Gadolinium

MRI signal enhancement using gadolinium based contrast agents (GBCAs) is an important supplement to unenhanced MRI for the diagnosis of numerous conditions is multiple body systems, but particularly in neurological, oncology and cardiovascular imaging. GBCAs, while proven generally safe, are not entirely risk free and an understanding of the risks and mitigations is required.

NSF and gadolinium retention

During the early 2000s, a serious condition called nephrogenic systemic fibrosis (NSF) was discovered and linked to the use of GBCAs in patients with severe kidney disease. This was proven to be an adverse effect of certain GBCA which released free gadolinium in the body.
Updated guidance relating to kidney disease and the risk stratification of the GBCAs, led to a rapid reduction and subsequent disappearance of NSF. A common approach in the UK was a clinical decision to switch from high or medium risk GBCAs to low risk GBCAs where possible.

Starting in 2014, reports of retained gadolinium in the brain following multiple doses of GBCA started to appear. At this point, pharmacovigilance action by the European Medicines Agency (EMA) and Medicines and Healthcare products Regulatory Agency (MHRA) and restricted the use of GBCAs according to their risk profile. High risk GBCAs (e.g. gadopentetate and gadodiamide) are no longer available for intravenous use. Medium risk GBCAs (e.g. gadoxetate and gadobenate) are restricted to delayed phase liver imaging only. Only low-risk GBCAs (e.g. gadobutrol, gadoteric acid, gadopiclenol) are available for general MRI.

Prescribing and protocolling

A risk-benefit decision is needed when prescribing a GBCA and involves identifying patients at increased risk from contrast, e.g those with previous contrast reaction, multiple allergies or renal disease. Recommendations on renal impairment and other conditions, can be found in guidelines from the RCR and from the MHRA.

Formal documentation of the decision to administer a GBCA must be kept. The RCR guidelines provide several examples of how this can be done e.g. a patient group directive (PGD).

Patient consent is an important part of medical care. The individual administering the GBCA must confirm consent, and ensure that the patient understands and agrees. Appropriate patient information leaflets should be available.

Supervision and acute reactions

Acute reactions to GBCAs include nausea and vomiting, urticaria, bronchospasm, laryngeal oedema, hypotension and generalised anaphylactic reaction. RCR guidelines provide treatment algorithms for the management of these reactions. It can be helpful to have treatment protocols readily available (e.g. in poster form) within the MR department. Suspected adverse effects can be reported via the Yellow card scheme.
Extravasation in MRI is typically mild and can be treated with elevation and advice. Where symptoms do not resolve quickly, or there are features such as skin blistering, paraesthesia, worsening or severe pain or evidence of altered perfusion, then specialist advice should be sought as an emergency.

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