

*Case Report***Dialysis catheter ‘fibrin-sheath stripping’: a cautionary tale!**M. P. Winn<sup>1</sup>, V. G. McDermott<sup>2</sup>, S. J. Schwab<sup>1</sup> and P. J. Conlon<sup>1</sup><sup>1</sup>Division of Nephrology, Department of Medicine and <sup>2</sup>Department of Radiology, Duke University Medical Center, Durham, NC, USA**Introduction**

Dual-lumen cuffed catheters have assumed an increasingly important role for short- and long-term vascular access for the provision of life-sustaining renal replacement therapy. Dual-lumen cuffed catheters are particularly useful for vascular access in patients with severe congestive cardiac failure or ischaemic heart disease who cannot tolerate the increased cardiac output associated with either a primary arteriovenous fistula or a polytetrafluoroethylene (PTFE) graft. Dual-lumen catheters are also frequently used as a bridge to more definitive vascular access, or in patients who have exhausted all traditional forms of vascular access.

The most frequent reason for dysfunction of one of these catheters is catheter thrombosis or the development of a fibrin sheath around the tip of the catheter. We recently described a strategy for treating catheter dysfunction using a combination of intra-catheter thrombolytic agents and snare-mediated fibrin sheath catheter stripping [1,2]. The technique involves the initial performance of a catheter study by the injection of contrast through the catheter. If this confirms the presence of a fibrin sleeve, a snare catheter (Microvena, White Bear Mountain, MN) is inserted through the femoral vein, and under fluoroscopic guidance the tip of the catheter is snared and the fibrin sleeve is ‘stripped’ from the end of the catheter. In our initial observation we noted this to be a safe and effective procedure without any complications. We have now performed this procedure on more than 100 occasions in 58 patients.

Recently we observed a serious complication of the procedure, which we report herein.

**Case report**

A 54-year-old black male presented to Duke University Medical Center with end-stage renal disease of unknown aetiology. A right internal jugular vein

Permcath<sup>®</sup> (Quinton Instrument, Co. Seattle) was inserted and a primary arteriovenous fistula created in the operating theatre. Four weeks later the patient presented with a fever and subsequently *Staphylococcus aureus* was cultured from his blood. The Permcath was removed and he was dialysed for 2 weeks via intermittent femoral catheters. Prior to discharge he had a second Permcath inserted into to his left internal jugular vein. Surveillance blood cultures after 4 weeks of intravenous vancomycin were sterile. Three weeks later the catheter began to malfunction, and despite the instillation of 5000 units of Urokinase it was not possible to achieve a blood flow of 300 ml/min. Utilizing meticulous sterile technique the patient underwent an uncomplicated catheter stripping procedure in the angiography suite, with restoration of a blood flow rate of 400 ml/min. Six weeks later the catheter again failed to provide adequate blood flow despite the instillation of urokinase into the catheter.

He was referred for repeat catheter stripping. A catheter study was performed, which demonstrated a moderate sized fibrin thrombus at the end of the catheter (Figure 1). Subsequently a 25-mm Microvena<sup>®</sup> gooseneck snare was introduced via the femoral vein and a fibrin sheath was successfully removed from the catheter, with restoration of good blood flow through the catheter and repeat contrast injection through the central venous catheter showed no evidence of the fibrin sheath.

Twenty minutes after completion of the procedure the patient experienced rigors, dyspnoea, tachypnoea, tachycardia, fever of 40.1°C, and he became hypotensive with a systolic blood pressure of 90 mmHg. A clinical diagnosis of pulmonary embolus was made and he was placed on 100% inhaled oxygen. Arterial blood gases demonstrated an arterial pO<sub>2</sub> of 174 mmHg and a pCO<sub>2</sub> of 26 mmHg. He underwent an emergency ventilation/perfusion scan, which revealed an intermediate probability of pulmonary embolus (Figure 2). The patient was treated with intravenous antibiotics and heparin. The day after admission blood cultures were reported as growing *Citrobacter freundii* and coagulase-negative staphylococcus. Because the infection was presumed to be arising from the Permcath, anticoagulation was discontinued and the catheter

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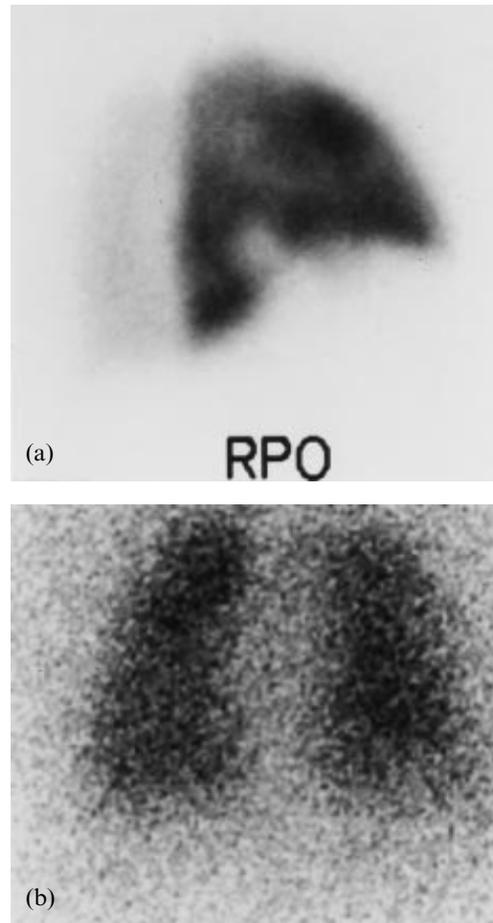
**Fig. 1.** Catheter study after the instillation of contrast into Permcat demonstrating the presence of a large fibrin sleeve around the end of the catheter (arrows).

removed. The patient was treated for an additional 3 weeks with oral and intravenous antibiotics and has made a complete recovery.

## Discussion

We have found fibrin sheath stripping to be an advance in the management of malfunctioning cuffed haemodialysis catheters. In our prior experience we identified no clinically significant complications [1,2], and in other series published by Crain *et al.* [3] and Haskal *et al.* [4] the only significant complication was an episode of supraventricular tachycardia, which responded to intravenous adenosine.

This we believe is the first reported case of the development of clinical pulmonary embolism as a result of catheter stripping. The technique we have described involves the stripping of fibrin thrombus from the tip of the catheter which in most circumstances will embolize to the lungs. Clearly the size of the fibrin thrombus could influence the probability of the patient's developing clinical symptoms. There are, however, few alternative options for the treatment of a thrombosis at the end of a cuffed catheter if it does



**Fig. 2.** Ventilation/perfusion lung scan demonstrating (a) a segmental perfusion defect at the base of the right lung on the right anterior oblique view, with (b) normal ventilation on a posterior equilibrium image.

not respond to the instillation of urokinase. Exchanging the catheter over a guide wire (which is the only alternative strategy) will almost always result in the embolization of the fibrin material to the lungs. Brismar *et al.* used fluoroscopy to study the effect of catheter removal on fibrin sheaths [5]. He noted the fibrin sheath frequently embolizes to the lung, which produced clinical symptoms in three of 60 cases. It is therefore surprising that we or others have not seen this complication before. The fibrin sheath removed in this case was large and could have increased the risk of clinically significant embolus.

A second unusual feature of this case was the development of bacteraemia following the stripping of the catheter. The patient did not have a clinically apparent infection during the life of this catheter; however, it would appear that bacteria became embedded in the fibrin sheath that was released into the circulation following the catheter-stripping procedure. This infection resolved promptly with removal of the catheter and administration of intravenous antibiotics.

In conclusion, we have reported a case in which a patient developed clinical evidence of a large septic

pulmonary embolism following catheter stripping. While the technique is a useful advance in the management of dialysis catheter malfunction, caution needs to be observed when a large fibrin sleeve is identified.

## References

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