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Inadvertent epidural administration of ceftriaxone in a post-cesarean section patient during analgesia top-up

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Abstract

A 28-year-old ASA II woman underwent elective cesarean section under epidural anesthesia (15 mL 0.5% bupivacaine with 4 µg/mL fentanyl at L3-L4). Postoperatively, she received epidural analgesia with 0.1% bupivacaine plus fentanyl infusion and 1 g IV ceftriaxone 12 hourly for prophylaxis. Six hours after delivery, a nurse inadvertently injected 1 g (10 mL of 10%) ceftriaxone epidurally instead of local anesthetic, due to an unlabeled syringe mix-up. Immediately, the patient experienced severe pain at the site of incision and lumbar region Numeric Rating Scale (NRS 10/10), with blood pressure rising from 118/68 to 156/92 mmHg and heart rate from 76 to 112 bpm, consistent with intense pain and sympathetic surge rather than direct neurotoxicity. IV pentazocine 30 mg and IM diclofenac 75 mg resolved pain within 3 minutes; moderate sedation (Ramsay 3) occurred but resolved quickly, with vitals stabilizing (Blood Pressure, BP 124/74 mmHg; Heart Rate, HR 88 bpm). Neurological examination remained normal. The epidural filter was flushed with 5 mL saline, and analgesia resumed safely after 30 minutes. No neurological deficits, fever, or infection developed over 48 hours of monitoring; she was discharged on day 4 with no sequelae at 18-weeks follow-up. This case illustrates medication errors in obstetric units and contrasts the benign outcome of epidural cephalosporin exposure (mild, transient symptoms) with severe risks of intrathecal administration. Strict safety protocols are essential.

Key words: epidural, ceftriaxone, cesarean section, analgesia.

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Introduction

Epidural analgesia is standard for post-cesarean pain control, with nurses often performing routine top-ups.[1] Medication mix-ups, particularly between epidural local anesthetics and IV antibiotics like ceftriaxone, remain a hazard in busy obstetric settings due to similar syringes or unlabeled preparations.[2,3] Ceftriaxone is routinely used for surgical prophylaxis, but epidural administration is rare and its safety poorly documented. Animal data indicate cephalosporins are neurotoxic intrathecally at high doses via GABA antagonism, potentially causing seizures.[4,5] Human epidural cases are scarce and typically report only mild, self-limited symptoms, unlike intrathecal errors linked to seizures and up to 17% mortality.[6,7] This report details inadvertent epidural injection of 1 g (10 mL of 10%) ceftriaxone post-cesarean, its effects, and factors explaining the favourable outcome.

Case Report

A written informed consent was taken from this 28-year-old ASA II woman (68 kg; Body Mass Index, BMI 26 kg/m²) who underwent elective lower-segment cesarean for previous scars under epidural anesthesia (15 mL 0.5% bupivacaine +4 µg/mL fentanyl at L3-L4) to publish this case. Surgery was uneventful (Apgar 8/9). Postoperative care included 0.1% bupivacaine +4 µg/mL fentanyl infusion (10 mL 2 hourly top-ups, 5 mL PRN) and IV ceftriaxone 1 g 12 hourly. Six hours post-delivery, a nurse injected 10 mL of 10% reconstituted ceftriaxone (100 mg/mL, prepared for IV use but unlabeled) epidurally, mistaking it for bupivacaine. The patient immediately reported severe pain at the incision site and lumbar region (Numerical Rating Scale, NRS 10/10); Blood Pressure (BP) rose to 156/92 mmHg and Heart Rate (HR) to 112 bpm from baselines of 118/68 mmHg and 76 bpm. IV pentazocine 30 mg and IM diclofenac 75 mg relieved pain in 3 minutes. Moderate sedation (Ramsay 3) occurred but she remained arousable; vitals normalized within 10 minutes. Neurological exam was normal. The catheter was flushed with 5 mL saline. Analgesia resumed after 30 minutes (8 mL 0.125% bupivacaine + fentanyl), with excellent control (NRS≤2) thereafter. Serial neurological checks for 48 hours were normal; no fever, meningism, or infection occurred. Labs remained stable (White Blood Cells count, WBC 11.2×10^{9}□/L; C-Reactive Protein, CRP 28 mg/L). Discharge occurred on day 4; at 2-week follow-up patient had lower backache NRS 5-6 and numbness at right lower limb which necessitated a review by a neurologist who requested Magnetic Resonance Imagining (MRI) which showed a normal study. She was given tablets (tabs) aceclofenac twice daily and levofloxacin 500 mg twice daily for 5 day and tabs chymoral 40 iu daily for 7 days with relief within one week. The 18-week follow-up showed no issues.

Discussion

This error during nursing-led top-up highlights risks from unlabeled syringes and workload.[2,3] Wrong-drug epidural errors, though less common than analgesia failures (2-17%), carry serious preventable consequences.[8-10] Despite receiving 1 g ceftriaxone

epidurally - exceeding animal intrathecal toxic doses (LD50 ~100 mg in rats via GABA antagonism)[4,11,12] - no neurological harm occurred. Explanatory factors include: dilution and absorption in the epidural space (fat, venous plexuses), limiting spinal cord exposure; ceftriaxone's high protein binding (95%) and molecular size restrict dural diffusion,[13-16] slower pharmacokinetics compared to intrathecal bolus, avoiding seizure-threshold peaks.[17,18]

Clinical evidence

A 2024 review showed intrathecal cephalosporins cause severe complications, while epidural cases (n=2) had no lasting harm; prior epidural cefazolin/ampicillin reports noted only transient pain/paresthesia.[5,7,19,20] Rapid systemic clearance in a young, healthy postpartum patient (half-life ~8 hours).[16,21] Sedation was attributable to pentazocine, not ceftriaxone neurotoxicity (which causes encephalopathy/seizures, especially in renal failure).[11,22] Epidural cephalosporin outcomes appear far safer than intrathecal or other agents like vancomycin/tranexamic acid[2,3] Post-incident, the unit implemented color-coded syringes, verbal read-back, separate prep areas.

Conclusions

Accidental epidural 1 g ceftriaxone caused acute severe pain and transient hemodynamic changes with transient neurological sequelae, likely due to favorable pharmacokinetics, dilution, and prompt management. This underscores the need for robust medication safety protocols in obstetric units, where epidural cephalosporin exposure appears markedly safer than intrathecal.

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