

Case Report

Extra-anatomic aorto-right subclavian bypass after complicated insertion of permanent dialysis catheter

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Summary

Central venous dialysis catheters are the first line of choice to start on hemodialysis. They could be a bridge to establish another dialysis access. Dialysis catheters are essential of two types: temporary (non-tunneled) and permanent (tunneled). Insertion of a dialysis catheter is a ubiquitous procedure in renal medicine. One of the rare but serious complications is vascular erosion. We report on a case of a 68-year-old female patient with acute kidney injury who needed emergency hemodialysis. A permanent dialysis catheter was inserted into her right subclavian vein. There was not good flow in the dialysis catheter's afferent and efferent lumens. The nephrologist performed a contrast chest roentgenoscopy, which showed that the dialysis catheter followed an abnormal course by passing into the ascending aorta. Emergency surgical extraction of the dialysis catheter was initiated using median sternotomy and supraclavicular incision to identify the entry point of the catheter into the subclavian artery. Due to the dissection of the subclavian artery, we performed an extra-anatomic aorto-subclavian bypass with a saphenous vein graft. The dialysis catheter was inserted through open access into the right subclavian vein.

Key words: Bypass, cardiac tamponade, central venous catheter, renal insufficiency, subclavian artery



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Introduction

Hemodialysis is one of the primary renal replacement therapies for treating patients with end-stage renal disease. The following are some ways to gain vascular access to perform hemodialysis: temporary dialysis catheter, permanent tunneled dialysis catheter, and arteriovenous fistula (AV fistula). AV fistulas are considered to be the best means to gain vascular access to perform hemodialysis due to the low level of complications, as well as their prolonged patency (Santoro et al. 2014).

However, for many patients, vascular access through AV fistulas cannot be achieved for various reasons, and inserting a dialysis catheter is the only reliable way to perform hemodialysis. For 80% of such patients in the USA, the preferred way to initiate hemodialysis is by central venous catheter (Aslam et al. 2014; Saran et al. 2017). Central venous catheters can become permanent or temporary until another dialysis access is established.

Complications may occur in 5 to 19% of dialysis catheter cases (McGee and Gould 2003; Kusminsky 2007). The complications can be infectious and noninfectious. The infectious complications include catheter-related bacteraemia, sepsis, and tunnel infection. According to literature data, catheter-related infections vary between 2–30/1000 catheter days (McGee and Gould 2003; Hammarskjöld et al. 2006; Pinon et al. 2009; Levy et al. 2010). Noninfectious complications include arterial puncture, venous thrombosis and occlusion, haematoma, pneumothorax, catheter malposition, and heart rhythm disorders.

Case presentation

We report on a case of a 68-year-old female patient referred to our hospital with end-stage renal disease caused by chronic pyelonephritis. The physical examination revealed an underweight asthenic habitus with a BMI of 18.3. Laboratory results showed high levels of serum creatinine 945.0 $\mu\text{mol/l}$ (reference ranges 44–96 $\mu\text{mol/l}$), urea 41.8 mmol/l (reference ranges 1.7–7.2 mmol/l), serum potassium 6.8 mmol/l (reference ranges 3.5–5.5 mmol/l), haemoglobin 143 g/l (reference ranges 120/160 g/l), hematocrit 43.2% (reference ranges 37–47%).

A decision was made to start emergency hemodialysis. The nephrologist chose to insert the dialysis catheter in the right subclavian vein via supraclavicular access.

Control roentgenography showed an atypical course of the dialysis catheter. The performed contrast roentgenoscopy showed the position of the catheter in the ascending aorta (Figs 1, 2). The nephrologist inserted the dialysis catheter into the ascending aorta through a right subclavian artery.

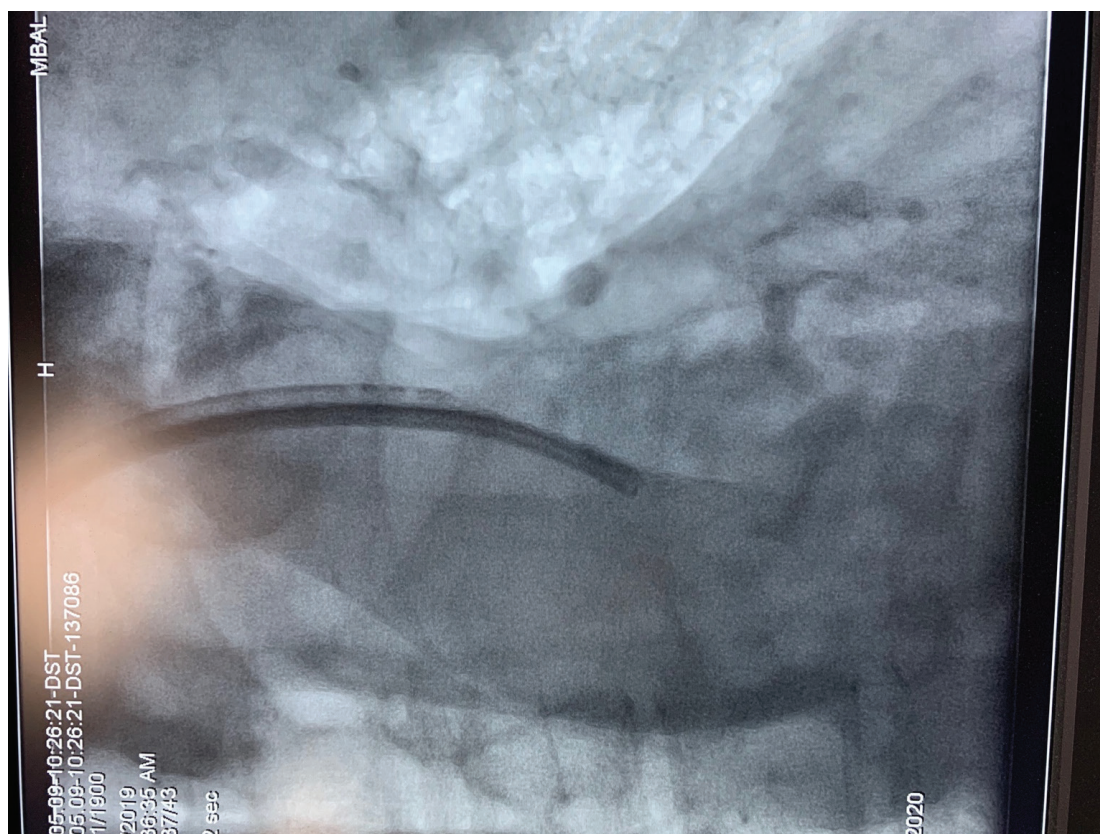


Figure 1. Dialysis catheter into the ascending aorta.



Figure 2. The entry point of the catheter into the subclavian artery.

The patient was admitted to our department with signs of acute right upper limb ischemia. The physical examination showed poor general condition with hypotension, pulseless and painful right upper extremity. Transthoracic echocardiography showed pericardial effusion with coagulum and signs of cardiac tamponade. Emergency surgical removal of the dialysis catheter and pericardial drainage was initiated.

After median sternotomy, the pericardium was opened, and blood was evacuated. After inspecting the aorta, a small lesion of the aortic wall caused by the dialysis catheter was repaired with a teflon-reinforced 4/0 Prolene suture. We inspected the right pleural space, where no hemothorax was seen. We explanted the catheter from the ascending aorta and confirmed an occlusive dissection of the distal part of the subclavian artery with insufficient arm perfusion.

An extra-anatomic aorto-subclavian bypass with termino-terminal anastomosis was performed using a saphenous vein graft, tunnelled subcutaneously (Figs 3, 4).

Finally, we implanted the dialysis catheter via the right subclavian vein directly into the right atrium.

During the postoperative period, hemodynamics remained stable without mediastinal bleeding and adequate right-arm perfusion.

Ten days after surgery, the patient was discharged in good overall condition on antiplatelet therapy with acetylsalicylic acid 100 mg daily.

At follow-up, within a month, the patient reported returning to her usual daily routine and receiving standard hemodialysis three times a week.

Discussion

Implanting dialysis catheters is a relatively standard procedure which, even when performed by experienced nephrologists, leads to complications in 15% of cases. A rare complication seen in 0.4–1% of cases is a vascular lesion,

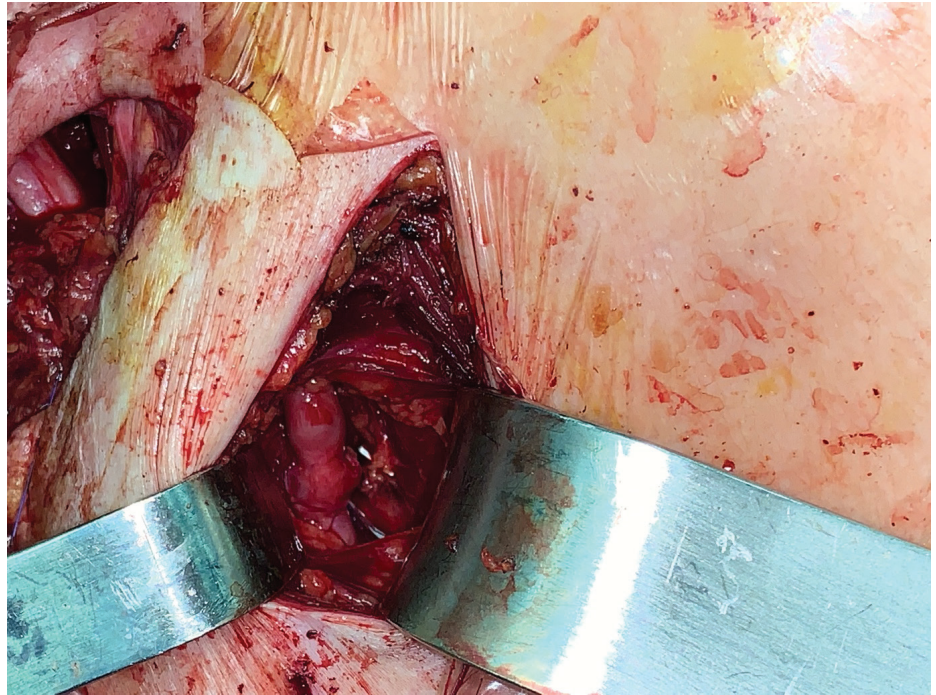


Figure 3. Termino-terminal anastomosis between saphenous vein graft and subclavian artery.

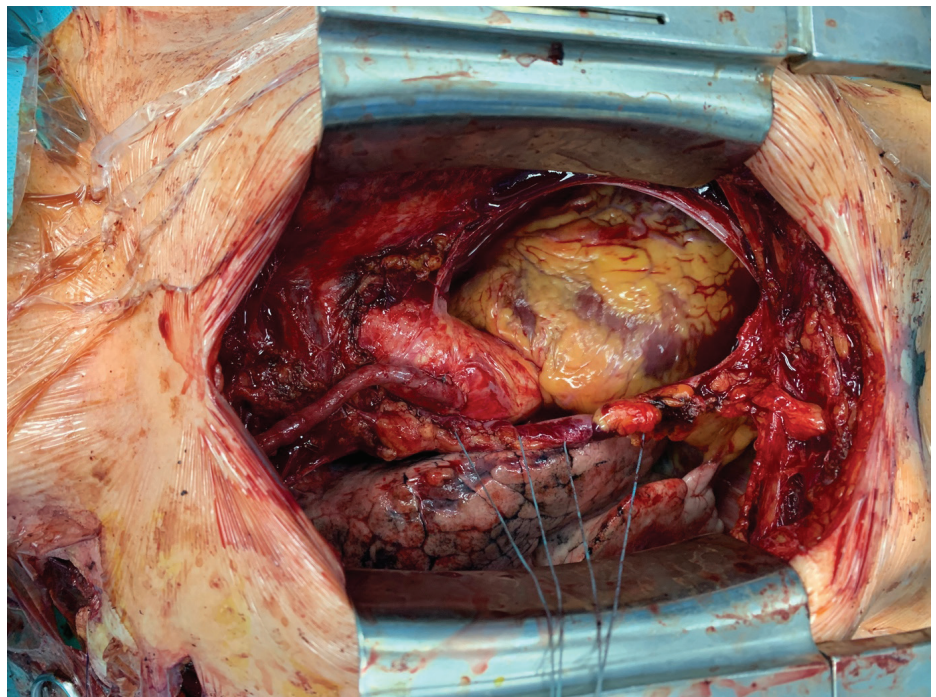


Figure 4. Aorto-subclavian bypass using a saphenous vein graft.

which sometimes takes time and is difficult to diagnose (Ellis et al. 1989). Arterial puncture is a type of vascular lesion seen in 1–11% of cases (Gibson and Bodenham 2013). Another complication is catheter malposition due to various factors such as the technique used for implantation, the chosen vascular access, anatomic characteristics, the experience of the person performing the procedure, and patient habitus and position.

The complications associated with dialysis catheter placement, such as catheter malposition and arterial vessel puncture, are significantly reduced with an ultrasound-guided and pilot needle venous puncture. Also, the operator's experience is another important factor in determining the complication rate. (Bansal et al. 2005; Oguzkurt et al. 2005)

In our patient, supraclavicular access was decided on for the right subclavian vein puncture. According to many studies, this access is easy and associated with the least complications. In the case of our patient, we did not use ultrasound guidance. Asthenic habitus and low BMI are possible prerequisites leading to the migration of the puncture needle to the right subclavian artery and arterial puncture, followed by the subsequent insertion of the catheter through the artery into the ascending aorta.

Extra-anatomic bypass is a surgical intervention commonly used for treating supra-aortic trunk disease.

There are few proven methods for effectively treating supra-aortic trunk diseases, such as endovascular intervention, extra-anatomic bypass, and endarterectomy. Modarai et al. (2004) demonstrated that extra-anatomic bypass for supra-aortic trunk disease had better patency and lower complication rate than percutaneous endovascular intervention. (Modarai et al. 2004).

Conclusion

In our case, the decision to perform open bypass surgery by supraclavicular access was made due to a lack of possibility to perform an endovascular procedure because the proximal portion of the right subclavian artery was dissected and occlusive.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

The authors declared that no informed consent was obtained from the humans, donors or donors' representatives participating in the study.

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

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Author contributions

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Data availability

All of the data that support the findings of this study are available in the main text.

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