

Measurement of this protein may be useful as a predictor of neurological outcome after life-threatening anemia and hypotension.

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Breakage of epidural catheters in two parturients

To the Editor:

We wish to report the separation and breakage of the internal stainless steel wire of two Arrow Flextip Plus® epidural catheters (Reading, PA, USA). Both patients requesting epidural labour analgesia had uneventful identification of epidural space at L3–L4 intervertebral space.

In the first case, on attempting to thread the catheter, resistance was met in passing the catheter beyond the needle tip. The attempt was abandoned and the needle and catheter were removed together. On removing the catheter from the needle, without any resistance, it was noticed that a 10-cm segment of the flexometallic spiral had unravelled and was protruding from the patient end of the intact catheter sheath. The most distal 4.5 cm segment had broken off from the rest of the spiral (Figure).

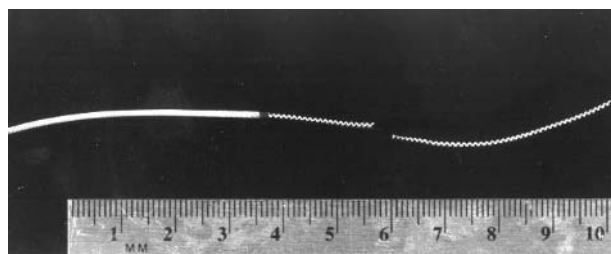


FIGURE Catheter from case #1 with broken off wire.

Following delivery the patient had an *x-ray* of her spine to ensure a fragment of the wire had not been left in her back.

In the second case, the catheter was threaded easily through the needle and 3 cm into the epidural space. After removing the needle, the proximal (non-patient) end of the catheter was noted to be unravelled, exposing 5 cm of the metal coil. The catheter was trimmed 5 cm from the end, an adapter was attached and the block was initiated. After delivery, the shortened catheter was removed intact.

Asai *et al.* reported breakage of a trapped Arrow catheter when traction was applied to remove it.¹ The metal coil was removed intact along with the catheter but the distal part of the catheter broke. They compared the tensile strength of Arrow catheters with nonreinforced Perifix, Perisafe and Portex catheters and concluded that the Arrow catheters are more likely to break.¹ Woehlck reported uncoiling of the wire in a trapped Arrow catheter during removal. The catheter came out and the uncoiled wire remained in the patient but could be removed intact with gentle traction.² In our two cases, the metallic spiral unravelled without undue force or traction being applied and without any apparent preexisting defect of the catheter sheath itself. Should fragments of epidural catheters break off, the recommendation is to leave them and monitor the patient for any signs of delayed complications due to granuloma formation, like lumbar stenosis³ or nerve root lesions.⁴ In conclusion, we report the separation of the stainless steel wire of two Arrow Flextip Plus® epidural catheters, which were otherwise intact.

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Use of acute normovolemic hemodilution for blood conservation during off-pump coronary artery bypass surgery

To the Editor:

Although the premise for using acute normovolemic hemodilution (ANH) as a blood conservation modality is sound,¹ results for patients undergoing cardiac surgery have been controversial.² Furthermore, use of ANH for off-pump coronary artery bypass (OPCAB) has never been described. Recently, I utilized ANH in a 67-yr-old male patient (90 kg) undergoing triple vessel OPCAB. Following anesthetic induction, ANH

was performed to a hemoglobin (Hb) of 100 g·L⁻¹ (collected four units [350 mL] of autologous whole blood [AWB]; replaced with an equal volume of 6% hetastarch in lactated electrolyte solution). My strategy was to transfuse AWB when Hb levels decreased below 90 g·L⁻¹ during the OPCAB. One AWB unit was transfused after the internal mammary artery anastomosis (Table). During revascularization of the left circumflex artery (LCA) with a saphenous vein graft (SVG), occlusion of the artery produced ST segment elevation and hypotension (Table). Additional crystalloid, norepinephrine infusion and a 2.5-mm intracoronary shunt only partially reversed the ST segment changes. After documenting a Hb of 8.6 g·L⁻¹, the second AWB unit was transfused, which was followed shortly thereafter by complete resolution of the ST segment changes. On completion of the last SVG to the right coronary artery, the remaining two AWB units were then transfused slowly (Table). Cell-saver blood (600 mL) was also reinfused producing a final Hb of 121 g·L⁻¹. Postoperative recovery was uneventful and no allogeneic blood was transfused.

Rosengart *et al.* advocate that for ANH to be effective, the "maximal" volume of AWB should be sequestered prior to cardiopulmonary bypass (CPB).³ However, CPB also produces hemodilution, which limits the volume of AWB that may be sequestered prior to initiating CPB. In contrast, in patients undergoing OPCAB, since hemodilution associated with CPB is avoided, a "maximal" volume of AWB may be collected. The endpoint for blood sequestration and the intraoperative AWB transfusion threshold or "trigger" should be clearly defined; the actual timing of AWB reinfusion should also be carefully coordinated with the surgeon's efforts. In the above patient, since the transfusion of AWB promptly reversed ST-segment changes following LCA occlusion, inadequate Hb concentration was probably contributory to myocardial ischemia, suggesting that ANH should be used with caution for OPCAB. Since considerable variation in transfusion practices still exists among cardiac surgery centres,³ ANH may represent a valuable blood conservation tool for OPCAB surgery. More information is clearly needed about its safety and efficacy for OPCAB.

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TABLE Chronology of intraoperative Hb levels during ANH and OPCAB surgery

Event	Hb (g·L ⁻¹)	Response
1st AWB unit complete	128	
2nd AWB unit complete	119	
3rd AWB unit complete	110	
4th AWB unit complete	101	
IMA anastomosis	89	1st AWB unit administered
L Cx anastomosis and myocardial ischemia	86	2nd AWB unit administered and resolution of myocardial ischemia
RCA anastomosis	95	
Post – protamine	94	3rd and 4th AWB units administered
Chest closure	114	auto CS administered
ICU admission	121	

Hb = hemoglobin; ANH = acute normovolemic hemodilution; OPCAB = off-pump coronary artery bypass; AWB = autologous whole blood; IMA = internal mammary artery; L Cx = left circumflex coronary artery; RCA = right coronary artery; auto CS = autologous cell-saver blood; ICU = intensive care unit.

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