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Retained epidural catheter: an update

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Abstract

The retained catheter fragment is a rare complication when performing epidural techniques. There is a paucity of studies available, with Australian data quoting an incidence of 1 in 60,000. For this article, we reviewed 36 case reports of retained epidural catheters between 1995 and 2020. The case reports found computed tomography scans to be the most reliable modality to investigate a retained epidural catheter. The decision to surgically remove or treat conservatively should be multidisciplinary with most operations involving symptomatic or long fragments. In our review, we found 25 (69.4%) reports of surgical removal, with 21 opting for immediate removal. Conservatively treated retained fragments should be monitored for neurological or infective complications. Patients should receive a follow-up plan and be educated regarding red flag symptoms to facilitate further management. For future reference, a detailed documentation of the incident, parties involved, discussions, and decisions should be made.

Keywords: anaesthesia, complications, retained epidural catheter, surgical intervention

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Introduction

The retention of an epidural catheter brings about significant distress to patient and doctor. A retained epidural catheter can occur as a result of shearing through the Touhy or fracturing of the catheter due to excessive traction upon removal. Inert and rarely causing complications, it commonly poses psychological and possible litigative implications rather than neurological deficit or permanent disability. The purpose of this review article is to facilitate decisions and clinical management of a retained epidural catheter.

Incidence

The incidence of a retained epidural catheter is rare, occurring 1 in 60,000 catheters based on Australian data.[1] Due to its infrequency, there is a paucity of experimental studies, randomised control trials, or meta-analyses regarding this subject. For the purpose of this article, we reviewed 36 case reports between the years 1995 to 2020. Epidurals were commonly placed in obstetrics, with 14 cases of labour analgesia and 1 case of Caesarean section (41.7%). There were 7 (19.4%) gynaecological cases including 4 hysterectomies, and 7 (19.4%) orthopaedic cases including 5 arthroplasties. Other disciplines included 4 (11.1%) urological cases, 3 (8.3%) from general surgery including 2 of which were from hepatobiliary. 22 (61.1%) cases involved solely an epidural for analgesia or anaesthesia, 10 (27.7%) combined with spinal anaesthesia, and the remaining 4 cases (11.1%) as a supplement to general anaesthesia.

Potential mechanisms and risk factors

From our review, 15 (41.6%) catheters were retained during removal,[2-16] and 8 (22.2%) catheters could not be removed due to knotting.[17-23] Knotted catheters mostly involved excessive lengths threaded during insertion ranging 4 to 17 cm with a median length of 7 cm. We found 5 (13.8%) cases whereby a fragment was sheared off as a result of being cut by the Touhy needle as it was withdrawn through it[24-28] and 4 (11.1%) cases of fragments fracturing from excessive force during extraction together with the Touhy needle.[16,29,30] There were 2 cases where the retained catheters were incidental findings many years after insertion[31,34] and 1 case of migration to the paravertebral space.[33]

Radiological investigation

Computed tomography (CT) is the recommended method of radiological investigation to detect the presence and location of a retained catheter.[7,10,26] In our review, 9 CT scans were performed with 7 (77.8%) scans correctly identifying the catheter.[7-13,26,27] However, the radio-opaque nature of most catheters would justify a simple radiograph in the absence of CT scan. All 6 case reports where X-rays were performed located the catheter. Magnetic resonance imaging (MRI) scans appeared less reliable, with the 6 scans performed only locating 4 (66.6%) retained fragments. Additionally, burns and migration are also a concern during MRI scans, especially with wire-reinforced catheters.

Decision for surgical removal

Indications for surgical removal include intrathecal migration, neurological symptoms, or an exposed fragment potentially forming a channel for infection. However, conservative treatment for asymptomatic patients has been reported. There is a lack of evidence regarding timing of surgery with potential migration, adhesions, and scar formation complicating delayed removal. In our review, we found 25 (69.4%) cases of surgical removal, with 21 opting for immediate removal. Timing of delayed removal ranged from 7 months to 12 years with equivocal surgical difficulty.[6,28,31,34] The option for surgical removal, timing of surgery, or conservative treatment should involve a multidisciplinary decision between Anaesthesia, Spine/Orthopaedics, and Neurosurgery to weigh the risks and benefits of each treatment option for the patient.

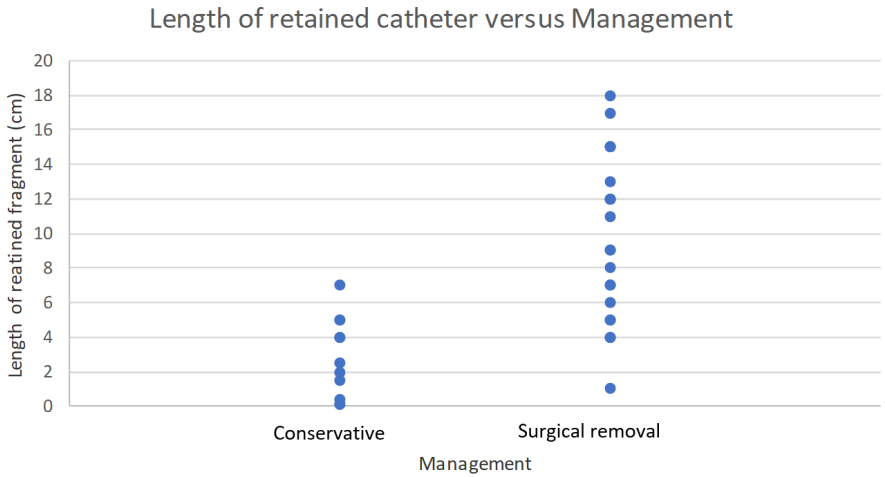

Fig. 1. Scatterplot of length of retained catheter versus management.

Table 1. Factors regarding surgical removal of a retained epidural catheter

Surgical removal	Conservative treatment
Exposed catheter fragment acting as fistula/ channel[17-23] Symptomatic fragment[5,26,28,34] Retained length > 5 cm Intrathecal migration Patient preference	Complications are rare Asymptomatic fragment Avoids complications of major surgery[13,30] Small retained fragment

Table 2. Red flag symptoms of a retained epidural fragment

Symptoms to look for
Lower back pain Palpitations and pallor Paraesthesia (numbness) Convulsions (fitting) Swelling, bogginess and erythema at insertion site Transient or permanent paralysis Radicular pain migrating to legs Urinary /bowel incontinence Headache Signs of infection, *e.g.*, fever

There were 10 (27.8%) catheters externally exposed due to knotting or migration, 4 (11.1%) cases with neurological deficit,5,26,28,34 [5, 26, 28, 34] and 1 case of fragment migration during follow-up for conservative treatment.[6] The remaining surgeries were due to the patient's preference in 3 (8.3%) cases, with 11 case reports not stating the indication for surgery. From our limited evidence, conservative management tends to involve fragments < 5 cm, as illustrated in Figure 1.

Spine surgery is not without its own complications, with 1 case of surgical site infection[13] and 2 cases of transient postoperative lower back pain treated with physiotherapy.[30,34] From our review, factors that may influence the decision to operate have been summarised in Table 1.

The decision to leave the retained epidural catheter in situ should be accompanied by a detailed explanation of a follow-up plan to the patient and family. This should include symptoms of catheter-related complications as outlined in Table 2,[5] including advice to seek immediate medical attention in the event of a symptomatic fragment. An information card warning of the presence of the retained fragment with red-flag signs stated therein can be given to the patient. We recommend

following patients up a month after discharge with subsequent intervals ranging between 6 months up to annually, with eventual discharge if they remain asymptomatic thereafter. A detailed documentation of the incidence, discussion, and decisions should be made for future reference. A flowchart that summarises our suggested management algorithm is included as Appendix 1.

Potential preventive measures

Several articles have suggested preventive measures for a retained epidural catheter. Experience and skill are of utmost importance, be it in the operator or supervisor role. In cases of multiple attempts, the catheter should always be withdrawn together with the Touhy needle to prevent shearing. During removal, a continuous low-force traction limits strain on the catheter and may prevent breakage. In the event of catheter stretching, stopping and allowing a few hours' grace period before reattempting can help prevent fracturing of the catheter. Slow injection of a saline bolus through the catheter may free it from surrounding tissue entanglements.[2,31] Patient positioning can improve removal success rates, with a lateral decubitus position or the position previously adopted during insertion potentially reducing the force required during removal.[35] However, these manoeuvres come with the caveat that there is a paucity of evidence to support their efficacy and should be utilised with caution.

Conclusion

A retained epidural catheter is a rare and distressing occurrence. Surgical removal should be a holistic multidisciplinary decision considering the clinical factors and patient's wishes. Patient education and follow-up are hallmarks of conservative management in the asymptomatic patient.

Declarations

Ethical approval and consent to participate

Not required

Competing interests

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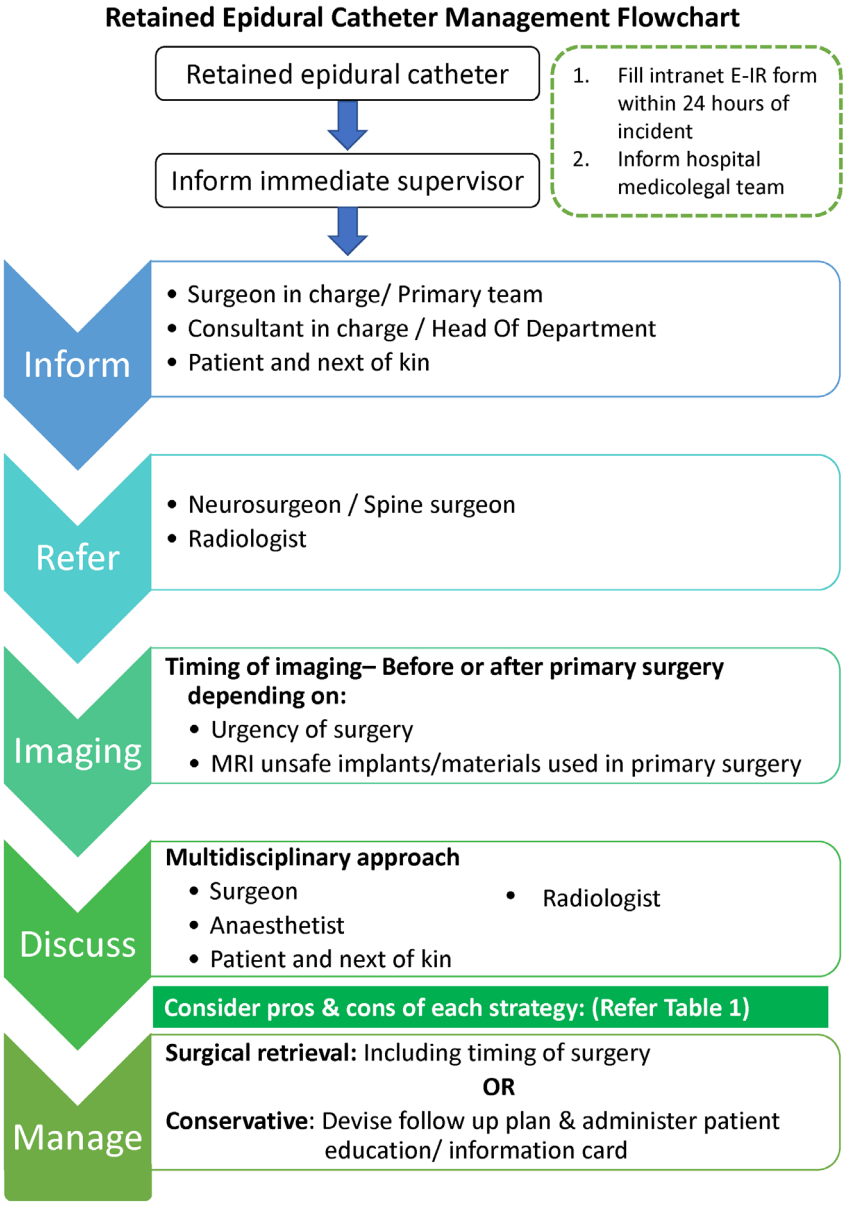
Appendix 1



This flow chart acts as a guide for the systematic management of a retained epidural catheter. Clinicians should apply it with discretion based on individual scenarios.