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Hemodynamic instability and dyspnea during intrathecal drug delivery system evaluation and revision: a case report of high spinal



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Introduction

Intrathecal drug delivery systems (ITDD) have been used for the management of intractable chronic pain.

Primary Benefits of ITDD:	Common Risks of ITDD:
Reduced systemic side effects	Pump or catheter malfunction
Increased efficacy	Other device malfunctions or biologic complications



When pump malfunction is suspected, diagnostic approaches to evaluate their function include:

- Catheter dye study & pump roller study
- Complication of these studies (intrathecal bolus injections) include unintended high spinal anesthesia (monitor for acute respiratory compromise, hypotension, or other hemodynamic instability)

Case Report

A **74-year-old male with a history of chronic, severe, intractable, lower back pain and lower extremity pain managed with ITDD, catheter tip placed at T8 with hydromorphone and bupivacaine** was found to have discordant pump volumes at his drug refill appointment (expected 19.3mL, actual aspirated 0 mL), concerning for possible pump malfunction.

During the catheter dye study:

- CSF could not be aspirated from pump side port. Contrast was injected to evaluate catheter integrity.
- A few minutes following the injection of contrast, the patient reported feeling **dyspneic**, unable to cough, and unable to take a deep breath, as well as having mild **hypotension**, and within 10 minutes complained of **foot paresthesia**. Sensory and motor testing demonstrated a **sensory block to T5 and moderate weakness in both lower extremities**.
- The anesthesia team suspected this episode of acute dyspnea, hypotension, and sensory/motor symptoms may be due to **high spinal from the bolus** given during the study. The patient received a bolus of 0.26 ml of medication solution (was 2% hydromorphone and 1.5% bupivacaine, meaning the patient received **5.2mg of hydromorphone and 3.9mg of bupivacaine**) with contrast injection at **T8 level**.
- Vasopressor boluses were given for hypotension. His shortness of breath and hypotension improved within 15 minutes. Within 45 minutes, his sensory block resolved, and the surgical and anesthesia team decided to proceed with pump revision under general anesthesia, as the pump roller study indicated malfunction of pump. The remainder of the procedure was without complications.

Of note, during a previous catheter study under general anesthesia, the patient had an episode of hypotension treated with phenylephrine, then a norepinephrine infusion, which is now hypothesized to be caused by another high spinal.

Key Takeaways

- ITDD systems can be used in patients with intractable chronic pain but carry a risk of pump malfunction.
- During catheter dye & pump roller studies for pump malfunction, Unintended high spinal anesthesia can occur with intrathecal bolus injections, potentially causing acute respiratory compromise, hypotension, or other hemodynamic instability.
- To prevent high spinal or drug toxicity in ITDD studies, use the lowest possible drug concentrations and ensure appropriate catheter placement.
- To minimize consequences of high spinal, anticipate urgent management of hypotension and respiratory compromise.

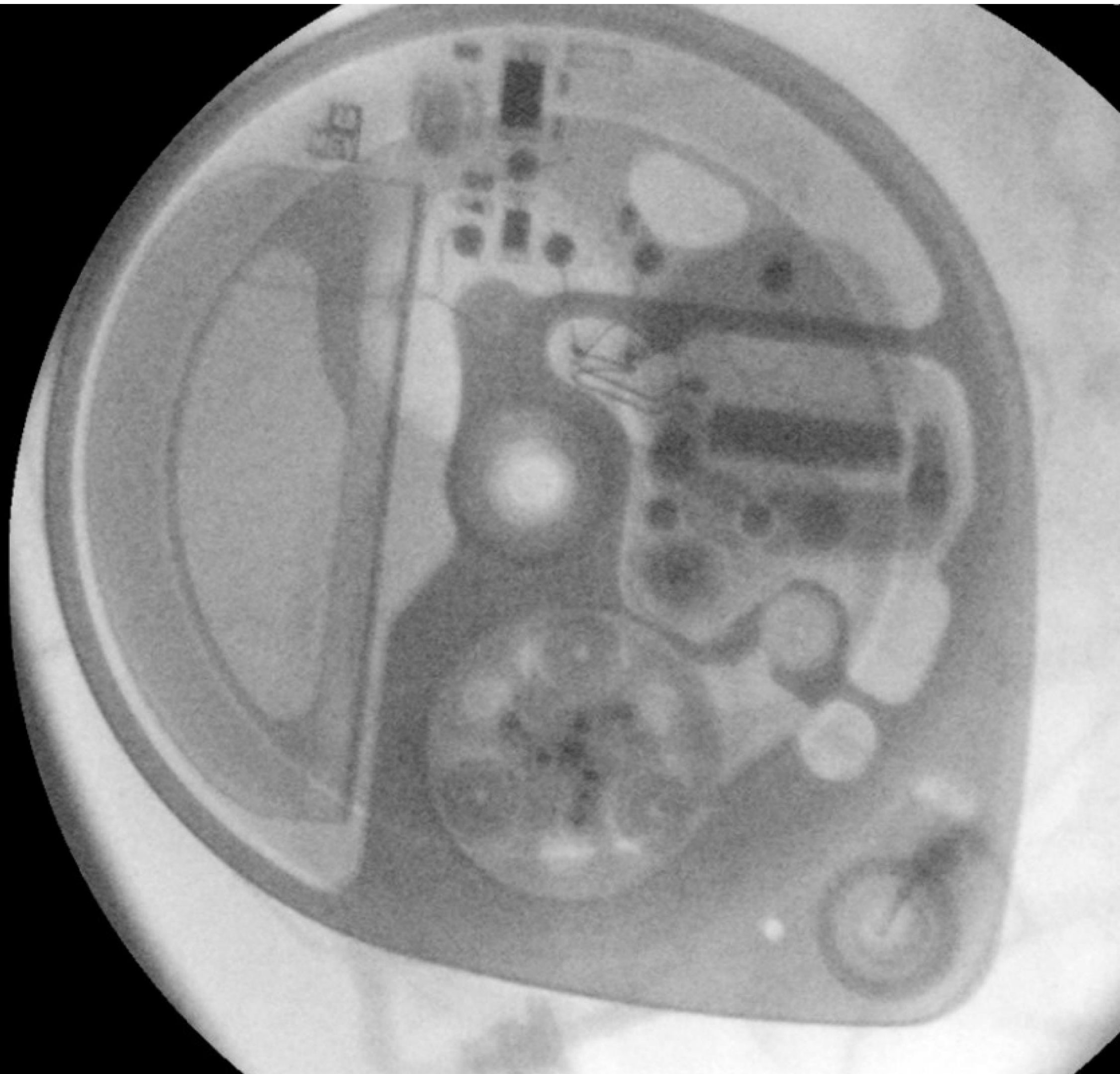


Image 1: Intrathecal pump with side port access for catheter dye study.

Results & Discussion

This case demonstrates the importance of recognizing and addressing potential high spinal anesthesia during intrathecal pump procedures, especially when boluses including local anesthetics and opioids are administered. Despite careful imaging and planning, certain anatomical considerations can elevate this risk. Intrathecal catheter tips are usually placed in the mid to low thoracic spine for efficacy. This can predispose to a more extensive or higher block than anticipated, even with low doses of local anesthetic and/ or opioid. For any episodes of hemodynamic instability and/or dyspnea in the setting of ITDD studies or revision, providers should maintain a high index of suspicion for high spinal block.

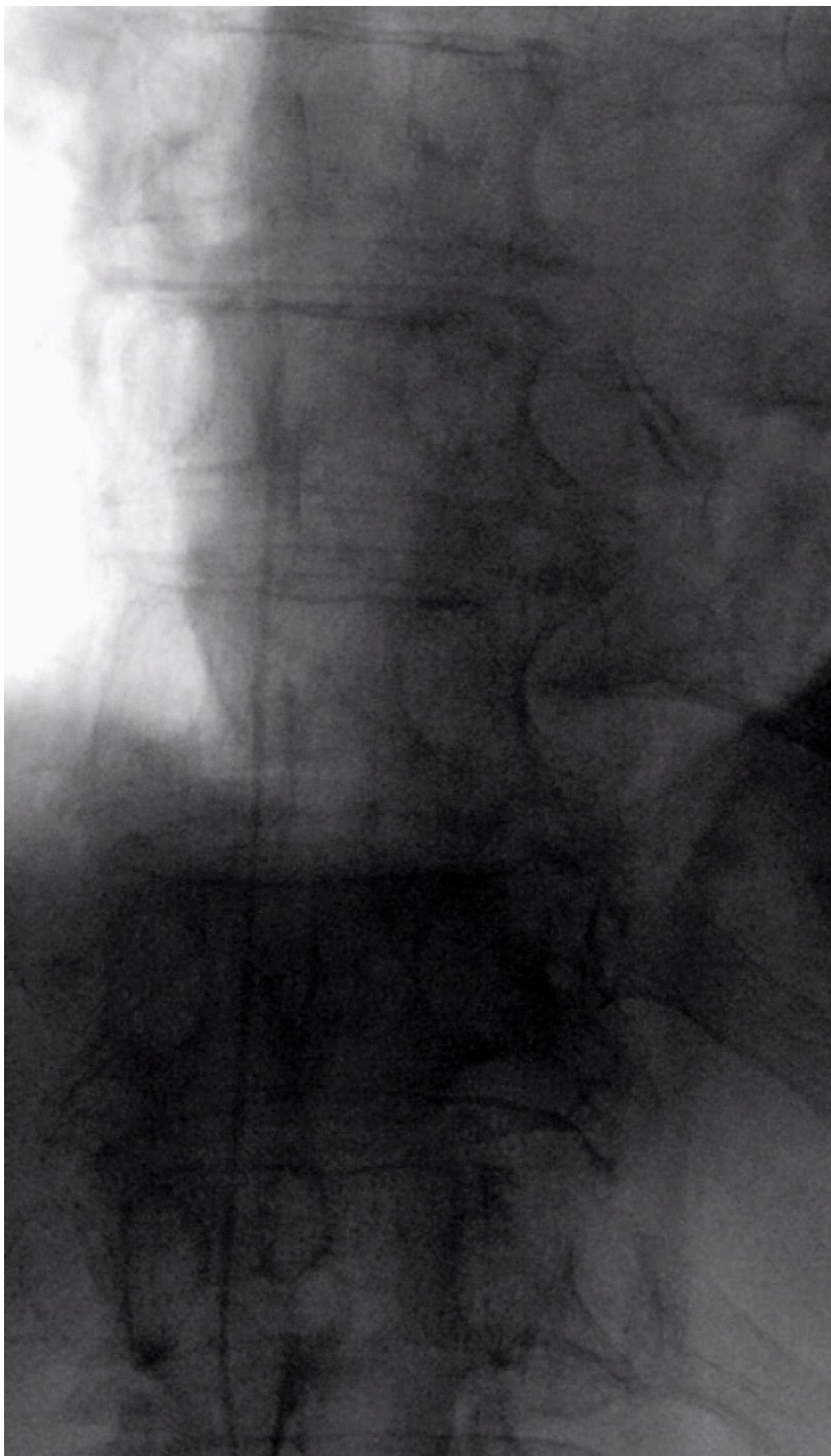


Image 2: Intrathecal catheter with tip at T8/9 level and contrast spread at the tip.

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Full
abstract &
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