Computed tomography as a problem solving tool in non-radiopaque central venous port systems – A report of three cases

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Abstract: Central venous port systems are now routinely used in oncology. The non-functioning port system is a common issue in radiology departments. Fluoroscopy is a first-line imaging modality. The potential usefulness of computed tomography as a problem-solving tool in three complex cases with non-radiopaque central venous port systems is presented.

Keywords: central venous port system, imaging, computed tomography

Introduction

Central venous port systems are now routinely used in modern oncology [1]. The non-functioning port is a common problem in clinical medicine. The examination of choice for needle positioning of a clinically not accessible port and for the examination of possible complications like leakage or occlusion is fluoroscopy [2]. An increased use of central venous port systems with non-radiopaque port chambers has been reported [3]. This may result in an unsuccessful examination with fluoroscopy. The potential use of CT in three patients with such non-radiopaque central venous port systems is presented.

Case 1

A 31-year-old male patient with seminoma undergoing chemotherapy presented with a non-functioning port

Fig. 1. Non-functioning port in a 31-year-old patient with seminoma. The port chamber is non-radiopaque on fluoroscopy but can be easily seen on computed tomography. A small amount of air inside the port chamber indicates previous correct needle placement. After replacement of the needle and with a forceful attempt filling of the system is evident, the diagnosis of partial occlusion was made.
system. On radiography and fluoroscopy, the port chamber was invisible, the rest of the system appeared intact. On examination, the port chamber seemed to be easily accessible, but the administration of saline was not possible despite numerous tries and the use of different needles. The patient was transferred to the CT suite. A limited CT scan of the upper parts of the thorax was performed. In contrast to the radiograph, the port chamber was well depicted, and there was a small amount of air inside the port chamber. This confirmed the correct placement of the meanwhile removed port needle. Another port needle was placed, and now with more pressure, a small amount of contrast media could be applied. Filling of the port chamber as well as the port catheter was confirmed (Fig. 1). There was only little discharge of contrast media into the superior vena cava. There was no extraluminal contrast media. The diagnosis of a partial occlusion because of a fibrin sheath was made and local lysis was advocated.

Case 2

A 71-year-old female patient with a pancreas carcinoma presented with a non-accessible port system despite numerous tries. Using fluoroscopy, another try to access the system at the presumably position of the non-radiopaque port chamber was undertaken. No aspiration of blood was possible, but injection of saline without obvious swelling was possible. After the injection of contrast media, the port chamber seemed to be filled with the impression of extraluminal contrast media around the port chamber. Leakage was suggested. For the detailed examination of the local situation, the patient was transferred to the CT suite. Dedicated imaging with a limited CT scan revealed that the inserted needle was positioned proximate beside the port chamber, and there was only contrast media around the port system. There was marked swelling of the surrounding soft tissues because of the injected saline/contrast media, and the port chamber could not be felt anymore. Using the displaced needle as a reference, the correct puncture site needle insertion was planned on the CT image, and the port system was finally successfully accessed. The proper functioning was confirmed by fluoroscopy afterward.

Case 3

An 85-year-old patient with colorectal cancer was presented to our department with presumed leakage of the port chamber. Because the port was non-radiopaque and because of the previous numerous unsuccessful attempts to access the port system, we decided to access it under CT-guidance. After confirmation of the correct needle placement, a CT scan of the upper thoracic aperture with a continuous application of contrast media with a low flow was performed (0.5 mL/s). Imaging revealed no paravasation and a correct delivery of the contrast media at the superior vena cava (Fig. 2).

Discussion

In the presented three cases, non-radiopaque port chambers invisible on radiography or fluoroscopy could be easily detected on CT. With the possibility of multiplanar reformations and dedicated window settings, CT offered
superior anatomical information compared to the previously performed fluoroscopy. In the first case, the confirmation of a previous correct needle placement leads to an attempt of a more forceful injection, resulting in filling of the port system with contrast media. This confirmed that it was only partially occluded. In the second case, the successful access to the port system was at last only possible using CT-guidance. In the third case, with continuous application of contrast media while scanning, the integrity of the port system was confirmed. The use of CT has nonetheless several limitations. Compared to fluoroscopy, it is more time consuming than fluoroscopy. The additional radiation burden should be taken into account, especially in children and young adults. Recently, researchers from Australia have shown that there is one excess cancer per 2200 CT scans and children and adolescents [4]. Because most young patients with a malignant disease or another serious chronic disease will receive numerous radiographic and CT examinations, the reduction of applied dose is mandatory. Another shortcoming of CT in contrast to fluoroscopy is the impossibility of real time imaging to show the exact contrast media influx into the superior caval vein.

In conclusion, the use of CT may be a problem solving tool with non-functioning central venous port systems in selected patients and scenarios, especially with implanted non-radiopaque port chambers.

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References

1. Marcy PY: Central venous access: Techniques and indications in oncology. Eur Radiol 18, 2333–2344 (2008)
2. Teichgräber UK, Pfirrmann R, Hofmann HAF: Central venous port systems as an integral part of chemotherapy. Dtsch Arztebl Int 108, 147–154 (2011)
3. Rusner C, Surov A: Ports made from synthetic materials are poorly visible on X-ray films. Dtsch Arztebl Int 108, 522 (2011)
4. Mathews JD, Forsythe AV, Brady Z, Butler MW, Goergen SK, Byrnes GB, Giles GG, Wallace AB, Anderson PR, Guiver TA, McGale P, Cain TM, Dowty JG, Bickerstaffe AC, Darby SC: Cancer risk in 680,000 people exposed to computed tomography scans in childhood or adolescence: Data linkage study of 11 millions Australians. BMJ 346, f2360 (2013)