
CASE REPORT

Complications in Computed Tomography Examination after Injecting Contrast Medium through an Implanted Port: a Case Report

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ABSTRACT

Many patients undergo computed tomography examination with contrast medium injection for improved diagnostic accuracy. In practice, it is tempting to use an implanted port to inject contrast medium in patients with poor peripheral access. We present a case of extravasation after intravenous contrast injection using a power injector through an implanted port. Several errors could have been avoided by exercising caution. A radiologist with knowledge of implanted ports should assist the clinician during patient management.

Key Words: Contrast media; Vascular access devices; Vena cava, superior

中文摘要

透過植入端口注入造影劑後電腦斷層掃描檢查的併發症：病例報告

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不少患者進行電腦斷層掃描檢查時會注射造影劑，以提高診斷準確性。對於外周靜脈通路不良的患者，臨床上也可通過植入端口注射造影劑。本文報告使用自動注射器通過植入端口注射靜脈造影劑後外滲的情況。如過程中謹慎行事可避免錯誤。了解植入端口放射科醫師應在治理患者期間為臨床醫生提供協助。

INTRODUCTION

Computed tomography (CT) examinations are commonly performed with injection of contrast medium to obtain images of good diagnostic quality. Automated power

injectors are commonly used because they provide a constant rate of injection and precise scan timing. The peripheral intravenous catheter is the first-line choice for injection of contrast medium via a power injector.

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However, central access may be the only available route in patients with poor peripheral access.

Many complications are associated with the use of a central venous catheter because of the high pressure generated by power injection. These include catheter rupture, contrast extravasation, haemothorax, and cardiac arrhythmia.¹⁻³

We herein describe a case of extravasation after intravenous contrast injection using a power injector through an implanted port. Adverse outcomes usually occur because of a series of minor errors in standard practice and are seldom attributed to a single error.⁴ A retrospective review of our case revealed multiple errors that led to the adverse outcome of extravasation.

CASE REPORT

A 64-year-old woman underwent hemicolectomy with adjuvant chemotherapy for colon cancer in July 2014. She received first-line palliative chemotherapy through an implanted port (ANYPORT®; G-MED, Seoul, Republic of Korea) for peritoneal seeding metastasis in January 2017. The port was inserted via the left subclavian vein the day before initiation of first-line palliative chemotherapy. There was no complication associated with the implanted port during chemotherapy, and she was admitted to our hospital for second-line palliative chemotherapy in February 2017. She complained of neck discomfort during the week prior to admission although her vital signs and laboratory findings were normal. She underwent CT examination of the neck for evaluation of metastasis on the day of admission. Before examination, a chest radiograph revealed the presence of a catheter tip perpendicular to the superior vena cava (Figure 1). However, the clinician did not note the catheter tip position. Contrast medium was injected through the existing implanted port because of poor peripheral venous access. Although blood was not readily aspirated from the port, the clinician presumed the line to be patent because it had been used to deliver chemotherapeutic agents for a month and had been flushed. Approximately 100 mL of iopamidol (Pamiray 370; Dongkook Pharma, Seoul, Republic of Korea) was administered through the port using a power injector at a rate of 2 mL/s. The patient became unresponsive and went into cardiopulmonary arrest immediately after the CT examination. She was successfully resuscitated and ultimately intubated. CT examination demonstrated extravasation of the contrast medium into the mediastinum with right pleural effusion (Figure 2). Her pulse rate was 65 beats per

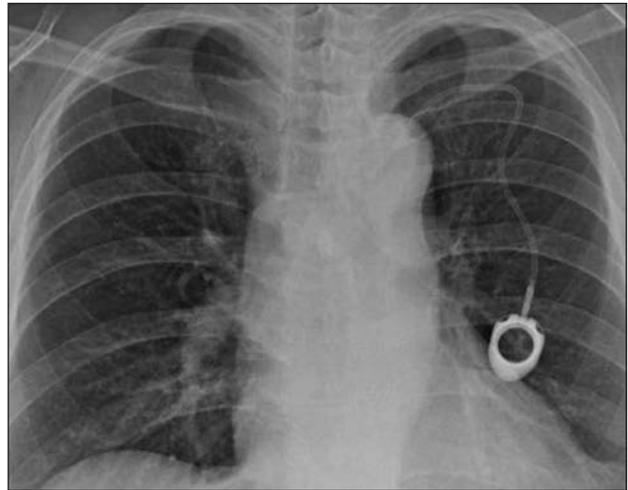


Figure 1. Frontal chest radiograph obtained before computed tomography examination showing the catheter tip is directed towards the lateral wall of the superior vena cava.

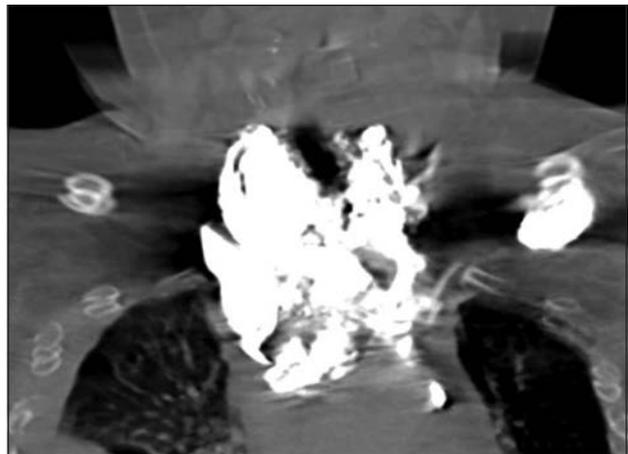


Figure 2. Reformatted coronal computed tomography showing contrast medium extravasation in the mediastinum.

minute, respiratory rate was 18 breaths per minute, blood pressure was 148/75 mmHg, and temperature was 37°C. Her haemoglobin level showed a slight decrease to 9 g/dL. She was closely monitored in the intensive care unit. Repeat CT examination 3 days after the initial study demonstrated resolution of the extravasation and vessel perforation by the catheter tip (Figure 3). The vascular surgeon decided to remove the implanted port and monitor the patient. The patient remained clinically stable thereafter.

DISCUSSION

Several errors could have been avoided in the present case. First, the clinician did not recognise the need for a power injectable port in the patient. Most manufacturers

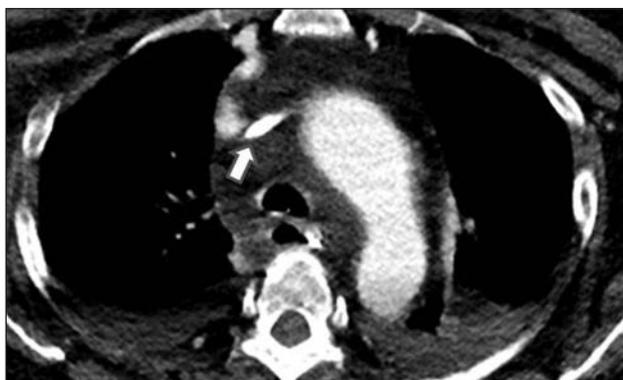


Figure 3. Axial computed tomography performed 3 days after contrast medium extravasation in the mediastinum showing resolution of the extravasation. The catheter tip is displaced outside the perforated proximal brachiocephalic vein (arrow).

do not recommend the use of standard ports for the injection of contrast medium because of the risk of catheter rupture. Several manufacturers have developed power injectable ports, including the PowerPort® (Bard Access Systems, Inc., Salt Lake City [UT], US), Smart Port® (AngioDynamics, Inc., Manchester [GA], US), Port-A-Cath II Power P.A.C. (Smiths Medical, Belgium), and Xcela® (Navilyst Medical, Marlborough [MA], US). Power injectable ports can be identified by their shape (eg, triangular shape of PowerPort®) or the presence of radiopaque letters “CT” that show up on imaging.⁵ The port type must be identified prior to a CT examination; moreover, pressure-tested port needles must be used. We believe that the catheter tip rupture caused by the high pressure of the power injector may have contributed to perforation of the vessel wall by the catheter.

Second, the clinician failed to notice the malpositioned catheter tip on the chest radiograph; the catheter tip was directed towards the lateral wall of the superior vena cava. The ideal catheter tip position is within the superior vena cava, above its junction with the right atrium and parallel to the vessel walls.⁶ If the catheter tip lies obliquely or perpendicularly, as in the present case, its movement with changes in body position may cause it to repeatedly abut the vessel wall with consequent vessel wall injury.⁷ Moreover, a curve at the tip of the catheter is suggestive of impending perforation of the vessel wall by the catheter.⁸ The majority of patients have recent chest radiographs, and the catheter tip position should be checked on these images. If no chest radiograph is

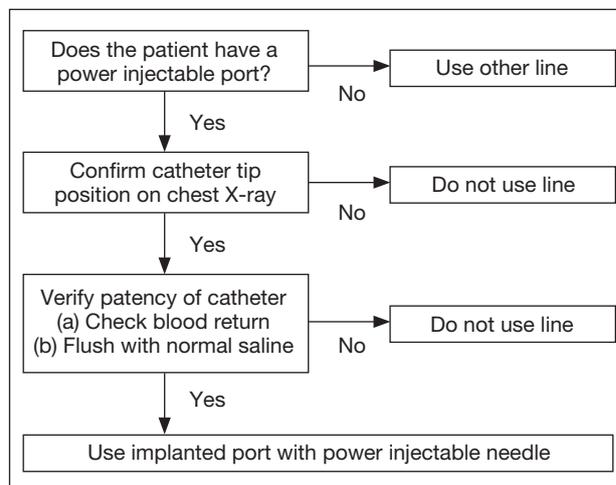


Figure 4. Proposed protocol for the clinical use of implanted ports for the injection of contrast media.

available, a CT examination, which is analogous to a chest radiograph, can be used to determine the tip position prior to contrast injection.⁸

Third, ensuring the return of blood is vital to confirm port patency before contrast injection. Inability or failure to aspirate blood indicates a malfunctioning catheter and may result in infiltration or extravasation. In our patient, although blood was not aspirated, intravenous fluid dripped freely and the line was flushed well with saline so the clinician presumed that the catheter was functioning well.

All the above-mentioned errors contributed to the adverse event in our patient. The development of a protocol for the clinical use of power injectors through implanted ports would help to prevent such mistakes (Figure 4). If a standard central venous catheter is the only available route for contrast injection, one may consider using the catheter according to the protocol proposed by Plumb and Murphy.⁹ The clinician handling the line should receive training in execution of the protocol in order to minimise the risk of medical errors and poor patient outcomes. Furthermore, a radiologist with clearer knowledge of implanted ports should assist the clinician during management of the patient.

CONCLUSION

Implanted ports can be used for contrast injection during CT examination in patients with poor peripheral venous access. However, severe adverse events may occur if the clinician is not adequately aware of the risks of

implanted port use. The clinician can prevent medical errors by accurately identifying a power injectable port and the catheter tip position. Radiologists also play an important role in the procedure and should be involved in the process.

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