

Use of Combined Spinal/Epidural Analgesia in an Obstetric Patient with Idiopathic Intracranial Hypertension and a Chiari Malformation Type 1

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Abstract

The anesthetic management of labor and delivery in a parturient with idiopathic intracranial hypertension (IIH) and Chiari Malformation Type-1 is complex and requires multidisciplinary input. The role of neuraxial analgesia (intraspinal, combined spinal-epidural, and epidural) with and without signs of elevated intracranial pressure (ICP) are examined, along with potential complications of dural puncture. We successfully managed labor analgesia in a parturient with idiopathic intracranial hypertension and Chiari Malformation Type-1 with a combined spinal-epidural technique (CSE). A CSE is a viable option in a parturient with IIH without active symptoms of elevated ICP.

Keywords: Idiopathic Intracranial Hypertension; Pregnancy; Obesity/complications; Anesthesia, Obstetrical/methods; Labor analgesia; Neuraxial analgesia.

Introduction

Idiopathic intracranial hypertension (IIH) is a chronic disorder of unknown etiology that most often occurs in obese women of childbearing age, suggesting that hormonal factors may play a role in pathophysiology (prevalence 2-12%) [1]. The diagnosis of IIH is based on findings of increased intracranial pressure (ICP, normal 6-25 cmH₂O) [2] with normal cerebrospinal fluid (CSF) composition, visual disturbances due to papilledema, and the absence of other intracranial abnormalities [1,3,4]. In parturients, it is occasionally associated with polycystic ovarian syndrome and empty sella syndrome [3, 5, 6]. One potential long-term effect is loss of vision [1, 3].

The Chiari Malformation Type 1 (CM-1) is an infrequently detected congenital anomaly (prevalence 0.5%) characterized by the downward displacement of the cerebellum with a tonsillar herniation below the foramen magnum that may be accompanied by syringomyelia, hydrocephalus, and increased ICP [4, 7]. There are significant similarities between CM-1 and IIH with similar demographics, clinical presentation, elevated ICP, including a high incidence of tonsillar ectopia in IIH and CM-1, and response to treatment [4, 8, 9]. Traditional therapies for IIH have varied in efficacy; they include administration of a carbonic anhydrase inhibitor/corticosteroid, serial lumbar punctures, or placement of a lumbar peritoneal shunt.

Currently, there is limited consensus on the management of neuraxial anesthesia (epidural, spinal, intrathecal catheter) for labor analgesia in cases of parturients with IIH [10-14]. We present a case of scheduled labor induction for a parturient with

IIH patient with a diagnosis of CM-1 in which effective management of labor analgesia was obtained with a combined spinal-epidural technique. The patient gave consent to publish the details related to her care.

Case

A 31-year-old G3P0020 female (5'1", 82 kg, BMI 38) at 38w1d presented for a scheduled labor induction secondary to chronic hypertension on labetalol and gestational diabetes treated with insulin. The past medical history was remarkable for a Chiari malformation Type 1, idiopathic intracranial hypertension (IIH), sleep apnea, empty sella syndrome, and polycystic ovarian syndrome. She was diagnosed with CM1 and idiopathic intracranial hypertension in 2015 and underwent a trial of acetazolamide for headache management that was discontinued due to side effects.

At 26 weeks of pregnancy, she was admitted for evaluation of intracranial hypertension after complaints of severe intermittent headaches that were exacerbated by coughing or bending over, associated with blurred vision, and ophthalmology findings of bilateral papilledema. Acetazolamide was not started as she could not tolerate it previously. At that admission, magnetic resonance venography was normal, and the brain magnetic resonance imaging revealed no tonsillar ectopia, intracranial mass effect, hydrocephalus, or extra-axial fluid collection. The MRI demonstrated a chronic partially empty sella with expansile remodeling - a nonspecific finding associated with IIH. A lumbar puncture by neurology in the lateral decubitus position

revealed an opening pressure of 28cmH₂O. Four mL of fluid was sampled for analysis (normal cell count, glucose, and protein). The closing pressure was 23mmHg. A positional headache occurred three days after the lumbar puncture and was treated conservatively.

On admission for labor induction, her blood pressure was 138/75 mmHg. Her neurologic exam was normal, with a pain score of 0/10. Her cervical examination was 2/50/-3 (cervical dilation, effacement, station) and soft. Labor induction was started per the protocol. On the morning after admission, neurology evaluated her with no note of headache, blurred vision, or neurological abnormalities. Approximately five hours later, when her cervical examination was 7/80/-1, she requested a labor epidural for increasing discomfort (6-7/10). She remained asymptomatic for headache and visual disturbances and was consented for a combined spinal-epidural (CSE) with the possibility of continuous spinal analgesia in case of accidental dural puncture. Using standard aseptic precautions in the right lateral decubitus position, a CSE was performed at L2-3. On the first attempt, a 17G Touhy® needle identified the epidural space with a loss of resistance to saline (7 cm depth). Clear CSF was observed through a 25G Pencan® spinal needle advanced through the epidural needle. After the slow withdrawal of 2 ml CSF, 2 mL 0.125% bupivacaine (5mg) with 15 mcg of fentanyl was injected intrathecally. A closed-end 20 G catheter was threaded and fixed at 14 cm at the skin. After a negative test dose with 3ml 1.5% lidocaine with epinephrine (1/200,000), an infusion of bupivacaine 0.125% with fentanyl (2mcg/ml) was started at a rate of 6 mL/hr. She remained comfortable with pain scores of 4-6 when she began pushing 6 hours after CSE placement. Ninety minutes later, she delivered a healthy 3.08kg newborn with Apgar scores of 1 and 9 without an episiotomy or lacerations. She did not experience any headaches or visual disturbances during the second stage of labor. After delivery, her pain was reported at 0-3/10, and she was able to care for her newborn. On the second day after delivery, they were discharged in the morning without complaints.

Discussion

Although IIH and CM1 are uncommon, there are special considerations for anesthetic management in parturients because of the increased ICP associated with these disorders. Both are concerning in parturients because of the additional physiological increase in ICP associated with pregnancy and the acute increases in ICP with delivery [3, 7, 10]. Key points in the anesthetic management of laboring parturients with CM-1 or IIH include (1) early analgesia to decrease painful uterine contractions to dampen elevations in ICP, (2) if elected, a slow titration of a bolus through the epidural should be administered to prevent undue extradural pressure and increases in ICP; (3) if symptomatic for elevated ICP then a vacuum-assisted vaginal delivery in the second stage of labor should be utilized to minimize increases in ICP during maternal Valsalva maneuvers [7,11].

A limited number of case reports/series have shown that epidural, spinal, or a combined spinal-epidural can be used successfully for labor analgesia for patients with IIH or CM-1

[7, 10-14]. Previous case reports have used intra-spinal catheters for delivery in patients with IIH for an inadvertent dural puncture, for those with elevated ICP or known significantly elevated ICP with serial CSF withdrawal during the pregnancy [11-14]. In these reports, the intraspinal catheter was helpful in the management of symptomatic IIH during delivery (headache and visual disturbances).

Since lumbar puncture for CSF drainage is a therapeutic modality for IIH, there is no contraindication to spinal anesthesia/analgesia in these patients. However, when using epidural techniques for labor analgesia and cesarean delivery, one should consider that the large volumes of medications administered into the epidural space for surgical anesthesia may carry a risk of acutely increasing ICP [3,10,11].

With the recent MRI not documenting CM-1 or tonsillar ectopia and the absence of signs or symptoms of increased ICP, we elected to perform a CSE to attain rapid onset of analgesia and allow for an epidural infusion instead of acute bolus for epidural analgesia. An intra-spinal catheter would have been an option with an inadvertent dural puncture or if there was perceived a need for CSF withdrawal to manage ICP. Furthermore, as she exhibited symptoms of a postural puncture headache (PDPH) with her last lumbar puncture, we felt that the risk of a PDPH from a large-bore dural puncture which has been reported in patients with IIH [12,14].

Although IIH and CM1 are uncommon, there are special considerations for anesthetic management in parturients with these disorders [10-14]. Though some of these patients may have an elevated ICP and there are often concerns for brain stem herniation, an important consideration is that there are no reports of this complication in these patients with controlled CSF removal for elevated ICP in IIH or intentional or inadvertent dural puncture for labor analgesia in either condition.

Conclusion

While parturients with symptomatic IIH have been successfully managed with intraspinal catheters to facilitate monitoring of ICP and therapeutic cerebrospinal fluid withdrawal, we report the successful management of labor analgesia for a patient without active signs or symptoms of increased ICP with a combined spinal-epidural technique. This technique provided for the rapid onset of analgesia and the extended analgesia via the epidural catheter for the remainder of labor and delivery without the risk of PDPH associated with intraspinal catheters.

Author Contribution

Venkata Damalanka, MD

Critical appraisal, significant contribution to background research, introduction, and discussion relating to Chiari Malformation Type-1 (CM-1), and editing of final content.

Nicole LeClair, DO

Critical appraisal of introduction, case presentation, and discussion, editing of final content.

Kai Mongan, MS

Significant contribution to background research of idiopathic intracranial hypertension (IIH) and the initial draft of the introduction and discussion relating to IIH. A significant

contribution to the integration of IIH and CM-1 into the introduction and discussion.

Peter Kovacs, MD

Major contribution to background information regarding IIH and the management of labor analgesia and delivery

Paul D. Mongan, MD (Corresponding author)

Primary provider regarding the development of the plan and patient care during delivery. A significant contribution to background research of IIH, primary author of the case presentation, significant contribution to the interim and final editing of the introduction, case management, and discussion.

Amie L. Hoefnagel, MD

Primary contribution of the direction of introduction and discussion, the coordination, and integration of work between all authors, and interim and final editing of the manuscript.

Conflict of Interest

This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue. The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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