Failure after cerebrospinal fluid flow and success after no cerebrospinal fluid flow during spinal anesthesia induction for intrapartum cesarean section
–A report of two cases–

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We report on failed spinal anesthesia (SA) after free flow of cerebrospinal fluid (CSF) and successful SA after no free flow of CSF in SA for laboring parturients undergoing emergency cesarean section (CS). We introduced a 25-gauge Sprotte type spinal needle for anesthesia for case 1 and confirmed backflow and aspiration of CSF. We injected 10 mg bupivacaine plus 15 μg fentanyl. However, sensory and motor block were not observed. During SA for case 2, a convincing dural “pop” was felt but without flow of CSF. Injection of 10 mg bupivacaine and 15 μg fentanyl produced successful sensory and motor block suitable for CS. The failure or success of SA in these intrapartum CS cases ran contrary to our expectations and could be related to the use of pencil-point needle and movement of the dura mater during labor. (Anesth Pain Med 2017; 12: 137-139)

Key Words: Cerebrospinal fluid, Cesarean section, Spinal anesthesia.

Spinal anesthesia (SA) is a widely used anesthetic technique for cesarean section (CS). We expect success of anesthesia if free flow of cerebrospinal fluid (CSF) is observed and failure if not during SA induction. This paper presents cases of unexpected failure and success of SA in parturients undergoing emergency intrapartum CS together with possible mechanisms.

CASES REPORT

Case 1

A 37-year-old pregnant woman (height = 167 cm, weight = 65 kg) at 39+3 weeks of gestation was in labor and was scheduled for intrapartum CS with a diagnosis of failure to progress. She denied having a medical or surgical history except for an appendectomy, and preoperative laboratory results were within normal ranges. We performed a routine pre-anesthetic evaluation and did not find problems associated with her airways. She experienced regular pain at 2-minute intervals. We decided to perform SA for cesarean section. A 25-gauge Sprotte type spinal needle with pencil-point tip (Pencan®, B.Braun, Germany) was placed by a fourth-year anesthesia resident using a midline approach in the L3-4 interspace with the patient in the left lateral decubitus position [1]. After observing free flow and aspiration of CSF, 10 mg of 0.5% hyperbaric bupivacaine plus 15 μg fentanyl was administered into the subarachnoid space (SAS). At the end of the injection, there was no aspiration of CSF by the spinal needle.

The patient did not report warm or tingling sensations in her legs. Sensory block to coldness was assessed at 1 min intervals using a cotton swab doused with alcohol. Loss of pain sensation was tested by pinprick (18-gauge needle) every 2 min. Ten minutes after injection of local anesthetic, neither sensory nor motor blockade were observed. While labor pain continued, general anesthesia for CS was induced, and a
female baby was delivered with Apgar scores of 9 and 10 at 1 and 5 min, respectively. Anesthesia lasted 64 minutes without any problems. After the patient regained consciousness in the recovery room, no sensory or motor block was observed.

Case 2
A 35-year-old pregnant woman (height = 163 cm, weight = 67 kg) was scheduled for emergency CS at 40+2 weeks of gestation due to impending fetal distress. She had no significant past medical history or present illness. Labor pain continued regularly at 3-minute intervals. SA for CS was performed. The patient was placed in the left lateral decubitus position, and a 25-gauge Sprotte type needle with pencil-point tip (Pencan®, B/Braun, Germany) was introduced in the L3-4 intervertebral space via midline approach without bony resistance by attending anesthesiologist. A dural “pop” (a sudden yielding sensation) was felt without flow of CSF. Another attempt was made, and “pop” were experienced, but we could not determine free flow of CSF. The needle was rotated counterclockwise 90° but did not achieve free flow of CSF. Episodes of fetal bradycardia were observed from the parturient, so delaying the operation was not desirable. A mixed solution of 10 mg of 0.5% hyperbaric bupivacaine and 15 µg fentanyl was administered into the SAS. During injection, we did not feel additional resistance during routine injection of SA, and pain during injection was not observed. We did not check free flow of CSF at the end of injection of the drug.

In the supine position, the patient reported a warm sensation in her lower extremities and disappearance of labor pain. We checked sensory block to coldness with a cotton swab doused with alcohol and pain sensation by pinprick. At 7 min after injection, the highest sensory block to coldness and to sharp pain reached the T4 and T6 levels, respectively. Sensory block height after delivery (coldness) was at the T3 dermatome. Cesarean section was performed without requirement of any additional analgesics.

DISCUSSION
We observed failure and success of SA in parturients undergoing emergency cesarean section. The results of these cases ran contrary to our expectations; we observed no sensory or motor block after observation of free flowing CSF and aspiration during SA in case 1 and successful anesthesia without observation of free flowing CSF in case 2.

A pencil-point Sprotte needle was used, and both patients reported labor pain. It has been suggested that the use of pencil-point needle could be the cause of SA failure because of differences in the location of needle tip and the side hole of the needle [2].

Labor pain could be related to unexpected results of SA. The dura is a membrane that can move with application of epidural pressure [3]. The increase in epidural space pressure is synchronous with intrauterine pressure during uterine contractions [4]. In addition, Corli et al. [5] reported that subjective pain assessments are correlated with the peak of the curve in the tocography monitor. In summary, labor pain can affect the movement of the dura.

In case 1, adequate CSF backflow and aspiration were identified, but no sensory block was achieved. In instances of intrapartum CS, this can be related to movement of the dura during labor and the use of a pencil-point needle [2,3]. When CSF backflow and aspiration are observed in SA for intrapartum CS during a period of no labor pain, the side hole of the pencil-point needle might be placed in the SAS. However, when local anesthetic is injected during a period of labor pain, the side hole of the pencil-point needle can be placed in the epidural or subdural space because the increased epidural space pressure during labor can push the dura toward

![Diagram](image-url)

**Fig. 1.** Possible position of the side hole of the pencil-point spinal needle. The hole is located in the subarachnoid space when the free flow of CSF is checked during induction of spinal anesthesia (A). Due to the epidural space pressure increase and ventral movement of the dura associated with increased labor pain (arrow), the side hole of the needle is located in the epidural or subdural space during injection of local anesthetics (B).
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Fig. 2. Possible position of the tip and side hole of the pencil-point spinal needle. The tip of the needle is located in the subarachnoid space, but the side hole is outside of the subarachnoid space when the free flow of CSF is checked during spinal anesthesia induction with ventral movement of the dura due to the epidural space pressure increase (arrow) (A). Due to the epidural space pressure decrease and dorsal movement of the dura associated with reduced labor pain, the side hole of the needle is located in the subarachnoid space during injection of local anesthetics (B).

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