



Immediate Adverse Reactions and Anaphylaxis Associated with Gadolinium-based Contrast Agents in a Patient with Meningioma: Case Report and Literature Review

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Object: Gadolinium chelates are relatively safe contrast media used in MRI. Immediate severe adverse effects are exceptionally rare. The incidence of immediate hypersensitivity reactions to MR contrast media was 0.079%, and the recurrence rate of hypersensitivity reactions was 30% in patients with previous reactions. The risk factors for immediate hypersensitivity reactions to MR contrast media were the female sex, allergies and asthma.

Case: We report a case of anaphylactic shock due to Gadobenate dimeglumine. While undergoing a magnetic resonance imaging examination, 36 year-old female patient became severely hypotensive, lost consciousness, and had generalized erythema immediately after the intravenous injection of this product. She recovered rapidly after injection of epinephrine and her blood volume

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was restored with intravenous fluids.

Conclusions: Although gadolinium is a safe contrast medium, anaphylactoid reactions do occur. Some are severe. Reactions to MR imaging contrast media are uncommon enough that radiologists may not be as familiar with their management as they are with the treatment of complications associated with iodinated radiographic contrast media. Gadobenate dimeglumine is comparable to gadodiamide in terms of safety and efficacy for imaging of CNS lesions.

Keywords: Gadolinium; magnetic resonance; contrast agents; contrast enhancement; adverse reaction; anaphylaxis.

1. INTRODUCTION

Magnetic resonance imaging (MRI) has proved to be a valuable diagnostic modality for central nervous system (CNS) disease. Although intrinsic tissue contrast is high, administration of intravenous contrast media has been shown to improve both lesion detection and differential diagnosis [1].

Allergic-like reactions to IV gadolinium containing contrast agents, although relatively rare, do occur [2,3].

Gadolinium chelates are relatively safe contrast media used in MRI. Immediate severe adverse effects are exceptionally rare and mostly concern mild anaphylactic reactions [4].

Acute adverse reactions related to gadopentetate dimeglumine and gadobenate dimeglumine were rare. When they occurred, most of the reactions were mild, although moderate and severe reactions did occur [5].

Safety assessments have indicated similar safety profiles for gadobenate dimeglumine and other gadolinium-based contrast agents, the reported overall incidence of adverse events being less than 0.03% in postmarketing surveillance [6].

The incidence of immediate severe hypersensitivity reactions to MR contrast media was 0.079%, and the recurrence rate of hypersensitivity reactions was 30% in patients with previous reactions. The risk factors for immediate hypersensitivity reactions to MR contrast media were the female sex, allergies and asthma. The incidence of immediate hypersensitivity reactions increased depending on the number of exposures to MR contrast media. Gadodiamide had the lowest rate (0.013%) of immediate hypersensitivity reactions, while Gadobenate dimeglumine had the highest rate (0.22%). The appropriate premedication with antihistamine or systemic corticosteroid should

be considered according to the severity of the previous hypersensitivity reactions [7,8].

Allergic-like reactions were classified as mild, moderate, or severe. Mild allergic-like reactions were characterized by one or more of the following: hives, pruritus, localized facial edema, nasal congestion, sneezing, and "scratchy throat." Moderate allergic like reactions were characterized by one or more of the following: diffuse erythema, dyspnea, wheezing, stridor, or emergency department transfer. Severe allergic-like reactions were characterized by one or more of the following: severe laryngeal edema, cardiopulmonary collapse, anaphylactoid shock, or hospital admission. Physiologic reactions (e.g., vasovagal reactions, nausea, vomiting) and contrast medium extravasations were not analyzed because they are not allergic like reactions [9,10].

The decision to use one gadolinium-based contrast product over another has become more complicated and increasingly important. When prescribing gadolinium-based contrast agents, radiologists need to consider not only the risk of NSF but also the risk of acute adverse reactions [5].

We have recommended in our practice that patients with a prior history of reaction to iodinated contrast media be closely observed during gadolinium administration. Premedication with steroids and histamine blocking agents may be considered in patients who had severe reactions to iodinated contrast media, although the usefulness or necessity of such premedication has not yet.

Allergic-like reactions to gadolinium-containing contrast media can occur despite premedication with corticosteroids and antihistamines [2,11].

Gadolinium chelates in appropriate volumes are useful alternative contrast media in selected high-risk patients undergoing angiographic studies [12].

To our knowledge and according to literatures, there was not any correlation with underlying disease and there is no report in meningioma.

We report a case of anaphylactic shock due to Gadobenate dimeglumine. While undergoing a magnetic resonance imaging examination, 36 year-old female patient became severely hypotensive, lost consciousness, and had generalized erythema immediately after the intravenous injection of this product. She recovered rapidly after injection of epinephrine and her blood volume was restored with intravenous fluids.

2. CASE REPORT

A 36-year-old female patient with a personal history of headache, while undergoing MRI scans, developed bronchospasm in the first minute of Gadolinium infusion. She became severely hypotensive, lost consciousness, and had generalized erythema immediately after the intravenous injection of this product. The procedure was cancelled and acute treatment of the reaction took place. The patient reported 2 additional MRI scans with definite use of

unknown contrast media in the past 2 months with the same adverse effect that was not noted before performing MRI in our center.

Within 5 minutes of MR contrast IV injection; the patient suffered severe cardiovascular collapse. MRI procedure was aborted and administration of Gadolinium discontinued. Aggressive IV fluid resuscitation and IV epinephrine administration were necessary to re-establish cardiovascular stability. Some periorbital and labial oedema were noted.

She had no prior history of allergies and asthma. She had no comorbidities and past medical history was negative.

She recovered rapidly after she was given injection of epinephrine and her blood volume was restored with intravenous fluids.

MRI revealed meningioma (Fig. 1). She was admitted to our neurosurgery department. Surgical resection was performed. The postoperative period was uneventful and during the early postoperative period had resolution of symptoms.

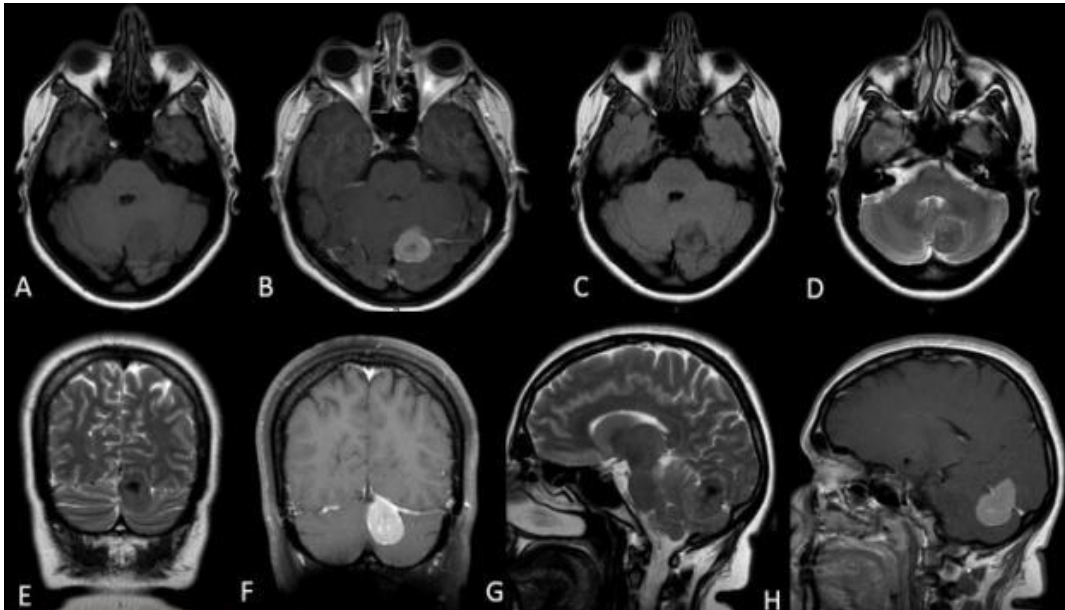


Fig. 1. Preoperative MR imaging for a 36-year-old woman with tentorial meningioma. MRI demonstrated a large left medial tentorial meningioma extending along tentorium with supra and infra- tentorium components, causing significant mass effect on these structures without early signs of hydrocephalus. Axial (A) T1, (B) enhanced T1, (C)FLAIR, (D) T2; coronal (E) T2, (F) enhanced T1; sagittal (G)T2, (H) enhanced T1 MRI

3. DISCUSSION

The incidence of adverse reactions is relatively low compared with that of contrast agents used for CT Gadolinium-based contrast agents used as medical imaging agents, can cause life-threatening or fatal anaphylaxis. There were differences in disproportionality of reporting between agents [13].

All gadolinium-based contrast agent adverse events reported to radiology quality assurance committees were graded according to American College of Radiology criteria and divided by the total number of injections to determine incidence during the past 10 years [14].

Adverse events were more likely in women, with a female to male ratio of 3.3, and in patients with history of prior allergic reactions ($p < 0.001$) [10].

Gadolinium-based contrast agents are very safe, with only rare reports of death, and raises the possibility that nonionic linear gadolinium-based contrast agents and gadopentetate dimeglumine may have fewer severe immediate adverse events compared with gadobenate dimeglumine [14].

Gadobenate dimeglumine is comparable to gadodiamide in terms of safety and efficacy for imaging of CNS lesions, with a possible advantage in imaging applications owing to enhanced T1 relaxivity. This effect is thought to be due to mild protein binding. The clinical availability of gadobenate dimeglumine will add another valuable tool to the armamentarium of the diagnostic radiologist. [1].

The indexes of suspicion for the occurrence of reactions to gadolinium, and both the documentation and the management of adverse reactions, must be as rigorous for reactions associated with MR imaging contrast agents as they are for reactions associated with iodinated contrast media [15].

After gadobenate dimeglumine was substituted for gadopentetate dimeglumine, a significant transient increase occurred in the frequency of reported allergic-like reactions [10].

Reactions to MR imaging contrast media are uncommon enough that radiologists may not be as familiar with their management as they are with the treatment of complications associated with iodinated radiographic contrast media.

Personnel must be trained and equipment for the management or resuscitation of patients experiencing reactions to gadolinium contrast media must be available at both hospital-based and freestanding facilities. The overall safety profile of gadolinium-based contrast media is excellent [12]. These can be minimized by the skill and vigilance of the radiologist and MRI team [3].

4. CONCLUSIONS

Although gadolinium is a safe contrast medium, anaphylactoid reactions do occur. Some are severe. Reactions to MR imaging contrast media are uncommon enough that radiologists may not be as familiar with their management as they are with the treatment of complications associated with iodinated radiographic contrast media. Gadobenate dimeglumine is comparable to gadodiamide in terms of safety and efficacy for imaging of CNS lesions.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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