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ORIGINAL ARTICLE

# Complications of 761 short-term intrathecal macrocatheters in obstetric patients: a retrospective review of cases over a 12-year period

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## ABSTRACT

**Background:** A continuous spinal catheter is a reliable alternative to standard neuraxial techniques in obstetric anesthesia. Despite the potential advantages of intrathecal catheters, they remain underutilized due to fear of infection, nerve damage or post-dural puncture headache. In our tertiary care center, intrathecal catheters are either placed intentionally in high-risk obstetric patients or following inadvertent dural puncture using a 19-gauge macrocatheter passed through a 17-gauge epidural needle.

**Methods:** A retrospective review of 761 intrathecal catheters placed from 2001 to 2012 was conducted. An institutional obstetric anesthesia database was used to identify patients with intrathecal catheters. Medical records were reviewed for procedural details and complications.

**Results:** There were no serious complications, including meningitis, epidural or spinal abscess, hematoma, arachnoiditis, or cauda equina syndrome, associated with intrathecal catheters. The failure rates were 2.8% (3/108) for intentional placements and 6.1% (40/653) for placements following accidental dural puncture. The incidence of post-dural puncture headache was 41% (312/761) and the epidural blood patch rate was 31% (97/312).

**Conclusions:** This review demonstrates that intrathecal catheters are dependable and an option for labor analgesia and surgical anesthesia for cesarean delivery. Serious long-lasting complications are rare.

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**Keywords:** Intrathecal catheter; Continuous spinal catheter; Obstetric anesthesia; Labor pain

## Introduction

Continuous spinal anesthesia has several potential advantages over epidural and single-shot spinal techniques, especially in high-risk obstetric patients. The ability to obtain dense surgical anesthesia rapidly and reliably, with the flexibility of extending neuraxial block level and duration, is useful for emergency cesarean delivery (CD).<sup>1–4</sup> Furthermore, placement of an intrathecal catheter (ITC) after accidental dural puncture (ADP) may avoid complications associated with repeated epidural attempts, including the 4–9% risk of a second ADP.<sup>5,6</sup> Although studies have revealed conflicting results, there is a trend towards a reduced incidence of epidural blood patch (EBP) with ITC.<sup>5,7,8</sup>

In our tertiary care center, ITCs are utilized for high-risk obstetric patients including those with morbid

obesity, severe cardiopulmonary disease, spinal abnormalities, or following ADP. This study reviews the complications of 761 parturients who had an ITC for labor analgesia and/or anesthesia for CD.

## Methods

After Institutional Review Board approval, all obstetric patients who had an ITC placed for labor analgesia or CD anesthesia from 2001 to 2012 were identified retrospectively using the division of obstetric anesthesia's quality assurance database. Anesthetic and obstetric records were reviewed for: indication for initial catheter placement (labor analgesia or CD anesthesia), reason for ITC placement (intentional or after ADP), lumbar level of ITC placement, maternal body mass index (BMI) at delivery, mode of delivery and duration of catheter placement.

Medical records from the anesthesia, obstetric, and neurology services in the peripartum and postpartum periods were reviewed for post-dural puncture headache

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(PDPH), meningitis, spinal or epidural abscess, spinal or epidural hematoma, and other neurological complications defined as new onset numbness, paresthesia, or sensory loss or motor weakness within one week of ITC placement. Imaging results, duration of complications and treatment were recorded. At our institution, following ADP, patients are followed by the anesthesia service daily for one week (in person while inpatient, then via daily telephone calls after discharge). Patients who receive an EBP are followed for five days following the procedure.

### Statistical analysis

Data were analyzed using SPSS version 22 (IBM Corp, Armonk, NY, USA). Type I error rate was set to 5%, and  $P < 0.05$  was considered statistically significant. Descriptive statistics, including the mean, median, standard deviation, and frequencies, were calculated for the age, BMI, length of time of indwelling catheters, mode of delivery, intentional and accidental puncture, PDPH, and EBP. Patients were categorized into three groups according to BMI values: non-obese (BMI  $< 30$  kg/m<sup>2</sup>); obese category I (BMI  $\geq 30$  and  $< 35$  kg/m<sup>2</sup>); and obese categories II and III (BMI  $\geq 35$  kg/m<sup>2</sup>). Secondary analysis with chi-squared tests was performed to determine

the association between BMI and mode of delivery, PDPH rates and EBP rates.

### Results

A total of 761 patients had ITC placement during the study period, of which 653 were placed after ADP and 108 were intentional ITC placements. The most commonly documented reasons for intentional ITC were: obesity (53.7%), with BMI ranging from 38–81 kg/m<sup>2</sup>; difficult epidural placement or failed epidural (26.9%); cardiopulmonary disease (13.9%); anatomic abnormalities of the spine (3.7%). The remaining 1.9% of catheters were placed for emergency CD to achieve rapid neuraxial anesthesia and avoid general anesthesia (Table 1). Body mass index had a positive association with intentional ITC placement and CD (Tables 2 and 3) and a negative association with ADP, all of which were statistically significant.

Povidone iodine skin preparation was used before catheter placement. The majority of catheters were placed with 17-gauge Tuohy needles and 19-gauge single orifice epidural catheters (Arrow FlexTip Plus<sup>®</sup> Epidural Kit). A small subset of cases were performed with 18-gauge Tuohy needles and 20-gauge multiorifice epidural catheters (B Braun PERIFIX<sup>®</sup> Continuous Epidural Anesthesia Tray). As documented in the anesthesia record, ITC placement was performed at L1–2 (0.3%), L2–3 (0.7%), L3–4 (43.4%), L4–5 (32.2%), L5–S1 (0.1%) interspaces, and was unspecified in 23.4% cases. Catheters were threaded 3–5 cm into the intrathecal space.

Patients who had an ITC placed for labor initially received a bolus of bupivacaine 1.25 mg and fentanyl 15 µg, followed by a continuous infusion of bupivacaine 0.1% with fentanyl 2.5 µg/mL at 2–3 mL/h. Patients who had an ITC for CD received hyperbaric bupivacaine 0.75% in incremental doses to achieve a T4 anesthetic level to pinprick sensation. Fentanyl 15–20 µg and preservative free morphine 0.25–0.3 mg were injected through the ITC before administration of bupivacaine.

Intrathecal catheters were removed in the labor room following vaginal delivery or in the operating room (OR) immediately postoperatively. Catheters remained in place from 24 min to 34 h 10 min, with a mean duration of 5 h 13 min. Duration was not recorded in four patients.

**Table 1 Documented indications for intentional intrathecal catheter placement**

Obesity	58 (53.7%)
Difficult epidural placement or failed epidural	29 (26.9%)
Cardiac disease	9 (8.3%)
Cardiomyopathy	5
Severe aortic stenosis	1
Aortic stenosis, aortic insufficiency	1
Mitral stenosis, mitral insufficiency	1
Atrial septal defect, ventricular septal defect	1
Pulmonary disease	6 (5.6%)
Cystic fibrosis	3
Pulmonary hypertension	2
Severe preeclampsia with pulmonary edema	1
Anatomic	4 (3.7%)
Spinal surgery	2
Severe scoliosis	2
Urgency	2 (1.9%)

Data are number (%).

**Table 2 Rates of intrathecal catheter placement as a function of body mass index**

	BMI $< 30$ kg/m <sup>2</sup>	BMI $\geq 30 < 35$ kg/m <sup>2</sup>	BMI $\geq 35$ kg/m <sup>2</sup>	Total	<i>P</i> value
Intentional ITC	18 (15.8%)	15 (13.2%)	81 (71.0%)	114	$< 0.0001$
ITC after ADP	243 (37.7%)	199 (30.9%)	202 (31.4%)	644	$< 0.0001$

Data are number (%).

BMI: body mass index; ITC: intrathecal catheter; ADP: accidental dural puncture.

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