

A Life-Threatening Mediastinal Hematoma After Central Venous Port System Implantation

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Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest:

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None declared

Patient: Female, 68
Final Diagnosis: Mediastinal hematoma
Symptoms: Agitation • severe hemodynamic instability • severe respiratory distress
Medication: —
Clinical Procedure: Cardiopulmonary resuscitation • reintubation • thoracic drain
Specialty: Surgery

Objective: Diagnostic/therapeutic accidents

Background: We report a case of surgical central venous port system implantation using Seldinger's technique with a life-threatening mediastinal hematoma due to the perforation of the superior vena cava.

Case Report: A 68-year-old woman was admitted to our institution for port implantation. Open access to the cephalic vein and 2 punctures of the right subclavian vein were unsuccessful. Finally, the port catheter could be placed into the superior vena cava using Seldinger's technique. As blood aspiration via the port catheter was not possible, fluoroscopy was performed, revealing mediastinal contrast extravasation without contrasting the venous system. A new port system could be placed in the correct position without difficulties. After extubation, the patient presented with severe respiratory distress and required consecutive cardiopulmonary resuscitation and reintubation. The CT scan showed a significant hematoma in the lower neck and posterior mediastinum with tracheal compression.

We assumed a perforation of the superior vena cava with the tip of the guidewire using Seldinger's technique. Long-term intensive treatment with prolonged ventilation and tracheotomy was necessary. The port system had to be subsequently explanted due to infection.

Conclusions: Mediastinal hematoma is a rare but life-threatening complication associated with central venous catheterization using Seldinger's technique. Perforation occurs most often during central venous catheterization in critical care. Mediastinal hematoma is an example of a mechanical complication occurring after central venous catheterization, which has been described only a few times in the literature to date.

This case highlights the importance of awareness of possible, rare, life-threatening complications during port implantation, mostly performed in multimorbid patients by surgeons in training.

MeSH Keywords: General Surgery • Vascular Access Devices • Venae Cavae

Full-text PDF: <http://www.amjcaserep.com/abstract/index/idArt/895486>



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Background

Central venous access is a common procedure with 3 main complication groups: mechanical, infectious, and thrombotic. Prior studies have demonstrated rates of mechanical complications, such as arterial puncture, improper positioning, pneumothorax, hematoma or hemothorax, in 5% to 19% of catheter attempts [1–3]. Infectious complications occur in 5% to 26% of catheter attempts and thrombotic complications in 2% to 26% [1].

Risk factors for mechanical complications can be patient-associated or surgeon-associated [1,2,4]. The rate of life-threatening complications reported in the literature is 6.2–10.7% [2,5].

Another example of intrathoracic hematoma due to a mechanical complication is esophageal perforation after introducing a nasogastric tube [6].

In this paper we present a rare but life-threatening complication of central venous catheterization due to perforation of the superior vena cava using Seldinger's technique.

Case Report

A 68-year-old female patient with primary peritoneal adenocarcinoma of serous-papillary type 1 (pT3c, pN1 (1/26), G3) was admitted to our hospital for an elective Chemo-Port placement. Six weeks before admission, she underwent tumor debulking with bilateral adnexectomy, omentectomy, and resection of pelvic and paraaortic lymph nodes. A vaginal hysterectomy had been performed in 1983 because of uterine prolapse.

Medical history contained one-vessel coronary artery disease treated with bypass surgery. An aneurysm of the aorta also

led to a supracoronary ascending aorta replacement with a biological aortic valve. Other comorbidities included atrial fibrillation and arterial hypertension. The patient was receiving antiplatelet treatment with acetylsalicylic acid. The preoperative laboratory parameters were normal.

In our institution, port implantation exposing the cephalic vein is usually performed under local anesthesia. In this particular case, we found a very small, collapsed right cephalic vein. Therefore, we decided to place the catheter over the right subclavian vein using Seldinger's technique. Two unsuccessful attempts and the patient's considerable agitation led to an endotracheal intubation. This action was followed by temporarily but severe hemodynamic instability. After stabilizing the patient, the port catheter was finally placed into the superior vena cava applying Seldinger's technique. Since blood aspiration was not possible to perform, fluoroscopy was used, showing mediastinal contrast extravasation without contrasting the venous system (Figure 1A, 1B).

After explantation of this catheter and a successful repuncture of the right subclavian vein, a new port system was finally placed in the correct position and without any contrast extravasation.

Following extubation, the patient presented severe respiratory distress. Consecutive cardiopulmonary resuscitation and reintubation were necessary. Clinically, she had reduced breath sounds and a hyper-sonorous percussion on the right side was heard. We presumed a pneumothorax; therefore, a thoracic drain was inserted.

The patient was transferred to the intensive care unit. The CT scan (Figure 2) showed a significant hematoma in the lower neck and posterior mediastinum, with tracheal compression.

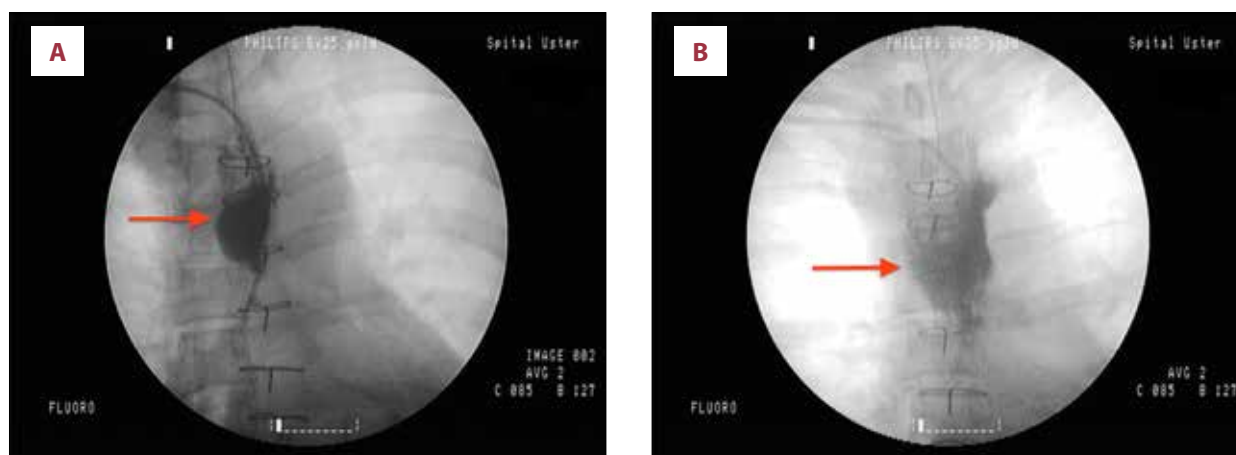


Figure 1. (A, B) Intraoperative fluoroscopy. These figures show the intraoperative fluoroscopy of the chest after placing the first port catheter using Seldinger's technique. The contrast agent applied on the port catheter extravasation into the mediastinum without contrasting the venous system.

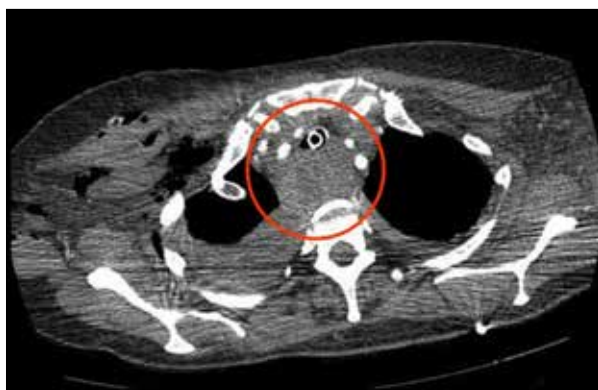


Figure 2. Postoperative CT scan. Directly postoperatively, a CT scan was performed. It shows a significant hematoma in the lower neck and posterior mediastinum with tracheal compression. Additionally, a small residual pneumothorax on the right side and large bilateral pleural effusions could be described, but an active hemorrhage could not be detected.

Additionally, a small residual pneumothorax on the right side and large bilateral pleural effusions were revealed, but active bleeding was not detected.

On the 6th postoperative day, a dilated tracheotomy was performed to ease ventilation.

A few days later, as the infection parameters increased, the patient still needed catecholamines and intensive care. No infection could be detected in the CT scans of the neck, thorax, and abdomen. The mediastinal hematoma seemed stable.

Because of low oxygen saturation and growing pleural effusion, the right pleura was punctured and antibiotics were adjusted. Nevertheless the patient remained febrile and infection parameters remained. With repeatedly positive blood cultures and after excluding endocarditis by transesophageal echocardiography, an infected port system was suspected. The port system was removed on the 16th postoperative day and analysis revealed colonization with *Enterococcus faecium*.

Thereupon, the patient recovered and was finally discharged to a rehabilitation clinic.

Discussion

Numerous complications are associated with central venous catheterizations. Complications can be divided into three groups: mechanical, infectious and thrombotic [1].

Patient-associated risk factors for mechanical complications are advanced age, gender, low or high body mass index, prior catheterization, surgery, or radiotherapy, and puncture site.

Surgeon-associated risk factors are the number of venous punctures, the time needed for placing the catheter, surgeon experience [1,2,4]. Higher success rates and lower rates of mechanical complications are clearly related to surgeon experience [7–9]. Using ultrasound guidance for catheter placement is still controversial.

Our patient was admitted for an elective Chemo-Port implantation. The procedure was performed by an experienced surgeon. The patient had a normal body mass index of 20.8 kg/m², and no prior operations or radiotherapy had been performed in the operation field. A possible risk factor for perforation was a previous central venous catheterization in the right subclavian vein 6 weeks before, during the tumor debulking surgery. We could not find any further surgeon- or patient-related risk factors.

Mediastinal hematoma, as an example of a mechanical complication after central venous catheterization, has only been described a few times in the literature to date [5,10–16]. It is a rare but life-threatening complication of central venous catheterization using Seldinger's technique. Perforation occurs generally during central venous catheterization in critical care. The perforation site is usually localized in the jugular or subclavian vein, and less often at the junction with the superior vena cava.

In this case, fluoroscopy revealed an extravasation in projection on the mediastinum. We assume that the perforation of the superior vena cava occurred while inserting the guidewire. An active hemorrhage was excluded by a CT scan, so we decided to use conservative treatment.

Retrospectively, it would have probably been wiser to interrupt the operation after detecting the mediastinal extravasation in order to first stabilize the patient. In doing so, some complications such as the pneumothorax and/or the postoperative catheter infection might have been avoided.

Conclusions

Chemo-Port implantation is a surgical procedure mostly performed in multimorbid patients by surgeons in training. Meticulous surgical technique, patient history, local particularities of the operation site, and knowledge of potential complications are extremely important. Close monitoring of the patient can provide life-saving information.

This case highlights the importance of awareness of potentially life-threatening complications during port implantation.

Acknowledgements

The patient gave consent for publication.

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