Dilemma with the route of venous access for hemodialysis catheter insertion in a patient with dilated ischemic cardiomyopathy treated by cardiac resynchronization therapy

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ABSTRACT

A 68 year old patient requiring urgent dialysis due to raising potassium was referred to our center. He had 3 indwelling catheters in his heart via right subclavian vein. His left subclavian and internal jugular veins were thrombosed possibly due to earlier indwelling catheters. The dilemma was if right internal jugular venous route could be used for insertion of dialysis catheter. Under fluoroscopic guidance, right internal jugular vein was cannulated with the dialysis catheter without problems. This case is being presented to highlight the need for imaging both by ultrasound and radiography during the procedure.

Key words: Cardiac resynchronization therapy; Chronic kidney disease; Hemodialysis catheter

INTRODUCTION

A 63-year-old diabetic, hypertensive male with chronic kidney disease (CKD) and ischemic heart disease on regular hemodialysis was referred to our tertiary care hospital for hemodialysis catheter insertion. He had dilated cardiomyopathy due to ischemic cardiomyopathy, which required cardiac resynchronization therapy (CRT) with triple chamber pacing leads in the right atrium, right ventricle, and coronary sinus inserted via the right subclavian vein 6 years ago [Figure 1]. Prior to initiation of CRT, the ejection fraction (EF) was 23%; following resynchronization, the EF improved to 50% by about a year. The patient had significant improvement in clinical symptoms also after CRT. He was regularly undergoing hemodialysis. He had difficulties in venous access. The patient had undergone arteriovenous fistula in the left cubital fossa 5 months ago but unfortunately, developed pseudoaneurysm of the anastomotic site; hence, the left forearm could not provide venous access for carrying out hemodialysis. He was undergoing hemodialysis through a “permacath” inserted through the left subclavian vein 3 months ago, which too developed inadequate flow (probably due to vein thrombosis) through the catheter. Following this, left internal jugular venous dialysis catheter was inserted to carry on with hemodialysis, which also failed subsequently. Now, the patient required hemodialysis urgently considering the high serum potassium value of 6.4 mEq/L. He was referred to our...
department for inserting a dialysis catheter at a suitable location.

It is our routine practice to check the status of the venous system using ultrasound examination, especially in patients with CKD scheduled for venous access for dialysis, because a significant number of them have occluded veins secondary to earlier cannulations. The ultrasound examination of the neck showed thrombus in the left subclavian and left internal jugular vein [Figures 2 and 3]. The following venous accesses were not possible for the reasons mentioned.

- Right subclavian vein: This route was not suitable because, in this vein, the three leads of the CRT were indwelling.
- Left subclavian vein: This route was also not suitable because of complete obstruction possibly due to the earlier presence of permacath, [Figure 2]
- Left internal jugular vein: Because of thrombotic obstruction due to indwelling dialysis catheter earlier, this route was also not suitable [Figure 3]
- Right internal jugular vein: This was the only patent vein [Figure 4], with good flow and Doppler signal. However, inserting catheter into this vein, one could run the potential risk of displacement of intraventricular and atrial leads. Yet another matter of concern was entangling of guide wire with CRT lead and dislodgment during removal of guide wire.
- Femoral veins were patent but avoided due to two reasons. First, the possibility of blood stream infection due to groin cannula and second, the hospital policy which prohibited patient discharge for those with indwelling groin cannulae. Ultimately, the only viable option appeared to be the possibility of reconsidering the right internal jugular vein cannulation. There was a dilemma in choosing the site of cannulation of hemodialysis catheter.

It was decided to carry out the cannulation carefully with the guidance of ultrasound and under image intensifier guidance such that the guide wire or the hemodialysis catheter would not get entangled with the three intracardiac leads. The native rhythm of the patient was unknown; a transcutaneous pacing lead

Figure 1: Chest radiograph showing intracardiac leads and pulse generator

Figure 2: Thrombus in the left subclavian vein

Figure 3: Left internal jugular vein with thrombus occluding the vein totally

Figure 4: Good Doppler signal in the right internal jugular vein
was kept in readiness to tackle the potential heart block that might result due to ventricular lead displacement.

Informed written consent was obtained; standard monitors and emergency resuscitative equipment including defibrillator/transcutaneous pacing were kept ready. Under aseptic precaution, under local anesthesia, under ultrasound guidance, the right internal jugular vein punctured using 16-gauge Seldinger needle; guide wire was introduced carefully under fluoroscopy visualizing the position of CRT leads. The guide wire was not inserted deep into the right ventricular cavity. The dialysis catheter was inserted put to the junction of the right atrium and superior vena cava. After completion of inserting the dialysis catheter, the guide wire was retrieved slowly, cautiously, all the time looking at the CRT lead under fluoroscopy to ensure that they were not entangled with it. There was no problem after this. The patient underwent dialysis immediately without any issue.

DISCUSSION

It is extremely rare to encounter patients requiring dialysis catheter in the presence of cardiac resynchronization and even rarer for them to have venous access issues. Our patient had both. CKD requires regular hemodialysis for adequate homeostatic function. Central venous access is required to safely carry out hemodialysis in these patients. Occlusion of central veins, infection, and dysfunction are known to occur. In patients with indwelling leads for pacing or otherwise, central venous catheters are known to entangle and dislodge. Our patient presented with multiple catheters in the right subclavian vein leaving us the option of inserting the dialysis catheter either in the femoral vein or the right internal jugular vein. Since 10% incidence of infection is reportedly associated with femoral venous cannulation for dialysis and our hospital policy prohibits the discharge of a patient with femoral cannulae, we decided to use the right internal jugular vein.

Checking central veins using ultrasound is an excellent practice. Without the prior knowledge, when needles are inserted into these thrombosed veins, typically, blood will return with the Seldinger needle; however, the guide wire or the catheter cannot be advanced. Forcing the wide bore dialysis catheter might result in catastrophic embolization of the thrombus from the major veins. The policy applies to patients with labile thrombus in the major veins scheduled for thrombectomy.

All possible precautions were taken to prevent entangling of either the guide wire or the dialysis catheter with the indwelling CRT leads. Although the patient described in this report may not have encountered asystole or severe bradycardia with dislodgment of the indwelling leads, repositioning of CRT leads is yet again invasive and fraught with problems. In patients with very low heart rate, with indwelling pacing leads that require such central venous cannulation, one could think of either percutaneous pacing or epicardial pacing. It is best to avoid problems in such patients who are already fighting problems. The other option of venous access in this patient would be to use synthetic grafts. Transesophageal echocardiography (TEE) may have assisted in visualization of CRT leads, especially of the right ventricular and coronary sinus leads. The additional benefit of using TEE is lack of exposure to radiation. Since the procedure was carried out under local anesthesia, the option of TEE was not entertained. When one encounters such patient, it may be prudent to obtain consent to conduct an arteriovenous fistula using a synthetic graft.

CONCLUSION

In patients with indwelling intracardiac leads requiring catheterization of central veins, one must exercise extreme caution to prevent the dislodgment by entangling the leads in situ.

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Conflicts of interest
There are no conflicts of interest.

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