CASE REPORT

CT demonstration of intravenous contrast medium extravasation and subsequent resorption in the mediastinum: a complication of a central venous catheter injection

H. Wong, S.K. Young, A. Lin

Departments of Radiology, Stanford University Medical Center, Stanford, Diagnostic Imaging, and Medicine, Santa Clara Valley Medical Center, San Jose, California, USA

Introduction

Extravasation of iodinated contrast media into peripheral soft tissue at the site of intravenous (IV) injection is a familiar complication. Although the reported overall rate of extravasation is relatively low (0.04%-1.3%), it is commonly seen because of the large number of radiological studies that require the use of IV contrast media. In particular, the increasing reliance on power injectors that deliver contrast media at a fast rate for CT studies has necessitated a high level of awareness of the nature of extravasation, its prevention and treatment.

Occasionally, an alternative route of contrast administration may be required in patients with poor peripheral IV access, and an existing central venous catheter is used in some institutions although this practice is discouraged by most manufacturers of such catheters. Even though the central line is carefully checked for patency and integrity and the injection rate is typically lowered, a theoretical risk exists for extravasation along the course of the catheter and, specifically, into the mediastinum. However, there is little documentation in the literature of the natural course of extravasated contrast media in the mediastinum.

We present a case in which contrast medium was extravasated into the mediastinum of an individual with cancer. This followed injection of the medium into an existing surgically implanted catheter and was depicted on initial CT. Complete resorption of contrast medium was demonstrated on follow-up CT 24 h later.

Case report

A 46-year-old woman with a history of stage IV breast cancer underwent CT of the neck and chest for restaging. Because of poor peripheral venous access, injection was performed through an existing single-lumen central venous catheter (size 9.6 French). This surgically implanted device had been used successfully for delivery of chemotherapy for 1 year. After the port was accessed in the left anterior chest wall, and the patency of the line was confirmed, approximately 100 ml iohexol 240 (Amersham, Buckinghamshire) was administered using a power injector (E-Z-EM) at a rate of 2 ml/s. The patient was not known to be allergic to IV contrast media. During and after the contrast administration, she reported no symptoms. CT (Fig. 1) demonstrated that there was no appreciable contrast medium in blood vessels or any other typically enhancing structures. Instead, it appeared that the entire amount was deposited in the mediastinum and anterior chest wall along the line of the catheter. The woman continued to be asymptomatic; specifically, she denied chest pain, shortness of breath, wheezing, itching or rash. As a precautionary measure, she was admitted to the hospital for observation and underwent follow-up chest CT without contrast (Fig. 2) 24 h after the
initial study. CT demonstrated a normal mediastinum with complete interval resorption of the extravasated contrast. The tip of the catheter was at the wall of the distal left innominate vein, which was the likely site of extravasation. The Mediport was removed, and the woman did not experience any adverse consequences during the ensuing 12 months. She ultimately died from complications related to her breast cancer.

Discussion

There is increasing use of CT, and advances in CT technology continue to expand its application. Furthermore, the standard use of power injectors enables precise delivery of relatively high volumes of contrast medium at relatively high rates (up to 5 ml/s now being routine). These factors justify the increased attention now paid to the issue of IV contrast medium extravasation in tissues.

Extravasation of iodinated contrast medium into the soft tissues at the injection site in extremities has been well studied. Extravasation is usually self-limited, and in the majority (80%) of cases the medium is resorbed within 24 h without sequelae. In addition to the commonly occurring local pain and swelling, much rarer but more serious complications such as skin ulceration or necrosis and the compartment syndrome are well known. Immediate treatment of extravasation includes the customary raising of the affected extremity and cold and hot compresses, and the somewhat controversial use of hyaluronidase. There has also been progress in preventive measures, the most significant example of which is the commercial introduction of an extravasation detection accessory (EDA) a few years ago. EDA, which can detect contrast medium extravasation of as little as 15 ml, has been successfully implemented in many centres.

On the other hand, there has been little discussion in the literature on the extravasation phenomenon in the mediastinum in the context of a CT study. Early understanding of mediastinal extravasation of iodinated contrast media focused on orally administered water-soluble medium for gastrointestinal studies. Typically the extravasation is in relatively small amounts and located adjacent to the oesophagus. Relatively quick resorption without serious sequelae is the norm. For this reason, the use of water-soluble contrast media is tolerated in a patient at risk for extravasation from the oesophagus.

There were reports of mediastinal extravasation of IV contrast medium during digital intravenous angiography (DIVA), a popular alternative to arteriography, in the early 1980s. Because of the high rate of the injection (up to 12 ml/s), the catheter recoil presumably resulted in tissue damage, for example in the superior vena cava or the right atrial wall, and subsequent contrast medium extravasation into the mediastinum. Patients typically...
complained of chest pain, and extravasation was detected on fluoroscopy. In some cases follow-up chest radiographs were performed, but in general no adverse sequelae were reported.

Most manufacturers of central venous catheters do not recommend the use of their products for the purpose of contrast medium administration, because of possible catheter damage, tissue injury or medium extravasation. It is well known that a small-bore catheter such as a PICC line easily sustains damage when subjected to a medium to high rate of injection by a power injector. However, in many centres an existing catheter with a tip in a central venous location is occasionally used for contrast medium injection when there is poor peripheral venous access.

According to reported cases of perforation of a vessel wall by a central venous catheter and the resultant inadvertent infusion of a chemotherapeutic agent in the mediastinum, an acute severe inflammatory reaction can occur with varied long-term effects. It is plausible that water-soluble contrast media, especially of the non-ionic variety, may act in a more innocuous way than tissue-vesicant medications.

To our knowledge, our case provides the first CT documentation of the natural course of extravasated IV contrast medium in the mediastinum. It demonstrates that when a mediastinal vessel is compromised, the volume of contrast medium collects in the mediastinum as would be expected. Although our patient remained asymptomatic, possibly because of the much slower rate of injection compared with the reported cases of DIVA, we chose to observe her for 24 h and repeat the CT because of the lack of data on the clinical course of such patients.

This case illustrates that in a case of mediastinal extravasation of a high volume of IV contrast medium, complete resorption of the medium may be expected and the patient is likely to remain asymptomatic. However, it might be prudent to document the initial extravasation on CT repeated in 24 h as well as to observe the patient during this period.

References