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Case Report

Application of Hong's technique for removal of stuck hemodialysis tunneled catheter to pacemaker leads

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ABSTRACT

The term "stuck catheter" refers to situations where a central venous catheter cannot be removed from the central veins or right atrium using standard technique, usually due to development of a fibrin sheath leading to adherence to SVC or right atrial wall. Endoluminal dilatation is an interventional radiology technique that has been previously reported in the removal of stuck hemodialysis catheters, and to the best of our knowledge, this case describes the first application of the technique to remove a hemodialysis catheter that was adherent to SVC wall and transvenous pacemaker leads.

Introduction

Tunneled central venous dialysis catheters are often used as a temporary vascular access for dialysis patients, while they wait for an arterio-venous fistula (AVF) to mature. However, it can remain as a long-term measure in cases where the AVF fails or in patients unsuitable for AVF formation or transplantation [1].

The long-term consequences of permacath placement include an increased risk of catheter dysfunction, infection, thrombosis, fibrosis, vessel stenosis, and vessel perforation which may eventually require the surgical removal of the catheter [2–4].

Surgical removal is usually a straightforward procedure performed under local anesthesia by dissecting the cuff from the tunnel, but this can be complicated by the presence of tight fibrin adhesions between the catheter and the vessel wall preventing catheter removal. In these cases, attempted forceful removal can lead to catheter fragmentation, embolization, or fatal vessel or right atrial tear [4–7].

There are many alternatives to open surgery including complex endovascular techniques, laser and nonlaser sheath removal, and more recently, endoluminal dilatation.

Endoluminal dilatation is an interventional technique pioneered by Hong [8] to remove a stuck catheter. It involves

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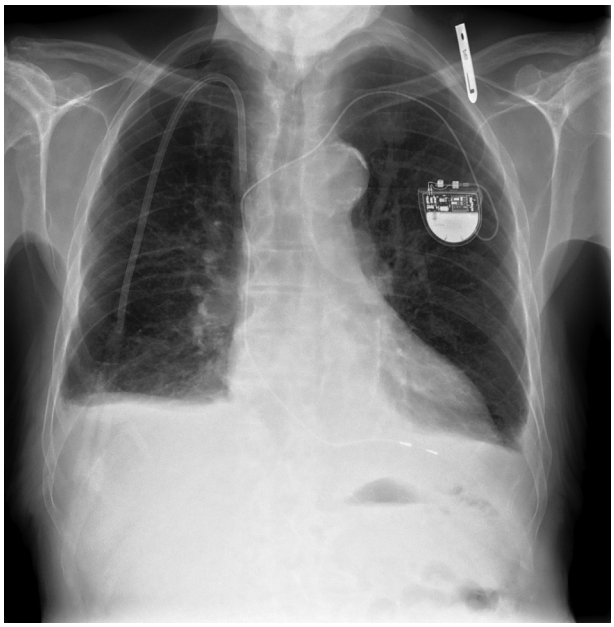

Fig. 1 – Chest radiograph shows right sided tunnelled dialysis catheter projected over wire from single lead pacemaker at SVC confluence and proximal SVC.

balloon dilatation within a catheter lumen, enlarging the lumen and stretching the catheter wall, breaking any adherent fibrin sheath which allows the catheter to be removed. Laser sheaths advanced over stuck pacemaker wires involve the use of laser energy to disrupt fibrin sheaths [9] and have been used to remove pacemaker leads adherent to indwelling catheters [10,11].

In our case, the catheter was tethered to adjacent transvenous pacemaker leads as well as the SVC wall which made removal impossible using standard techniques without affecting the pacemaker on which this patient was still dependent. To the best of our knowledge, this report describes the first case where Hong's technique has been successfully used to remove a catheter adherent to pacemaker leads in addition to SVC wall.

Case report

An 85-year-old man with metastatic renal clear cell carcinoma and end-stage renal failure had a permacath inserted in November 2011 for hemodialysis, while waiting for a left brachiocephalic AVF to mature. He had been deemed unsuitable for renal transplantation. He also had a single lead pacemaker inserted 2 years prior to permacath insertion and remained pacemaker dependent (Fig. 1).

Unfortunately, he had failure of the left brachiocephalic AVF in January 2012, and he continued to have hemodialysis, 3 times a week for 3 years, via the right internal jugular tunneled catheter before a small hub crack was noticed in November 2014. An attempt to seal this with a repair kit was unsuccessful. Due to the risk of air embolus and infection, dialysis was stopped via this route and commenced via a right femoral nontunneled catheter, and catheter exchange was requested by the renal team.

The patient was brought to the IR room with a view to straightforward exchange of the right internal jugular permacath for a new catheter via the same track.

The catheter was withdrawn through a small neck incision, clamped and cut and the proximal fragment then dissected from the tunnel and removed. A guide wire was then inserted through the distal fragment still in the vein and advanced to the inferior vena cava (IVC). It was then attempted to remove the in situ distal fragment of the catheter, but there was significant resistance felt. On fluoroscopy, as the catheter fragment was pulled, the pacemaker lead moved with the catheter at the confluence of the SVC, and during this maneuver, there were multiple ectopic beats on cardiac monitoring. It was decided that forceful traction was not appropriate due to the risk of central vein tearing and also dislodgement of pacemaker leads.

Endoluminal dilatation was then attempted using standard 6 mm × 4 cm and 4 mm × 4 cm balloon dilatation catheters through the lumens of the permacath (14-F split cath, Medcomp, PA, USA), but these would not pass. Unfortunately, lower profile balloon dilatation catheters were not available at that time. In view of this, it was decided to proceed with other maneuvers to remove the stuck permacath.

Initially, the right subclavian vein was punctured as the right internal jugular above the catheter was occluded and a standard 7 French vascular sheath inserted over a guide wire. Venograms revealed a tight SVC stenosis around the dialysis catheter and pacemaker wire at the confluence of the SVC, and this was dilated with a 10-mm balloon initially with no significant change in the stenosis following this due to recoil.

A 20-mm wire loop snare (Cook Medical, Bjaeverskov, Denmark) was advanced from the right subclavian, through the stenosis to the IVC, and the guidewire in the IVC was engaged. The snare was then withdrawn over the wire to the permacath in an attempt to strip the sheath from the permacath and release the catheter. This appeared successful over the initial 2–3 cm, but then, the snare would not advance any more proximally. Multiple attempts were then made to disengage the snare from the catheter by using multiple different shaped angiographic catheters, balloons, and longer sheaths to dislodge the snare, but none of these were successful. There was also a risk of the snare cutting through the dialysis catheter with distal embolization of a catheter fragment.

The right common femoral vein was then punctured, and a wire was eventually manipulated through the SVC stenosis into the right brachiocephalic vein. This proved difficult due to the recoiled stenosis at the SVC confluence and multiple collateral vessels, which the wire would preferentially cannulate. A range of angiographic catheters and balloons were used to try to dislodge the snare from the dialysis catheter from below, but these also proved unsuccessful due to the confined space in the right brachiocephalic vein (Fig. 2A–C).

After a prolonged procedure (approximately 4 hours), a discussion took place between the nephrology team, IR team, and the patient's relatives. Due to his advanced age and background of metastatic renal cell carcinoma, it was decided not to refer the patient to a cardiothoracic surgical