Case Report

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A case of hypertensive crisis following administration of nonionic low molecular weight contrast in hemorrhagic stroke patient: a case report

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Introduction: Radiocontrast agents can be iodinated or noniodinated. Iodinated agents are further divided into low and high molecular weights. In recent decades, LOCM has largely replaced the use of HOCM due to safety concerns, but an increasing number of severe side effects cases have been reported.

Case presentation: A 62-year-old woman presented with acute right hemiparesis. A CT scan revealed ICH with IVH. A contrasted CTA was ordered, during which Iohexol was administered. Shortly after the injection, she developed a hypertensive crisis. She was transferred to the ICU, intubated, and given labetalol. Repeated CT scan showed increased IVH with posterior edema. Her family declined surgical intervention. Unfortunately, she died.

Discussion: This represents a unique adverse effect of a low molecular weight contrast agent that has been rarely reported before, particularly in pheochromocytoma patients. Nevertheless, our patient had subtle hypertension that was revealed during hospital admission but without pheochromcytoma.

Conclusion: This case represents an unusual instance of a severe adverse. It suggests that the malignant rise in blood pressure may not be catecholamine-induced.

Keywords: case report, contrast media, hemorrhagic stroke, hypertensive crisis, LOCM

Introduction

Contrast media play a pivotal role in enhancing the diagnostic capability of various imaging modalities, including ultrasound (UV), computed tomography (CT), and MRI. By improving the visibility of structures and fluids within the body, these agents provide critical information that aids in accurate diagnosis and treatment planning. Commonly used contrast media include iodine-based compounds, barium, and gadolinium, each with its unique properties and applications[2].

Within the realm of contrast agents, iodinated contrast agents (ICA) are classified into four groups distinguished by their chemical composition, physiological effects, and biological reactivity. These classifications reflect variations in viscosity, osmolality, and immunogenicity[3], which in turn influence their safety profiles and suitability for specific patient populations. While these agents significantly improve imaging outcomes, their use is not without potential complications. The most common of which are contrast-induced nephropathy, allergic-like reactions, includes nausea, vomiting, hives, bronchospasm, angioedema, and other anaphylactic responses or physiologic reactions, includes cardiac arrhythmias, depressed myocardial contractility, cardiogenic pulmonary edema, and seizures[4]. In this case, Omnipaque (Iohexol), a low osmolar contrast medium (LOCM), was administered in a small quantity (approximately 50 gr). Despite the relative safety of this agent, it caused a significant increase in hypertension. This case report has been reported in line with the Surgical CAse Report (SCARE) Criteria[5].

HIGHLIGHTS

- The choice of contrast agent is based on the imaging technique and the patient's requirements.
- Contrast agents can result in toxic or allergic adverse effects.
- Toxic effects may include hemodynamic changes, contrast-induced nephropathy, and contrast-induced neurotoxicity.
- Noncontrasted CT is typically the initial imaging modality used to distinguish between ischemic and hemorrhagic strokes[1]. However, contrast-enhanced CTA is employed for patients with secondary causes of ICH.
- Malignant rise in blood pressure related to contrast agents may not be catecholamine-induced.

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Case presentation

A 62-year-old woman with no prior medical history presented to our department with acute right hemiparesis. During the examination, vital signs were stable except for hypertension (BP = 170/100). Neurologically, the patient was alert and oriented (GCS = 15/15), with the same muscle strength in both right upper and lower limbs (grade 3/5). Additional findings included dysphonia and central paralysis of the facial nerve. The rest of the neurological examination was unremarkable. Brain CT revealed 2 foci of ICH near the left lateral ventricles surrounded by edema with IVH (Fig. 1). The patient was admitted to our ward and received conservative therapy for 5 days. Vital signs and consciousness were closely monitored during this period. Blood pressure management involves a combination therapy of ARBs, HCT, and CCB. The chemistry panel was normal, PR/CR indicated no kidney injury, and fundoscopy showed grade I hypertension injury. Echo Doppler for renal arteries was normal, and CT abdomen showed no masses (Fig. 2). A repeat CT scan with contrast of the brain was scheduled 2 days later. Iohexol, an iodine low molecular weight substance, was administered. Shortly after the administration, the patient's consciousness deteriorated (GCS 5/15). She experienced bradycardia and emergent hypertension (BP = 280/170). Labetalol was administered, and she was promptly transferred to the ICU, where she was intubated and stabilized. A subsequent CT scan revealed an increase in IVH along with posterior vasogenic edema (Fig. 3). The family declined the surgical option, and unfortunately, the patient passed away.

Discussion

Intracerebral hemorrhage, accounting for 10–15% of all stroke cases, is a significant contributor to mortality with a survival rate of only 38%. It is characterized by the extravasation of blood into the brain parenchyma, which can extend to involve the ventricles with or without the subarachnoid space[1]. It is classified as primary, linked to hypertension or amyloid angiopathy (CAA), or secondary due to vascular malformations, tumors, stimulant drugs, or coagulopathies[6].

Noncontrasted CT is typically the initial imaging modality used to distinguish between ischemic and hemorrhagic strokes[1]. In cases when ICH happens along with intraventricular hemorrhage (IVH), this presents a significant clinical challenge, particularly when the underlying etiology is not immediately evident. One critical consideration in the management of IVH is the thorough characterization of the vascular anatomy, especially in cases where subarachnoid hemorrhage (SAH) was missed. The identification of vascular anomalies, such as aneurysms or malformations, is essential for guiding appropriate treatment and preventing further neurological complications. MRI and magnetic resonance angiography (MRA) are valuable noninvasive imaging modalities that can effectively characterize vascular structures without the need for contrast agents. However, while MRI and MRA are adept at identifying larger vascular anomalies, their resolution may be insufficient for detecting smaller structural abnormalities or subtle lesions that could be responsible for bleeding.

Conversely, computed tomography (CT) imaging, particularly when enhanced with contrast, often provides superior resolution for visualizing the intricate details of vascular anatomy. However, it is also employed for patients with secondary causes of ICH, such as tumors, IVH, or individuals with hemorrhages in the cerebellar, putamen, or thalamic regions[1]. The lack of MRI imaging procedures in our country is a significant concern that limits diagnostic capabilities and impacts patient care. While CT scans serve as a practical solution there.

Contrast agents utilized for CT scans are composed of iodine or barium. Iodinated agents are categorized as low or high osmolar[2]. Similar to other medications, contrast materials can induce various side effects, classified by their pathophysiology as allergic or toxic reactions[4]. Allergic reactions can manifest acutely, presenting symptoms like nausea, vomiting, pain on injection, hemodynamic changes, bradycardia, hypotension, arrhythmias, rash, angioedema, flushing, bronchospasm, and cardiovascular collapse[3]. Delayed allergic effects mediated by

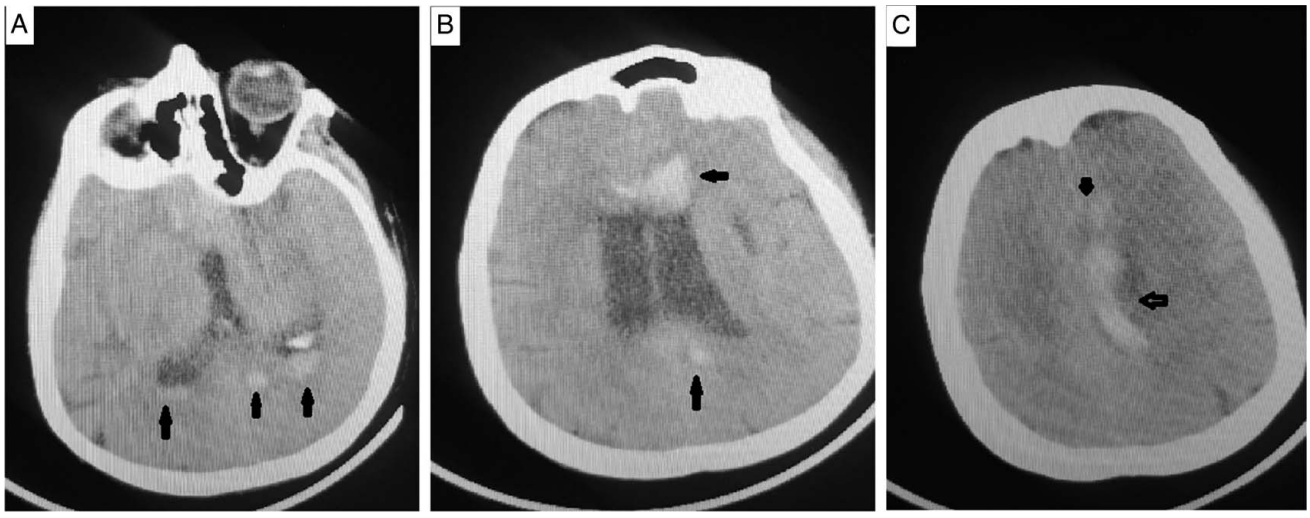

Figure 1. A noncontrasted CT of the brain, axial view, showing foci of intracerebral hemorrhage surrounded by edema (black arrow) and intraventricular hemorrhage (hollow arrow).

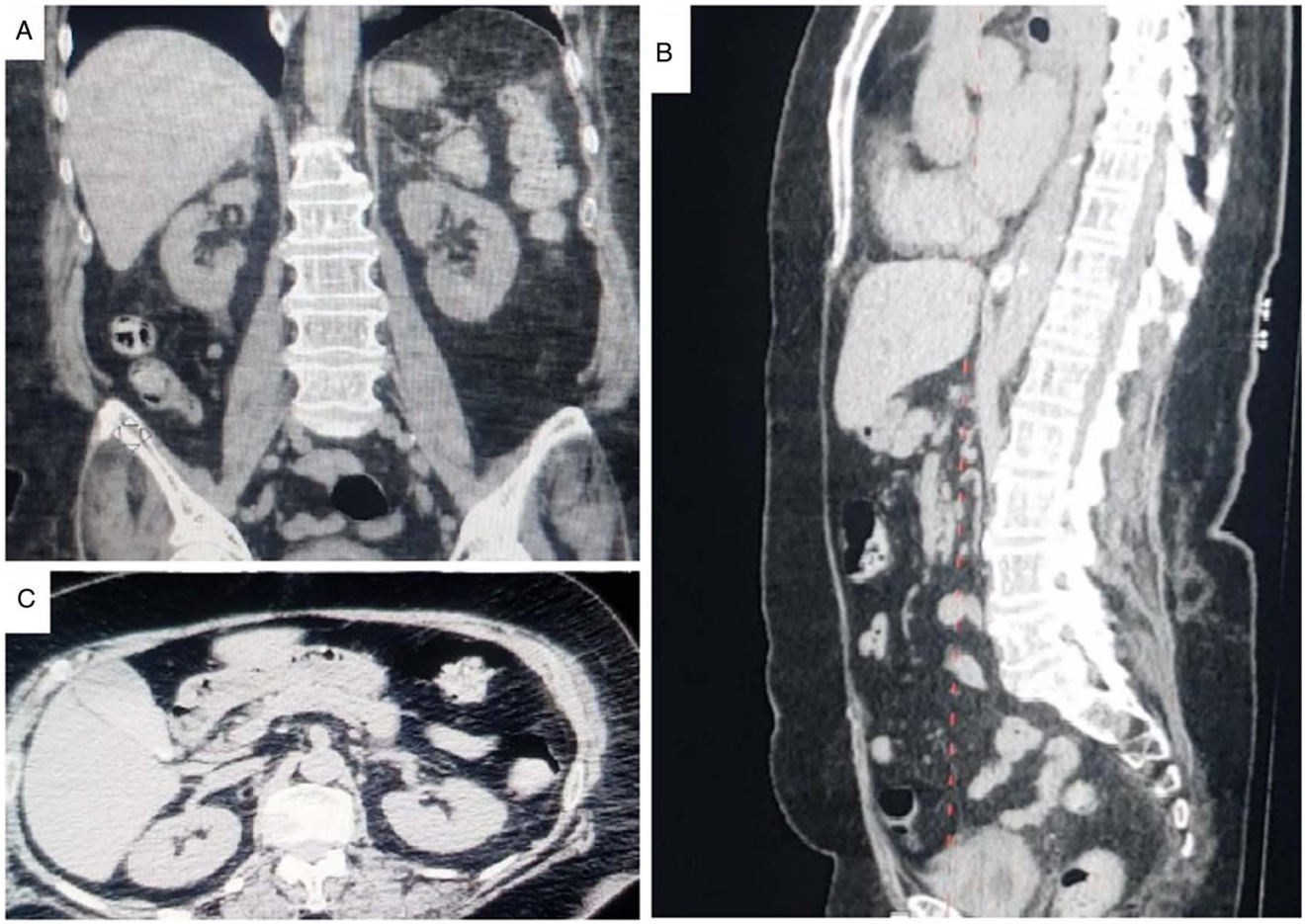

Figure 2. A nonenhanced CT scan of the abdomen, A. coronal view, B. sagittal view, C. axial view, all A, B, and C show no pathology.

T-cells may include severe skin reactions, nausea, vomiting, diarrhea, and rarely, hypotension[3].

Conversely, toxic reactions result from direct cellular insult, such as contrast-induced neurotoxicity from neuronal dysfunction[4] or contrast-induced nephrotoxicity due to vasoconstriction, direct renal epithelial toxicity, and increased free radical formation[3]. Although rare, these toxic effects can lead to cardiovascular compromise, such as a hypertensive crisis

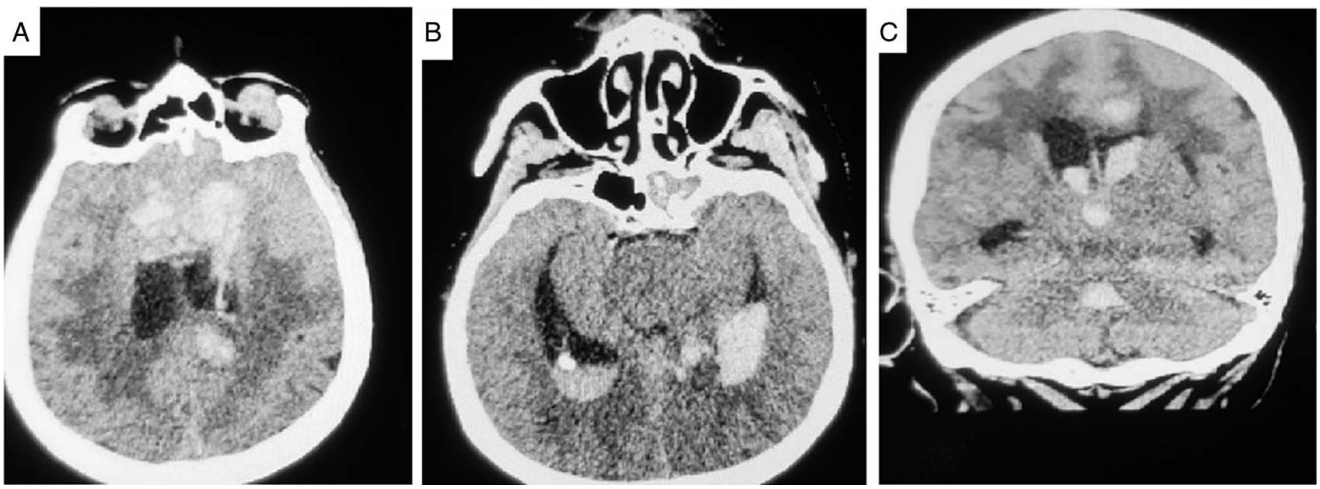

Figure 3. A noncontrasted CT scan of the brain, A, B. axial views, C. sagittal view and they demonstrate foci of ICH, increase of IVH along with posterior vasogenic edema.

triggered by increased catecholamine's due to contrast media[7]. While this adverse event was commonly reported in the past century with high molecular weight contrast media (HOCM), occurrences with low molecular weight contrast media (LOCM) are rare, particularly in patients with pheochromocytoma[7].

Conclusion

Adverse reactions to contrast agents are infrequent but can present significant challenges in clinical practice. This case highlights an unusual instance of a severe adverse reaction manifested as a malignant rise in blood pressure following contrast injection. Notably, the patient exhibited no apparent secondary causes of hypertension, raising intriguing questions about the underlying mechanisms of such reactions.

In the context of contrast media, a common supposition links acute hypertensive episodes to catecholamine surge, as elucidated by Nakano *et al*.[7]. However, the absence of corroborating evidence for catecholamine involvement in this scenario suggests that alternative pathophysiological pathways may underpin the observed hypertension. This raises the possibility that individual variability, including genetic predispositions or unique vascular responses, could contribute substantially to the adverse reactions experienced by certain patients.

Understanding why some individuals exhibit these severe reactions while others do not is crucial for improving patient safety and tailoring contrast utilization strategies.

Ethical approval

This study is a case report. Consent has been taken from the patient's brother, so there is nothing to be declared in this section.

Consent

Written informed consent was obtained from patient's family to publish this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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Author contribution

Both N.A. and M.S.A. participated in designing, data collection, and writing of the manuscript.

Conflict of interest disclosure

The authors declare that they have no competing interests.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

Mohamad Sami Alshutaihi.

Data availability statement

All data and medical information used in this study are available in the archives of the neurology department at Aleppo University Hospital and can be verified upon request.

Provenance and peer review

Not applicable.

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