentate ( $p = 0.033$ ) and edentulous ( $p = 0.043$ ) dentition. The predictive values for the height of the right MS were 65% in males and 70% in females ( $p = 0.002$ ).

**Conclusion:** The morphometry of the maxillary sinuses can be used for predicting sexual dimorphism using MS height.

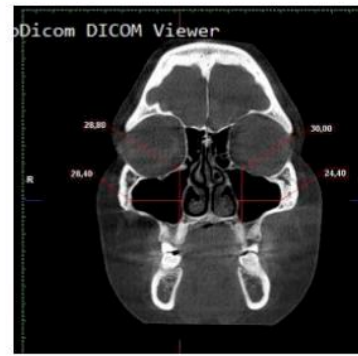
### Sexual dimorphism of maxillary sinuses in an adult dental population using cone beam computed tomography



-80 CBCTs  
-20-70 years-old



-Maxillary sinus localization  
-Measurements of the width, length and height of both maxillary sinuses



-Statistically significant differences for height on the right ( $p = 0.003$ ) and left ( $p = 0.044$ ) sides according to sex.

**Conclusion:** The morphometry of the maxillary sinuses can be used for predicting sexual dimorphism using MS height.

## Morphometric And Signal Intensity Benchmarking Values Of 3D Crani Mr Neurography Of Peripheral Cranial And Occipital Nerves

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<sup>1</sup>University Hospitals Leuven, Department of Oral & Maxillofacial Surgery, Leuven, Belgium, <sup>2</sup>OMFS-IMPACT Research Group, Faculty of Medicine, University Leuven, Department of Imaging and Pathology, Leuven, Belgium, <sup>3</sup>AZ St-Jan Brugge-Oostende, Department of Radiology, Bruges, Belgium, <sup>4</sup>AZ St-Augustinus, Department of Radiology, Antwerp, Belgium, <sup>5</sup>University Ghent, Ghent, Belgium, <sup>6</sup>KU Leuven and Department of Dentistry, University Hospitals Leuven, Department of Oral Health Sciences, Leuven, Belgium, <sup>7</sup>Karolinska Institutet, Department of Dental Medicine, Stockholm, Sweden

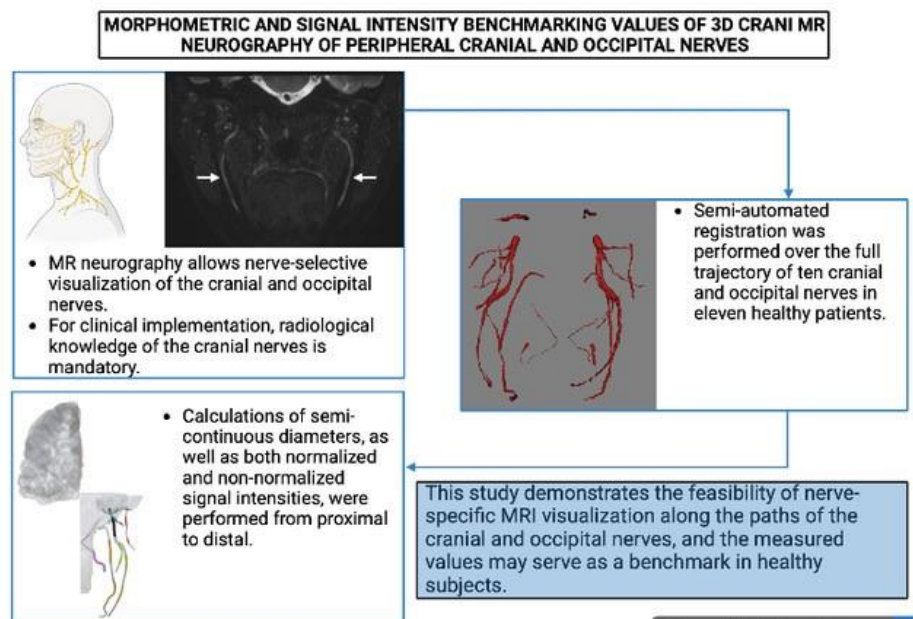
### Abstract:

**Aims:** New imaging techniques such as MR neurography (MRN) allow for direct visualization of peripheral nerves. The objective was to benchmark morphometric and signal intensity values quantitatively in healthy subjects using the authors' 3D CRANI magnetic resonance neurography sequence in healthy subjects.

**Materials and Methods:** Imaging was performed on a 3.0 Tesla MRI system equipped with a 32 channel head coil. Extraforaminal cranial nerves and occipital nerves of eleven healthy subjects were measured. Continuous measurements were divided in five equally long segments. Thereafter, mean and median normalized and non-normalized signal intensities and diameters were stratified per segment and per nerve.

**Results:** Overall, the distal segment has the lowest values while the midproximal segment has the largest values. Most nerves show as anticipated a gradual decrease in nerve diameter as well as a signal drop from proximal to distal. The detected nerves are well discriminated. The facial nerve's normalized and non-normalized signal intensities and diameters did not gradually decrease. Additionally, there was no progressive shrinkage in the diameter of the maxillary and auriculotemporal nerves.

**Conclusion:** The values measured in this study may lay a benchmark for cranial and occipital nerves in healthy subjects as such to raise clinical understanding of the anatomy and radiological properties of these nerves. Furthermore, the present study demonstrates the feasibility of nerve specific MRI visualization along the paths of the cranial and occipital nerves, opening the gateway towards clinical applicability of MRN for numerous applications in the head and neck region.



## How Dentomaxillofacial Radiology Is Related To Human Rights?

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<sup>1</sup>Public Dental Services, Ministry of Health, Nicosia, Cyprus, <sup>2</sup>Dental School, National and Kapodistrian University of Athens, Oral Diagnosis and Radiology, Athens, Greece

### Abstract:

**Aims:** To demonstrate how dentomaxillofacial radiology is related to human rights by assisting asylum seekers in Cyprus in obtaining asylum based on dental age estimation.

**Materials and Methods:** The cases of asylum seekers carried out by the health services of Cyprus from 2015 to 2022 were analyzed. Particularly, 536 cases of asylum seekers were referred for dental age estimation since age is one of the major parameters that considered to obtain asylum. Consequently, 536 panoramic radiographs, 389 of males and 147 of females were studied and dental age was estimated through evaluating the tooth developmental stages by 3 trained observers. Dental age estimation methods used were the London Atlas, Demirjian, Willems, and Kullma.

**Results:** The majority of the cases 83.86% were adults claiming to be minors. Most of the cases (160) were examined in 2019. The main number of cases were from Syria, Pakistan, Sierra Leone.

**Conclusion:** Age estimation of minors and especially unaccompanied minors through dental radiographs is a fundamental component of human rights. Assessment and documentation of juvenile based on dental radiographs ensures access to benefits such as the educational system and may result in the acquisition of asylum.

### How dentomaxillofacial radiology is related to human rights?

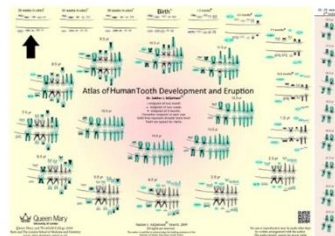
#### Aim

To demonstrate how dentomaxillofacial radiology is related to human rights by assisting asylum seekers in Cyprus in obtaining asylum based on dental age estimation



#### Material and Methods

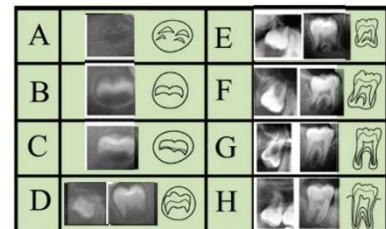
The cases of 536 asylum seekers to the health services of Cyprus from 2015 to 2022 were analyzed. Dental age estimation methods used were the London Atlas, Demirjian, Willems, and Kullman.



The London Atlas



Lower 3<sup>rd</sup> molar developmental stages according to Kullman



Tooth Developmental stages according to Demirjian

#### Results

The majority of the cases 83.86% were adults claiming to be minors

#### Conclusions

Age estimation of unaccompanied minors through dental radiographs is a fundamental component of human rights.

Assessment and documentation of juvenile based on dental radiographs ensures access to benefits such as the educational system and may result in the acquisition of asylum



## The Changes In Cranio-Cervical Angle And Upper Airway Volume After Orthognathic Surgery In Class Iii Malocclusion Patients – A Preliminary Study

C.Y. Chen<sup>1,2</sup>, H.J. Hsu<sup>3,4</sup>, W.C. Wang<sup>5,1,2</sup>, L.M. Lin<sup>1</sup>, Y.K. Chen<sup>5,4,2</sup>

<sup>1</sup>Kaohsiung Medical University Chung-Ho Memorial Hospital, Division of Oral Pathology & Maxillofacial Radiology, Kaohsiung, Taiwan, <sup>2</sup>Kaohsiung Medical University, Oral & Maxillofacial Imaging Center, College of Dental Medicine, Kaohsiung, Taiwan, <sup>3</sup>Kaohsiung Medical University, School of Oral Hygiene, College of Dental Medicine, Kaohsiung, Taiwan, <sup>4</sup>Kaohsiung Medical University Chung-Ho Memorial Hospital, Division of Oral & Maxillofacial Surgery, Kaohsiung, Taiwan, <sup>5</sup>Kaohsiung Medical University, School of Dentistry, College of Dental Medicine, Kaohsiung, Taiwan

### Abstract:

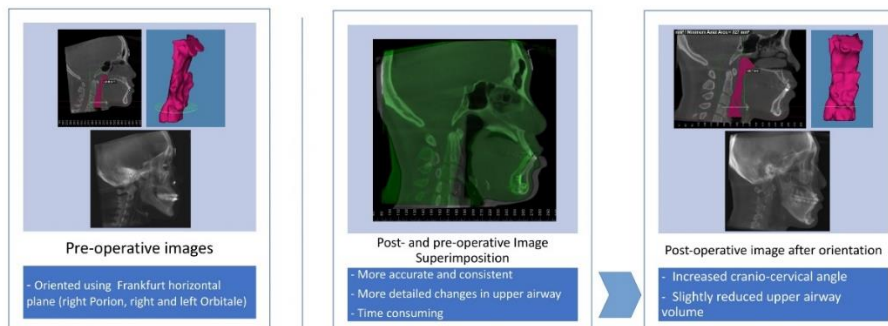
**Aims:** The purpose of this study is to investigate the changes in cranio-cervical angles and upper airway volume of patients with class III malocclusion after orthognathic surgery using cone-beam computed tomography (CBCT).

**Materials and Methods:** This study was conducted retrospectively in patients with class III malocclusion ( $ANB < 0^\circ$ ) who underwent mandibular or bimaxillary setback surgery. Patients under eightenn years old, or presenting with the following conditions: pharyngeal pathology, syndromic conditions, respiratory problems, or history of surgery involving jaw bones are all excluded. A total of 20 patients (12 males and 8 females) with age between 18 and 41 ( $24.8 \pm 4.82$ ) were enrolled. The CBCT scans were taken preoperatively, 6 months postoperatively, and 1 year postoperatively. During scanning, patients were instructed to maintain upright posture and natural head position with tongue in rest position. The postoperative images were superimposed on the preoperative images to make all images in the same orientation. The anatomic characteristics of upper airway and cephalometric parameters were measured using Dolphin Image Software and then statistically analyzed by paired t-test.

**Results:** The mean of cranio-cervical angle was significantly increased 6 months ( $p < 0.01$ ) and 1 year ( $p < 0.01$ ) after surgery. The mean of total upper airway volume demonstrated an insignificant reduction 6 months ( $p = 0.107$ ) and 1 year ( $p = 0.114$ ) post-operation.

**Conclusion:** The significant increase of cranio-cervical angle after setback surgery might have compensation effect on upper airway volume, which resulted in less reduction of upper airway volume post-operation.

### The changes in cranio-cervical angle and upper airway volume after orthognathic surgery in class III malocclusion patients - A preliminary study



Conclusion: The significant increase of cranio-cervical angle after surgery might have compensation effect on upper airway, which resulted in less reduction of volume after surgery.

# Condylar Asymmetry In Patients Diagnosed As Internal Derangement-Evaluation On Panoramic Radiography

*D.-C. Chen<sup>1,2</sup>*

<sup>1</sup>Kaohsiung Veterans General Hospital, Department of Stomatology, Kaohsiung, Taiwan, <sup>2</sup>National Yang Ming Chiao Tung University, Department of Dentistry, Taipei, Taiwan

**Abstract:**

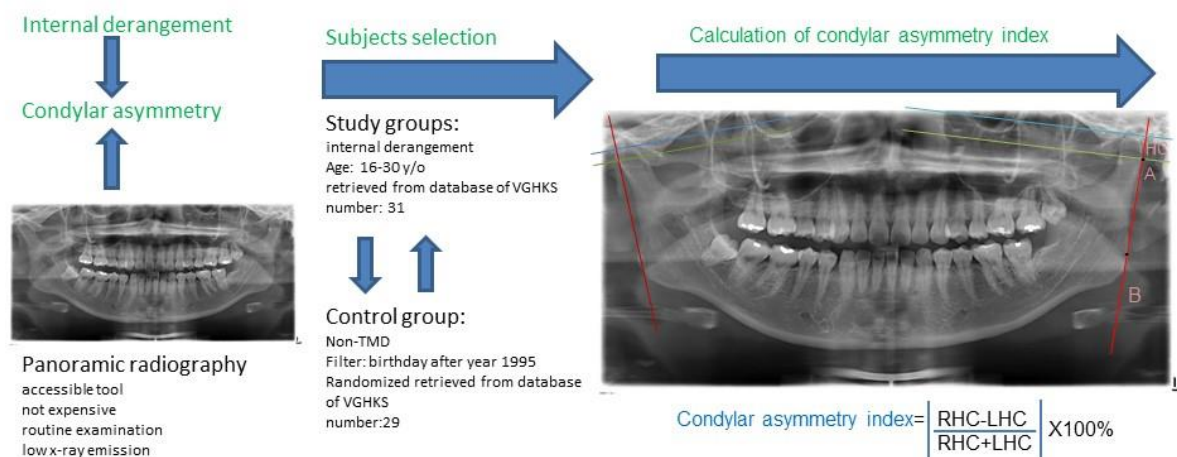
**Aims:** The purpose of this study was to evaluate condylar asymmetry on panoramic radiography in patients diagnosed as internal derangement.

**Materials and methods:** This was a retrospective study. The study subjects were patients (aged from 16-30) diagnosed as internal derangement according to the Diagnostic Criteria for the Temporomandibular Disorders (DC/TMD) from 2019 to 2022, visiting Kaohsiung Veterans General Hospital (VGHKS). The control subjects were non-TMD patients randomized selected from database of VGHKS. The inclusion criteria of PR films were full dentition, absence of maxillofacial bone fracture or surgery. 31 subjects for study group and 29 in the control group. The asymmetry indexes (AI) of condyles were followed the method developed by Habets et al. The most lateral points of the condyle and the ramus were marked as A and B. The ramus tangent line (T-line) was drawn passing through A and B. The distance between the line perpendicular to T-line through the most superior point of condyle and the line through the A point of condyle defined as the height of condyle (HC). AI = (right HC-left HC) / (right HC+ left HC) x100%.

**Results:** The analysis revealed AI of study group (7.9% ± 1.7%, mean ± S.E.) was significantly higher than the control group (1.9 %± 0.43%), P < 0.05.

**Conclusion:** Panoramic radiography provides as an accessible tool to evaluate condylar asymmetry for patients with internal derangement. This preliminary study showed the asymmetry indexes of patients with internal derangement are higher than the non-TMD population.

## CONDYLAR ASYMMETRY IN PATIENTS DIAGNOSED AS INTERNAL DERANGEMENT-EVALUATION ON PANORAMIC RADIOGRAPHY



Conclusion: Panoramic radiography provides as an accessible tool to evaluate condylar asymmetry for patients with internal derangement. This preliminary study showed the asymmetry indexes of patients with internal derangement are higher than the non-TMD population.

# Reliability And Accuracy Of A Semi-Automatic Segmentation Protocol Of The Nasal Cavity Using Cone Beam Computed Tomography In Patients With Osa

H. Chen<sup>1</sup>, T. Lv<sup>1</sup>, L. Li<sup>2</sup>, Q. Wang<sup>3</sup>, Y. Li<sup>4</sup>, S. Ge<sup>5</sup>, D. Zhou<sup>6</sup>, E. Emami<sup>7</sup>, M. Schmittbuhl<sup>8</sup>, P. van der Stelt<sup>9</sup>, N. Huynh<sup>8</sup>

<sup>1</sup>Shandong University, Department of Orthodontics, Jinan, China, <sup>2</sup>Shandong University, School of Mechanical Engineering, Jinan, China, <sup>3</sup>Southern Medical University, Department of Orthodontics, Jinan, China, <sup>4</sup>Shandong University, Department of Otorhinolaryngology, Jinan, China, <sup>5</sup>Shandong University, Department of Periodontics, Jinan, China, <sup>6</sup>Shandong University, School of Chemistry and Chemical Engineering, Jinan, China, <sup>7</sup>McGill University, Montreal, Canada, <sup>8</sup>University of Montreal, Montreal, Canada, <sup>9</sup>Academic Centre for Dentistry Amsterdam, Amsterdam, Netherlands

**Abstract:**

**Aims:** To assess: (1) intra- and inter-observer reliability of the volume measurement of the nasal cavity based on the cone beam computed tomography (CBCT) images; (2) the accuracy of the segmentation protocol for evaluation of the nasal cavity.

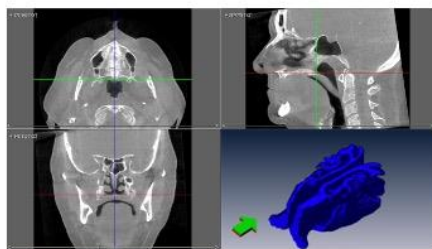
**Materials and Methods:** This study used test-retest reliability and accuracy methods within two different population sample groups, from Eastern Asia and North America. Thirty obstructive sleep apnea (OSA) patients were randomly selected from administrative and research oral health data archived at two dental faculties in China and Canada. To assess the reliability of the protocol, two observers performed nasal cavity volume measurement twice with a 10-day interval, using Amira software (v4.1, Visage Imaging Inc., Carlsbad, CA). The accuracy study used a computerized tomography (CT) scan of an OSA patient, who was not included in the study sample, to fabricate an anthropomorphic phantom of the nasal cavity volume with known dimensions (gold standard). This phantom was scanned using one NewTom 5G (QR systems, Verona, Italy) CBCT scanner. The nasal cavity was segmented based on CBCT images and converted into standard tessellation language (STL) models. The volume of the nasal cavity was measured on the acquired STL models.

**Results:** The intra-observer and inter-observer intraclass correlation coefficients for the volume measurement of the nasal cavity were 0.980-0.997 and 0.948-0.992 consecutively. The nasal cavity volume measurement was overestimated by 1.1%-3.1%, compared to the gold standard.

**Conclusion:** The semi-automatic segmentation protocol of the nasal cavity in patients with sleep apnea and by using cone beam computed tomography is reliable and accurate.

**Reliability and accuracy of a semi-automatic segmentation protocol of the nasal cavity using cone beam computed tomography in patients with sleep apnea**

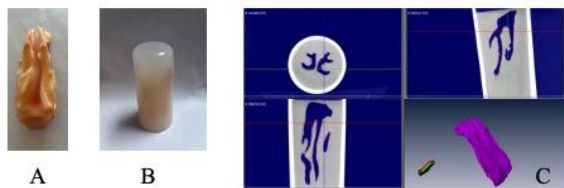
- Reliability and accuracy of segmentation protocol of the nasal cavity



Lower boundary of nasal cavity

**Reliability analysis**

❖ The intra-observer and inter-observer ICC was 0.980-0.997 and 0.948-0.992.



A. Polylactic Acid (PLA)-phantom of nasal cavity; B. PLA-phantom surrounded by silicone; C. CBCT images of the silicone phantom of the nasal cavity.

**Accuracy analysis**

❖ The nasal cavity volume was overestimated by 1.1%-3.1%, compared to the gold standard.

**Conclusions:** The semi-automatic segmentation protocol of the nasal cavity in patients with sleep apnea and by using cone beam computed tomography is reliable and accurate.

# Ct Findings Of Progressive Hemifacial Atrophy (Romberg Syndrome): A Case Report And Review

G. Concha<sup>1</sup>

<sup>1</sup>Universidad de Los Andes, Facultad de Odontología, Santiago, Chile

## Abstract:

**Aims:** To describe the CT imaging findings in a 10-year-old boy with progressive hemifacial atrophy and to correlate it with the reports available in the literature.

**Materials and Methods:** PHA or Romberg Syndrome is an uncommon degenerative condition. The alterations detected in the CT examination of a 10-year-old child with progressive hemifacial atrophy (PHA) are evaluated, contrasting the findings with the characteristics described in the literature in the last 5 years.

**Results:** There are currently 51 publications available on the imaging characteristics of PHA, in the last 5 years. The described characteristics are similar to those observed in the evaluated patient; atrophy of the skin and subcutaneous structures in a localized area of the face. Enophthalmos is also seen, because of loss of periorbital fat. In the literature it is described that there is a possibility of facial bone hypoplasia, which is not observed in our case.

**Conclusion:** CT of a 10-year-old boy with PHA shows atrophy of subcutaneous structures on the left side of the face. Enophthalmos is also seen. These characteristic that coincides with what has been described in the literature of the last 5 years, for this degenerative condition.

## CT findings of PROGRESSIVE HEMIFACIAL ATROPHY (Romberg Syndrome) A Case Report and Review,



10-year-old boy with progressive hemifacial atrophy (PHA)



CT imaging findings



51 publications available on the imaging of PHA, in the last 5 years

PHA shows atrophy of subcutaneous structures on one side of the face. Enophthalmos is also seen.



# Imaging Characteristics To Differentiate A Diving Ranula From Other Cystic Lesions Of The Oral Cavity: A Pictorial Review.

G. Concha<sup>1</sup>

<sup>1</sup>Universidad de Los Andes, Facultad de Odontología, Santiago, Chile

## Abstract:

**Aims:** To describe the imaging findings (CT and MRI) that allow to differentiate diving ranula (DR), or plunging ranula, from other cystic lesions that can occur in the sublingual and submandibular spaces.

**Materials and Methods:** The radiographic characteristics of DR described in the literature are analyzed to differentiate it from other lesions with a cystic appearance that can develop in the sublingual and submandibular spaces. Images are presented that allow the identification of these characteristics.

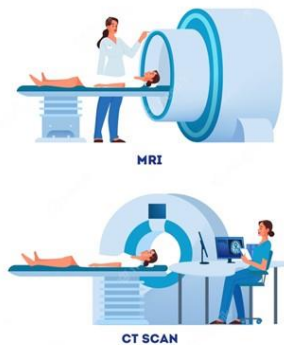
**Results:** DR imaging findings consider a well-defined comet-shaped unilocular cystic mass with its tail in the collapsed sublingual space and its head in the posterior submandibular space. The “tail sign” can be identified in TC and MRI studies. Even if uninfected, wall is enhancing after intravenous injection of contrast medium.

**Conclusion:** The “tail sign” helps to identify DR on CT and MRI studies, allowing differential diagnosis of other cystic lesions that may occur in the oral cavity.

## Imaging characteristics to differentiate a DIVING RANULA from other cystic lesions of the oral cavity: A pictorial review.



Diving Ranula (DR) occur in the sublingual and submandibular spaces



CT / MRI imaging findings to make a differential diagnosis



The “tail sign” can be identified DR

The “tail sign” helps to identify DR on CT and MRI studies.

# Quality Improvement Project: Cone-Beam Computed Tomography Requests And Justification In Oral Surgery And Oral And Maxillofacial Surgery Departments

A. Davies De Mugica<sup>1</sup>, A. Loughlin<sup>1</sup>

<sup>1</sup>Royal London Dental Hospital, Dental and Maxillofacial Radiology Department, London, United Kingdom

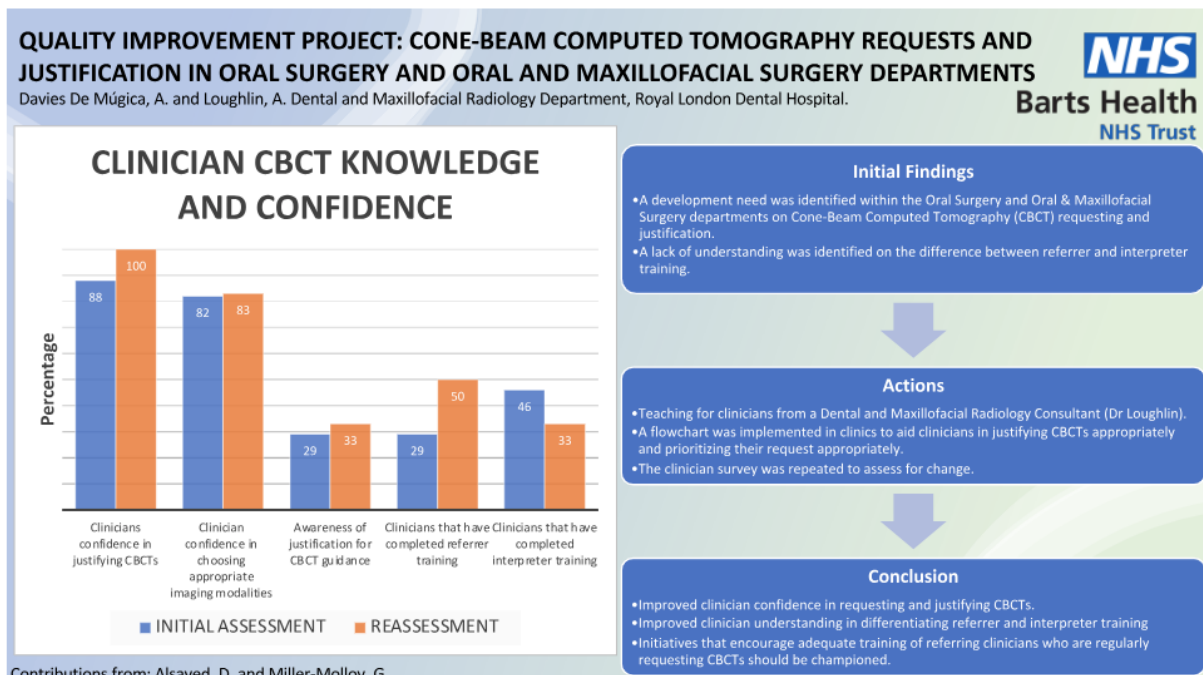
## Abstract:

**Aims:** A development need to improve clinician confidence in requesting and justifying cone-beam computed tomography (CBCTs) (in accordance with SEDENTEXCT guidance) was recognised within Oral Surgery (OS) and Oral and Maxillofacial Surgery (OMFS) departments. This quality improvement project aimed to develop local guidance to increase clinician confidence in requesting and justifying CBCTs.

**Materials and Methods:** A clinician survey was sent to OS and OMFS departments at a London dental hospital to assess their confidence in requesting and justifying CBCTs; 17 clinicians responded. This survey used a 5-point Likert scale from 'not at all confident' to 'extremely confident'. The results were presented at a local OS and OMFS audit meeting accompanied by teaching on CBCT requesting and justification by a Dental and Maxillofacial Radiology Consultant. A flowchart was created and displayed in clinics to aid the identification of appropriate imaging modalities and clinical justification. A follow-up survey was completed; 6 clinicians responded.

**Results:** Clinician confidence in justifying CBCTs improved with all clinicians responding they were 'somewhat confident' or higher following intervention. Awareness of justification for CBCT guidance, understanding of the difference between referrer and interpreter training, and clinician confidence in choosing appropriate imaging modalities all increased.

**Conclusion:** Following the implementation of a flowchart and targeted teaching, this quality improvement project met the aim of improving clinician confidence in requesting and justifying CBCTs. An important outcome was the recognition of the difference between referrer and interpreter training by clinicians. Initiatives that encourage adequate training of referring clinicians who are regularly requesting CBCTs should be championed.



# Clinical Assessment And Ultrasonographic Evaluation In Autoimmune Related Sialadenitis

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## Abstract:

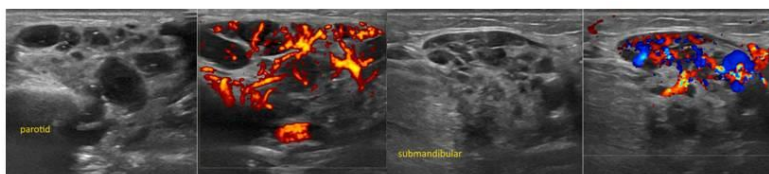
**Aim:** This study emphasizes the role of ultrasonography in the evaluation of autoimmune disorders affecting the salivary glands, specifically Sjögren syndrome and IgG4 sialadenitis.

**Materials and Methods:** Two different Ultrasound devices with a linear high frequency transducer (6-15 and 4-18MHz) were used, with a preset small parts protocol. Color/power Doppler technique was used with a low pulse repetition frequency (PRF). The glands were scanned on axial and longitudinal plane.

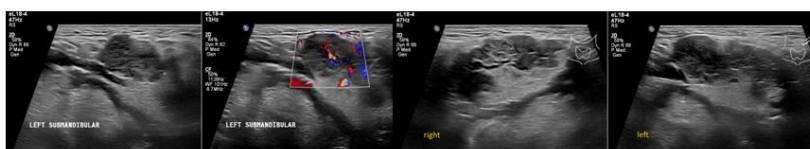
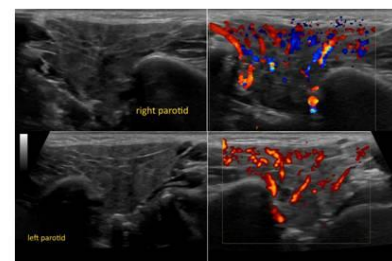
**Results:** Sjögren syndrome. US demonstrated bilateral involvement of both submandibular and parotid glands, with diffuse thickening of their fibrous stroma (honeycomb appearance), hypoechoic nodules and increased vascularity. The findings were compatible with primary Sjögren disease. Secondary Sjögren syndrome. Bilateral tenderness of the parotid, and a mild decrease in echogenicity with increased vascularity. Taking into consideration the patient's history of rheumatoid arthritis, the most likely diagnosis is secondary Sjögren syndrome. IgG4 sialadenitis, presented a non-painful nodular swelling in the left submandibular area. IgG4 sialadenitis, also known as Küttner's tumor. Küttner's tumor almost exclusively affects the submandibular gland. It is benign and presents as a palpable mass that can mimic neoplasia. The ultrasound exam demonstrated a solid, hypoechoic nodule on the left submandibular gland with central vascularity. Various smaller hypoechoic nodules were seen in the rest of the gland. Periglandular lymph nodes were present. The imaging findings suggested Küttner's tumor. This patient had a history of chronic pancreatitis and the laboratory findings supported the ultrasound suspicion of an autoimmune IgG4 sialadenitis.

**Conclusions:** Ultrasound examination of the salivary glands contributes to the differential diagnosis of autoimmune sialadenitis combined with clinical and laboratory findings.

## Clinical assessment and ultrasonography evaluation in autoimmune related sialadenitis



**Primary Sjogren** Bilateral parotid and submandibular involvement with honeycomb appearance on B-mode, due to thickening of the fibrous stroma and decrease in size of the parenchyma. Note the widespread hypoechoic nodules and areas of cystic degeneration. Hyperaemia can be seen throughout the gland on colour Doppler technique.



**Ig4 Sialadenitis** Ultrasound showed a hypoechoic nodule in the anterior aspect of the salivary gland. The nodule is solid and demonstrates central vascularity. On long-axis images multiple nodules can be seen, in addition to the palpable one. The right submandibular gland demonstrates abnormally decreased echogenicity.



**Secondary Sjogren.** Decreased echogenicity of the parotid gland with hyperaemia. Reactive lymph nodes with string of beads appearance.

## Investigation Of The Etiology Of Hyperostosis Frontalis Interna And Its Relationship With Age/Gender Using Cone-Beam Computed Tomography Scans

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### Abstract:

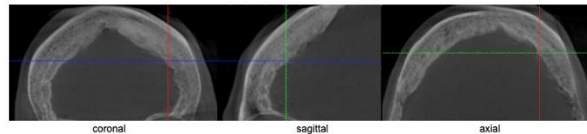
**Aims:** Hyperostosis frontalis interna (HFI) is an overgrowth of bony tissue on the inner plate of frontal bone of the calvaria. Due to its potential to be related to gender and age, it has been the subject of various anthropological and forensic medicine investigations. Although it has been associated with various diseases and hormonal disorders, its etiology and associated conditions are still unclear. To our knowledge, there was no study in the literature examining HFI using cone-beam computed tomography (CBCT) scans. The aim of this study was to examine the prevalence of HFI, age / gender relationship, and related diseases using CBCT scans.

**Materials and Methods:** Radiologic examination of the inner aspect of the frontal bone of 300 patients (141 males and 159 females), which had undergone CBCT scan of the examined region, was carried out using the reconstruction technique and HFI was categorised. Chi-square test was performed.

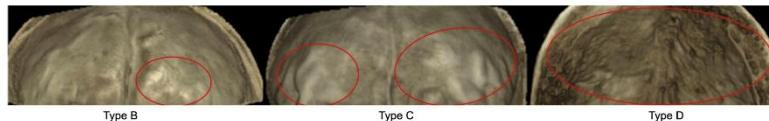
**Results:** Presence of HFI was significantly higher in women ( $p < 0,05$ ), and 86.2% of HFIs were women over 65 years of age. Type B (75.9%) was most common in HFIs. This was followed by type C (13.8%) and type D (10.3%), respectively. The most common disease was hypertension (20,7%). The most commonly used drug was anticoagulants (17,2%). In addition, 27.6% of the patients had a body mass index above 30.

**Conclusion:** HFI is more common in elderly female and has been associated with a variety of diseases. This is data from a pilot study and needs to be supported by a larger sample.

### Investigation of the etiology of hyperostosis frontalis interna and its relationship with age/gender using cone-beam computed tomography scans



HFI is an overgrowth of bony tissue on the inner plate of the frontal bone of the calvaria. Due to its potential to be related to gender and age, it has been the subject of various anthropological and forensic medicine investigations. Although it has been associated with various diseases and hormonal disorders, its etiology and associated conditions are still unclear.



HFI was categorised. **Type A** - no HFI

**Type B** - a nodular bony overgrowth without isolated margins and with only a slight elevation

**Type C** - an extensive nodular bony overgrowth associated with irregular thickening of up to 50% of the frontal endocranial surface.

**Type D** - a continuous bony overgrowth involving more than 50% of the frontal endocranial surface.

**Conclusion:** HFI is more common in elderly female and has been associated with a variety of diseases. This is data from a pilot study and needs to be supported by a larger sample.



# Osteolytic Lesions Of The Jaws In Multiple Myeloma Patients On Panoramic Radiographs

S. Friedlander Barenboim<sup>1</sup>, N. Yarom<sup>1,2</sup>, R. Shehadeh<sup>1</sup>, A. Inerman Mosongnik<sup>1</sup>

<sup>1</sup>Sheba Medical Center, Tel Hashomer, Israel, <sup>2</sup>Tel Aviv University, Tel Aviv, Israel

## Abstract:

**Aims:** Multiple myeloma (MM) represents 10% of all malignant hematological diseases and manifests in multiple organs, including bones and joints. The jaws are affected in approximately 30% of MM patients. Almost 80% of all diagnosed MM cases show skeletal alterations that are detectable in radiographic exams. In the absence of clinical signs, the presence of osteolytic lesions on dental radiographs is an indication for the dentist to refer the patient for further evaluation. This study aims to examine the frequency and radiographic characteristics of MM lesions in the jaws in patients from diagnosis throughout the course of the disease on panoramic radiographs.

**Material and Methods:** Subjects with a diagnosis of MM who presented to the Oral Medicine unit for routine evaluation between 2012 and 2022 were included. Panoramic radiographs from 100 MM patients were evaluated and analyzed, with the following description criteria: anatomic location, size, number of lesions, margins, inner aspect, relationship with adjacent structures, and presence or absence of a punched-out appearance. The exams were subdivided into groups of patients using, or not bone modifying agents. Only radiographs of satisfactory quality were included. In patients with a diagnosis of Medication related osteonecrosis of the jaw (MRONJ) only the non MRONJ involved areas were included.

**Results:** The research is still in the phase of statistical analysis therefore final results are not included in this abstract. Demographic results are included. In a sample of 10 patients, and 12 radiographs the sex ratio f:m was 1:1, the age average was 68.16 years, the average time from diagnosis was 3.79 years. The most frequent anatomic location of lytic lesions were the right condyle, right body of mandible and right angle of mandible (4.86% of all sites). In 41.6% lesions were larger than 10 mm.

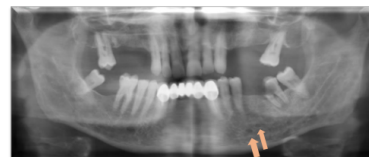
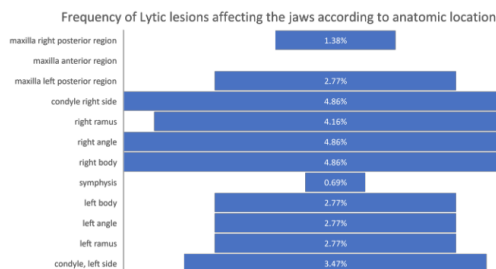
**Conclusions:** Panoramic radiographs are a diagnostic tool for dentists in their daily practice. Osteolytic lesions in panoramic radiographs may be the first sign of disease.

## Osteolytic lesions of the jaws in multiple myeloma patients on panoramic radiographs



Multiple myeloma (MM) has widespread manifestations in multiple organs, including bones and joints.

The jaws are affected in approximately 30% of MM patients. Almost 80% of all recently diagnosed MM cases show skeletal alterations that are detectable in radiographic exams.



Panoramic radiographs are a diagnostic tool for dentists in their daily practice. Osteolytic lesions in panoramic radiographs (arrows) may be the first sign of disease.

# CBCT Approach In The Pre-Surgical Evaluation Of The Pediatric Patient With Cholesteatoma

D. Haba<sup>1,2</sup>, A. Mocrei<sup>1</sup>, R. Serban<sup>1</sup>, L. Radulescu<sup>1</sup>, S. Cozma<sup>1</sup>, B. Cavaleriu<sup>1</sup>, A. Rohozneanu<sup>3</sup>, C. Martu<sup>1</sup>

<sup>1</sup>University of Medicine and Pharmacy Grigore T Popa Iasi, Surgery, Iasi, Romania, <sup>2</sup>SC MEDIMAGIS SRL, Iasi, Romania, <sup>3</sup>N Oblu Emergency Hospital, Radiology, Iasi, Romania

## Abstract:

**Aims:** Cholesteatoma is a mass formed by the keratinizing squamous epithelium in the tympanic cavity or mastoid and has an aggressive pattern in the pediatric population. CBCT is an excellent alternative to classic CT, but despite a significantly lower dose of radiation, a good spatial resolution, and a small amount of time needed for the examination, there is still uncertainty concerning when to indicate CBCT in the assessment of the temporal region in children. Our aim is to assess the feasibility of CBCT in the evaluation of cholesteatoma in a pediatric population in NE of Romania.

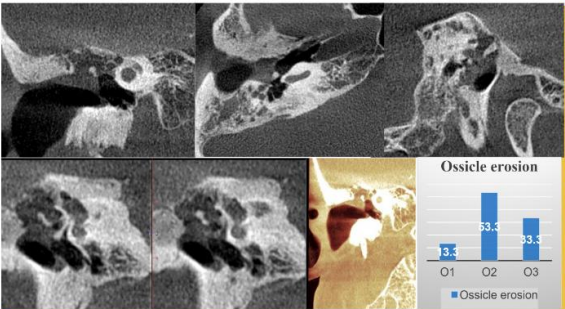
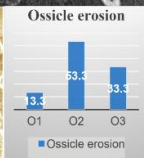
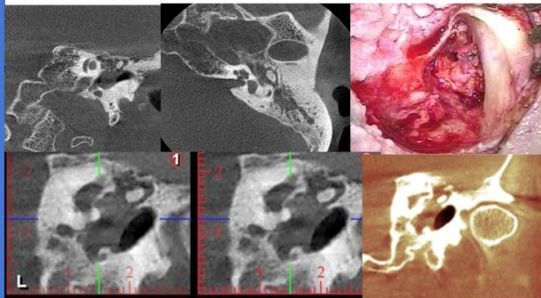
**Materials and Methods:** Retrospective study of 35 patients (5 to 17 years), who performed temporal CBCT scan evaluations for cholesteatoma from 2017 until 2023 in Medimagis Clinic. Scan acquisitions were performed with a Planmeca 3D Mid. We used the SOC (Mills) classification to evaluate the localization and the ossicular damage. One patient presented with clinical signs of sepsis and performed a cerebral MRI scan. All patients were surgically treated, with a good correlation between the imaging and the intra-operative findings.

**Results:** The most common finding was an extensive form of cholesteatoma, occupying the middle ear in 60% of cases, with the erosion of the scutum, the lateral semicircular canal, the long process of the incus, the tegmen tympani, as well as in a few cases the stapes superstructure and the facial nerve canal.


**Conclusion:** CBCT is a feasible imaging tool for the assessment of extension and bone damage in cholesteatoma in children and is an excellent alternative to classic CT.

## CBCT APPROACH IN THE PRE-SURGICAL EVALUATION OF THE PEDIATRIC PATIENT WITH CHOLESTEATOMA

D. Haba, R. Serban, L. Radulescu, S. Cozma, B. Cavaleriu, Ancuta Rohozneanu, A.Mocrei

PARS FLACCIDA	PARS TENSA								
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  <p style="font-size: x-small; color: #000080;">Cholesteatoma of the right ear with scutum and the long process of the incus and stapes superstructure erosion, fully occupying the Prussak's space (a niche in the epitympanum lateral to the ossicles).</p> </div> <div style="text-align: center;"> <p style="font-size: x-small; color: #000080;">MOST COMMON</p>  <p style="font-size: x-small; color: #000080;">Ossicle erosion</p> <table border="1" style="font-size: x-small; margin: 0 auto;"> <tr><th>Ossicle</th><th>Percentage</th></tr> <tr><td>O1</td><td>13.3</td></tr> <tr><td>O2</td><td>53.3</td></tr> <tr><td>O3</td><td>33.3</td></tr> </table> </div> </div>	Ossicle	Percentage	O1	13.3	O2	53.3	O3	33.3	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  <p style="font-size: x-small; color: #000080;">Large soft tissue mass (cholesteatoma) in left middle ear that begins postero-superiorly and extends posteriorly towards the facial recess and tympanic sinus, and medially towards the ossicular chain.</p> </div> <div style="text-align: center;"> <p style="font-size: x-small; color: #000080;">LEAST COMMON</p> </div> </div>
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CBCT is a feasible imaging tool for the assessment of extension and bone damage in cholesteatoma in children and is an excellent alternative to classic CT.



## Imaging In Esthesioneuroblastoma And Long-Term Follow-Up After Surgery

D. Haba<sup>1,2</sup>, D.-A. Ilinca<sup>3</sup>, D. Pomohaci<sup>4</sup>, D. Păduraru<sup>3</sup>, A.-C. Istrate<sup>3</sup>, M.R. Balcan<sup>3</sup>, D. Palade<sup>1</sup>, C. Antohi<sup>1</sup>

<sup>1</sup>University of Medicine and Pharmacy Grigore T Popa Iasi, Surgery, Iasi, Romania, <sup>2</sup>SC MEDIMAGIS SRL, Iasi, Romania, <sup>3</sup>N Oblu Emergency Hospital, Radiology, Iasi, Romania, <sup>4</sup>University of Medicine and Pharmacy Grigore T. Popa Iasi, Surgery, Iasi, Romania

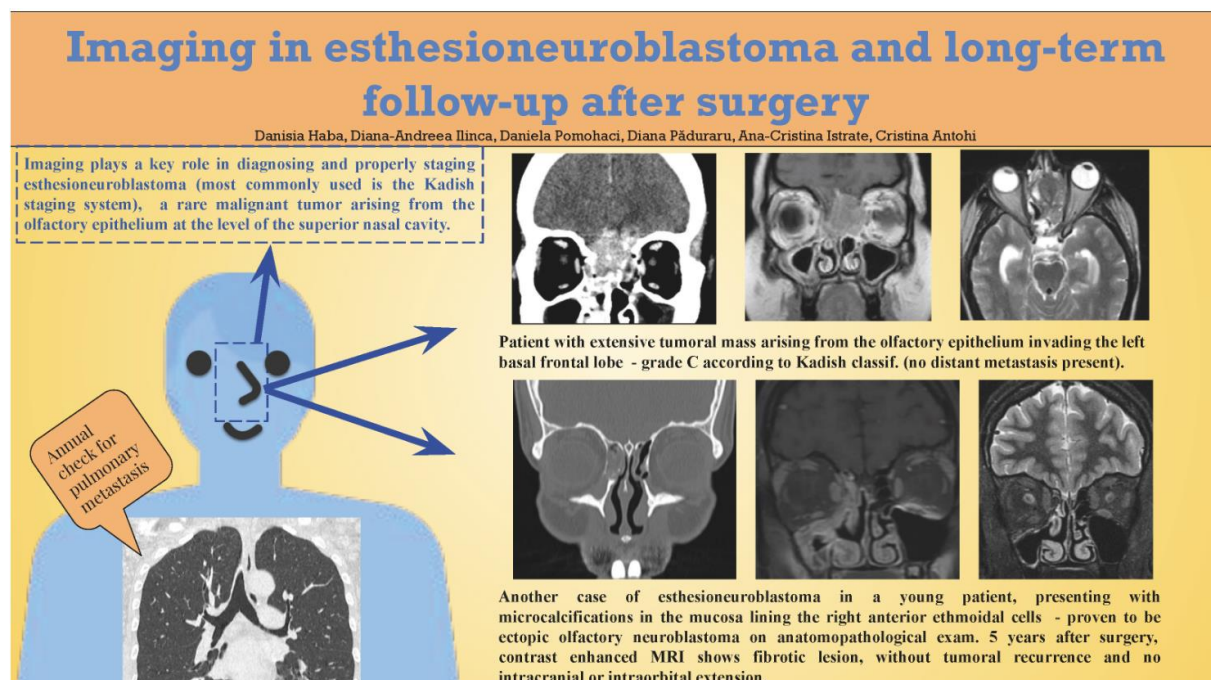
### Abstract:

**Aims:** Imaging plays a key role in diagnosing and properly staging esthesioneuroblastoma, a rare malignant tumor arising from the olfactory epithelium at the level of the superior nasal cavity. The study assesses the role of CBCT, CT, and MRI in the diagnosis of the tumor to understand staging, patterns of extension, and post-surgery imaging in order to rapidly identify recurrence.

**Materials and Methods:** We retrospectively studied 5 patients with confirmed anatomopathological esthesioneuroblastoma, and imaging follow-up from 2018 until 2023 in N. Oblu Emergency Hospital and Medimagis Clinic.

**Results:** We used CBCT or CT for localization and clearly identifying osseous involvement (bone remodeling, invasion in cribriform plate) and MRI investigations (cerebral and neck MRI) in order to recognize key imagistic findings, the local and very rare neck extension that could impact the surgical procedure and add them to the report. CBCT or HRCT with MPR was used to assess bone extension, the location of a soft tissue mass in the high nasal vault or ectopic in the ethmoidal sinus, associated with hyperostosis (n=1), and bone erosion (n=4). MRI is used mostly for soft tissue extension (n=5) and/or orbital (n=2) and intracerebral spread (n=2). Patients were imaging evaluated 2 to 4 months after surgery, biannually for the first 5 years, and annually afterward.

**Conclusion:** Although esthesioneuroblastoma is an uncommon intranasal malignancy, it should be taken into consideration if a soft tissue mass is discovered during a routine CBCT sinus or CT craniocerebral scan and further investigated with MRI for accurate staging and treatment.





# Comparative Evaluation Of Masseter Muscle Stiffness By Muscle Hardness Meter And Ultrasound Elastography In Patients With Temporomandibular Disorders

*D. Jatti Patil<sup>1</sup>*

<sup>1</sup>KM Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to be University, Oral Medicine and Radiology, Vadodara, India

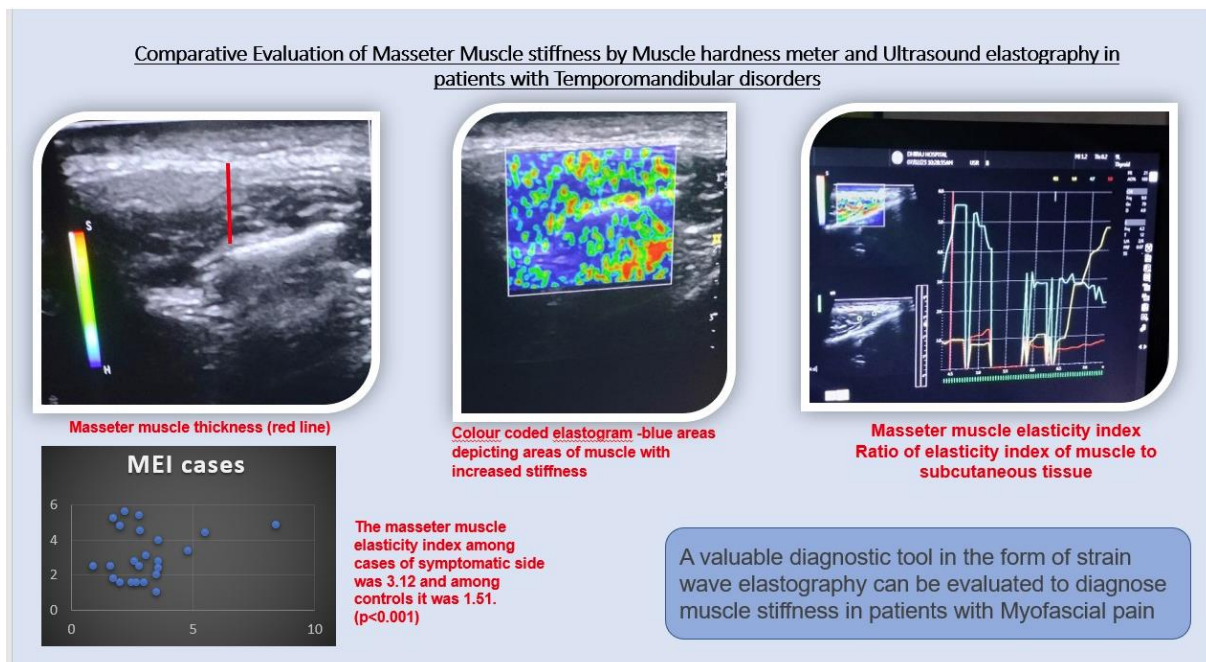
## Abstract:

**Aims:** To evaluate and compare the stiffness of masseter muscles by Muscle hardness meter and Ultrasound strain wave elastography in patients with Temporomandibular disorders and adult healthy volunteers.

**Materials and Methods:** This case-control comparative study included 40 patients diagnosed with myofascial pain and 40 healthy volunteers. A portable muscle hardness meter was used for quantitative measurements of the muscle stiffness. Strain wave elastography was performed using the LOGIQ P9 machine and transducer. The masseter muscle thickness and masseter muscle elasticity index were evaluated bilaterally on the symptomatic side and contralateral side.

**Results:** The mean age of patients was 37.52 among cases and 36.37 among controls. Myofascial pain was seen more among females as compared to males. (30 females and 10 males). The masseter muscle elasticity index among cases of symptomatic side was 3.12 and among controls it was 1.51. ( $p < 0.001$ ) The muscle hardness as measured by the portable muscle hardness meter showed moderately positive correlation with the masseter muscle elasticity index ( $r = 0.67$ ) There was a positive correlation between pain intensity and the masseter muscle elasticity index among patients with myofascial pain. ( $r = 0.82$ ) There was no significant difference in the masseter muscle thickness among patients with myofascial pain and healthy controls.

**Conclusion:** A valuable diagnostic tool in the form of strain wave elastography can be evaluated to diagnose muscle stiffness in patients with Myofascial pain. Masseter muscle elasticity index can be used as an objective measure to evaluate patients with myofascial pain. This can aid in diagnosis and formulating tailored treatment protocol in these patients.





## Case Report Of Central Mucoepidermoid Carcinoma Of The Maxilla

T. Kang<sup>1</sup>, J. Lee<sup>2</sup>, S.-J. Yoon<sup>2</sup>

<sup>1</sup>Chonnam National University, School of Dentistry, Dental Science, Gwangju, Korea, Republic of, <sup>2</sup>Chonnam National University, School of Dentistry, Department of Oral and Maxillofacial Radiology, Gwangju, Korea, Republic of

### Abstract:

**Aims:** This report presents a case of a 23-year-old woman with central mucoepidermoid carcinoma(MEC) of the maxilla.

**Materials and Methods:** On clinical examination, slight swelling covered by normal appearing mucosa was seen in the right buccal and palatal region. Panoramic and CBCT examination revealed well defined radiolucent lesion with lobulated and scalloped border was seen in the right maxillary sinus. A provisional diagnosis was odontogenic keratocyst. Marsupialization of lesion was performed and cystic fluid was obtained. However, 1st biopsy result after marsupialization was diagnosed as low grade of MEC. Histologic examination revealed nest of mucous cells, epithelioid cells and intermediate cells in fibrous stroma. Contrast-enhanced CT and MRI images taken after the initial biopsy showed that the lesion in the maxillary sinus, which maintained the cortical bone boundary, and invaded the hard palate with soft tissue extension.

**Results:** Therefore, the lesion was diagnosed as a central mucoepidermoid carcinoma.

**Conclusion:** If soft tissue evaluation is deemed necessary in case of palatal swelling, contrast-enhanced CT should be considered as a more useful examination method than CBCT.

### Case report of Central mucoepidermoid carcinoma of the maxilla

Taehee Kang<sup>1</sup>, Jae-Seo Lee<sup>2</sup>, Suk-Ja Yoon<sup>2</sup>

<sup>1</sup>School of Dentistry, Dental science, Chonnam National University, Gwangju , Republic of Korea

<sup>2</sup>Department of Oral and Maxillofacial Radiology, School of Dentistry, Dental science, Chonnam National University, Gwangju , Republic of Korea

This report presents a case of a 23-year-old woman with central mucoepidermoid carcinoma(MEC) of the maxilla. On clinical examination, slight swelling covered by normal appearing mucosa was seen in the right buccal and palatal region. Panoramic and CBCT examination revealed well defined radiolucent lesion with lobulated and scalloped border was seen in the right maxillary sinus. A provisional diagnosis was odontogenic keratocyst. Marsupialization of lesion was performed and cystic fluid was obtained. However, 1<sup>st</sup> biopsy result after marsupialization was diagnosed as low grade of MEC. Contrast-enhanced CT and MRI images taken after the initial biopsy showed that the lesion in the maxillary sinus, which maintained the cortical bone boundary, and invaded the hard palate with soft tissue extension. Therefore, the lesion was diagnosed as a central MEC.

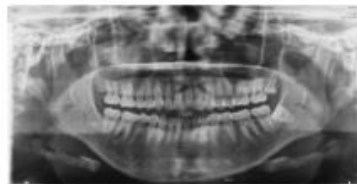


Fig 1. Panorama radiograph revealed that multilocular radiolucency with scalloped border in the right posterior maxillary region was seen.

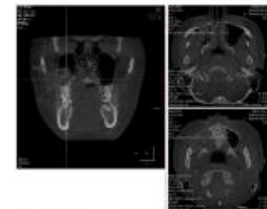


Fig 2. CBCT revealed multilocular expansile radiolucency with scalloped border in the right maxillary sinus and hard palate

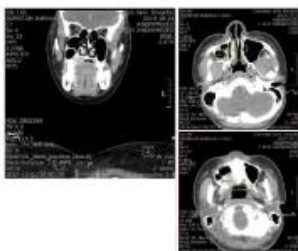


Fig 3. MDCT revealed that enhancing mass in the right hard palate. Well defined radiolucency with corticated border in the right maxillary sinus was seen. The cortical destruction and soft tissue extension in the right hard palate was seen.

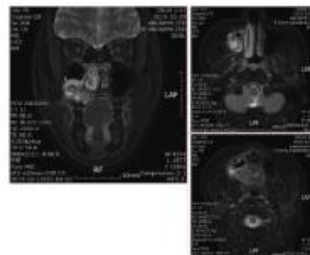


Fig 4. MRI revealed that heterogenous signal intensity mass in the right maxillary sinus and hard palate

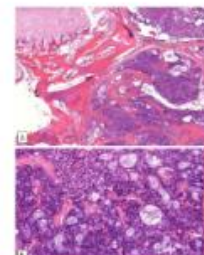


Fig 5. Histologic examination revealed that nest of mucous cells, epithelioid cells and intermediate cells in fibrous stroma

Created in BioRender.com bio

# Hearing Assessment In Chronic Otitis Media By Radiological Landmarks In Down Syndrome

S. Khanna

## Abstract:

**Aims:** The assessment of middle ear function by radiological landmarks of the middle ear region in Trisomy 21, Otitis Media (OM) and control groups. The Eustachian tube length (ET length), Posterior Upper Facial Height (PUFH), Maxillary Depth (MD), Total Cranial Base (TCB), and S-Ba to ET length and S-Ba to Palatal line were compared in Trisomy 21, Otitis Media and control groups.

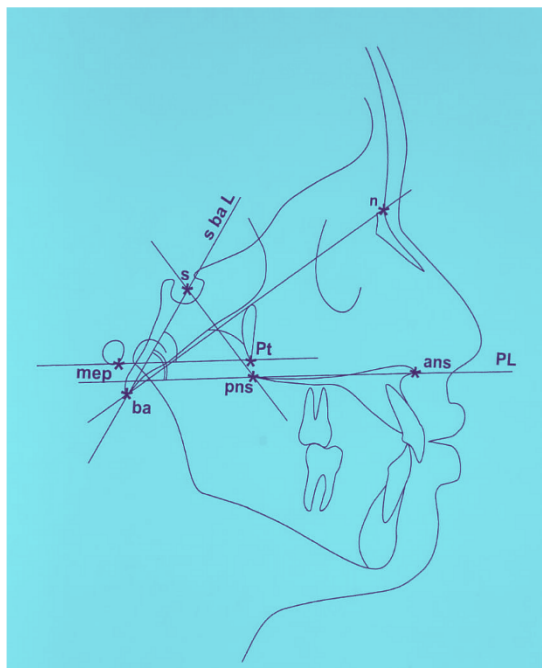
**Materials and Methods:** The study comprised of 75 subjects of both sexes in the age range of 7 to 20 years. Digital Lateral Cephalometry was performed for Trisomy 21, OM and controls (n=25). The Eustachian tube function was determined using the Pure Tone Audiometry & Immittance audiometry.

**Results:** ET length, PUFH, MD and TCB were found to be significantly reduced in the Trisomy 21, OM and controls. S-Ba to ET length and S-Ba to Palatal line showed a marked reduction in patients with Trisomy 21 & OM. and S-Ba to ET and S-Ba to PL and was significantly reduced in patients with B and C tympanograms. There was an association between middle ear function and radiological landmarks in the study groups.

**Conclusion:** Aberration in the dimension of the region of the ET can be considered as a predisposing factor for OM in Trisomy 21. Assessment of ET related parameters in OM and Trisomy 21 is vital in analyzing the alteration in function and implementing preventive measures for decreasing the disability.

Key words: Middle ear, Lateral Cephalometry, Down's Syndrome

## Hearing Assessment in Chronic Otitis Media by Radiological Landmarks in Down Syndrome



Key words: Middle ear, Lateral Cephalometry, Trisomy 21



### Objective

The assessment of middle ear function by radiological landmarks of the middle ear region in Trisomy 21, Otitis Media (OM) and control groups. The Eustachian tube length (ET length), Posterior Upper Facial Height (PUFH), Maxillary Depth (MD), Total Cranial Base (TCB), and S-Ba to ET length and S-Ba to Palatal line were compared in Trisomy 21, Otitis Media and control groups.



### Methods

The study comprised of 75 subjects of both sexes in the age range of 7 to 20 years. Digital Lateral Cephalometry was performed for Trisomy 21, OM and controls (n=25). The Eustachian tube function was determined using the Pure Tone Audiometry & Immittance audiometry.



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### Conclusion

Aberration in the dimension of the region of the ET can be considered as a predisposing factor for OM in Trisomy 21. Assessment of ET related parameters in OM and Trisomy 21 is vital in analyzing the alteration in function and implementing preventive measures for decreasing the disability..

# Positron Emission Tomography - Magnetic Resonance Imaging, A New Hybrid Imaging Modality For Dentomaxillofacial Malignancies. A Systematic Review

S. Koutsipetsidou<sup>1</sup>, A. Mitsea<sup>2</sup>, N. Christoloukas<sup>3</sup>, P. Papavasileiou<sup>1</sup>, G. Oikonomoy<sup>4</sup>, C. Angelopoulos<sup>3</sup>

<sup>1</sup>University of West Attica, Radiology and Radiotherapy, Biomedical Sciences, Athens, Greece, <sup>2</sup>National and Kapodistrian University of Athens, Oral Diagnosis & Radiology, School of Dentistry, Athens, Greece, <sup>3</sup>National and Kapodistrian University of Athens, Oral Diagnostic and Radiology, Athens, Greece, <sup>4</sup>University of West Attica, Biomedical Sciences, Radiology and Radiotherapy, Athens, Greece

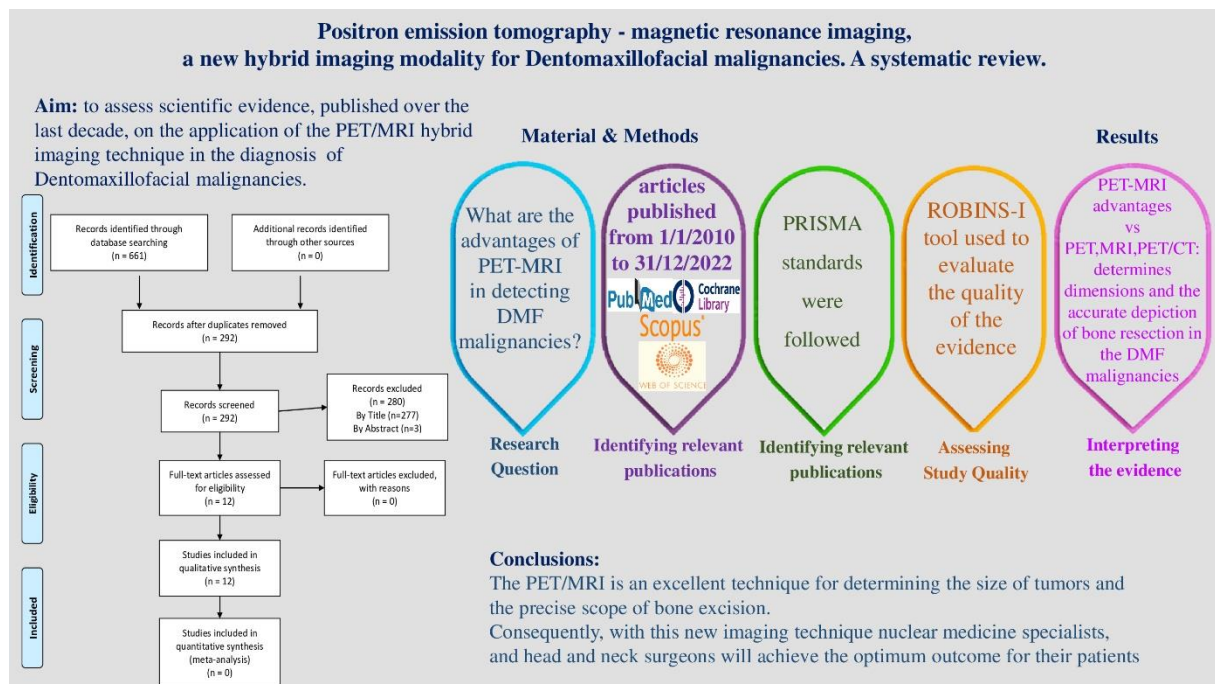
## Abstract:

**Aims:** The aim of this review is to assess scientific evidence, published over the last decade, on the application of the PET/MRI hybrid imaging technique in the diagnosis of Dentomaxillofacial malignancies.

**Materials and Methods:** Four databases, namely: PubMed, Scopus, Cochrane Library, and the Web of Science, were employed for articles published between January 2010 and December 2022. The quality of the evidence was assessed with the ROBINS-I tool. The criteria defined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards were followed for the selection of the papers included in the review.

**Results:** A total of 669 publications were initially retrieved. Following the application of the PRISMA criteria, a set of 12 articles was created. PET-MRI presents better diagnostic performance, compared to PET, MRI, and PET/CT imaging in the determination of malignancies' dimensions and the accurate depiction of bone resection in the head and neck region. When combined with histopathological analysis (Ki67 index, p16), the diagnostic accuracy is improved. The advantage of this imaging technique is due to the combination of tissue contrast, offered by the MRI, and the metabolic information provided by the PET. Contraindications include claustrophobia, MRI incompatibility of implanted medical devices or possible metallic fragments in the body (e.g. cardiac pacemakers, neurostimulators, cochlear implants, and insulin pumps), and high cost.

**Conclusion:** PET/MRI is an excellent technique for determining the size of tumors and the precise scope of bone excision. Consequently, with this new imaging technique nuclear medicine specialists, and head and neck surgeons will achieve the optimum outcome for their patients.



# Clinical Features Of Tumors And Tumor-Like Pathologies Involving The Buccal Fat Pad

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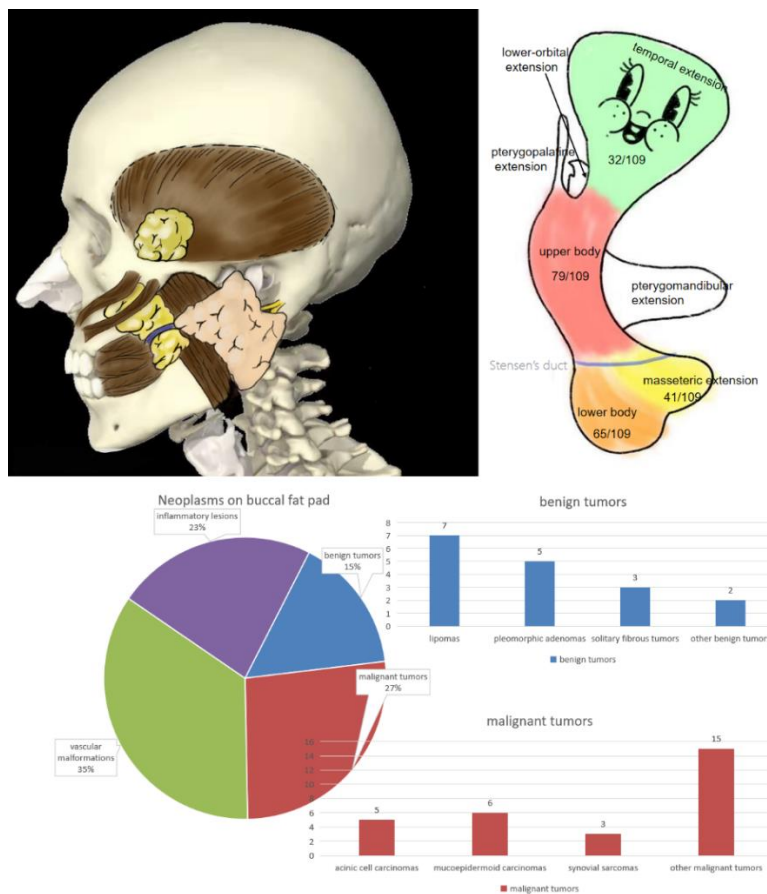
**Abstract:**

**Aims:** To investigate the clinical, radiological, and pathological characteristics of pathologies involving the buccal fat pad (BFP) and to explore the treatment protocols.

**Materials and Methods:** 109 cases of primary pathologies involving the BFP (pBFPs) diagnosed between January 2013 and September 2021 were assessed. The patients' clinical presentations and radiological and histopathological findings were retrospectively analyzed, and their treatment outcomes were evaluated.

**Results:** The pBFPs were categorized as benign tumors (17/109), malignant tumors (29/109), vascular malformations (38/109), and inflammatory masses (25/109). Benign tumors included lipomas (7/17), pleomorphic adenomas (5/17), solitary fibrous tumors (3/17), and others (2/17). Malignant tumors included adenoid cystic carcinomas (5/29), mucoepidermoid carcinomas (6/29), synovial sarcomas (3/29), and others (15/29). Vascular malformations included venous (37/38) and arteriovenous (1/38) malformations. In 18 cases with inflammatory masses, the lesions appeared after cosmetic facial botulinum toxin injection (13/18) or other facial procedures (5/18). The BFP upper body was the most frequently involved site (79/109), while other frequently involved sites included the lower body (67/109) and the masseteric (41/109), temporal (32/109), and pterygopalatine (30/109) extensions.

**Conclusion:** BFP could give rise to benign tumors, malignant tumors, vascular malformation and inflammatory masses involving the buccal, masticatory, infratemporal and temporal spaces.





# Prevalence And Morphometry Of The Posterior Condylar Canal On Cone-Beam Computed Tomography (Cbct): A Preliminary Study

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<sup>1</sup>Altınbaş University Faculty of Dentistry, Department of Oral and Dentomaxillofacial Radiology, Istanbul, Turkey

## Abstract:

**Aims:** The aim of this retrospective study was to investigate the prevalence and morphometric features of the posterior condylar canal (PCC) using cone beam computed tomography (CBCT), as well as its relationship with age, sex, and side.

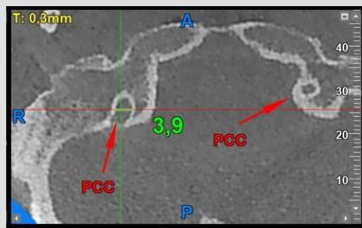
**Materials and Methods:** CBCT scans of 150 patients were examined retrospectively. The presence and the mean diameter of the PCC on both sides were analyzed. Kolmogorov-Smirnov, Shapiro-Wilk, one-way analysis of variance (ANOVA), Student's t-test, chi-squared test, and Tukey's HSD were used. P values <0.05 were accepted as statistically significant.

**Results:** The mean age of the patients was 40.89±19.56 years. PCC was present bilaterally in 63,3% and unilaterally in 26% of the patients. The prevalence of PCC was 10,7% on the right side and 15,3% on the left. The mean diameter of the total PCC was 3,16±1,18 mm. The mean diameter of the right PCC was 3,12±1,01 mm, and 3,3±1,37 mm in females, and males. The mean diameter of the left PCC was 3,11±1,21 mm, and 3,16±1,23 mm in females, and males. A statistically significant difference was found between the age groups in terms of the mean diameter of total PCC.

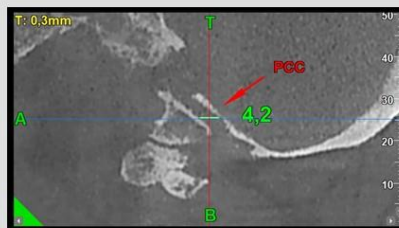
**Conclusion:** Information obtained from this study regarding the presence and morphometric features of the PCC may assist surgeons in treatment plans and reduce the risk of neuro-surgical complications. Radiologists should report the results of the preoperative examination of the morphometry of the PCC. CBCT imaging is a reliable diagnostic method that can be used to evaluate the PCC before surgical procedures.

## Prevalence and Morphometry of the Posterior Condylar Canal on Cone-Beam Computed Tomography (CBCT): A Preliminary Study

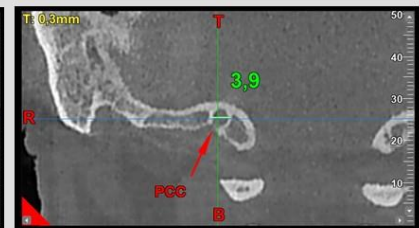
**Aim:** To investigate the prevalence and morphometric features of the PCC and its relationship with age, sex, and side.



Axial section of CBCT, bilateral PCC



Coronal section of CBCT



Sagittal section of CBCT

➤ PCC was present bilaterally 63,3% and unilaterally in 26%. The mean diameter of the total PCC was 3,16±1,18 mm.

**Conclusion:** CBCT imaging is a reliable diagnostic model that can be used to evaluate the PCC before surgical procedures to avoid complications.

# Ultra High-Frequency Ultrasonography Evaluation For Sucking Dynamics For New Born Ankyglossia

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## Abstract:

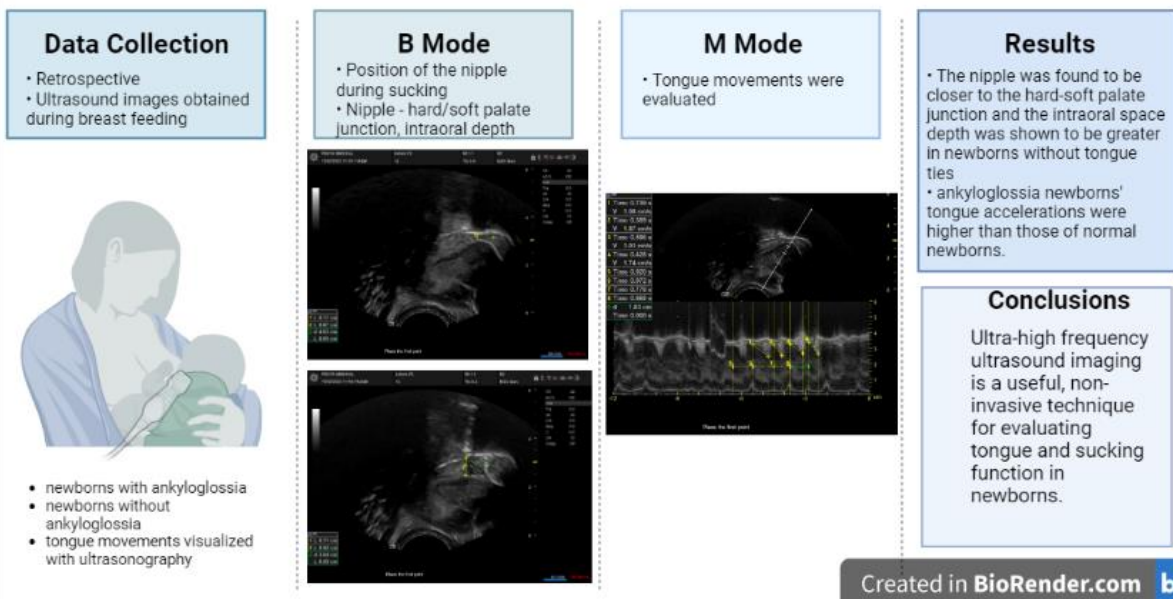
**Aims:** This study aimed to determine variations between newborns with clinically confirmed tongue ties and healthy controls in the mobility of the tongue during sucking function utilizing ultra high-frequency ultrasound imaging modalities.

**Materials and Methods:** The study was designed as a retrospective study. The research utilized B- and M-mode ultrasound images collected to assess the link between tongue tie and lip tie severity and breastfeeding difficulties. 30 newborns with clinically diagnosed tongue ties and 30 control patients' ultrasonography images were analyzed for the study. The position of the nipple in the mouth during the sucking function was measured using B-mode images. M-mode ultrasound images were used to assess tongue movements during the sucking function.

**Results:** A statistically significant difference between newborns with tongue ties and newborns without tongue ties was revealed when the position of the nipple in the mouth during sucking was assessed ( $p < 0,05$ ). The nipple was found to be closer to the hard-soft palate junction and the intraoral space depth was shown to be greater in newborns without tongue ties. When the tongue's function in sucking was examined, it was shown that ankyloglossia newborns' tongue accelerations were higher than those of normal newborns. Between the two groups, there was a statistically significant difference ( $p < 0,05$ ).

**Conclusion:** Ultra-high frequency ultrasound imaging is a useful, non-invasive technique for evaluating tongue and sucking function in newborns.

## Ultra-high frequency ultrasound imaging is a useful, non-invasive technique for evaluating tongue and sucking function in newborns.



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# Investigation Of Algerian Private Dentists Awareness About Interactions Between Magnetic Resonance Imaging And Oral Metallic Materials: National Study

M.A. Rais<sup>1</sup>, M.A. Nacer<sup>2</sup>, A. Mohamed<sup>3</sup>

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## Abstract:

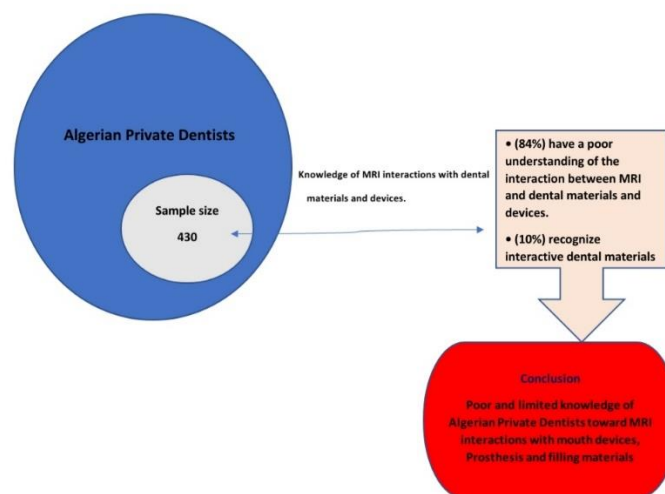
**Aims:** Definitely, Magnetic resonance imaging (MRI) has become a widely used life-saving diagnostic tool for all human systems diseases including maxillofacial & head and neck region. It should be highlighted that multiple restorative dental materials could interact with MRI and thus cause serious impact on the obtained results. The purpose of this study is to assess Algerian private sector dental practitioners understanding toward interaction between MRI and oral metallic materials.

**Materials and Methods:** This is a cross-sectional study conducted during September 2022- January 2023 through an online survey. The target population was Algerian general dentists working exclusively in private offices. Specialists, residents and faculty practitioners are excluded from the study. The questionnaire consisted of 13 multiple questions including a demographic section, questions about MRI use, restorative materials and the possible interaction between both.

**Results:** Among 430 participants in the study, findings reported that the majority of participants (84%) have a poor understanding of dental restorations susceptible to interact with MRI. Only (10% of the study population recognized more than 4 dental restorations that interact with MRI. For  $P < 0.001$ ), findings showed that (63%) of participant dentists prefer referring patients with metallic devices to a public or university hospital (16.4%) than asking to remove the devices before their MRI exam (4.3%).

**Conclusion:** The results of the present study showed a limited knowledge of Algerian private general dentists about MRI interactions with oral prosthesis and metallic devices. This knowledge must be improved by providing continuous education and enhancing multidisciplinary work between general dentists and other healthcare providers.

### Investigation of Algerian Private Dentists Awareness about Interactions Between Magnetic Resonance Imaging and Metallic Dental Prosthesis



# Radiation Protection Aspects In Cbct-Imaging: An Evaluation Of All Cbct-Images Acquired Over 6Years At A Central European University Dental Clinic

R. Schulze<sup>1</sup>, S. Klingler<sup>2</sup>, B. Philippe<sup>2</sup>, M. Tschanz<sup>2</sup>

<sup>1</sup>Universität Bern, Dept. of Oral Surgery and Stomatology, Division of Oral Diagnostic Sciences, Bern, Switzerland, <sup>2</sup>Universität Bern, Dept. of Oral Surgery and Stomatology, Bern, Switzerland

## Abstract:

**Aims:** This retrospective study aims to statistically evaluate all CBCTs acquired with respect to radiation protection aspects over a period from 2017 to 2022 at the Division of Dental Radiology at the Dental Hospital of the University of Bern, Switzerland.

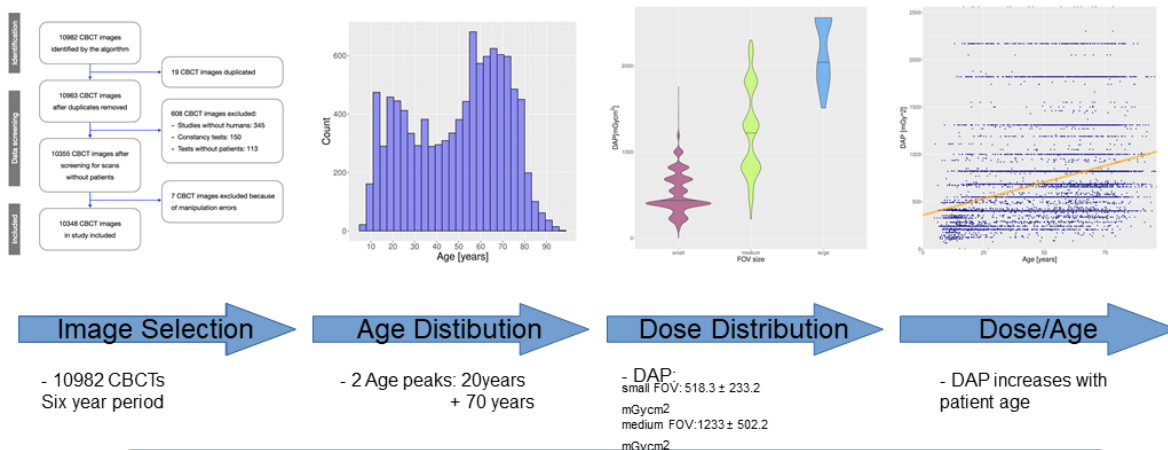
**Materials and Methods:** Using self-produced SQL- and python scripts the database was searched and parameters (patient age and sex as well as dose area product (DAP), kV, mA, scan angle, field-of-view(FOV)-size, exposure time) from all CBCT-images (3DAccuitomo 170 and X800, J Morita Corp. Osaka, Japan) acquired between 01.01.2017 and 27.06.2022 were extracted in an anonymous fashion. Data were statistically evaluated using R language and environment for statistical computing.

**Results:** 10348 CBCTs were acquired over the respective period, in patients between 5 and 96 years of age (mean: 43.4 years  $\pm$  21.6 yrs). Around 20% of the patients per year were under 25years of age with this share even increasing over the 6 years period. The vast majority of CBCTs (99.7%) were small to medium FOV (up to 10cm height) with only 0.3% exceeding this FOV-size. Milliampere settings did not significantly correlate with age, while kV ( $\rho = 0.0210$ ,  $p = 0.0327$ ) and DAP showed a positive correlation with age.

**Conclusion:** The retrospective evaluation of more than 10000 CBCTs acquired in a University Dental Clinic setting clearly exhibits potential in radiation protection enhancement, particularly for children and juveniles. Optimization of exposure parameters and age-related settings would be beneficial for this vulnerable patient group.

## RADIATION PROTECTION ASPECTS IN CBCT-IMAGING: AN EVALUATION OF ALL CBCT-IMAGES ACQUIRED OVER 6YEARS AT A CENTRAL EUROPEAN UNIVERSITY DENTAL CLINIC

Samuel KLINGLER, Philippe BIEL, Moses TSCHANZ, Ralf SCHULZE



Our retrospective study of patients undergoing CBCT scans for various purposes in a central European University Dental Clinic emphasizes the need to fully establish well-known radiation protection aspects in a regular daily clinical setting.



# Evaluation Of Rheumatic Diseases Affecting The Temporomandibular Joint: A Cone Beam Computed Tomography Study

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<sup>1</sup>Akdeniz University Faculty of Dentistry, Oral and Maxillofacial Radiology Department, Antalya, Turkey

## Abstract:

**Aims:** The aim of this study was to investigate the temporomandibular joint (TMJ) components in patients with various rheumatic diseases and to compare them with a control group based on CBCT (cone beam computed tomography) images.

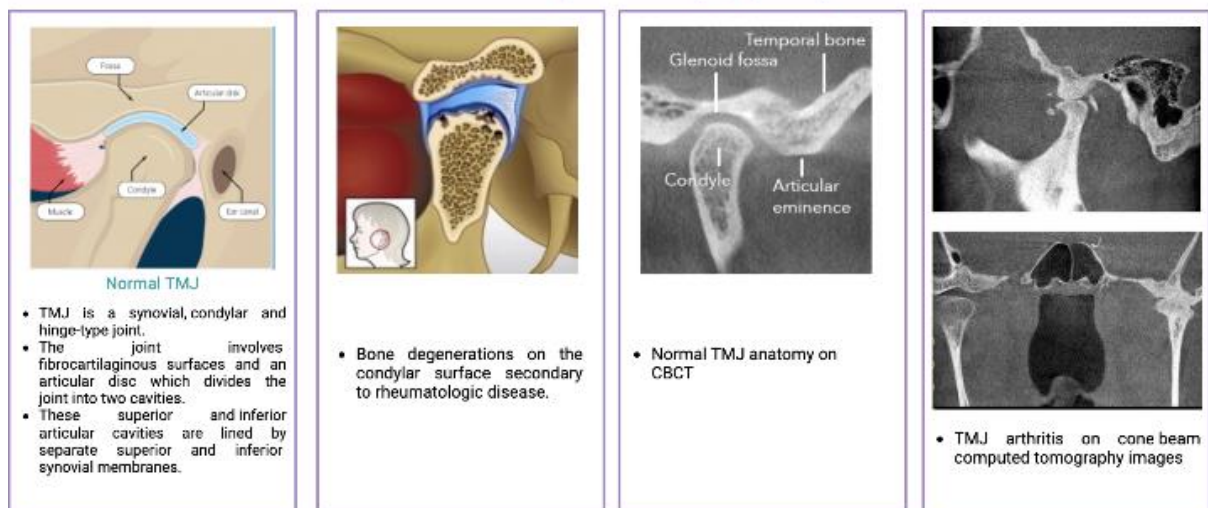
**Materials and Methods:** This study comprised an assessment of CBCT images of 65 patients (130 temporomandibular joints) with various rheumatic diseases following classification criteria set by the International League of Associations for Rheumatology (ILAR). 65 patients (130 temporomandibular joints) with similar age and gender distribution were examined as the control group. Pathologies were classified into totally 12 types. Statistical analysis of all data was done with SPSS version 18. Conformity of continuous variables to normal distribution was examined by Kolmogorov Smirnov test. Mann-Whitney U test was used to compare the mean of two independent groups. Pearson Chi-square test, Yates correction and Fisher's Exact test were used in the analysis of categorical variables.

**Results:** The mean age of the patient and control groups was 50±13 and 48±16, respectively, and no statistically significant difference was found between the patient and control groups in terms of age distribution. ( $p=0.123$ ). Condylar erosion, condylar flattening, subcondylar sclerosis, osteophyte, subcortical cyst, articular surface resorption and articular surface flattening rates were found to be statistically significantly higher in the patient group than in the control group ( $p<0.05$ ).

**Conclusion:** Dentomaxillofacial radiologists should examine the bony components of the TMJ in patients with rheumatic diseases and a multidisciplinary approach from a dental specialist and rheumatologist is required.

## Evaluation of Rheumatic Diseases Affecting the Temporomandibular Joint (TMJ) According to International League of Associations for Rheumatology

### A Cone Beam Computed Tomography Study



In our study, we found statistically significant increase in temporomandibular joint degeneration findings in individuals with rheumatological disease compared to individuals without.

# Postero-Anterior Radiographic Evaluation To Predict Gender And Age

R.R. Shantiningsih<sup>1,2</sup>, R.A. Prianto<sup>2</sup>, M. Mudjosemedi<sup>2</sup>

<sup>1</sup>Universitas Airlangga, Oral and Maxillofacial Radiology Specialist Study Program, Surabaya, Indonesia,

<sup>2</sup>Universitas Gadjah Mada, Department of Dentomaxillofacial Radiology, Sleman, Indonesia

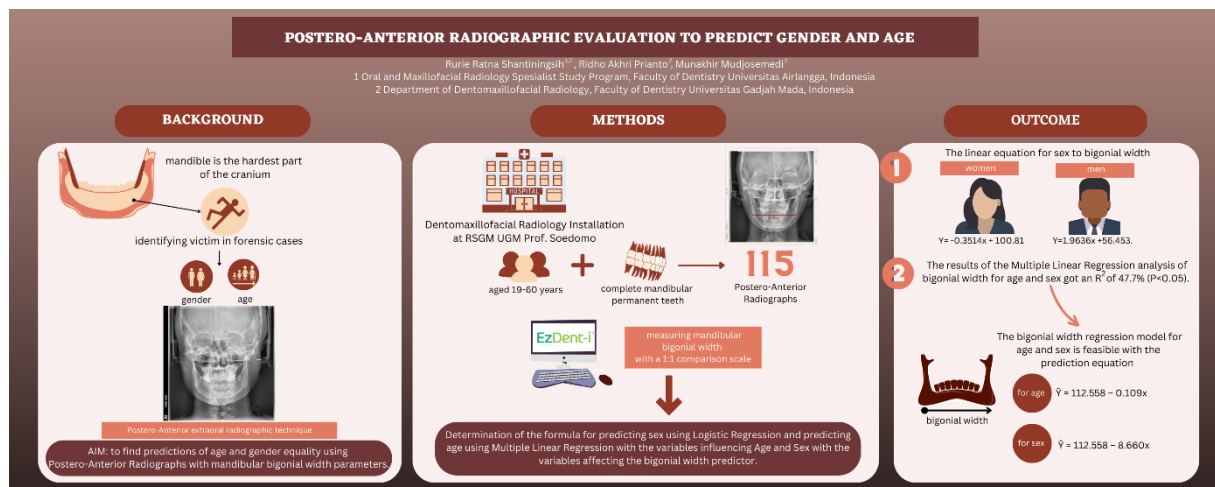
## Abstract:

**Aims:** The mandible is the hardest part of the cranium, which is not easily crushed and has a high degree of sexual dimorphism. The postero-anterior extraoral radiographic technique can be used to measure the width of the mandibular bigonial, which is one of the landmarks in the mandible. This study aimed to find predictions of age and gender equality using Postero-Anterior Radiographs with mandibular bigonial width parameters.

**Materials and Methods:** The study sample comprised 115 postero-anterior radiographs from subjects aged 19-60 with complete mandibular permanent teeth. Samples were obtained from the Dentomaxillofacial Radiology Installation database at RSGM UGM Prof. Soedomo. Measuring mandibular bigonial used EzDent-I Vatech Software with a 1:1 comparison scale. Determination of the formula for predicting sex using Logistic Regression and predicting age using Multiple Linear Regression. Influencing variables are Age and Sex, while the affecting variable is the bigonial width predictor.

**Results:** The results of the Multiple Linear Regression analysis of bigonial width for age and sex got an R<sup>2</sup> of 47.7% (P<0.05). Thus, the bigonial width regression model for age and sex is feasible with the prediction equation  $\hat{Y} = 112.558 - 0.109x$  for age and  $\hat{Y} = 112.558 - 8.660x$  for sex prediction.

**Conclusion:** This study concludes that the linear equation for sex to bigonial width was obtained for women  $Y = -0.3514x + 100.81$  and for men  $Y = 1.9636x + 56.453$ .



# Retrospective Analysis Of Clinical And Radiographic Features Of Patients With Maxillofacial Malignancies

B. Stevanovic Sancar<sup>1</sup>, S. Günen Yllmaz<sup>1</sup>

<sup>1</sup>Akdeniz University, Oral ve Maxillofacial Radyology, Antalya, Turkey

## Abstract:


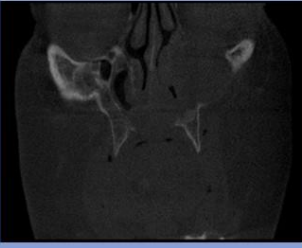
**Aims:** The aim of this study is to discuss the demographic, clinical and radiological features of patients who were evaluated with suspicion of malignancy and subsequently diagnosed with malignant pathology.

**Materials and Methods:** Medical and dental history such as age, gender, presence of systemic disease was obtained from the digital report cards of the 27 patients admitted to Department of Oral and Maxillofacial Radiology. The frequency maxillofacial malignancies, the region where they are seen and clinical informations were examined. Furthermore, panoramic radiographs and CBCT images were evaluated and features such as resorption in the related hard tissues, periosteal reaction and perforation were examined in detail.

**Results:** The mean age of the patients was  $54.5 \pm 9.35$  years, 16 male and 11 female ( $p > 0.05$ ). Eight of the cases were found in the mandible, 12 in the maxilla, 2 in the maxillary sinus and 5 in the vertebra. Nine of the cases were hematologic malignancy, 4 were sarcoma, and 14 were carcinoma ( $p > 0.05$ ). Clinically, swelling, paraesthesia, ulceration, tooth mobility, pain and lymph node involvement were not found in most of the patients ( $p > 0.05$ ). Radiologically; bone resorption was observed in 24 patients; expansion in 7 cases, periodontal ligamentar changes in 14 cases, loss of lamina dura in 8 cases, and periosteal reaction in 6 cases.

**Conclusion:** In order to make an early diagnosis and avoid treatment delays, dentists must thoroughly examine anatomical structures during clinical and radiographic evaluation. A multidisciplinary approach, is required when a neoplastic lesion is suspected by radiological examinations.

## Retrospective analysis of clinical and radiographic features of patients with maxillofacial malignancies

AIM	METHODS	RESULTS
To discuss the demographic, clinical and radiological features of patients who were evaluated with suspicion	The frequency of maxillofacial malignancies, clinical informations , panoramic radiographs and CBCT images were evaluated.	GENDER: male 16 female 11
		8 mandibula 12 maxilla, 2 maxillary sinus 5 vertebra.
		9 hematologic malignancy, 4 sarcoma 14 carcinoma
		Bone resorption 24 Periosteal reaction 6 Expansion 7 Loss of lamina dura 8 Periodontal change 14

# Mandibular Lingual Canal In Cone Beam Computed Tomography: Anatomical Description And Potential Use In Forensic Identification

*D. Villagrán<sup>1</sup>, E. Parraguez<sup>1,2</sup>, L. Araneda<sup>1</sup>*

<sup>1</sup>San Sebastián University, Santiago, Chile

<sup>2</sup>Universidad Mayor, Santiago, Chile

## Abstract:

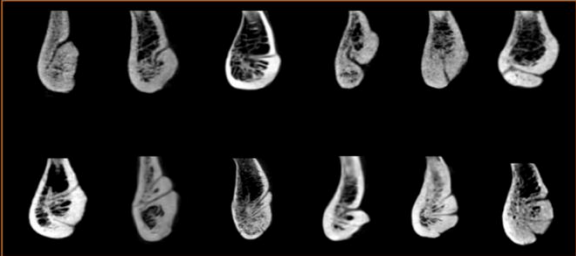
**Aims:** Determine anatomical variations of the mandibular lingual canal (LC) in CBCT and its use as a reliable method for forensic identification.

**Materials and Methods:** Observations and descriptions were made in a sagittal section and different radiographic types of LC were recorded according to Sekerci's (2014) classification over 100 mandibular CBCT from the San Sebastián University database. A matching experiment of images was performed by five trained observers: 100 slides with 12 cross sections of LC arranged randomly (10 different and 2 identical), where 10 did not have an identical pair.

**Results:** LC were observed in 100% of CBCT, where 56% presented more than one foramen and LC. 55% of the canals presented multiple locations (above and below the mental spines). The most frequent inclination when there was only one canal was downward (30%). The presence of bifurcations was scarce (14%). The mean length of the LC was 7.81mm for men and 6.25mm for women. There were no gender-related differences in LC anatomical features, number, or position. Type VI LC according to Sekerci's classification were the most frequent. In the matching experiment the average success rate was 97.4%. All recognized slides that did not have an identical pair.

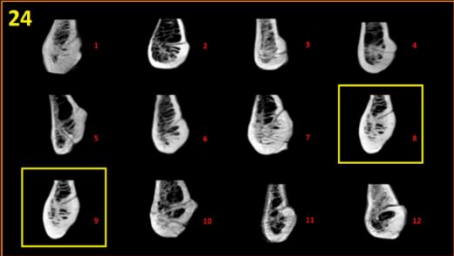
**Conclusion:** CBCT revealed multiple anatomical characteristics of the mandibular LC: presence, position, number, inclination and length. The results show the existence of significant variability in the anatomy and location of the LC, suggesting that each mandible presents a specific anatomical configuration of the LC for each individual, demonstrating that they could be used in human identification.

**Mandibular Lingual Canal In Cone Beam Computed Tomography: Anatomical Description And Potential Use In Forensic Identification**



- Sagittal section of mandibular CBCT
- Observation and description of lingual canals
- Presence, position, number, inclination and length of lingual canal

24



- Example of matching experiment of lingual canals images (10 different and 2 identical)
- 100 slides of 12 lingual canals images, where 10 did not have an identical pair

**Conclusion:** Existence of significant variability in the anatomical characteristic of the mandibular lingual canal, demonstrating they could be used in human identification.



## Computed Tomography Imaging Spectrum Of Van Buchem Disease

*P. Arora<sup>1</sup>, J. Gibbons<sup>2</sup>, J. Hise<sup>2</sup>, M. Nair<sup>1</sup>*

<sup>1</sup>Texas A&M College of Dentistry, Oral & Maxillofacial Radiology, Dallas, United States, <sup>2</sup>Baylor University Medical Center, Department of Radiology, Dallas, United States

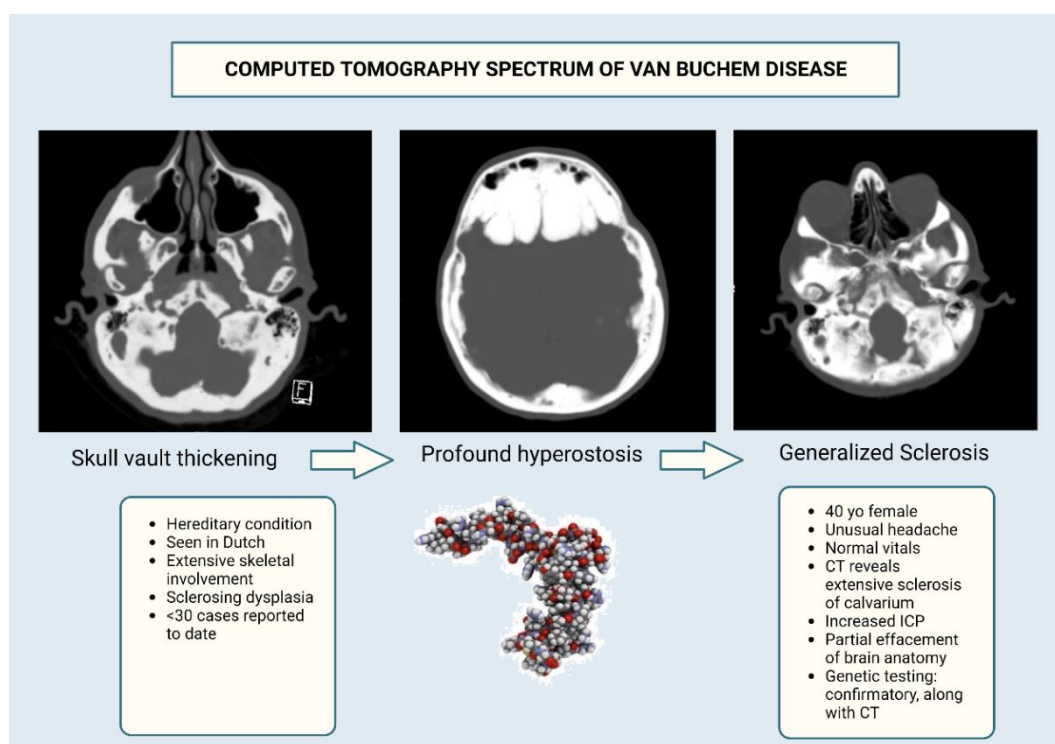
### Abstract:

**Aims:** Van Buchem disease is a hereditary, sclerosing bone dysplasia inherited in an autosomal recessive pattern, seen almost exclusively in the Dutch population. Patients inflicted by this disease have diffuse sclerosis and bone overgrowth of the skeleton. Computed Tomography findings of this rare condition are reported.

**Materials and Methods:** A 40-year-old female presented to the emergency department with a worsening headache over one week. She denied associated vision changes, muscle weakness, or paresthesias. She described the headache as being unusual and not typical of her usual headaches. Her vital signs were all within normal limits. The clinical findings of the case suggested further investigation through computed tomography evaluation.

**Results:** Computed tomography of the head without contrast was performed which showed profound hyperostosis cranialis with generalized sclerosis of the entire calvarium and visualized cervical spine. Additionally, elevated intracranial pressure with diffuse sulcal and cisternal effacement and slit-like appearance of the ventricles were noted. Overall, these findings were characteristic of a hereditary sclerosing bone dysplasia. Her laboratory studies were within normal limits, including white blood cell count, erythrocyte sedimentation rate, and C-reactive protein. Based on phenotypic abnormalities of skull, imaging characteristics and genetic testing, a diagnosis of Van Buchem Disease was established.

**Conclusion:** Van Buchem disease, is an exceptionally rare disease, with less than 30 cases reported in the literature. The scarcity of literature on this condition demands reporting of new cases to assess for potential variations in clinical and/or radiographic presentations. Early detection on scans can markedly improve prognosis and quality of life in these patients.



# Magnetic Resonance Imaging Findings Of Facial Lupus Panniculitis - An Unusual Case Report

*P. Arora<sup>1</sup>, M. Kumar<sup>1</sup>, N. Sharma<sup>2</sup>, H. Liang<sup>1</sup>*

<sup>1</sup>Texas A&M College of Dentistry, Oral and Maxillofacial Radiology, Dallas, United States, <sup>2</sup>Consultant Dmfr, Atulaya Healthcare, Chandigarh, India

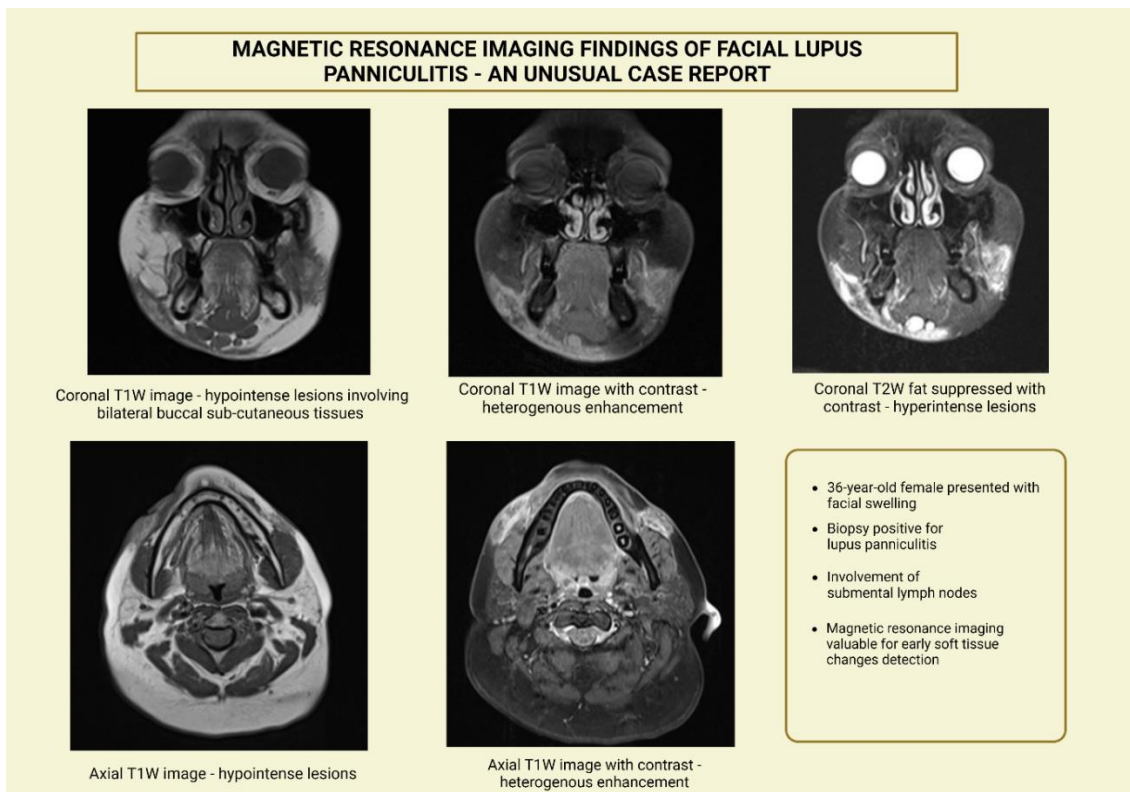
## Abstract:

**Aims:** Lupus panniculitis is a rare inflammatory disease of the subcutaneous tissue, which can occur with systemic or discoid lupus erythematosus. This association presents a rare aggressive infection that requires prompt diagnosis and treatment. We aim to highlight the magnetic resonance imaging findings for this rare condition with an even rarer site of involvement. The scarcity of literature on the magnetic resonance imaging findings of facial lupus panniculitis merits reporting.

**Materials and Methods:** 36-year-old female with a past medical history of discoid lupus erythematosus presented with swelling of face. The clinical findings of the case suggested further investigation through magnetic resonance imaging study.

**Results:** Magnetic resonance imaging demonstrates thick band of subcutaneous and cutaneous (10 mm thick and 3-4 cm wide) T2 hyperintense lesions noted bilaterally in the buccal vestibule level. These lesions appear hypointense on T1 images. There is no frank evidence of involvement of masticatory muscles. Contrast imaging demonstrated heterogenous enhancement of the lesions. Additionally, surface irregularity and ulceration are noted on right side. Involvement of sub mental lymph nodes is evident. Histopathologic evaluation confirmed diagnosis of lupus panniculitis. Patient is currently on antimalarials, steroids and immunosuppressants.

**Conclusion:** Our case is unique owing to facial involvement which is a very rare presentation of lupus profundus with very few case reports. Magnetic resonance imaging is beneficial in the diagnosis of the early inflammatory changes of the soft tissues and crucial to prevent fatal consequences such as marrow changes and skeletal deformities.



## Identification Of Middle-Mesial Canal In Mandibular First Molar Using Cone-Beam Computerized Tomography: A Case Report

Y.Y. Chen<sup>1</sup>, K.H. Lin<sup>1</sup>, Y.C. Wang<sup>1</sup>, W.Q. Wang<sup>1</sup>, M.G. Tu<sup>1,2</sup>

<sup>1</sup>China Medical University and Hospital, Department of Endodontics, Taichung, Taiwan, <sup>2</sup>China Medical University, School of Dentistry, Taichung, Taiwan

### Abstract:

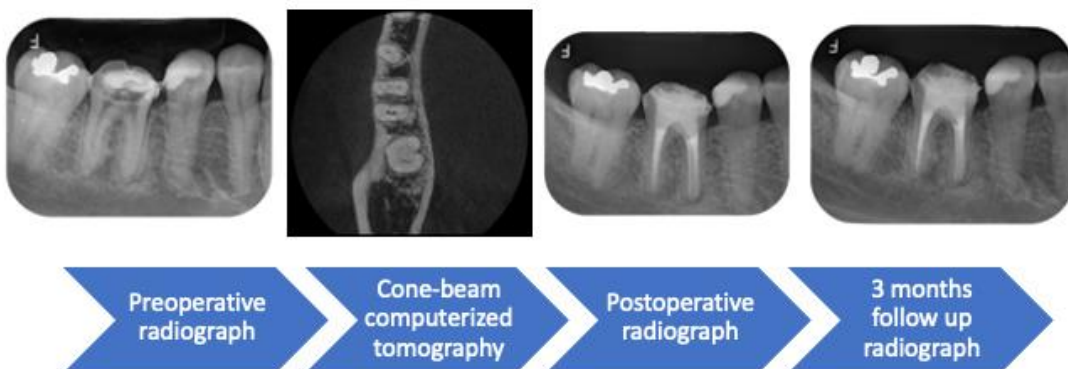
**Aims:** This is a case report that shows identification of middle-mesial canal in mandibular first molars assisted by using cone-beam computerized tomography (CBCT).

**Materials and Methods:** A 46-year-old female patient was referred by her general dentist to the Department of Endodontics, China Medical University Hospital, Taichung, Taiwan for treatment of her right mandibular first molar. The patient's chief complaint was mild lingering pain after drinking cold water. The diagnosis was symptomatic apical periodontitis. Our treatment plan was endodontic treatment followed by permanent crown restoration. During the first endodontic treatment appointment, an extra canal over mesial root was suspected, so CBCT (Planmeca, 575x575 pixel, 0.075 mm voxel size; Romexis software) was taken for examination. The middle-mesial canal was identified under CBCT imaging. Negotiation of the extra canal was achieved in the next appointment with the aid of dental operating microscope (DOM) and ultrasonic devices. CBCT imaging was helpful in locating the middle-mesial canal orifice in the isthmus of the mesial root to prevent over preparation when locating the extra canal due to its three-dimensional views.

**Results:** Root canal treatment was completed after the following appointments. Three months follow up showed no symptom and sign. Periapical X-ray film revealed periapical healing improved of this tooth.

**Conclusion:** Location and disinfection of all existing canals in the tooth plays an important role in root canal treatment. The "middle-mesial canal" is now more routinely recognized if the DOM and ultrasonic troughing technique are used. Periapical radiographs with angle variations may facilitate root canal detection, and the use of CBCT imaging is also helpful in extra root canal detection.

### Identification Of Middle-Mesial Canal in Mandibular First Molar Using Cone-beam Computerized Tomography: A Case Report.



**Conclusions:** Periapical radiographs with angle variations may facilitate root canal detection, and the use of CBCT imaging is helpful in extra root canal detection.

## Case Report Of Incidental Finding: Mandibular Canine With Rare Configuration

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### Abstract:

**Aims:** CBCT scan is a diagnostic tool with increasing use in Dentistry. Reporting a CBCT scan is a task that includes an accurate interpretation of the full volume captured by the scan. This paper shows how important this is.

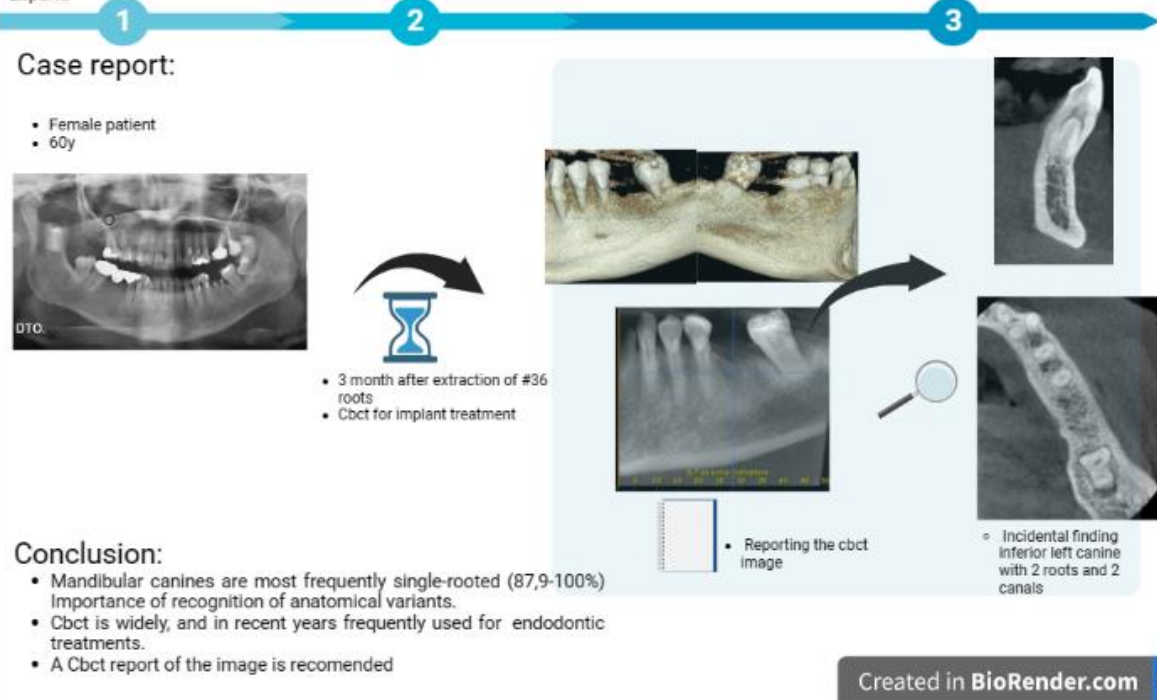
**Materials and Methods:** While reporting a CBCT volume, on a female patient for implant placement on the lower left first molar (36), there was an incidental finding of an inferior left canine (33) which presented two individual roots and two canals. There was a 2D image that did not reveal this anatomy. Only on the CBCT scan we could accurately identify the two roots that were overshadowed in the 2D image.

**Results:** Mandibular canines present a relatively simple canal configuration which is one root and one canal in most cases (94%). In rare cases, there can be two canals (2%–6%) and the incidence of two roots with two root canals is even rarer. Missed canals are amongst the main reasons of treatment failure in endodontics, frequently because of failure of clinician to recognize root canal variations and to be aware of the possibility of finding rare configurations in seemingly “easy teeth.” This can adversely affect the outcome and long-term prognosis of the tooth. This case reports the presence of such rarest configuration in mandibular canine of a female patient.

**Conclusion:** Success of endodontic treatment relies heavily on the knowledge of root canal configuration and morphology. The CBCT scan is one of the most comprehensive tools for patient diagnose when used correctly and precisely.

## Case report of an incidental finding: Mandibular canine with rare configuration

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### Conclusion:

- Mandibular canines are most frequently single-rooted (87,9-100%) Importance of recognition of anatomical variants.
- Cbct is widely, and in recent years frequently used for endodontic treatments.
- A Cbct report of the image is recommended

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## The interdisciplinary approach of periapical lesions in the oncological patients

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### Abstract:

**Aim:** We wanted to correlate Dkk 1 levels with the presence and size of periapical lesions in oncological patients by using ortopantomography versus cone beam computed tomography.

**Material and Methods:** Our study included 63 people, of which 33 patients with ENT cancer and 30 healthy people, all of whom had a blood sample taken to see the value of Dkk 1 responsible for assessing bone loss in general as well as at the level of periapical lesions correlated with paraclinical examination represented by ortopantomography and cone beam computed tomography performed to assess the dental status in order to record the presence and size of periapical lesions.

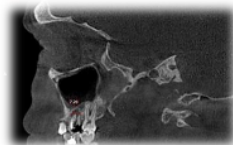
**Results:** Statistically significant correlations were observed regarding the presence and size of periapical lesions in the oncological patient versus healthy one, as well as correlations between the Dkk 1 level and the presence of periapical lesions. Increased levels of Dkk1 were present in patients with periapical lesions identified on both OPGs and CBCT. The number and size of periapical lesions was significantly increased in oncological patient compared to the control group.

**Conclusion:** The interdisciplinary approach of oncological patient is important. The CBCT was used to confirm the OPGs in correlation with the results from Dkk1.

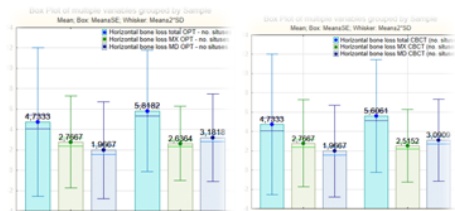
## The interdisciplinary approach of periapical lesions in the oncological patients



OPG- ENT cancer patient periapical lesion at the level of 2.6 – 4.4 mm



The coronal cross section of the CBCT reveal a periapical lesion on 2.6 – 7.2 mm



OPG- bone loss is higher in oncology patients compared to the control group

CBCT- bone loss is higher in oncology patients compared to the control group

**Conclusion:** The interdisciplinary approach of oncological patient is important. The CBCT was used to confirm the OPGs in correlation with the results from Dkk1.

## The Radiological Criterion For Evaluating The Effectiveness Of The Use Of Mineral Trioxide Aggregate In The Treatment Of Periapical Lesions

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### Abstract:

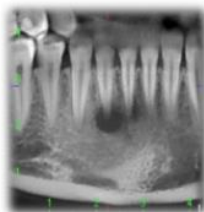
**Aim:** Was to evaluate the evolution of periapical lesions by using cone beam computed tomography after definitive root filling with mineral trioxide aggregate.

**Material and Methods:** 40 years old male patient came to restore dental aesthetics in the frontal area. Present periapical lesions in the region of teeth 1.2 and 2.3 and we decided to treat them in order to preserve the teeth. We prepared the root canal up to #80/02, for irrigation we used NaOCl 2,5% and at the end we performed the root canal sterilization using laser: 1 W/ 4 times on the same root channel, circular movements four times on each root canal. We performed cone beam computed tomography to evaluate the lesions both before and after treatment to see the evolution of the lesions.

**Results:** The use of laser root canal sterilization and sealing with MTA led to healing of periapical lesions. By using cone beam computed tomography it was found that the size of the lesions decreased.

**Conclusion:** Mineral trioxide aggregate is effective in healing periapical lesions and cone beam computed tomography helps us to evaluate the healing of periapical lesions by measuring them in 3D before and after treatment.

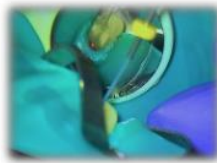
### Effectiveness of the use of mineral trioxide aggregate in the treatment of periapical lesions evaluated using cone beam computed tomography



Panoramic CBCT cross section- Periapical lesions 4.1 and 4.2



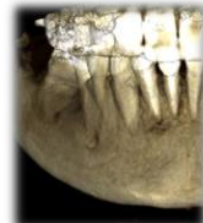
3D CBCT cross section periapical lesions 4.1 and 4.2



Sterilization of the root canals with the laser before the final obturation



Panoramic CBCT cross section- healing of the periapical lesions 4.1 and 4.2



3D CBCT cross section- healing of periapical lesions 4.1 and 4.2

**Conclusion:** Mineral trioxide aggregate is effective in healing periapical lesions and cone beam computed tomography helps us to evaluate the healing of periapical lesions by measuring them in 3D before and after treatment.

# Incidental Findings In A Patient With A Cleft Palate, Experiencing Limitation Of Mandibular Closure, During Maxillary Distraction Treatment.

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## Abstract:

**Aims:** To show radiographic findings in a patient with cleft palate undergoing maxillary distraction. To describe how these findings are visualized on a Cone Beam Computed Tomography. To correlate these findings with the clinical history and compare them with previous images.

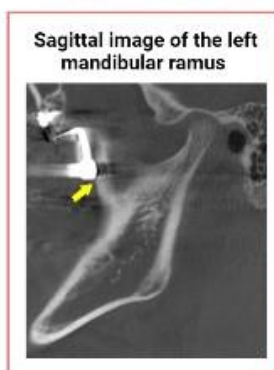
**Materials and Methods:** A tomography study was anonymized, providing only information on the patient's age, sex, and relevant medical history. A detailed imaging diagnosis was made by a team of maxillofacial radiologists from a private center. The findings were communicated to the treating clinician, and a 6-month follow-up was suggested.

**Results:** Through a systematic review of the radiographic volume, three incidental findings were detected. Initially, a contact was observed between the left distraction device and the coronoid process of the respective side, which explained the limitation of mandibular closure. Subsequently, in coronal views of the left mandibular ramus, a two-headed or bifid condyle was observed. Finally, when exploring through the axial axis, a well-defined hyperdense tumor-like lesion of benign appearance was observed occupying part of the ethmoid labyrinth, whose characteristics were compatible with a diagnosis of osteoma.

**Conclusion:** The radiologist's thorough analysis of the scan volume is of great importance. The clinical history provided by the treating clinician, as well as previous images of the patient, is key to detect and diagnose all radiographic findings.

## Incidental findings in patient with cleft palate, experiencing limitation of mandibular closure, during maxillary distraction treatment.

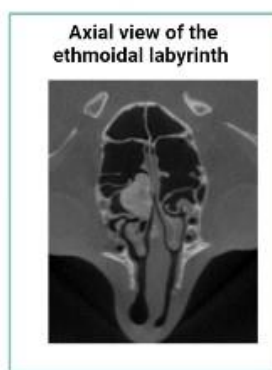
**1** Contact between the distraction orthodontic hardware and the coronoid process



**2** Bifid condyle



**3** Osteoma located in ethmoidal labyrinth



**4** Conclusions

The radiologist's thorough analysis of the scan volume is of great importance. The clinical history provided by the treating clinician, as well as previous images of the patient, is key to detect and diagnose all radiographic findings.

# Hypophosphatemic Rickets From A Dentomaxillofacial Point Of View: A Case Report With Clinical And Radiological Findings, And Recommendations

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## Abstract:

**Aims:** Hypophosphatemic rickets is a rare condition that affects the bone metabolism, characterized by low serum phosphate levels and resistance to vitamin D or ultraviolet radiation therapy, and some dentomaxillofacial findings. The aim of this study is to present a case of hypophosphatemic rickets along with the clinical and radiological findings and recommendations from a dentomaxillofacial perspective.

**Materials and Methods:** Extra-oral, intra-oral, and radiological examinations of a 16-year-old female patient, who was referred to our clinic for consultation by a pediatric endocrinologist with the diagnosis of “hypophosphatemic rickets”, were performed. In addition to cephalometric analysis, age determination by Cameriere’s radiological age estimation methods using lateral cephalometric and panoramic radiographs were carried out.

**Results:** Intra-oral examination revealed poor oral hygiene and multiple caries lesions. A narrow maxilla with a deep palate vault causing moderate to severe crowding in the upper arch was observed. In radiological examination, enlarged pulp chambers resembling taurodontism and also anomaly in bone trabeculation was noted. Cephalometric analysis indicated a hyperdivergent skeletal pattern. Additionally, the delay in dental and skeletal development was confirmed by radiological age estimation.

**Conclusion:** Patients with hypophosphatemic rickets need interdisciplinary care consisting of the cooperation of different specialties. Follow-up examinations should be performed at regular intervals by a team of endocrinologist, dentist, orthopedist, and rehabilitation specialist. From the oral and maxillofacial point of view, 6-month follow-ups and early dental interventions in this particular patient group will help reduce the overall burden of dental care.

**HYPHOPHOSPHATEMIC RICKETS FROM A DENTOMAXILLOFACIAL POINT OF VIEW:  
A CASE REPORT WITH CLINICAL AND RADIOLOGICAL FINDINGS, AND RECOMMENDATIONS**

A 16-year-old female patient was referred to our clinic for consultation by a pediatric endocrinologist with the diagnosis of “hypophosphatemic rickets”. \*

### Intra-oral Findings




Figure 1. Intra-oral view of a) upper arch, b) right lateral side, c) anterior side d) left lateral side, e) lower arch

Intra-oral examination revealed poor oral hygiene and multiple caries lesions. A narrow maxilla with a deep palatal vault causing moderate to severe crowding in the upper arch was observed.

### Radiological Findings

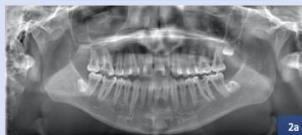


Figure 2a. Panoramic radiography revealed enlarged pulp chambers resembling taurodontism and also anomaly in bone trabeculation




Figure 2b. Cephalometric analysis indicated a hyperdivergent skeletal pattern

The dental and skeletal growth delay was confirmed by Cameriere’s radiological age estimation methods using lateral cephalometric and panoramic radiographs.

### Laboratory Findings

Date	Phosphorus		Calcium		Alkaline phosphatase		Parathormon (PTH)		25-Hydroxy Vitamin D3	
	Value	Reference Value	Value	Reference Value	Value	Reference Value	Value	Reference Value	Value	Reference Value
13.10.2012	2.3 mg/dL	2.80 mg/dL	292 U/L	100-250 U/L	57.3 ng/L	10-30 ng/L	17.2 mg/dL	10-20 mg/dL		
03.01.2013	2.8 mg/dL	2.95-5.1 mg/dL	313 U/L	45-100 U/L	105.0 ng/L	10-30 ng/L	16.3 mg/dL	10-20 mg/dL		
06.11.2013	2.7 mg/dL		369 U/L		118.0 ng/L		16.3 mg/dL			
26.10.2010	3.1 mg/dL		399 U/L		493.0 ng/L		26.34 mg/dL			
2.06.2009	3 mg/dL		512 U/L	8.8-10.2 mg/dL	219.0 ng/L		23.39 mg/dL			
26.09.2010	3.1 mg/dL		654 U/L	50-239 U/L	22.33 ng/L	15-45 ng/L				
11.09.2010	2.1 mg/dL		751 U/L		66.54 ng/L					
4.04.2010	2.7 mg/dL		800 U/L							
4.04.2010	2.7 mg/dL	3.35-5.4 mg/dL	899 U/L							
20.11.2010	2.7 mg/dL		1003 U/L		57.27 ng/L		20.39 mg/dL			
14.10.2010	2 mg/dL		500 U/L		60.37 ng/L		19.71 mg/dL			
14.09.2011	3.1 mg/dL		776 U/L	122-400 U/L	39.3 ng/L		12.84 mg/dL			
17.05.2011	3 mg/dL		657 U/L		209.3 ng/L		28.29 mg/dL			
13.10.2011	2.8 mg/dL		610 U/L	8.8-10.8 mg/dL	71.8 ng/L	12-88 ng/L	26.13 mg/dL			

Table 1. Results of blood tests covering 13 different dates in a period of 6 years

Considering the results of 13 different laboratory tests:

- Phosphorus levels are lower,
- Alkaline phosphatase levels are higher,
- Parathormone levels are higher, and
- 25-Hydroxy Vitamin D3 levels are lower than expected normal values mostly.
- Calcium levels are in the normal range in general.

These laboratory findings are typical in hypophosphatemic rickets patients who develop secondary hyperparathyroidism as a complication of the treatment.

\*Full consent was obtained from the legal guardian of the patient.

**Conclusion:** Patients with hypophosphatemic rickets need interdisciplinary care consisting of the cooperation of different specialties. Follow-up examinations should be performed at regular intervals by a team of endocrinologist, dentist, orthopedist, and rehabilitation specialist. From the oral and maxillofacial point of view, 6-month follow-ups and early dental interventions in this particular patient group will help reduce the overall burden of dental care.



## Mucoepidermoid Carcinoma Is This You?

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<sup>1</sup>Bezmialem Vakif University, Oral and Maxillofacial Radiology, Istanbul, Turkey

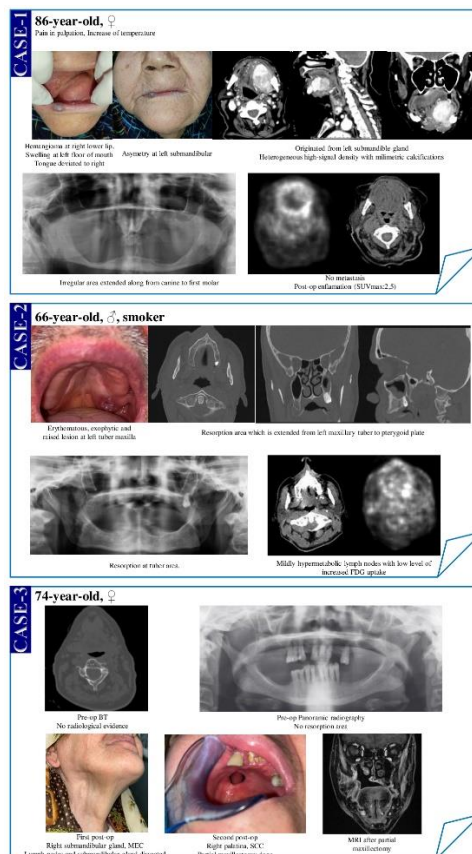
### Abstract:

**Aims:** Mucoepidermoid carcinoma(MEC) is a malignant tumor which mixture of epidermoid and mucous cells originating from the ductal epithelium of the salivary glands. These cases aim to represent three mucoepidermoid carcinoma in different clinical courses.

**Materials and Methods:** The first patient, 86-year-old, was referred to our clinic with a swelling at left mouth floor and referred with squamous-cell-carcinoma(SCC) pre-diagnosis. The biopsy reported as MEC(Intermediate/High-grade). The second patient, 66-year-old, smoker, visited our clinic with bleeding scar at palatina and referred with SCC pre-diagnosis. Histopathological diagnosis indicated as proliferative verrucous leukoplakia. The biopsy repeated because of recurrence and reported as low-grade MEC. The third patient, 74-year-old, diagnosed with high-grade MEC because of fixed mass in the right mouth floor six years ago. One-year later, radiological changes detected around right upper second molar, suspected as recurrence and biopsy planned. The specimen reported as well-differentiated SCC.

**Results:** In every cases, specific imaging methods should be preferred with histopathological examination for a better diagnosis. In our cases we preferred magnetic resonance imaging, contrast-enhanced computed tomography and positron emission tomography with histopathologic evaluation. Then, all patients were referred to otorhinolaryngology for operation and to oncology service to get radiotherapy. Unfortunately, the first patient passed away one-year later.

**Conclusion:** Clinical examination with radiological assesment may lead us misdiagnosis. In these cases, we clearly see some malignancies can confuse clinicians even pathologs. That's why we need to asses clinic, radiologic and pathologic evidences together and always should be ready for unexpected.



## From Stab To Scan: A Radiographic Case Series Of Maxillofacial Knife Trauma

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<sup>1</sup>University of the Western Cape, Department of Oral and Maxillofacial Radiology, Cape Town, South Africa

### **Abstract:**

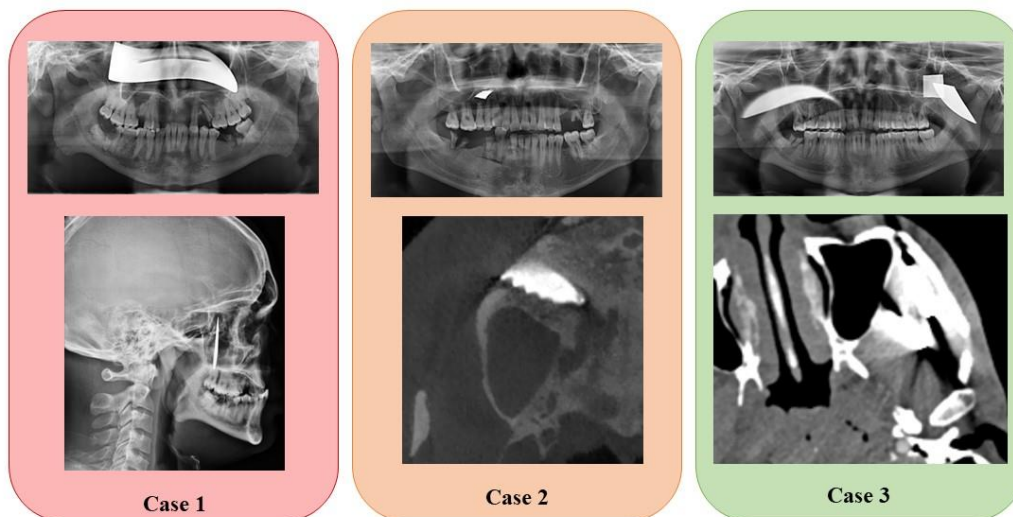
**Aims:** Intentional craniofacial injury caused by a retained knife, also known as Jael's syndrome, is a rare surgical challenge requiring thorough radiographic examination to identify the extent, severity, and location of the foreign body. We present a case series of three patients at the Faculty of Dentistry, University of the Western Cape.

**Materials and Methods:** NA

**Results:** An incarcerated mixed-race male presented with poor oral hygiene and limited mouth opening. Conventional radiographs revealed an embedded blade in the midface with extension into the posterior hard palate, maxillary sinus and posterior ethmoid air cells. History revealed he was stabbed two years prior. The patient never returned for follow-up. Secondly, a mixed-race male presented with lip lacerations, paraesthesia and a mandibular body fracture after being hit with a rock. Conventional radiographs and CBCT revealed a serrated knife blade tip within the mid-segment of the hard palate. The patient recalled being stabbed 6 years prior and was unaware of the embedded blade. The patient absconded from further treatment. Finally, a black male was stabbed in the left zygoma two months prior and presented with severe trismus. Two retained knife blade pieces were noted on the pantomograph. Conventional CT confirmed the extent within the left masticator space, zygoma and lateral pterygoid plate. Surgical removal under general anaesthesia was successfully performed.

**Conclusion:** Miraculously, the first and second cases had no sequelae from their injuries and their nonchalance led to an inadvertent non-surgical approach. Such well-placed stabs have hit the right spot and can provide new insights into the literature.

### From Stab to Scan: A Radiographic Case Series of Maxillofacial Knife Trauma



Jael's syndrome is an intentional craniofacial injury caused by a *retained* knife. This rare surgical challenge requires thorough radiographic examination to identify the extent, severity, and location of the foreign body.

# Tiny Teeth, Big Impact: The Consequences Of Chemotherapy On The Developing Dentition After Treatment Of Neuroblastoma

S. Indermun<sup>1</sup>

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**Abstract:**

**Aims:** The aim of this case report is to present the effect of chemotherapy on tooth development in a paediatric patient treated for neuroblastoma.

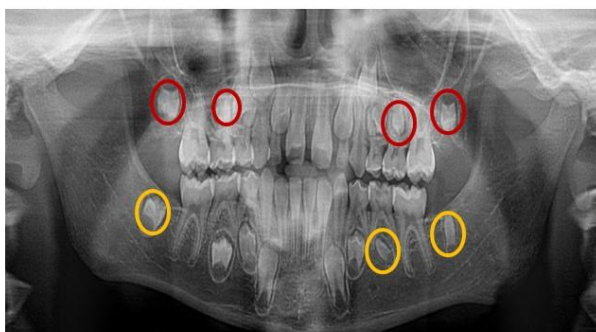
**Materials and Methods:** NA

**Results:** A seven-year-old female presented for a general check-up at Tygerberg Oral Health Centre, University of the Western cape. A pantomograph revealed abnormally developing maxillary and mandibular premolars and second molars. A review of her medical history revealed she was diagnosed with stage IV neuroblastoma at age 2, received chemotherapy and was currently in remission. The period of tooth development correlates with the peak times of diagnosis and treatment of neuroblastoma. These patients undergo intensive treatment including radiotherapy and chemotherapy and it has been shown to have late adverse effects and disturbances in dental development such as tooth agenesis, microdontia, hypodontia, enamel hypoplasia and root malformations.

**Conclusion:** Paediatric patients undergoing chemotherapy at early ages constitute a high-risk group affected by tooth aberrations. It is important that the parents of paediatric patients undergoing cancer treatment are informed by oncologists about dental abnormalities that can develop in the future. The management of pediatric cancer demands a multi-disciplinary approach, and the indispensable role of dentists in this process cannot be overlooked. By making them an integral part of the care team, we can ensure comprehensive management.

### Tiny Teeth, Big Impact:

#### The consequences of Chemotherapy on the Developing Dentition after treatment of Neuroblastoma



Permanent Teeth	Mandibular Teeth							
	Central incisor	Lateral incisor	Canine	1 <sup>st</sup> Premolar	2 <sup>nd</sup> Premolar	1 <sup>st</sup> Molar	2 <sup>nd</sup> Molar	3 <sup>rd</sup> Molar
Initial calcification	3-4 months after birth	10 months after birth	4-5 months after birth	1.5 years	2 years	Birth	2.5 years	7-9 years
Crown Completion	4-5 years	4-5 years	6-7 years	5-6 years	6-7 years	2-3 years	7-8 years	12-16 years
Root Completion	10 years	11 years	13-15 years	12-13 years	12-14 years	9-10 years	14-16 years	18-25 years
Permanent Teeth	Mandibular Teeth							
	Central incisor	Lateral incisor	Canine	1 <sup>st</sup> Premolar	2 <sup>nd</sup> Premolar	1 <sup>st</sup> Molar	2 <sup>nd</sup> Molar	3 <sup>rd</sup> Molar
Initial calcification	3-4 months after birth	3-4 months after birth	4-5 months after birth	1-2 years	2-2.5 years	Birth	2-3 years	8-10 years
Crown Completion	4-5 years	4-5 years	6-7 years	5-6 years	6-7 years	2.5-3 years	7-8 years	12-16 years
Root Completion	9 years	10 years	12-14 years	12-13 years	13-14 year	9-10 years	14-15 years	18-25 years

The effect of chemotherapy on tooth development in a paediatric patient treated for neuroblastoma. *Left:* Pantomograph shows affected microdontic maxillary and mandibular 2<sup>nd</sup> premolars and molars. *Right:* Table shows the time of chemotherapy correlates with the developmental stages.

## Hybrid Lesion Of The Mandible - Imaging Features Of A Diagnostic Challenge

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<sup>1</sup>Texas A&M University School of Dentistry, Oral and Maxillofacial Radiology, Dallas, United States

### Abstract:

**Aims:** To delineate the radiographic criteria to aid in the diagnosis of hybrid lesions of the jaws.

**Materials and Methods:** A 16-year-old female presented with a right mandibular swelling. A cone beam computed tomography study revealed a large, expansile, mixed density lesion in the canine-premolar region. Differential diagnosis included a fibro-osseous lesion, central giant cell lesion, central hemangioma and ameloblastic fibroma. Intralesional biopsy revealed a hybrid lesion of fibrous dysplasia with a focus of giant cell proliferation.

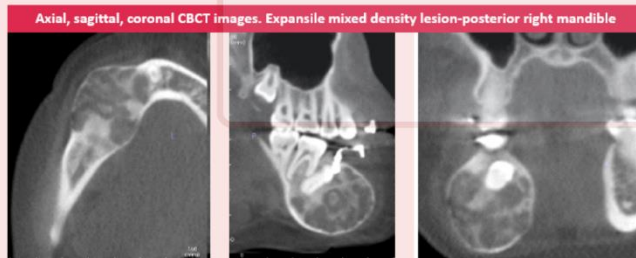
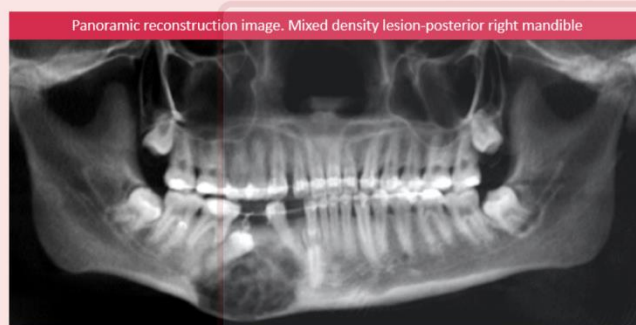
**Results:** Hybrid lesions, comprising two or more separate entities, are very rare. They remain a diagnostic challenge, usually made by correlating the clinical, radiological and histopathological findings, and that are seen to vary depending upon the concurrent pathologies. The ten or so hybrid fibrous dysplasia with central giant cell granuloma cases reported have presented as unilocular/multilocular, expansile lesions with curved, wispy septation vs. residual bone/ calcifications dispersed within a largely radiolucent background. Considerable thinning or even resorption of the surrounding cortical margins may be noted, along with displacement/ impaction/resorption of adjacent teeth. The presence of an altered bone pattern / ground glass appearance in the periphery of the lesion may be an important radiological clue as was noted in our case.

**Conclusion:** The rarity of this case merits reporting. The presence of a giant cell population is common to both pathologies and may influence the biological behavior and recurrence rate. We aim to highlight the radiographic findings of such combined lesions which may aid a clinician / pathologist to look closer and make an adequate management plan.

### Hybrid lesion of the mandible – Imaging features of a diagnostic challenge

#### Hybrid fibro-osseous and central giant cell granuloma lesions

- Rare entities.
- Greater understanding will reduce the likelihood of misdiagnosis and aid in deterring recurrences.
- Imaging findings (as observed in our 16-year-old female patient and from available literature):
  - a. Variable imaging dependent upon concurrent bony lesion.
  - b. Unilocular/multilocular, expansile lesions with curved, wispy septation vs. residual bone/ calcifications dispersed within a largely radiolucent background.
  - c. Altered/ground glass bone pattern.
  - d. Considerable thinning of the surrounding cortical margins.
  - e. Displacement/impaction/resorption of adjacent teeth.



Hybrid lesion comprising fibrous dysplasia & central giant cell granuloma



# Radiological And Metabolic Response Of Central Giant Cell Lesion To Denosumab: Advantages And Potential Pitfalls

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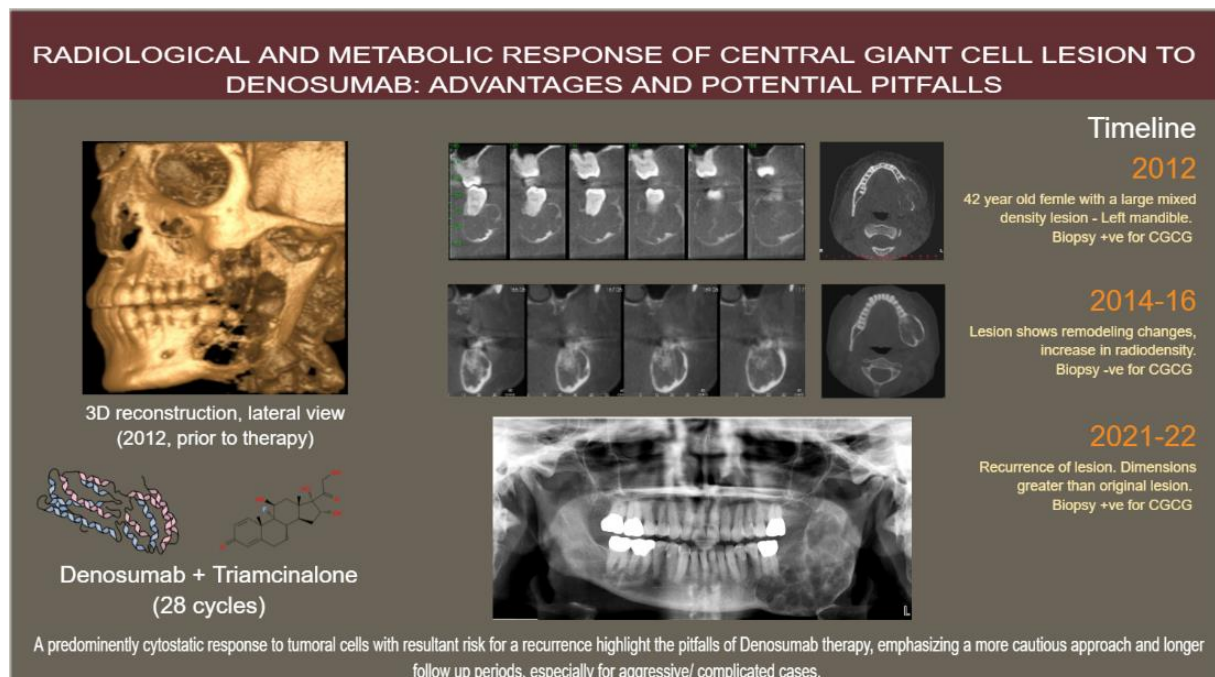
## Abstract:

**Aims:** To evaluate the long term radiological and metabolic response of a large and locally aggressive giant cell lesion of the mandible to denosumab.

**Materials and Methods:** Retrospective analysis through clinical and pathological reports and periodic cone beam computed tomography studies over a 10-year period in a post-menopausal, middle-aged woman with type 2 diabetes and hypertension was done. Patient had been treated with intralesional triamcinolone and subcutaneous denosumab (28 cycles, starting August 2012).

**Results:** Follow up cone beam computed tomography studies and biopsy specimens since treatment completion (February 2013) indicated an initial decrease in size with increased radiodensity within the lesion and resultant improvement in facial asymmetry and mandibular range of motion. However, a suspicious panoramic study done in October 2021 was followed by a pathology specimen which demonstrated a recurrence and extension of the tumor beyond the original boundaries in the left mandible and ramus region.

**Conclusion:** Denosumab induced a radiological and pathological remission in the initial phase of therapy followed by a recurrence in this case. The predominantly cytostatic response of this monoclonal antibody on the tumor cells has been linked with an increased risk of local recurrence as well as malignant transformation/pulmonary metastasis. These represent potential pitfalls in this line of therapy. Denosumab may be considered as an initial or adjunctive treatment for central giant cell lesions, though optimal treatment length and long-term safety requires further evaluation. Radiographic monitoring aids in early detection of recurrence. Our study also highlights the significance of longer follow-up periods.



# Application Of Cone Beam Computerized Tomography In Autotransplantation - Cases Report

*K.H. Lin<sup>1</sup>, Y.Y. Chen<sup>1</sup>, Y.C. Wang<sup>1</sup>, W.Q. Wang<sup>1</sup>, H. Shih<sup>2</sup>, M.G. Tu<sup>1,3</sup>*

<sup>1</sup>China Medical University Hospital, Department of Endodontics, Taichung City, Taiwan, <sup>2</sup>China Medical University Hospital, Department of Oral and Maxillofacial Surgery, Dental Department, Taichung City, Taiwan, <sup>3</sup>China Medical University, School of Dentistry, Taichung City, Taiwan

## Abstract:

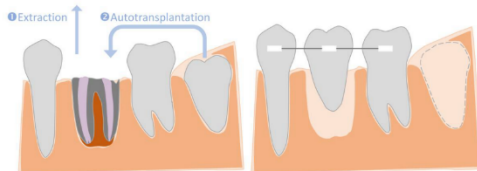
**Aims:** Tooth autotransplantation involves the extraction of an unerupted or erupted tooth and its placement in an extracted or surgically prepared socket within the same person. It's a better treatment option for patient in function, cost, time, prognosis and biocompatibility compared to expensive prosthesis or implant. The procedure and outcome assessment of autotransplantation could be more specific and predictable by the application of CBCT.

**Materials and Methods:** Three cases of third molar autotransplantation are presented in our cases report, and endodontic treatment of all third molars are performed within 2 weeks after surgery. Pre-treatment panoramic X-ray film and CBCT were taken for treatment planning, 3D replica of the donor tooth preparation and 3D printed guiding template fabrication. Post-treatment CBCT and periapical X-ray film were taken for the assessment of bone healing.

**Results:** Decrease of apical radiolucency and periodontal ligament healing could be noted in periapical X-ray films and CBCT image of all cases, and the autotransplanted teeth are all in normal function now.

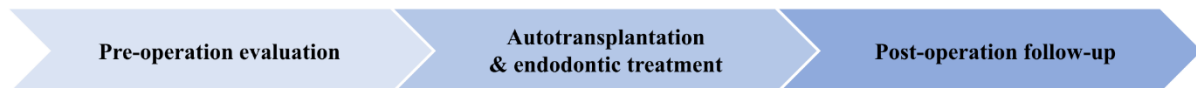
**Conclusion:** CBCT plays an important role not only in pre-operative treatment planning, but also in post-operative follow-up to evaluate the autotransplantation cases outcome in three dimensions.

## Assessment of Autotransplantation by using Cone Beam Computerized Tomography - cases report

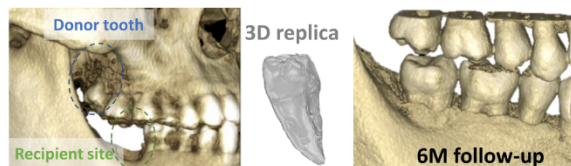


**Tooth autotransplantation :**

Extraction of an unerupted or erupted tooth and its placement in an extraction or surgically prepared socket within the same person.



- Treatment plan discussion
- **Pre-operative CBCT** taking
  - Recipient site evaluation
  - Donor tooth selection
- 3D replica preparation
- Autotransplantation by oral surgeons
- Endodontic treatment in 2 weeks after operation
- Regular follow-up appointment
  - Clinical examination
  - Periapical film taking
  - **Post-operative CBCT** – evaluate treatment outcome



# Radiographic Findings In A Patient With History Of Cancer Treated With Radio And Chemotherapy.

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<sup>1</sup>Universidad Finis Terrae, Odontology, Santiago, Chile, <sup>2</sup>Universidad de Los Andes, Odontology, Santiago, Chile, <sup>3</sup>Universidad Diego Portales, Odontology, Santiago, Chile

## Abstract:



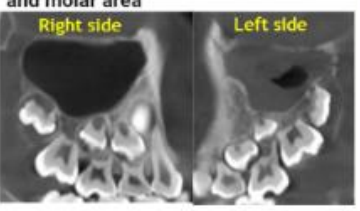
**Aims:** To show and describe radiographic findings in a patient with history of cancer treated with radio and chemotherapy. To compare findings on the side undergoing radiotherapy versus the side not undergoing radiotherapy.

**Materials and Methods:** A study of tomography and panoramic images was anonymized, maintaining the information of age and gender. Medical history information is collected. A detailed description of the findings in the maxilla is made. A descriptive comparison of the right side versus the left side of the maxilla is made.

**Results:** A complete description of the radiographic findings and comparison of one side of the maxilla with the other was made.

**Conclusion:** It is verified that there is a stop in the development of the dental germs in evolution. The side not treated with radiotherapy presents a slightly more development than the contralateral side.

### Radiographic findings in a patient with history of cancer treated with radio and chemotherapy.

1 Case background	2 Findings	3 Conclusion
<ul style="list-style-type: none"><li>An 11-year-old female with history of osteosarcoma in the left maxillary sinus and left nasal cavity at the age of 3.</li><li><b>Treatment:</b><ul style="list-style-type: none"><li>Chemotherapy</li><li>Radiotherapy</li><li>Complete tumor resection</li></ul></li></ul>	<ol style="list-style-type: none"><li>No root development seen on the left maxillary teeth.</li><li>Very incipient root development seen on the right maxillary teeth.</li><li>Hypoplastic left maxillary sinus.</li><li>Absent medial wall of the left maxillary sinus due to tumor resection.</li></ol> <p><b>Panoramic image</b></p>  <p><b>CBCT -Coronal images of maxillary sinuses</b></p>  <p><b>CBCT- sagittal images of the premolar and molar area</b></p> 	<p>Radio and chemotherapy severely affected the maxillary teeth germs.</p> <p>However, there is a significant difference between the patient's right and left maxillary teeth.</p> <p>This difference is attributable to the fact that chemotherapy has a systemic effect (affecting both sides of the maxilla), while radiotherapy was only applied to the patient's left side.</p>

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## Maxillofacial Imaging In A Pediatric Gorlin Syndrome Patient: When And Why?

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<sup>1</sup>Hebrew University, Department of Oral Medicine, Sedation and Imaging, Hadassah Medical Center, Faculty of Dental Medicine, Jerusalem, Israel, <sup>2</sup>Hebrew University, Department of Oral and Maxillofacial Surgery, Hadassah Medical Center, Faculty of Dental Medicine, Jerusalem, Israel

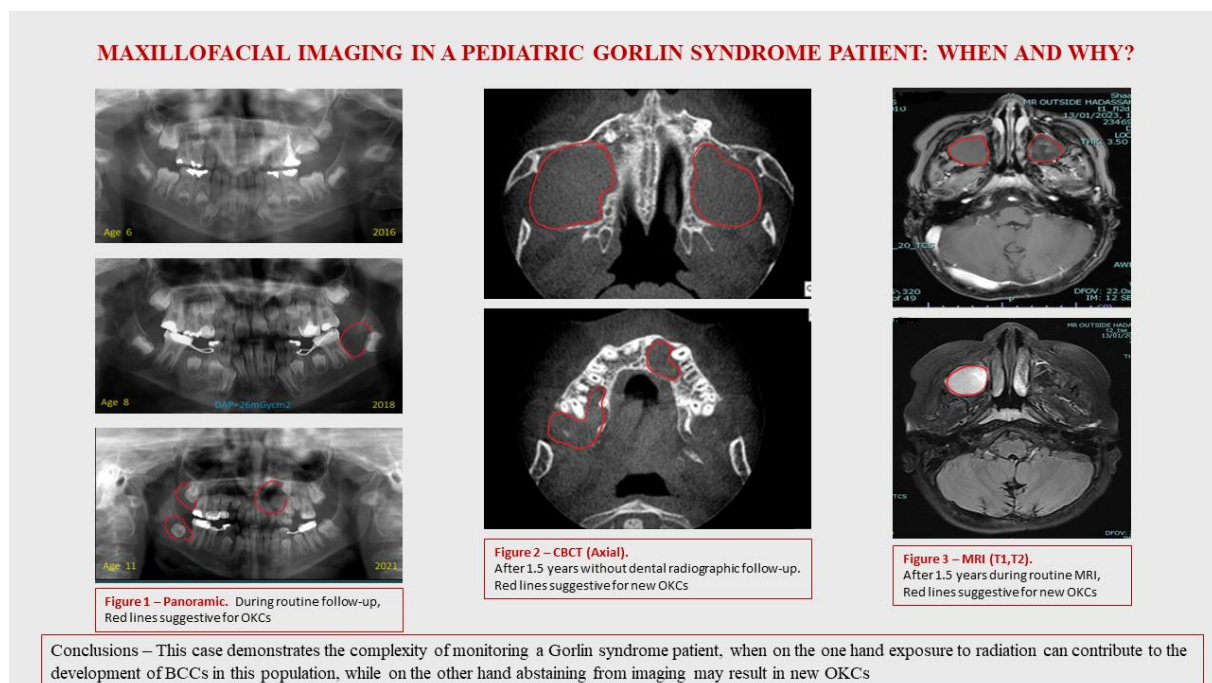
### Abstract:

**Aims:** Gorlin syndrome is a rare autosomal dominant tumor-predisposing disorder. Affected patients have multiple developmental anomalies including multiple basal cell carcinomas, odontogenic keratocysts (OKCs) at an early age and early onset of cutaneous basal cell carcinomas. Exposure to radiation has traditionally been contraindicated due to reports of Basal Cell Carcinoma (BCC) induction. Therefore, patients are instructed to avoid images as much as possible. We hereby present the dilemma of role of monitoring a patient with Gorlin syndrome.

**Materials and Methods:** A 12 yrs old female patient, diagnosed with Gorlin syndrome (PTCH1 mutation) at the age of five, monitored at our department since infancy clinically and radiographically using panoramic images and had has a several OKCs marsupialization procedures at the oral and maxillofacial surgery department. During the follow-ups she was diagnosed with desmoplastic medulloblastoma and was treated with chemotherapy, surgery and radiotherapy. Subsequently, several basal cell carcinomas developed at the irradiated sites.

**Results:** Imaging recommendation were digital panoramic x-ray every six months after the appearance of the first OKC until there are no cysts for two years. However, despite clinical and radiological follow-up, she had recently developed new OKCs in the maxilla.

**Conclusion:** This case demonstrates the complexity of monitoring a Gorlin patient, when on the one hand exposure to radiation can contribute to the development of BCCs in this population, while on the other hand abstaining from imaging may result in new OKCs.





## Is 2D Imaging always Sufficient For Caries Detection?

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### Abstract:

**Aims:** Caries detection sensitivity in intra-oral images varies between 23-90%. The aim of this case presentation was to demonstrate that not all caries may be detected in bitewings, and that although not indicated for caries detection, CBCT volumetric examination may aid in some specific cases.

**Materials and Methods:** A 50-year-old healthy man, arrived at our pain clinic, after suffering for two years of pain, in the oral cavity. Pain was noted especially when eating. Extra-oral and intra-oral examination was unremarkable, apart from a specific region of pain, close to the greater palatine nerve, which showed normal mucosa lining. Regional anesthesia did not eliminate the pain. Bitewing images were non-contributory. Neuropathic pain of the right upper jaw with involvement of the greater palatine nerve was suspected, and the patient was referred to a CBCT scan.

**Results:** CBCT scan revealed normal anatomy of the great palatal region, however, reviewing the entire volume revealed suspected caries at the palatal surface of the right 3rd molar. Following the extraction of the tooth, patient was relieved of his pain.

**Conclusion:** This case emphasizes the limitation of 2D bitewing images, especially in molar teeth. It also shows the importance of arriving to the correct diagnosis and that the appropriate treatment plan via a comprehensive approach of a combination of patient history, clinical examination and imaging.

## Is 2D imaging always sufficient for caries detection?

### Case presentation:

- Demographic: A 50-year-old healthy man
- Main complaint: Pain of 2 yrs duration, while eating

### Intra-oral examination:

- Localized pain close to the greater palatine nerve
- Regional anesthesia did not eliminate the pain.



Figure 1 - 2D imaging - Phosphor plates bitewings showing normal anatomy of the right maxillary 3<sup>rd</sup> molar

Figure 2 - CBCT – coronal view, right maxillary third molar in maxilla, demonstrating caries in the palatal aspect. Blue arrow showing region of localized pain



**Conclusion –** The diagnosis of caries should be made based on a combination of patient history, clinical examination, and imaging. A comprehensive approach that incorporates multiple diagnostic tools can help ensure accurate caries detection and appropriate treatment planning.

## Denosumab For The Management Of Bone Pathology Of The Jaws— Case Series With Radiological Follow Up And Literature Review.

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### Abstract:

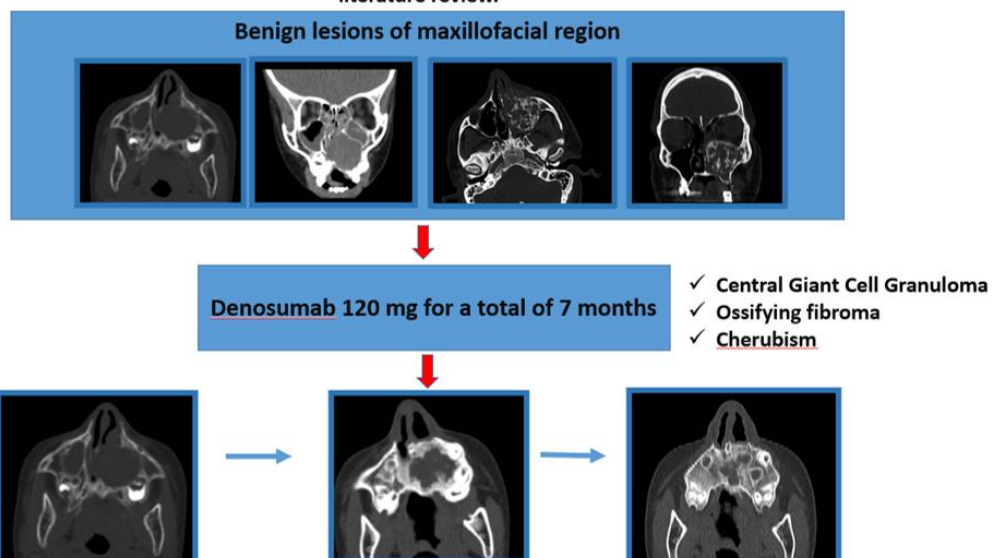
**Aims:** Denosumab has been used successfully to treat disease-associated osteoclast overactivity, including giant cell tumor of the jaws, as well as, Denosumab is a potential treatment of other osteoclast bone dysplasias including aneurysmal bone cyst (ABC), and cherubism. We present our experience of conventional and off-label Denosumab use for treatment of benign lesions of maxillofacial region with radiological follow up and summarize existing evidence of use of Denosumab in maxillofacial region.

**Materials and Methods:** One of the cases that we present is a youngest reported patient with CGCG, another one- according to our knowledge is a first case of Ossifying fibroma treated by Denosumab injections, and additionally positive outcomes of Denosumab treatment in 2 patients with Cherubism. All patients were treated with monthly subcutaneous injections of Denosumab 120 mg for a total of 7 months.

**Results:** Already at 6 months follow up radiographs demonstrated regression of the lesion. The lesions started to calcify at around two months after the first injection and continued to become more radiopaque during the follow-up.

**Conclusion:** Modern literature mostly pays attention to Denosumab treatment of CGCG, as well as, sporadic reports of other bone dysplasias are mentioned. Denosumab is increasingly being considered as a nonsurgical treatment option for CGCG or as an initial approach to minimize surgical morbidity, We believe that our experience can help other practitioners cope with the same cases, thus to reduce surgical morbidity, to improve prognosis and aesthetic outcome. The outcomes of treatment in our patients show great promise.

### Denosumab for the management of bone pathology of the jaws— case series with radiological follow up and literature review.



## Soft Tissue Chondroma

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<sup>1</sup>Akdeniz University Faculty of Dentistry, Oral and Maxillofacial Radiology, Antalya, Turkey

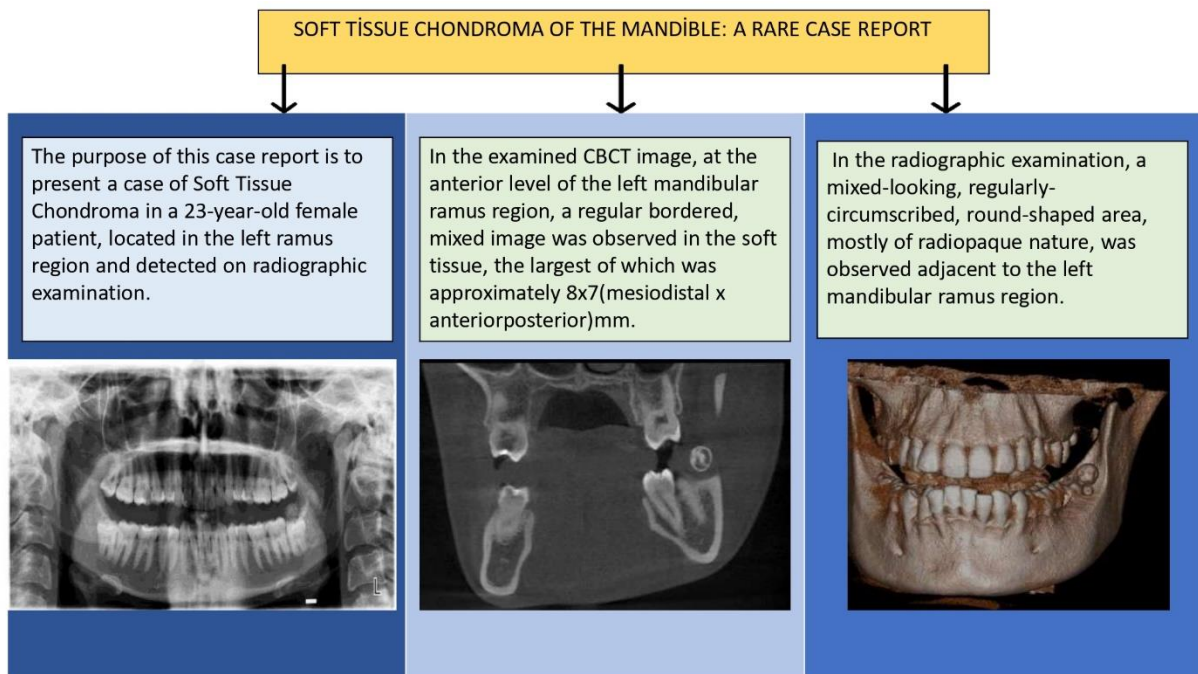
### Abstract:

**Aim:** Chondromas are benign neoplasms originating from mature hyaline cartilage. They generally have limited growth potential and are not regionally aggressive. They usually occur as a benign and painless tumor mass. The purpose of this case report is to present a case of Soft Tissue Chondroma in a 23-year-old female patient, located in the left ramus region and detected on radiographic examination.

**Material and Methods:** A 23-year-old female patient applied to Akdeniz University Faculty of Dentistry for routine dental examination. In the radiographic examination, a mixed-looking, regularly-circumscribed, round-shaped area, mostly of radiopaque nature, was observed adjacent to the left mandibular ramus region. The patient did not have any symptoms or discomfort in the relevant region. For detailed examination, Cone Beam Computed Tomography (Morita X800 LP) (CBCT) imaging was performed in our clinic. In the examined CBCT image, at the anterior level of the left mandibular ramus region, a regular bordered, mixed image was observed in the soft tissue, the largest of which was approximately 8x7(mesiodistal x anteriorposterior)mm.

**Results:** It was decided to remove the relevant tumor for histopathological examination. The structure, which was removed as a result of the operation in the Oral and Maxillofacial Surgery Clinic, was sent for pathological examination. The related structure was defined as a calcified hyaline nodule of non-odontogenic origin.

**Conclusion:** Chondromas are rare benign mesenchymal tumors composed of mature hyaline cartilage. About 10% of the cases are localized in the soft tissues of the head and neck region. They grow slowly and painlessly. The treatment is surgical excision. Since the recurrence rate is high, it should be followed clinically and radiographically.



# Malt Lymphoma Of The Parotid Gland Associated With Sjögren's Syndrome: Case Report

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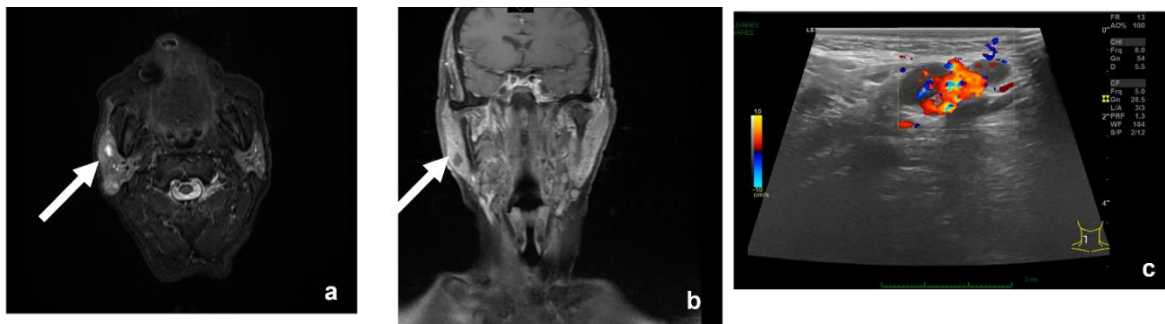
## Abstract:

**Aims:** Emphasize the importance of diagnosis and present a case of a patient with parotid MALT lymphoma treated with radiotherapy and chemotherapy. Mucosa-associated lymphoid tissue (MALT) is a rare type of non-Hodgkin Lymphoma that affects B cells and grows at the expense of lymphoid tissue associated with mucous membranes. It is established that salivary glands may have associated lymphoid tissue (MALT) lymphoma, as a result of Sjögren syndrome. But this condition is often misdiagnosed due to its relatively benign presentation, localized behavior, slow growth, and several years of evolution.

**Materials and Methods:** A case report of an 81-year-old female with Sjögren's Syndrome, and a history of Raynaud's Syndrome, showed a swelling area at the right parotid region on physical examination. Ultrasonography (linear GE 14MHZ) and magnetic resonance imaging were performed, and detected an image suggestive of MALT lymphoma of the parotid gland. The biopsy confirmed the imaging diagnosis. Radiotherapy treatment was indicated and complete remission was obtained after four courses of chemotherapy with rituximab plus CHOP (R-CHOP: cyclophosphamide (625 mg/m<sup>2</sup>), doxorubicin (42 mg/m<sup>2</sup>), vincristine (1.2 mg/m<sup>2</sup>), prednisolone (100 mg/body), and rituximab (375 mg/m<sup>2</sup>)).

**Results:** Upon completion of the treatment, patient is found to have no evidence of disease at the most recent follow-up visit.

**Conclusion:** Parotid gland MALT lymphoma. in an early stage, is a disease with an excellent prognosis, although other pathological changes may be associated. Furthermore knowledge of the clinical and radiological features of this pathology with a high index of suspicion is essential to make a radiological diagnosis to guide subsequent treatment.



Magnetic resonance imaging of an 81-year-old woman with parotid MALT lymphoma presenting as right parotid gland (a. axial view, b. coronal view); colour doppler US shows internal vascularity in right parotid gland (c).

Knowledge of the clinical and radiological features of MALT lymphoma with a high index of suspicion is essential to make a radiological diagnosis to guide subsequent treatment.



## Magnetic Resonance Imaging Spectrum Of Orbital Mucormycosis In Severe Acute Respiratory Syndrome Coronaviruses-2 Patients.

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<sup>1</sup>Atulaya Healthcare, Radio-Diagnosis, Chandigarh, India, <sup>2</sup>Agrawal Diagnostic Centre, Radio-diagnosis, Indore, India

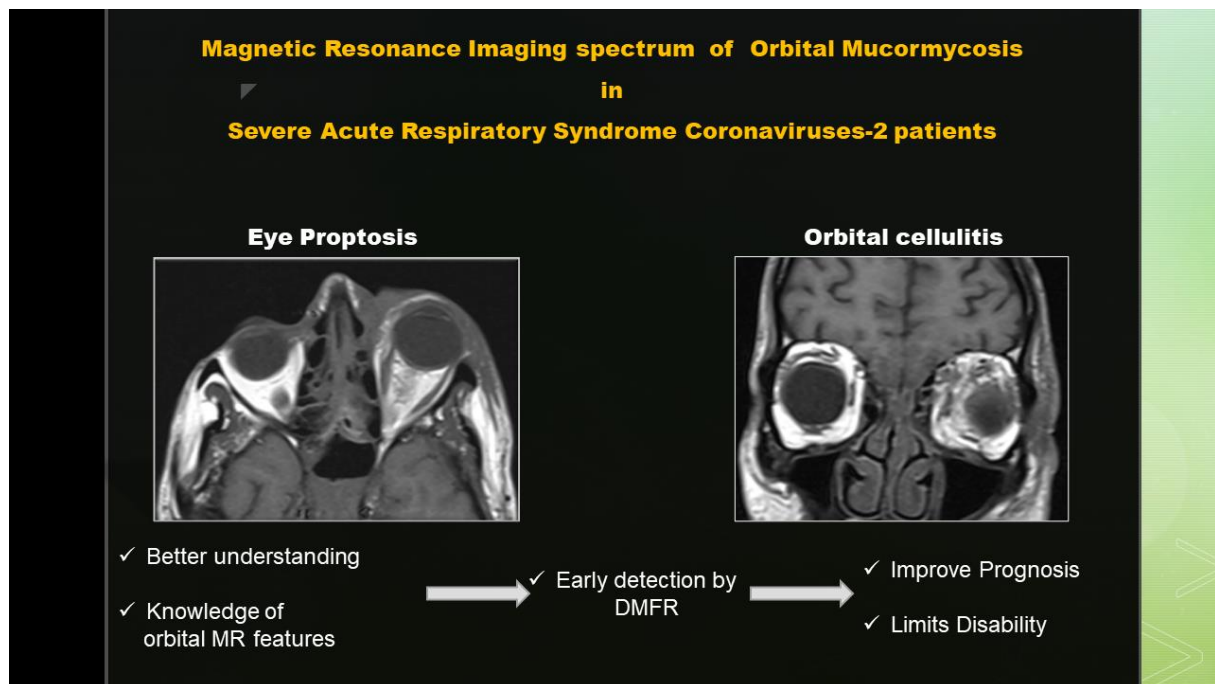
### Abstract:

**Aims:** India started facing the second wave of Corona Virus Disease-19 (Covid-19) pandemic in early 2021. COVID-19-associated rhino-orbital-cerebral mucormycosis (CA-ROCM) was declared an epidemic by many states in India (Hada M, 2022). Aim of this study is to discuss Magnetic Resonance Imaging (MRI) findings of orbital mucormycosis in CA-ROCM patients and henceforth sensitize Dento-Maxillofacial Radiologist for orbital region pathologies.

**Materials and Methods:** MRI scans of CA-ROCM positive or suspected patients who showed orbital involvement were retrospectively selected for this study. Appropriate Cases were chosen from database of 2 Imaging centres in India.

**Results:** Common findings which we observed in orbital mucormycosis MRI scans were proptosis of eyeball, orbital cellulitis, necrosis of tissues and orbital nerve involvement.

**Conclusion:** Early detection of orbital involvement on face scans can markedly improve prognosis of CA-ROCM cases and can also restrict eye disability in affected patients. As DMFR routinely interprets face scans covering orbital region, a fundamental knowledge of ROCM appears vital in the present scenario.



# Intratumoral Administration Of Astatine-211-Labeled Gold Nanoparticles For Alpha-Particle Therapy: An Effect Of Local Administration To Tongue Cancer

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<sup>1</sup>Osaka University Graduate School of Dentistry, Department of Oral and Maxillofacial Radiology, Suita, Japan, <sup>2</sup>Osaka University Graduate School of Medicine, Department of Nuclear Medicine and Tracer Kinetics, Suita, Japan, <sup>3</sup>Osaka University, Radioisotope Research Center, Institute for Radiation Sciences, Suita, Japan, <sup>4</sup>Osaka University, Department of Chemistry, Graduate School of Science, Toyonaka, Japan, <sup>5</sup>Osaka University, Division of Science, Institute for Radiation Sciences, Toyonaka and Suita, Japan

## Abstract:

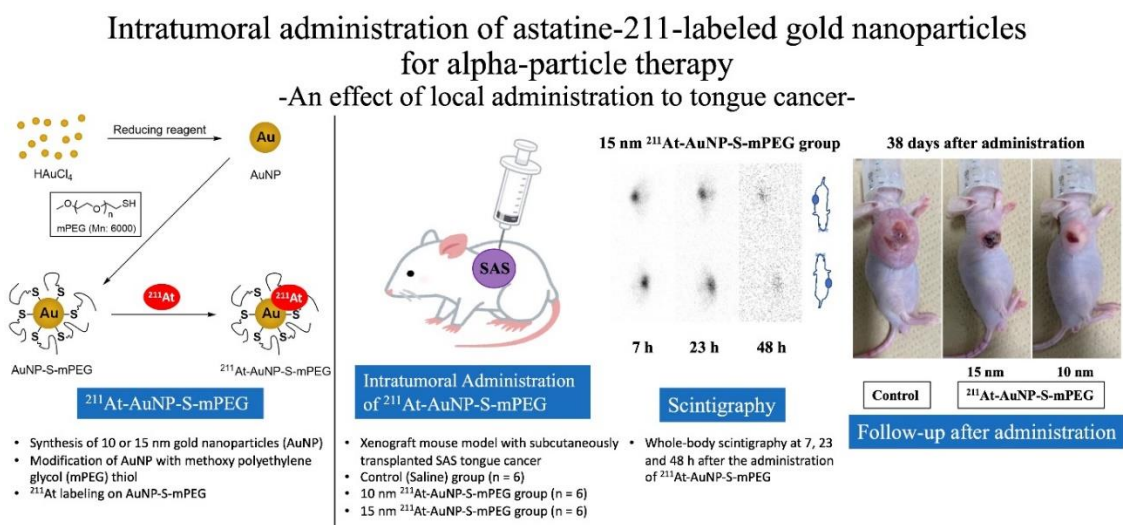
**Aim:** To investigate the antitumor effect of astatin-211 (half-life: 7.2 hours) labeled gold nanoparticles (<sup>211</sup>At-AuNP) administered intratumorally using a xenograft mouse model of tongue cancer.

**Material and Methods:** AuNP with a diameter of 10 or 15 nm that had been modified with methoxy polyethylene glycol (mPEG) thiol and labeled with <sup>211</sup>At (<sup>211</sup>At-AuNP-S-mPEG) were intratumorally administered to SAS tongue cancer subcutaneously transplanted into xenograft mouse models (6 mice in each of 10, 15 nm <sup>211</sup>At-AuNP-S-mPEG and control groups). Systemic and intratumoral distributions of the particles in the mice were then evaluated using scintigraphy, and the changes in tumor volumes were followed for 38 days. The tumors were excised 38 days after administration and their weights were measured.

**Results:** Scintigraphy was useful to evaluate accurately systemic and intratumoral distributions of the particles at high resolution (pixel size: 1.2 mm). After intratumoral administration, <sup>211</sup>At-AuNP-S-mPEG became localized in the tumor and did not spread to systemic organs during a time period equivalent to 6 half-lives of <sup>211</sup>At.

The tumor volume and weight of <sup>211</sup>At-AuNP-S-mPEG group were significantly smaller than that seen in the controls (p < 0.001). There were no significant differences for the tumor volume and weight between <sup>211</sup>At-AuNP-S-mPEG with a diameter of 10 nm group and 15 nm group (p = 0.290 and 0.634, respectively).

**Conclusions:** Tumor growth was strongly suppressed by <sup>211</sup>At-AuNP-S-mPEG. Intratumoral administration of <sup>211</sup>At-AuNP-S-mPEG for alpha-particle therapy has a potential to be a safe local treatment method without systemic complications.



**Conclusions:** Tumor growth was strongly suppressed by <sup>211</sup>At-AuNP-S-mPEG. Intratumoral administration of <sup>211</sup>At-AuNP-S-mPEG for alpha-particle therapy has a potential to be a safe local treatment method without systemic complications.

## Phosphaturic Mesenchymal Tumor Of The Mandible; A Diagnostic Challenge

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### Abstract:

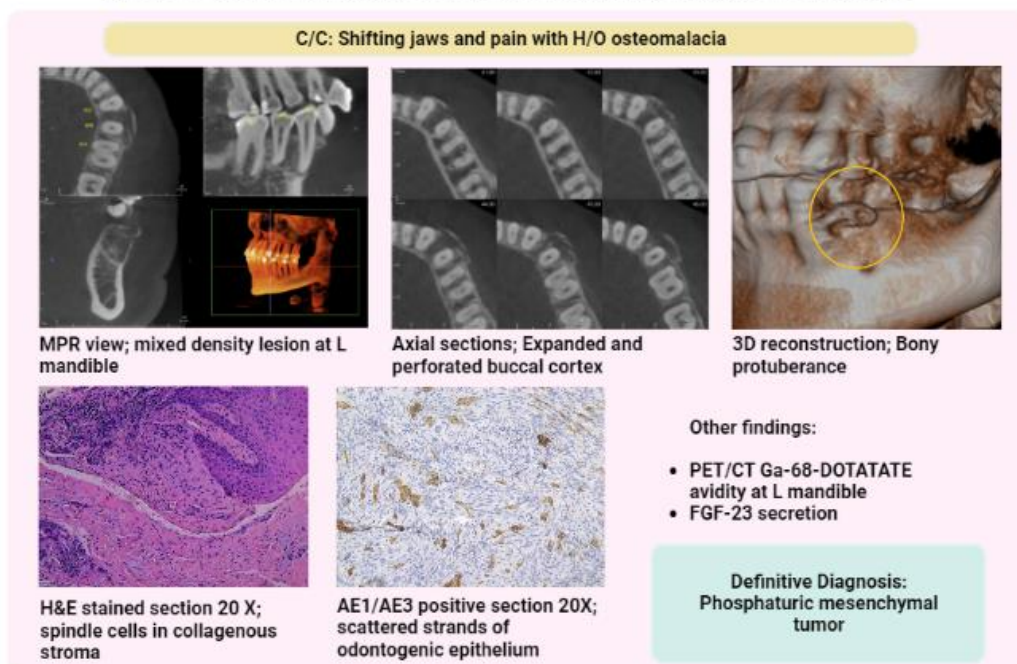
**Aims:** We describe a case of phosphaturic mesenchymal tumor (PMT) of mandible which was previously diagnosed as odontogenic fibroma.

**Materials and Methods:** Introduction: PMT is a rare neoplasm that secretes fibroblast growth factor-23 (FGF-23) that causes tumor induced osteomalacia (TIO). The tumor presents a diagnostic dilemma owing to its slow growing nature and non-specific clinical symptoms.

**Results:** Case: A 32 F presented with the chief complaint of 'shifting jaws' and intermittent pain along with a history of osteomalacia. CBCT demonstrated a localized, corticated, mixed density lesion with wispy septations at site nos. 19-22 with an expanded and perforated buccal cortex. The mandibular arch had a generalized trabecular bone sparseness. Biopsy and histopathological analysis were performed and the lesion was diagnosed as odontogenic fibroma. A review of patient's recent PET/CT Ga-68-DOTATATE revealed a hotspot conforming with the site of tumor. Further, positive finding of FGF-23 in situ and patient's history of osteomalacia contributed to the clinical suspicion of PMT. Deeper sections of tissue were submitted for a second evaluation which demonstrated "grungy" calcified matrix not seen previously. This led to a definitive diagnosis of PMT and surgical excision was planned for the patient.

**Conclusion:** PMT produces paraneoplastic osteomalacia by secreting FGF-23. It involves the head and neck region in 5% of cases, particularly in the sinonasal area. Due to its rarity and non-specific presentation, a comprehensive evaluation is necessary. Surgical excision is the treatment of choice and reverses the metabolic effects. Since the clinical behavior is unpredictable, a long-term follow-up is warranted.

### Phosphaturic mesenchymal tumor of the mandible; a diagnostic challenge



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## Detecting Mandibular Second Molar With C-Shaped Root And Distal Lingual Root By Using Cone Beam Computerized Tomography-A Case Report

M.-G. Tu<sup>1,2</sup>, T.-Y. Huang<sup>2,3</sup>

<sup>1</sup>China Medical University, School of Dentistry, Taichung, Taiwan, <sup>2</sup>China Medical University Hospital, Department of Endodontics, Taichung, Taiwan, <sup>3</sup>National Cheng Kuang University, Institute of Oral Medicine, Tainan, Taiwan

### Abstract:

**Aims:** A good knowledge of root canal anatomy facilitates successful endodontic treatment. Sagittal, coronal, and axial section CBCT images allows the clinician to visualize the direction and curvature of extra canals from three-dimensional perspectives eliminating the superimposition of anatomical structures and enhance the success of endodontic treatment.

**Materials and Methods:** We report an endodontic referral case of a mandibular second molar with C-shaped root and distal lingual root. A 33-year-old female presented to our department due to discomfort of her lower right gum area for more than three months. Periapical radiograph revealed tooth 47 previous initiated endodontic treatment with sinus tract. The diagnosis was symptomatic apical periodontitis with previous treated of 47. Routine endodontic procedure was performed with the help of dental operative microscope and ultrasonic devices. Under the microscope finding, extra distolingual canal was suspected, a #10 file inserted combined CBCT taken (Plamenca, 575x575 pixel, 0.075mm voxel size; Romexis software). After 3 appointment's treatment, the case was obturated by warm gutta-percha method.

**Results:** Post-operative treatment follow up revealed symptom free and periapical healing improved. In this case we will discuss prevalence of distolingual root combined with C-shaped root of mandibular second molar.

**Conclusion:** The inclusion of CBCT as a complementary tool in endodontic treatment has facilitated the ability to detect unusual extra root canal cases. CBCT assists successful in locating small and narrow canal three-dimensionally and improve the endodontic treatment success rate.

