Complication of femoral vein CV port catheter malposition

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A 77-year-old man was admitted with multiple co-morbidities including cerebral infarction, postoperative ossification of the cervical posterior longitudinal ligament, sick sinus syndrome with a cardiac pacemaker inserted from the right subclavian vein, and panperitonitis due to a complicated gastrostomy catheter exchange. The patient developed a critical and rare complication of central venous (CV) catheterization from the femoral vein under ultrasonographically guided insertion and real-time fluoroscopy. Smooth backflow of blood from the catheter was confirmed, and the patient was stable. Twenty-nine days later, he developed a high fever and hypotension. Based on the laboratory data, a diagnosis of septic shock was made. On abdominal computed tomography (CT), malposition of the CV port catheter was identified. CT showed the catheter passed from the femoral vein into the lumbar vein and the tip ultimately penetrated into the retroperitoneal space. Despite resuscitation, the patient died. Although we used an ultrasonographically guided technique and fluoroscopy-guided catheterization, we could not avoid catheter misplacement. To avoid this critical complication, contrast fluoroscopy, to confirm that the catheter was in the appropriate vessel, should have been performed. Surgeons should be aware of such critical complications when inserting a CV catheter from the femoral vein.

Key words: complications, central venous catheterization, femoral vein, misplacement, lumbar vein

Introduction

Severe complications such as hemothorax and pneumothorax have been reported when central venous (CV) catheters are inserted from the subclavian vein. CV catheterization from the femoral vein rarely causes such a severe complication; however, some complications including hematoma, infection, dissection, aneurysm, and femoral nerve injury have been reported in the literature. Most of them are not life threatening, and few critical complications have been reported. We describe here a critical and very rare complication where the tip of the CV catheter was malpositioned from the femoral vein to the lumbar vein. It finally penetrated into the retroperitoneal space and formed an abscess, which resulted in intercurrent septic shock and death.

Case Report

A 77-year-old man was admitted with multiple co-morbidities including cerebral infarction, postoperative ossification of the cervical posterior longitudinal ligament, sick sinus syndrome with cardiac pacemaker inserted from right subclavian vein, and panperitonitis due to a complicated gastrostomy catheter exchange. He had been bedridden for 3 years due to these comorbidities. We decided to insert a CV port for him to start hyperalimentation. The right femoral vein was selected for this procedure.

CV port insertion

A BARD X-port isp® 3-way valve catheter (C. R. Bard, Inc. Salt Lake City, UT, USA; product code 7707540) was inserted with an ultrasonographically guided technique and fluoroscopy-guided catheterization. Smooth and sufficient backflow was confirmed twice, both before the guidewire was inserted and after the catheter was inserted. We also had blood flowing from the dilator when inserted. When we inserted the guidewire, it ran on as expected in an inferior vena cava (IVC) line; however, when we inserted the actual catheter, it stopped near the bifurcation of the IVC. We inserted the guidewire again and were reassured that it followed the expected line of an IVC catheter, therefore, we did...
not use contrast medium to confirm the placement. Figure 1 shows the abdominal radiograph just after the catheter insertion.

A few hours after the surgery, there was no backflow of blood from the catheter and drip insertion was difficult. We tried to push saline manually, and there was no resistance. However, we needed to use an infusion pump for the saline because it did not drip naturally. We started to use the line on day 1. On day 7, the patient had fever and we checked the abdominal radiograph, CBC (complete blood count) with differential, BMP (bone marrow pressure), CRP (carbon-reactive protein), urinalysis and urine cultures. A urinary tract infection was noted, and we started ceftazidime. On day 16, the CRP was still elevated even though we used ceftazidime. At this time, we considered checking the tip of the catheter, but due to the patient's condition, we were unable to move him from the ward. On day 19, we conducted

Figure 1. Abdominal radiograph just after the catheter insertion
A previously placed left central venous (CV) catheter is present and is marked by a double arrow. The right femoral catheter is the one that was inserted this time and is marked by a single arrow. Note that the tip of the right CV catheter is just below the left CV catheter. 173 × 173 mm (150 × 150 DPI)

Figure 2. Abdominal computed tomography (CT) on day 29
A, B. A large mass in the right retroperitoneal space. The tip of the CV catheter is at neither the inferior vena cava nor common iliac vein, but inside the mass. Both the high-density area, which is considered coagulated blood or pus, and the low-density area, which is considered an infusion of fluid, are evident.
C, D. The catheter is certainly in the right femoral vein, and goes up to a lumbar vein where the tip ultimately penetrated into the retroperitoneal space. In all figures the solid arrow points to the catheter and the dashed arrow points to the common iliac vein.
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ultrasonography of the abdomen and found no abnormalities. On day 29, he showed high neutrophil (13,200/μl), high CRP (21.5 mg/l) and the following vital signs BP (blood pressure): 82/46 mmHg, HR (heart rate): 95/min, BT (body temperature): 38.1°C as well as hot extremities, and septic shock was diagnosed. Computed tomography (CT) scans of the head and abdomen were performed without contrast because the patient had an elevated creatinine of 1.6 mg/dl. On the abdominal CT, a large phlegmon with an air-fluid level was noted in the right retroperitoneal space (Figure 2 A-D). The tip of the catheter was in the phlegmon. Distally, the catheter was in the right femoral vein, and traveled up to a segmental lumbar vein, where the tip exited into the retroperitoneal space. Three-dimensional CT (Figure 3 A-B) showed the tip of the catheter right and the posterior of the L5 vertebral body. Upon diagnosis, we immediately stopped infusion and removed the catheter. The patient was in septic shock, and we thought the most appropriate treatment at this stage would be drainage of the retroperitoneal abscess. However, family members refused the surgery. Despite conservative treatment, the patient died on day 37.

Discussion
Severe complications such as hemothorax and pneumothorax have been reported when a CV catheter is inserted from the subclavian vein. CV catheterization from the femoral vein, however, rarely causes such severe complication. In this report, we have presented a very rare complication, the malposition of a central venous catheter into the lumbar vein resulting in septic shock. Only 15 previous cases of femoral line malposition into the lumbar vein have been reported. The age of the patients varied widely, from 3 days old to 86 years old. Interestingly, 12 of 16 cases (including our case) were under 7 years old. In three of 16 cases, neurologic complications such as meningitis, seizure, quadriplegia, paraplegia, and urinary retention were reported. In some cases, a hump was noticed in the abdomen. Our patient had neither a hump nor neurological deficit. The tip of the catheter was located in the retroperitoneal space not in the spinal canal.

The reported complication might occur early due to direct penetration of the vessel by the catheter or late due to pressure necrosis of the vessel or vasculitis. In our case, it appears to have occurred early because we could not get blood back a few hours after the insertion, and the path of the catheter on fluoroscopy at the time of placement was not normal. Smooth backflow of blood was confirmed during the catheterization, therefore, we hypothesize that the catheter may have been located in a small lumbar vein. Just after the surgery, backflow could not be obtained, suggesting that the catheter may have penetrated the wall of the smaller vessel leaving the tip in the retroperitoneal cavity.

Real-time fluoroscopy has been reported to increase the reliability of catheterization. In the present case, we confirmed that the tip of the catheter was in the vicinity of the bifurcation between the IVC and common iliac vein by checking the path of the guidewire through the IVC on real-time fluoroscopy. However, in reality, the tip of the catheter was misplaced; indicating the single anteroposterior fluoroscopic view was not sufficiently sensitive. We recommend that if there are any abnormalities during the placement of the catheter that contrast fluoroscopy be used to confirm the precise location of the catheter.

The use of ultrasonographic guidance during CV line
placement has been demonstrated to significantly decrease the failure rate, complication rate, and number of attempts required for successful access.\(^5\)\(^6\)\(^8\) A recent randomized, multicenter trial using point-of-care limited ultrasonography assistance for CV cannulation reported that ultrasonographic guidance has an odds ratio of 53.5 (6.6 - 440) compared to the landmark-based technique for success of cannulation.\(^9\) The average number of attempts and average time to cannula placement were also significantly lower in the ultrasonographically guided group. However, there are limitations to following the tip of the catheter by ultrasonography. Once the tip of the catheter enters the intra-abdominal space, noise cause by backscattering from gas inside the bowel makes following the tip extremely difficult. Therefore, this technique would not be helpful to avoid the misplacement of the catheter.\(^10\)

We could not obtain written informed consent from family members to drain the retroperitoneal mass surgically, therefore, we are unsure of the composition of the mass. We thought the mass could have been an abscess because the white blood cell count and CRP value were rising daily, and the patient did become septic. However, hematoma was another possibility. Since the catheter penetrated the lumbar vein, the mass could have been a hematoma. The Hounsfield units on CT inside the cavity ranged from 13.8 to 23, the wall of the cavity was 49 (inside the aorta was 39). There was no progressive anemia over the 34 days. A hematoma would not easily explain the air-fluid level, but the air may have originated either from the catheter or from inside the cavity. There is one report of retroperitoneal hemorrhage in the literature, but in that patient there were acute symptoms such as low blood pressure,\(^11\) which the patient in the present study did not show. Based on these findings, the most appropriate diagnosis was septic shock due to a retroperitoneal abscess.

One possible cause of the septic shock was our decision to remove an existing CV catheter from the left femoral vein in the same operation as we inserted the replacement. Normally the removal is done as a separate operation, at least 24 hours prior to replacement, to avoid bacteremia. However, because there was another obvious source of infection in the abscess, we believe this to have caused the septic shock.

In the present case, we used both an ultrasonographically guided technique and real-time fluoroscopy to ensure safe and accurate placement of the catheter. We did not expect complications of the femoral vein catheterization because there are very few reported in the literature, and we had never experienced any complications with such catheterization at our institution. Moreover, during catheterization, all surgical steps proceeded smoothly, and we obtained significant backflow of blood twice, although the catheter stopped midway along the guidewire. If the catheter stops midway during the insertion, we should consider the following possibilities:
1. Malposition to a small branch,
2. Dissection of the vessel wall,
3. Anatomical anomaly of the vessel, and
4. Coagulation inside the vessel.

Moreover, when we discovered that the saline would not drip naturally, we also should have considered failure of the catheter tip, tube, CV port junction, or the port itself. At this point, we should also consider using contrast fluoroscopy.

When the patient first spiked a fever on day 7, we did not suspect misplacement of the catheter because the surgeon was very confident of the successful catheterization. Surgeons should be aware of the possibility for this lethal complication with catheterization via the femoral vein. Whenever patients show abnormal vital signs, misplacement of the catheter should be suspected and immediately investigated.

**Conclusions**

To avoid the complication of malposition of the CV port catheter, surgeons should be aware of the possibility of catheter misplacement when any of the following six indicators are present:
1. No blood backflow,
2. Slow gravity infusion,
3. The catheter path overlying the vertebral column rather than right of midline for catheters in the IVC,
4. The tip of the catheter stops before the bifurcation of the IVC and common iliac vein,
5. Focal neurological findings, and/or
6. A hump in the abdomen on the side of the catheter.

Ultrasoundographic-guided insertion cannot prevent this complication completely. We should have used contrast fluoroscopy to confirm placement inside the vessel. Although this is an extremely rare complication, it can cause a critical result. Surgeons need to be aware of this complication and know how to diagnosis it.

**References**


