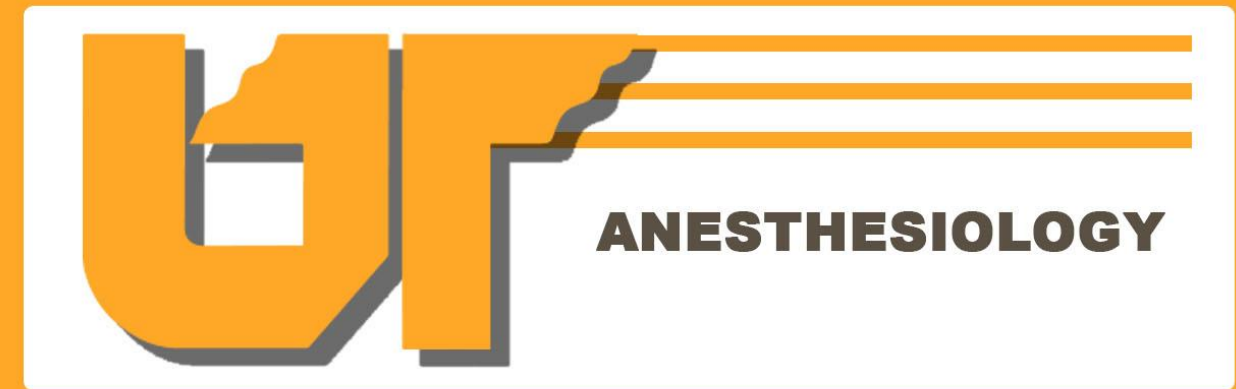




Simultaneous Intravascular Migration and Knot Formation of an Epidural Catheter: A Rare Mechanical Complication

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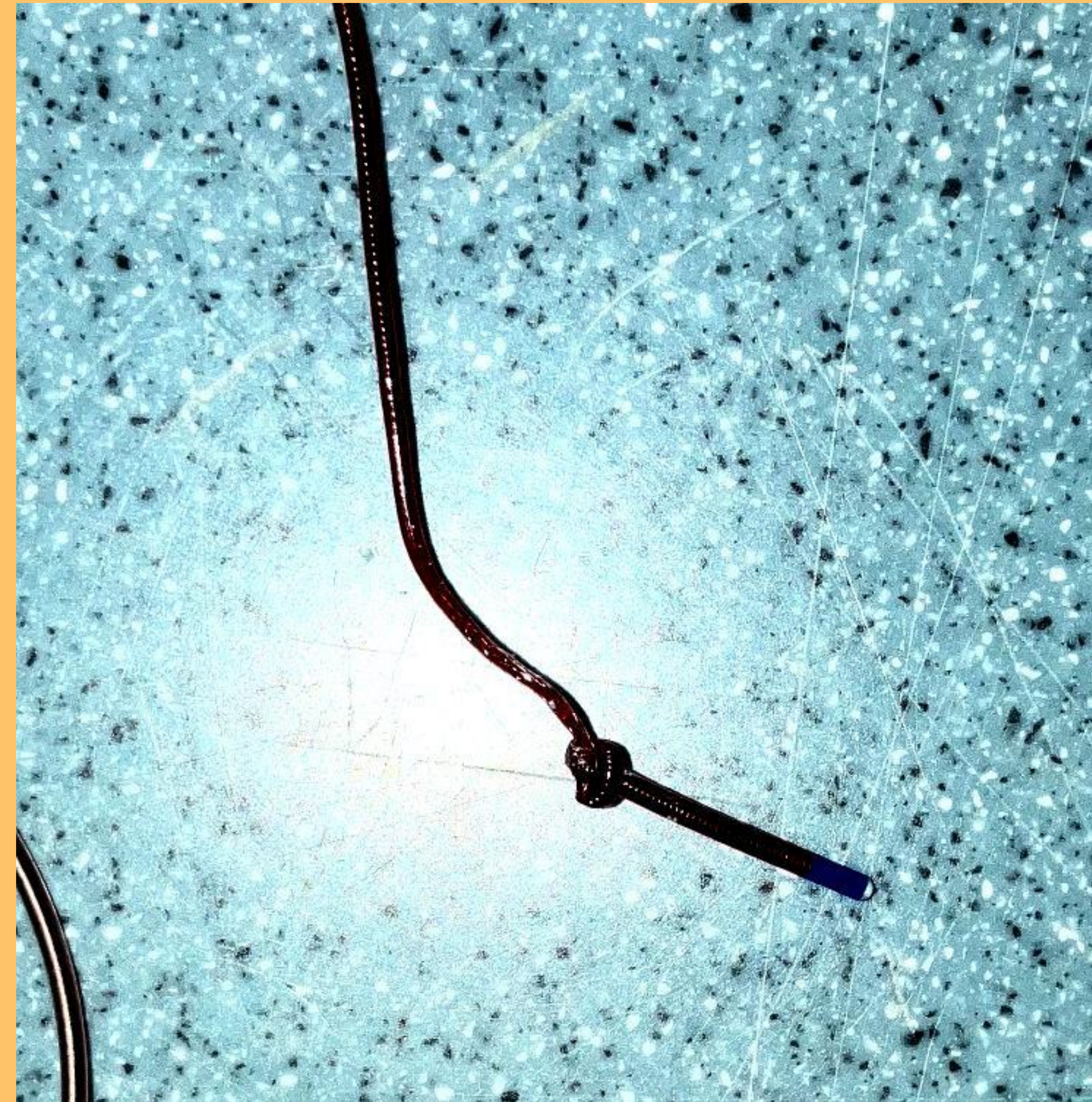


Learning Objectives:

- Recognize signs of delayed intravascular migration of an epidural catheter after initially normal placement
- Identify risk factors and mechanisms contributing to epidural catheter knot formation
- Describe safe management strategies when encountering resistance during catheter removal
- Apply preventative techniques to reduce mechanical complications of neuraxial anesthesia

Case Report:

- A 32-year-old ASA II patient underwent epidural catheter placement at the L4–L5 level for labor analgesia. Loss-of-resistance to saline was achieved without difficulty, and the catheter was advanced to 5 cm past depth of loss-of-resistance. Initial aspiration was negative, and a test dose produced no hemodynamic or neurologic changes.
- Approximately 2 hours later, the patient reported worsening pain with contractions. Examination revealed:
 - 9/10 pain with contractions
 - Tinnitus
 - Sensory level to cold above L1
- Repeat aspiration yielded blood, raising concern for intravascular migration.
- Catheter removal was attempted but met with resistance. After multiple repositioning attempts, the catheter was successfully removed using slow, steady traction. Inspection revealed a distal knot.
- The patient experienced no neurologic deficits, bleeding, or vascular complications at time of discharge.



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Discussion:

- This case highlights several important clinical considerations:
- Delayed intravascular migration can occur despite initially negative aspiration and test dosing; inadequate analgesia should prompt reassessment
 - Advancing the catheter beyond recommended depth (typically 3–5 cm) may increase the risk of looping and knot formation
 - Resistance during catheter removal should raise suspicion for mechanical complications such as knotting
 - Forceful traction must be avoided due to risks of:
 - Catheter fracture
 - Retained fragments
 - Vascular or neurologic injury

Best Practices Include:

- Limiting catheter advancement to 3-5 cm
- Frequent reassessment of analgesia quality
- Gentle, patient repositioning during difficult removal
- Maintaining high suspicion for delayed complications

Conclusion:

- Simultaneous intravascular migration and knot formation of an epidural catheter is an exceptionally rare but clinically significant complication (Approximately 1 in 3.3 million). Early recognition, careful management, and adherence to safe neuraxial techniques are critical to minimizing patient harm and improving outcomes.