

Mediastinal contrast extravasation after injection via central venous catheter with follow-up venography: a case report

Ekstravazacija kontrastnega sredstva v mediastinum po aplikaciji preko centralnega venskega katetra s kontrolno venografijo: prikaz primera

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Abstract

A central venous catheter can occasionally be used for contrast injection during a CT scan, with mediastinal contrast extravasation as a possible rare complication in this setting. According to the published cases, interventional venography has never been performed to assess the venous system directly. We present a case of mediastinal contrast extravasation with follow-up venography, which clearly depicted a subintimal leak and no evidence of sustained extravasation. The contrast was reabsorbed shortly after the extravasation with no adverse effects for the patient. The presented case illustrates the importance of recognition of proper positioning of central venous catheters before performing angiographies with relatively high flow velocity, such as CT angiography, as well as the importance of performing staff being familiar with different aspects of working with central venous catheters.

Izvleček

Pri računalniškotomografski (CT) preiskavi lahko kontrastno sredstvo občasno apliciramo preko centralnega venskega katetra. V tem primeru lahko pride do redkega zapleta, kot je ekstravazacija kontrastnega sredstva v mediastinum. Glede na dostopne objavljene primere pa po tem zapletu še nikoli ni bila opravljena klasična venografija za neposredno oceno venskega sistema. Prispevek prikazuje primer ekstravazacije kontrastnega sredstva v mediastinum in kontrolno venografijo, ki je pokazala le subintimalno zatekanje brez znakov nadaljnje ekstravazacije. Kontrastno sredstvo se je kmalu po ekstravazaciji brez posledic za bolnika ponovno absorbiralo. Primer prikazuje pomen prepoznavanja pravilnega položaja centralnih venskih katetrov pred izvedbo angiografskih preiskav, pri katerih se uporabljajo sorazmerno visoke hitrosti pretoka, kot je CT angiografija. Opozarja pa tudi, kako pomembno je, da udeleženo osebje obvlada postopke pri delu s centralnimi venskimi katetri.

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1 Introduction

Contrast media extravasation is a well-known, although relatively rare complication of contrast-enhanced CT scans. In the majority of CT scans, contrast media are injected via peripherally inserted venous cannulas, so the majority of current knowledge regarding extravasation was derived from such patients (1). In patients with difficult peripheral venous access, a central venous catheter (CVC) is occasionally used for contrast administration, usually in combination with a power injector (2). According to the literature, contrast extravasation into the mediastinum was reported in several cases when using CVCs in this fashion (3-6). However, to our knowledge, in all cases published, the patients were followed up only by chest x-ray and CT scans, and no direct radiological assessment of the venous system was done. We present a case of mediastinal contrast extravasation with follow-up interventional venography to assess the venous vasculature status after contrast administration via CVC.

2 Case presentation

A CT of the thorax and abdomen was performed in a 42-year-old male with a

history of acute pancreatitis after surgical intervention. A triple lumen left jugular CVC was placed on admission to the ICU. Due to the poor peripheral venous access, CVC was used for contrast application. It was flushed and tested before the scan. A power injector was attached to the catheter; 120 ml of non-ionic iodinated 370 mg/ml intravenous contrast medium was injected at the flow rate of 4 ml/s. The scan was triggered by a bolus tracker placed in the descending aorta. The scan showed a large amount of extravasated contrast medium in the mediastinum (Figure 1). There was very subtle opacification of vascular structures and parenchymal organs. The patient was intubated and sedated during the scan and his vital signs were stable. The CVC was left in place. In order to assess the venous vasculature status, interventional venography was performed 4 hours after the CT scan via the same CVC. A subintimal position of the CVC tip in the superior vena cava (SVC) was noted and a subintimal contrast leak was observed. The catheter was carefully repositioned a few centimetres backward and contrast was injected again at flow rates of up to 10 ml/s without any additional signs of extravasation (Figure 2). After the repositioning and retesting, the CVC was removed.

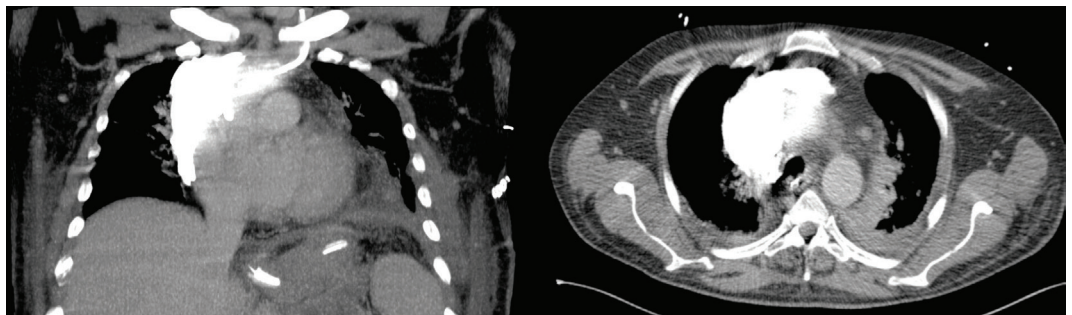


Figure 1: CT venography with coronal and axial reconstruction shows a large extravasation of contrast media in the mediastinum. The proximal part of the jugular central venous catheter can be seen in the left image.

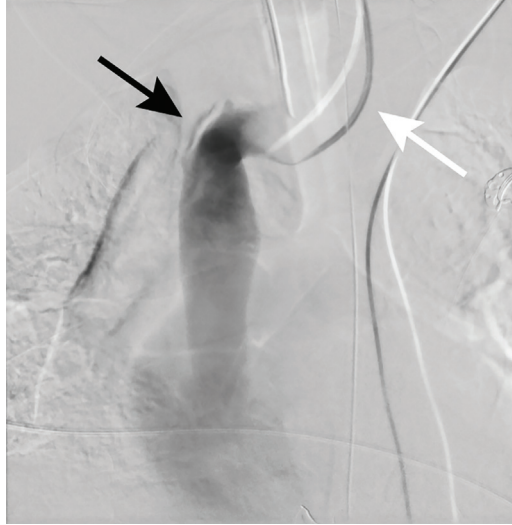


Figure 2: DSA venography showing a subintimal leak of contrast medium (black arrow) in the superior vena cava, but no active extravasation. Central venous catheter is still in place (white arrow).

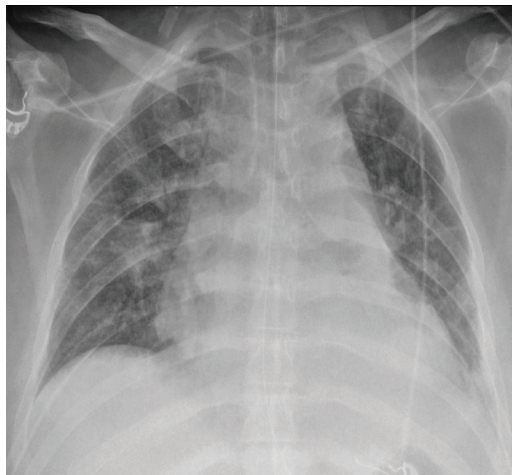


Figure 3: Supine radiograph in AP projection: a follow up image at 48 hours without any clear evidence of extravasated contrast.

The patient was followed up by chest x-rays. The extravasated contrast was weakly visible after 24 h and was not noticeable after 48 h (Figure 3).

3 Discussion

Contrast extravasation is a rather rare event. A recent systematic review

estimates 0.26% extravasation rate in patients with peripherally placed venous cannulas (1). There is no detailed data for CVCs, but the overall risk of complications when injecting intravenous contrast media via CVC using a power injector has been estimated at 1% (2). Most of these complications were minor, however some more severe complications were also reported, including catheter fragmentation with embolization, cardiac arrhythmias, mediastinal haematoma and mediastinal contrast extravasation (2-6).

Some of the risk factors for contrast extravasation in patients with peripheral cannulas are older age, female gender, in-patient status, use of a power injector, high flow rates and not warming up the contrast when using the more viscous 370 mg/ml contrasts (1). There is no data on risk factors in CVCs, but most of the risk factors for contrast extravasations via peripheral cannulas can be applied to our case as well. These are the complex condition of the patient, the use of a power injector with a high flow rate as well as the administration of more viscous (i.e. 370 mg/ml) contrast agent, which was not properly warmed up.

After reviewing the case, some additional potential factors were identified as well. The CVC was inserted through the left internal jugular vein and the tip of the CVC was lodged against the wall of the SVC at the level of the confluence of brachiocephalic veins in a subintimal position. The combination of a left-sided CVC with its tip in the superior part of the SVC has been linked to an increased risk of SVC wall injury – a left-sided CVC must pass through the left brachiocephalic vein, causing the tip to be at an acute angle with the lateral SVC wall after entering SVC (7). The incorrect location was not recognized on the chest

x-ray taken before the CT scan.

Secondly, the power injector was attached to the brown port of the CVC, which is the most distal port and it opens at the very end of the catheter tip. Incorrect port attachment as well as the combination of the catheter tip placement and the high flow rate at the end of the tip most likely resulted in direct vessel wall damage, with a consequent larger contrast extravasation.

Follow-up venography showed that the leak in the vessel wall was transient and that the only evidence of vessel wall injury was the subintimal tear. No further leak was detected even at high flow rates. Presumably spontaneous closure after contrast extravasation could be attributed to the relatively low pressure in the venous system.

The extravasated contrast medium reabsorbed in a rather fast fashion without any adverse effects to the patient. This is consistent with previous reports of mediastinal contrast extravasation, which also reported efficient and fast resorption and no major adverse events (3-5). Conversely, contrast extravasation related to peripheral venous cannulas can lead to rare serious complications, including skin ulceration, compartment syndrome and tissue necrosis (1).

The case illustrates the importance of checking the correct positioning of a CVC before a CT scan if the CVC will be used for contrast application. Chest X-ray remains the gold standard for assessing CVC position and possible complications (i.e. pneumothorax) due to its cost, accessibility and reliability, but it has a lower accuracy in determining the precise location of the CVC tip compared to

other modalities (e.g. transoesophageal echocardiography, fluoroscopy) (7).

Furthermore, the case shows that radiology staff performing the CT examinations should be closely familiar with specific types of CVCs used at their institution, so they can connect the injector to the appropriate port and minimize the risk of extravasation. However, if the extravasation does occur, it is probably unlikely that it will lead to further major bleeding and the contrast will most probably be rapidly reabsorbed without any major consequences to the patient.

4 Conclusion

We present a case of mediastinal contrast extravasation during a CT scan using a central venous catheter for contrast administration. It illustrates the importance of confirmation of correct positioning of CVCs before application of a contrast medium with relatively high flow velocity (as applied in CT angiography) as well as performing staff being familiar with different aspects of working with CVCs. However, in our case and in the rare previously published cases of mediastinal extravasation, the extravasated contrast was rapidly reabsorbed without any major adverse effects for the patients. Furthermore, we also showed that the leak in the superior vena cava was transient, with x only a subintimal tear shown on follow-up venography.

5 Informed consent

Informed consent was obtained from the patient included in this case report.

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