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TECHNICAL NOTE

Contrast injected, scan triggered, but where has contrast gone?

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Abstract

Intra-arterial injections during CT scan examinations are a rare occurrence in day-to-day radiology practice but are of potential significance when they do occur. They render an imaging study non-diagnostic, and for imaging techniques like CT scan, expose patient to undue radiation dose. Equally disturbing for both patient and clinicians, including radiologists, is the need for repeat imaging. For certain emergency indications, such an event may yield erroneous results and severely hamper patient's management. We report one such event that occurred in our cardiac CT scan section with the aim to raise awareness about such events among our colleagues.

Key words: Arterial variation; coronary CT angiography; intra-arterial injection

Introduction

Inadvertent injections into the arterial circulation are of importance to all physicians, particularly the anesthesiologists, as the adverse effects of the injected drugs can sometimes be quite severe and limb-threatening. While these become readily apparent to non-radiologists, radiologists are unaware of such issues as these are rather uncommon and unreported in their practice. It is important for us to be aware of these events as cannulation is an integral part of most imaging studies that entail injection of contrast. These studies may be rendered non-diagnostic by inadvertent intra-arterial injections and sometimes even erroneous diagnoses may be made. We highlight these facts by a case which we recently encountered in our cardiac radiology department in a patient scheduled for a coronary computed tomography angiography (CCTA).

Case Report

A 56-year-old diabetic male with a history of atypical chest pain was referred for CCTA. An intravascular access with an 18-G cannula was achieved relatively easily in the right cubital fossa and the tubing of the pressure injector was connected to the cannula. Planning of retrospective electrocardiographic ECG-gated CCTA (Somatom Definition, Siemens, Germany) was done with a bolus tracking technique, with the region of interest (ROI) placed in the upper descending aorta. The Hounsfield value (HU) for automatic triggering was set at 100. However, an unexpected delay was noted in the triggering of the scan. Meanwhile, the patient moved his right upper limb. The scan was abandoned and the patient was examined. While the patient's vital signs were stable, his right upper extremity was cold. There was no swelling at the injection site. The patient was shifted to the observation room where his vitals and the status of right arm were constantly monitored.

Review of the limited CCTA images revealed no contrast in the coronary arteries and ascending aorta [Figure 1A]. Streaks of contrast were noted in the arch of aorta and the descending aorta, with faint opacification of the right cardiac chambers [Figure 1B]. Whereas there was no contrast in the right brachiocephalic vein or superior vena cava, there was opacification of the right subclavian and right common carotid arteries. These imaging findings could be explained by an inadvertent intra-arterial injection of contrast, with retrograde flow of contrast into the right upper limb arterial circulation and aorta. Some venous return from the distal circulation of the right upper limb could explain the faint appearance of contrast in the right heart chambers.

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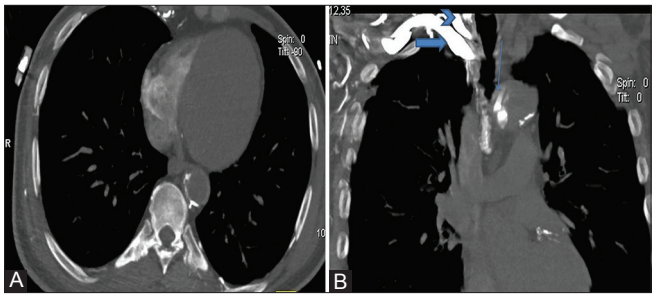

Figure 1 (A, B): Axial (A) and coronal reformatted reconstruction (B) from a CCTA examination reveals contrast opacification of the right subclavian (thick arrow) and common carotid arteries (arrow head), with streaks of contrast in the arch of aorta (thin arrow). The right cardiac chambers are also faintly opacified. Note is made of calcification in the left main coronary artery

Discussion

Inadvertent intra-arterial injection of contrast agent during CT examinations is an uncommon complication. The usual cause for such occurrence is a variation in the vascular anatomy of the upper limb. These variations have a high incidence,[1] yet radiologists in the CT room are frequently unaware of their presence and this may result in an erroneous diagnosis. Morhard, *et al*.[2] reported a case of inadvertent intra-arterial contrast injection in an elderly female suspected of stroke. CT angiography of the patient yielded decreased perfusion values in the anterior circulation, suggesting diagnosis of bilateral internal carotid artery occlusion. However, evaluation of the rest of the study led to a correct interpretation.[2]

A comprehensive list of arterial variations of the upper limb has been published by Rodriguez-Niedenfuhr, *et al*.[1] Among these, a superficial ulnar artery is the most commonly encountered aberrant superficial artery in the forearm and hand, noted in almost 4% of their subjects.[1] However, inadvertent arterial cannulation in the arm most commonly occurs in an aberrant superficial radial artery because of its proximity to the cephalic vein and the fact that the antecubital vein is the most preferred site for routine cannulation.[3] In our case also, an aberrant superficial radial artery was cannulated.

During routine cannulation, identification of a superficial vessel as an artery or a vein is not straightforward. Palpation may be used as one of the criteria to distinguish an artery from a vein; however, many authors have reported absence of pulsation to be an unreliable sign to exclude an artery.[4] After cannulation, indicators suggestive of intra-arterial rather than venous access include pulsatile retrograde flow, intense pain on injection of drugs, and signs and symptoms of distal limb ischemia. Besides these, early recognition is also facilitated by an awareness that an aberrant artery may exist. Hence, the possibility of inadvertent intra-arterial cannulation should always be kept in mind whenever injections are planned in the antecubital fossa or other regions of the forearm. Early recognition of this occurrence is crucial to avoid injection of drugs associated with a high incidence of limb complications and in case of imaging studies to avoid an erroneous diagnosis.

References

1. Rodriguez-Niedenfuhr M, Vazquez T, Nearn L, Ferreira B, Parkin I, Sanudo JR. Variations of the arterial pattern in the upper limb revisited: A morphological and statistical study, with a review of the literature. J Anat 2001;199:547-66.
2. Morhard D, Pellkofer H, Reiser MF, Ertl-Wagner B. Inadvertent intra-arterial contrast agent injection mimicking bilateral occlusion of the internal carotid arteries in a patient with suspected stroke on maximum-slope, nondeconvolution perfusion computed tomography. Stroke 2009;40:46-9.
3. Chin KJ, Singh K. The superficial ulnar artery—A potential hazard in patients with difficult venous access. B J Anaesth 2005;94:692-3.
4. Duggan M, Braude BM. Accidental intra-arterial injection through an 'intravenous' cannula on the dorsum of the hand. Paediatr Anaesth 2004;14:611-2.

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