Management of Retained Epidural Catheter Fragment After Combined Spinal Epidural during Routine External Cephalic Version

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Introduction

- Combined spinal epidural (CSE) anesthesia is a procedure that involves the subarachnoid injection of anesthetic with subsequent placement of an epidural catheter.
- CSE technique is routinely utilized for external cephalic version (ECV) to decrease maternal pain and potentially convert to surgical neuraxial anesthesia in the case of emergent delivery.
- *Retained epidural catheter fragments have a reported incidence ranging from 2 in 1,000 to 1 in 60,000.*
- Due to its rarity, management algorithms for retained catheter fragments come from case reports. The first step is expert consultation and imaging to determine the location of the fragment. If found to be intrathecal, creating a CSF leak, or causing neurologic symptoms, surgical removal is likely indicated.
- There is also discussion about the MRI conditional nature of springwound catheters, further complicating imaging decisions, and techniques to mitigate the risk of catheter shearing during placement and removal.

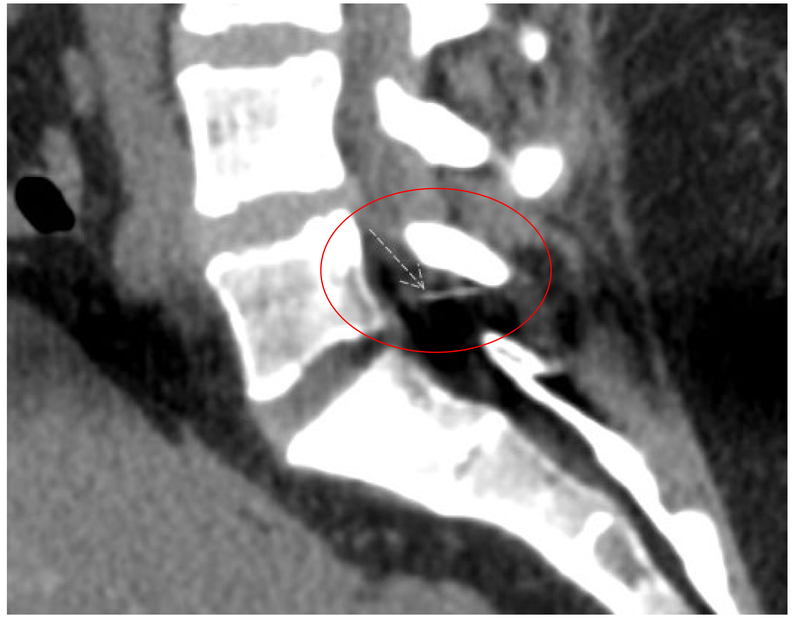

Figure 1. CT Lumbar spine. "Thin radiodense substance measuring 1.7 cm in length that enters the right side of the L5-S1 epidural space and terminates adjacent to the right side of the thecal sac. Recommend clinical correlation."

Case Presentation / Anesthetic Plan

- The patient was a 22-year-old G2P0 who presented for a routine ECV at 37 weeks and 1-day gestation. Her obstetric (OB) history was notable for chronic hypertension (cHTN), pre-pregnancy obesity (BMI 39 -> 41), Chiari I malformation (no neurologic deficits), and cervical insufficiency with a prior cerclage.
- The anesthetic plan was a CSE with 1mL intrathecal 0.25% bupivacaine and 15mcg fentanyl. The 17G Tuohy needle was inserted at L4-L5 with a LOR at 9cm. A 25G spinal needle was placed via the Tuohy, and CSF was noted. The spinal dose was given, and the needle was removed. A springwound epidural catheter (19G closed-tip, multi-port) was threaded but was unable to advance beyond the 11cm catheter marking. Multiple attempts at threading were made unsuccessfully, and the catheter was removed. Resistance was noted with removal, and the patient was repositioned multiple times. The catheter was eventually removed with a steady, constant pull force. A 2nd epidural catheter was placed via the remaining Touhy. The surgical team made three unsuccessful attempts at ECV, and the case was otherwise uneventful.

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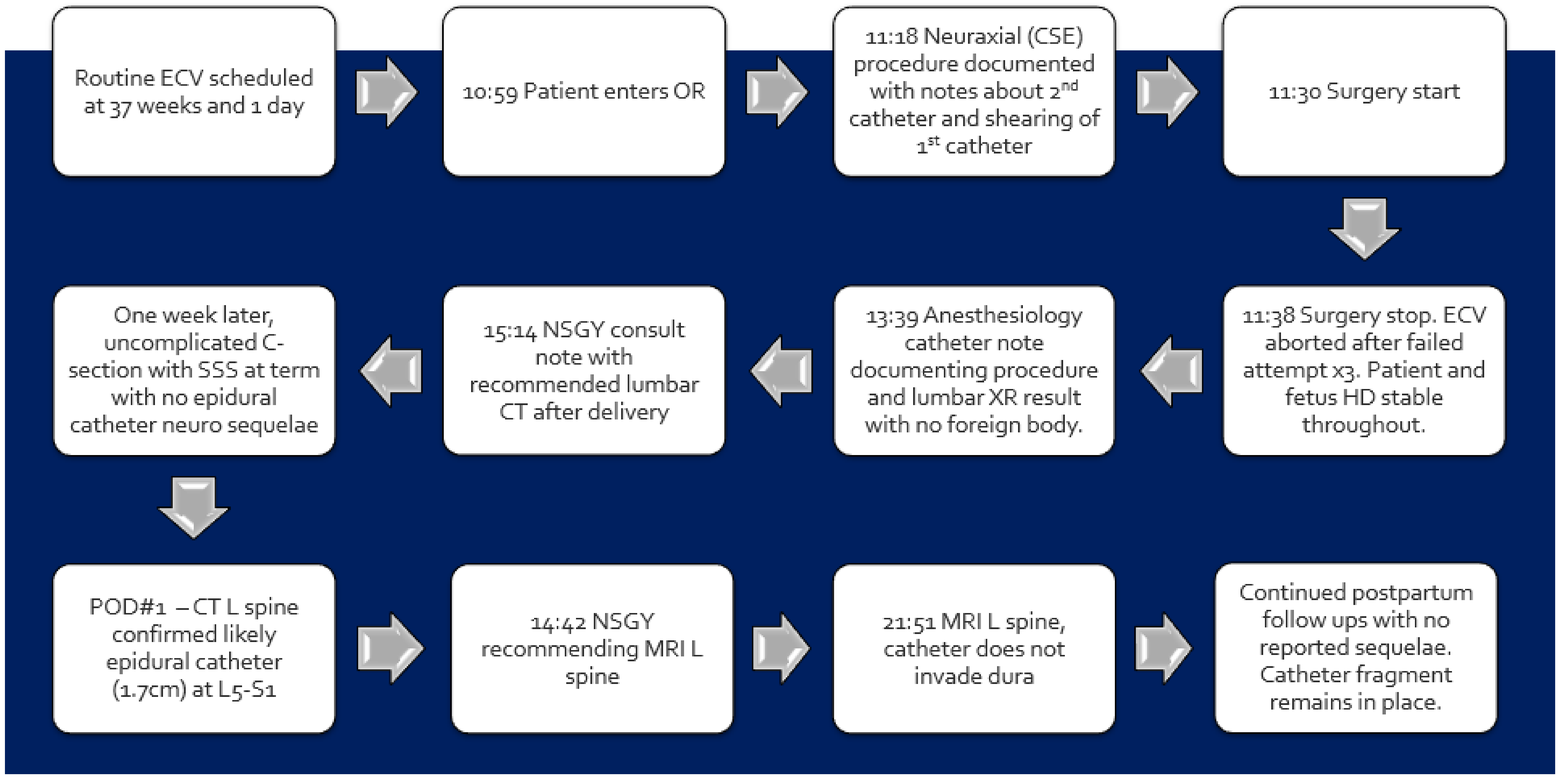
PROCESS MAP OF EVENTS



Epidural Catheter Removal

- The Touhy needle was still in place during attempts at initial catheter removal.
- An epidural or spinal **catheter may shear and break off if the catheter is withdrawn through a needle**.
- If the catheter must be withdrawn, the **needle and catheter should be withdrawn as a unit**.

Catheter Fragment Management

- Rarely, catheters do break on removal. We favor aggressive attempts to remove broken catheters located in the subarachnoid space.
- **However, it may be unnecessary to remove broken catheters located in the epidural space; rather, in these circumstances, the patient can be informed of the complication and observed over time.**
- **The incidence of catheter migration or other delayed sequelae appears to be low.**
- Imaging (radiography, computed tomography, magnetic resonance) may help identify the precise location of a broken catheter.

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Outcome

- To date, the patient has no neurologic or systemic sequelae from the retained epidural catheter fragment (1.7cm). The plan is to follow up at 6 months and 1 year.

Clinical Imaging Decisions

- MRI spine imaging has traditionally been a poor choice for ferromagnetic catheters because of metallic artifact as well as risk of neural damage secondary to heating of a wire-enforced catheter in the epidural space. There have been no documented cases of injury occurring secondary to MRI in a patient with a sheared epidural catheter.
- CT imaging is preferred as an initial imaging modality for determining catheter location.

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SHARING EXPERTISE

MRI Safety Information

MR Conditional The PERIFIX FX *Springwound* Catheter is MR Conditional. For all MR Examinations: A patient implanted with the PERIFIX FX Springwound Epidural Catheter may be safely scanned at 1.5T or 3.0T under the following conditions. Failure to follow these conditions may result in injury.

Parameter	Condition/Information
Device Configuration	Closed-Tip Multi-Port or Open-Tip Uniport Not Filled or Filled with Any Liquid or Any Drug
Static Magnetic Field Strength (B0)	1.5T and 3.0T
Maximum Spatial Field Gradient	20 T/m (2000 Gauss/cm) 1.5T 17 T/m (1700 Gauss/cm) 3.0T*
RF Excitation	Any
RF Transmit Coil Type	Any
Operating Mode	Normal Operating Mode
RF Conditions	Whole-Body Averaged SAR ≤ 2 W/kg
Scan Duration	2 W/kg whole-body averaged SAR for 60 minutes of continuous RF (a sequence or back to back series/scan without breaks).
Scan Regions	Any landmark is acceptable.
Image Artifact	The presence of the PERIFIX FX *Springwound* Epidural Catheter may produce an image artifact. Some manipulation of scan parameters may be needed to compensate for the artifact.
Additional Instructions	Ensure proper and secure fixation of the PERIFIX FX *Springwound* Nerve Block Catheter to the patient using an appropriately applied dressing. Failure to ensure the secure fixation of the PERIFIX FX *Springwound* Nerve Block Catheter to the patient's skin can result in a displacement of the catheter. * For patient landmarks that will place the catheter inserted region inside the MRI bore, and for patients positioned prone or on their side, the edge of the body at the catheter location must be at least 10 cm inside from the wall of the magnet bore.

Figure 2. MRI conditional parameters for PERIFIX FX Springwound Catheter used for CSE procedure

Epidural Catheter Removal Learning Points

What should be done during routine removal of an epidural catheter? What are the correct steps if one fractures during placement or removal?

1. use slow, continuous force at all times
2. discontinue application of force if catheter begins to stretch and reapply traction several hours later
3. place patient in the same position as insertion
4. place patient in lateral decubitus position
5. attempting remove in extreme flexion OR extension if the previous interventions are not efficacious
6. attempt removal after injection of preservative-free normal saline through the catheter
7. consider CT to identify the etiology of entrapment
8. leave a retained catheter in place in adult patients
9. provide education regarding "red flags" sequelae
10. Neurosurgery consultation for all cases of catheter fragment is in the spinal canal

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