Safe removal of long-term cuffed Hickman-type catheters

S Galloway, A Bodenham

The use of long-term venous access devices is increasing. Most devices are anchored by a cuff, usually made of Dacron. The disadvantage of such cuffs is that a cut-down procedure is required for their removal. This article presents a simple technique for removal of Hickman-type catheters, emphasizing avoidance of complications.

The use of long-term venous access devices for chemotherapy, total parenteral nutrition and long-term antibiotic therapy is increasing. Most devices are characterized by the presence of a cuff, usually made of Dacron, to provide anchorage in subcutaneous tissues (*Figure 1*). There are a number of different devices, e.g. Hickman, Broviac and Groschong catheters, but their functional characteristics are similar in terms of their cuff design. There are also implanted ports where the port itself acts as the anchor.

The Dacron cuff elicits a tissue reaction with fibrous growth around and into it. This anchors it over time (usually in about 3–6 weeks). This then provides a secure anchor to prevent dislodgement and may have a useful function in preventing spread of infection inwards from the exit site.

The disadvantage of such anchor cuffs is that a cut-down procedure is required for removal. This is a deceptively simple procedure which is often left to untrained junior staff to perform in less than ideal circumstances with poor instruments on a general ward. There is the potential for a number of complications (*Table 1*) which have been seen repeatedly, and of course for pain and discomfort associated with the procedure.

The technique used for removal of Hickman tunnelled central venous catheters has changed since the earliest description by Hickman et al (1979). These authors described a 'strong pull' to remove the catheter, leaving the cuff in situ. This technique produced problems. Retained cuffs can produce a nidus for infection and may erode through the skin of the chest wall (Fisher, 1985). Retained cuffs have been mistaken for metastatic nodules on thoracic computed tomography (CT) imaging (Fernandez et al, 1989) and caused confusion when visualized on mammography (Fisher, 1992). Heavily infected or recently inserted catheters may be able to be removed with a gentle pull.

The usual technique used today was described by Reed et al (1985). These authors suggested that Hickman's original method was associated with pain and increased risk of catheter break-

Figure 1. A single lumen silastic 9 French gauge cuffed Hickman-type catheter (Vygon Ltd, UK). Note Dacron cuff (arrow).

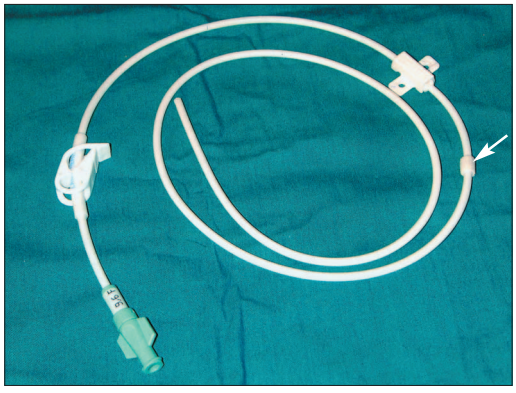

TABLE 1.
Complications of removal of tunnelled lines

Catheter damage and embolism
Air embolism
Venous thrombosis
Rigors and signs of systemic infection
Local infection
Bleeding

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age. Also contamination of the tip through the exit site could cause false positive results on subsequent microbiological culture. The cut-down technique that they described is similar to that described below. Even using this technique there can be difficulties. The cuff is occasionally left behind following a difficult removal (Ray et al, 1996) or the catheter can rupture (Prischl et al, 1993). Fibrin tracts form around the catheter creating a potential portal for venous air entry after catheter removal (Mennim et al, 1992). Inadequate technique can lead to complications, of most concern is catheter embolization which often requires surgical or radiological retrieval (*Figures 2* and *3*).

Figure 2. A chest X-ray of an infant. The attempted Hickman catheter removal was carried out under general anaesthesia by a consultant paediatric surgeon. The catheter was accidentally cut through and the inner fragment embolized to lie between the right atrium and the right ventricle (arrows) through the tricuspid valve. The fragment was removed by radiological snaring from the groin.

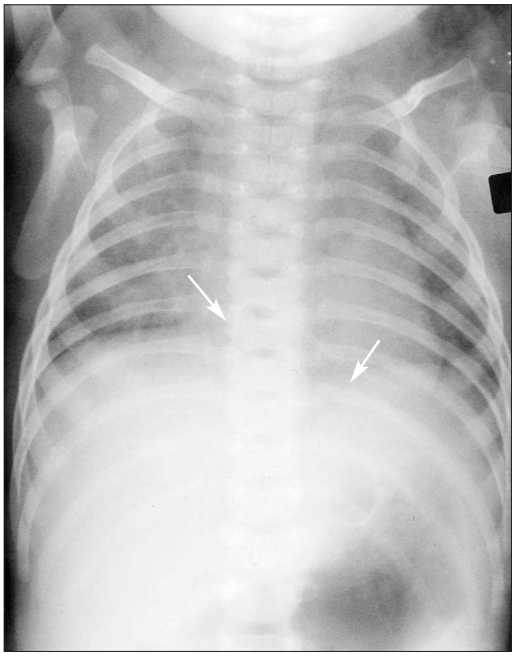
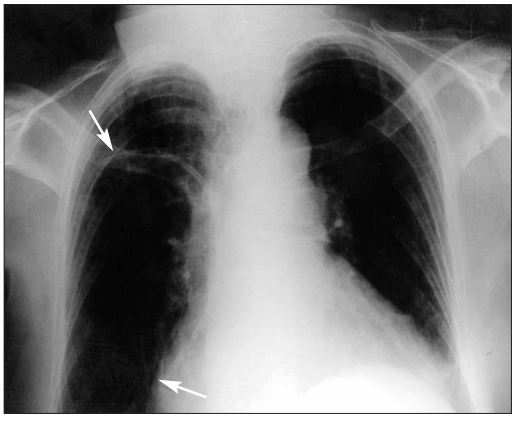


Figure 3. A chest X-ray of a female adult. An oncology senior house officer attempted removal of a Hickman line on a general ward. The catheter was inadvertently cut through and the intravascular segment is seen lying between right subclavian vein and right atrium (arrows). The end of the catheter lying behind the clavicle could not be found outside the vein by a vascular surgeon and was removed via radiological snaring from the groin.



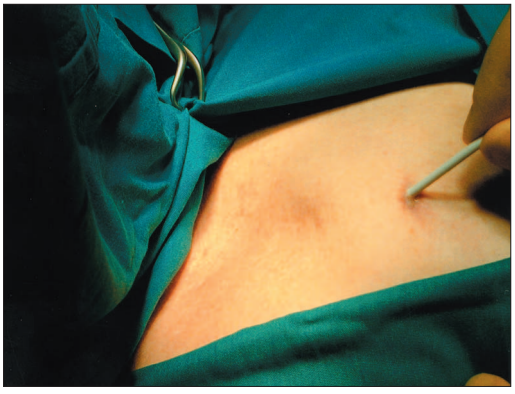
REMOVAL PROCEDURE

The procedure is best carried out in a well-lit operating area under aseptic conditions. The procedure is usually carried out under local anaesthesia with or without light sedation, but general anaesthesia may be necessary in the very anxious or heavily infected case. The patient's skin is prepared with antiseptic solution and draped as for any minor surgical procedure.

The position of the cuff needs to be identified. In thin patients the cuff may be easily palpable through the skin (*Figure 4*) when the catheter is pulled. Gentle traction on the external portion of the catheter may produce skin tethering indicating the position of the Dacron cuff (*Figure 5*).

Figure 4. The cuff of a Hickman catheter is often easily palpable through the skin.

Figure 5. Skin tethering with traction on the external portion of the catheter indicates the position of the Dacron cuff.



If the cuff is just inside the exit site it may be difficult to feel.

Local anaesthetic should be infiltrated at the site of the cuff and along the track of the catheter. A minimum of 10–20 ml of local anaesthetic should be used. Lignocaine with adrenaline 0.5% or 1% are suitable choices.

If the cuff cannot be localized an alternative technique can be used. This involves the use of a small blunt-tipped probe. This can be passed up the line track from the exit site until resistance is felt from the cuff. Lifting the probe tip anteriorly will reveal the approximate site of the cuff (*Figure 6*).

A 2 cm longitudinal incision is made in the skin over the site of the cuff (*Figure 7*). The cuff and catheter can be felt as a solid structure on probing with forceps. Blunt dissection using artery forceps or scissors will reveal the cuff (*Figure 8*) which can be pulled up and out of the wound. Further dissection will allow access to the inner portion of the catheter (*Figure 9*). This will usually be embedded in a fibrin sleeve which will need to be incised to reveal the white silastic catheter material (*Figure 10*). The intravenous portion can then be pulled free and pressure applied over the site of the vein puncture (*Figure 11*).

Pressure is applied over the vein puncture site to stop bleeding, reduce haematoma formation and to avoid air passing into the venous circulation. The catheter tip can be cut off and sent for culture if necessary. At this point the risk of catheter embolus is removed and further blunt and sharp dissection will allow complete removal of the cuff (*Figure 12*). The remaining portion of the catheter can then be cut through and removed through the exit site.

Figure 6. A blunt probe has been passed via the exit site up the subcutaneous tract. The anchored cuff stops the probe. Lifting the probe tip anteriorly will reveal the site of the cuff.

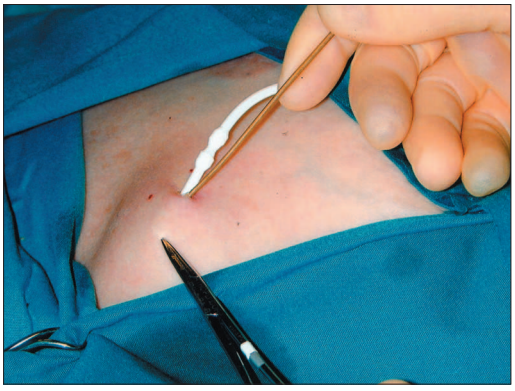


Figure 7. A 2 cm longitudinal skin incision over the cuff site.

Figure 8. Blunt dissection reveals the cuff.

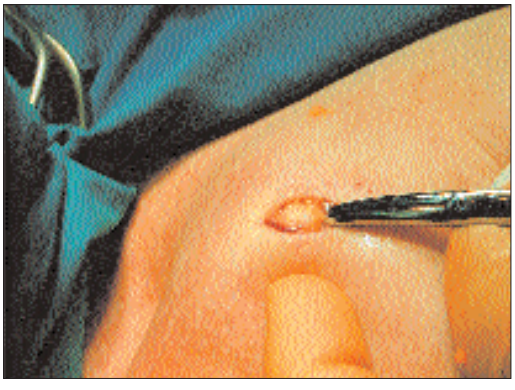


Figure 9. Further dissection reveals the proximal end of the catheter.

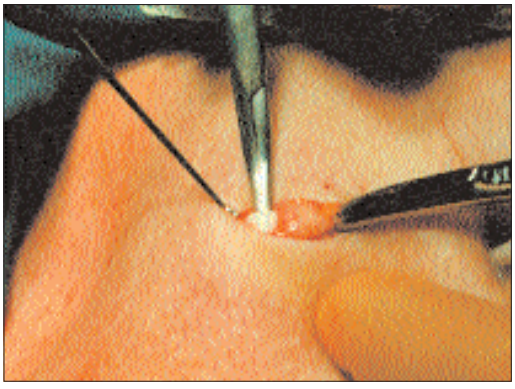
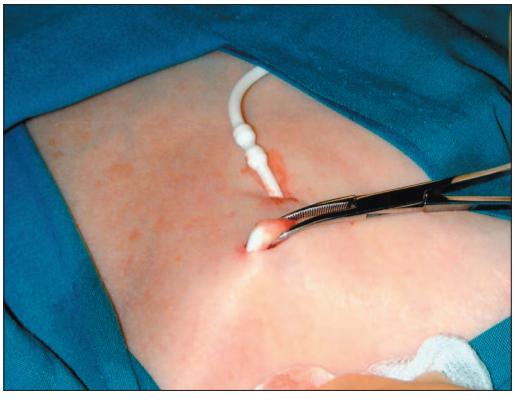


Figure 10. Incision of the fibrin sleeve reveals the inner segment of the silastic catheter. This part of the catheter can then be pulled out of the vein.



The tract will seal with clotted blood over a few minutes. Finally closure of the incision with sutures (*Figure 13*) and application of a sterile dressing completes the procedure.

The exit site is cleaned and is usually left open to granulate. Sometimes the cuff lies just inside the exit wound, making it difficult to palpate. After checking its position with a probe as described above, the exit wound can be enlarged to allow access to the cuff and a similar removal sequence is followed.

The patient should be observed for 2 hours post-procedure in case septic or bleeding complications occur. If difficulties ensue or the catheter is damaged an X-ray should be taken to ascertain the position of the catheter and a referral made to a vascular surgeon or radiologist. The action taken will depend on the position of the catheter segment. If part of it remains extravascular then it may be possible to retrieve it surgically. Alternatively intravascular catheter segments can be retrieved under X-ray screening usually with a snare which is usually passed via the femoral vein (Fisher and Ferreyro, 1978; Grabenwoeger et al, 1988). **HM**

Figure 11. Pressure should be applied over the vein puncture site to reduce haematoma formation.

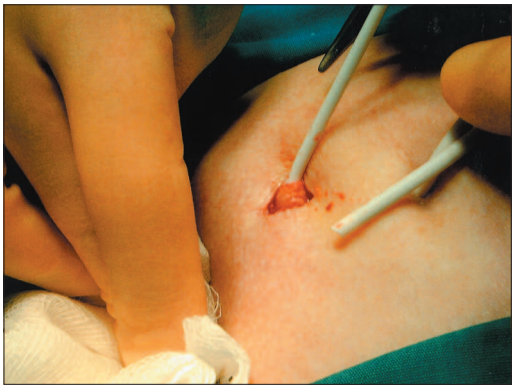
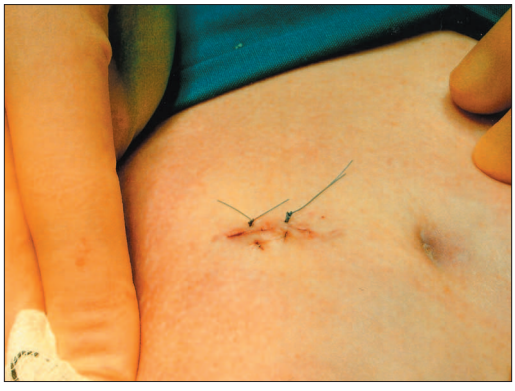


Figure 12. Further dissection allows removal of the cuff.

Figure 13. The incision is closed with 3/0 ethilon sutures.



Conflict of interest: none.

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KEY POINTS

- Devices have a Dacron cuff which requires a cut-down procedure for removal.
- Removal necessitates adequate training for staff.
- An operating theatre is the ideal location for this procedure.
- Adequate instrumentation is important.
- The intravascular segment of the catheter should be removed before cutting the catheter.
- The most serious complication is catheter embolus.