

Case Report

Epidural Anesthesia for Cesarean Section for Parturient with Recently Diagnosed Asymptomatic Chiari Malformation Type I: A Case Report

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Abstract

Description

Chiari malformations (CMs) are congenital defects of the brain and skull that result in inferior or displacement of the cerebellum. There are four types of CMs distinguished by the severity of the anatomic defects and parts of the brain that protrude beyond the foramen magnum. Of these types, CM Type I (CMI) is the least severe. It is characterized by the downward displacement of the cerebellar tonsils beyond the foramen magnum by more than 5 millimeters and goes into the cervical spinal canal. CMI is the most common type with an incidence of 0.1-0.5% in the general population and a predominance in females. Given its relatively benign nature, CMI is often found incidentally or in adulthood when symptoms such as a headache or neck pain are present. It can be associated with syringomyelia or, less commonly, hydrocephalus. Although surgical decompression can be performed, most patients do not require surgical treatment.

CMs present a unique challenge for anesthesiologists providing care to parturients. Since a majority of patients do not have a history of surgical decompression or ventriculoperitoneal shunting, it is difficult to evaluate for hydrocephalus when the patient is in labor. Therefore, many patients with diagnosed CMI are scheduled for an elective cesarean section. Numerous case reports and literature reviews have documented the successful use of spinals, epidurals and combined spinal-epidurals (CSEs) in these patients without neurologic sequelae.

The patient in this case presented with CMI, which was diagnosed one year prior to our encounter, without any treatment. At the time of labor, she was asymptomatic. Although she had two prior vaginal deliveries under epidural anesthesia, she was scheduled for an elective cesarean section this time given the new diagnosis. This case report demonstrates the safe and successful use of epidural anesthesia for a parturient with CMI.

Keywords

Arnold-Chiari malformation; Chiari malformation type I; pregnancy; parturient; epidural anesthesia; Cesarean section

Introduction

Chiari malformations (CMs) are congenital defects of the brain and skull that result in inferior displacement of the cerebellum. Multiple types of CMs exist, differing in the severity of the anatomic defects. Of these types, CM Type I (CMI) is the least severe but most common, with an incidence of 0.5–3.5% in the general population and a predominance in females.¹ Given its relative benign nature, CMI is often found incidentally or in

adulthood when symptoms such as headache or neck pain present. It can be associated with hydrocephalus or syringomyelia. Although surgical decompression can be performed, most patients do not require surgical treatment.

CMs present a unique challenge for anesthesiologists providing care to parturients. Since a majority of patients do not have a history of surgical decompression or ventriculoperitoneal

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shunting, it is difficult to evaluate for hydrocephalus when the patient is in labor. Symptoms from mild hydrocephalus (i.e., headache, nausea, vomiting, seizures, etc.) can mirror symptoms seen in a normal pregnancy or other pregnancy-related disease states like pre-eclampsia. Hydrocephalus and increased intracranial pressure (ICP) pose serious risks for neuraxial anesthesia, such as neurologic deterioration due to cerebellar herniation. However, the pain of contractions from labor could also exacerbate the increased ICP. Therefore, many patients with diagnosed CMI are scheduled for an elective cesarean section. Numerous case reports and literature reviews have documented successful use of spinals, epidurals and combined spinal-epidurals (CSEs) in these patients without exacerbating symptoms.

Our patient presented with a CMI, which was diagnosed one year prior to our encounter, without any treatment. At the time of labor, she was asymptomatic. Although she had two prior vaginal deliveries under epidural anesthesia, she was scheduled for an elective cesarean section this time given the new diagnosis. This case report demonstrates the safe and successful use of epidural anesthesia for a parturient with CMI.

Case Description

A 31-year-old G3P0202 female presented to labor and delivery for an elective cesarean section. The patient was diagnosed one year ago with CMI. At that time, she was symptomatic with complaints of persistent headache and bilateral facial, arm and chest numbness and weakness. Although an initial CT scan of the brain was negative, a follow-up brain MRI showed 7 mm inferior cerebellar tonsillar ectopia. No hydrocephalus or other secondary findings of mass effect or shift were noted. The neurosurgeon was consulted, and no surgical intervention was recommended. The patient was prescribed gabapentin for cephalgia and discharged from the hospital with the recommendation to follow up with an outpatient sleep study to assess for sleep apnea, as this could affect ICP.

In her first trimester, the patient presented to the emergency room several times for evaluation of nausea and vomiting, which

was attributed to hyperemesis gravidarum. During the course of her pregnancy, multidisciplinary discussions involving the neurologist and obstetrician were held to evaluate delivery options. It was recommended that the patient have an elective cesarean to avoid elevated pressures secondary to uterine contractions and pushing associated with vaginal delivery. Her previous two deliveries occurred prior to diagnosis of CMI and were normal spontaneous vaginal deliveries done under epidural anesthesia with no reported problems.

At the presenting visit, the patient was at 37 weeks and two days gestational age. The patient denied any neurologic symptoms, including numbness and weakness of the extremities. The neurologic examination was unremarkable. She disclosed that she did not follow up for the sleep study. Given her lack of current symptoms, consistent follow up with neurology, and stable pregnancy and disease course, epidural anesthesia was planned for her cesarean section. Extensive discussion was held with the patient regarding the risks and benefits, and the patient consented to the plan.

An epidural catheter was placed at the L3–L4 level using a 17 gauge Touhy needle and midline approach with the patient in a sitting position. Loss of resistance with saline was obtained at 4 cm. The epidural catheter was threaded smoothly and secured at 9 cm. A 3 mL test dose of lidocaine 1.5% with epinephrine 1:200,000 was used to confirm placement. After the patient was anesthetized with a total of 15 mL of 2% lidocaine with epinephrine 1:200,000, the procedure began and continued without incident. After the successful birth, 2.5 mg of morphine and 50 mcg of fentanyl were administered through the epidural catheter for postoperative pain control. The patient recovered in the postpartum unit with no new complaints and an examination revealed no neurologic deficits. The patient was then discharged on postoperative day two. Subsequent follow-up after discharge did not reveal any new symptoms.

Discussion

Anesthetic management for a parturient with a CM is controversial and involves careful planning depending on the patient's presentation.

Case reports and case series have described the successful use of neuraxial techniques, including epidurals, spinals and CSEs.² However, the true safety of these techniques compared to general anesthesia has yet to be determined given the lack of clinical trials due to ethical considerations.

The initial step in evaluating an obstetric patient with a CM is taking a thorough history and performing a physical examination. The exam needs to focus on eliciting any new or worsening neurologic symptoms and conducting a neurologic examination looking for signs of increased ICP (papilledema, visual changes, nausea, vomiting, altered level of consciousness, etc.). Recent imaging should be reviewed as well as any documentation from specialists. Associated conditions such as syringomyelia, tethered cord, seizures or sleep-related breathing disorders should also be evaluated as they can change anesthetic management. Our patient did not have any new symptoms, and her prior symptoms of headache, severe nausea and vomiting had subsided by the time of her presentation. She also did not present with any associated conditions that would prevent neuraxial anesthesia.

Spinal anesthesia is commonly used for elective cesarean sections to provide immediate and dense anesthesia with a predictable duration. However, it involves puncturing the dura and carries an inherent risk of decreased cerebral perfusion pressure and tentorial herniation. Epidural anesthesia aims to avoid dural puncture and provides the ability to insert a catheter for longer-term pain management. However, an accidental dural puncture is possible and given the larger needle size compared to those used for spinals, a dural puncture with an epidural needle is more likely to cause complications. Previous studies have shown that the anesthesiologist's level of experience is a significant risk factor for accidental dural puncture during epidural placement. Therefore, having the most experienced anesthesiologist on the team place the epidural catheter minimizes the risk.³ General anesthesia also remains an option and has been used safely.⁴ However, it is generally avoided due to airway concerns, both in healthy obstetric patients and those with CMs. Additionally, the stimulation with laryngoscopy can potentially contribute to the increased ICP.

Given that our patient had two epidural catheters placed without difficulty in the past and that she was not experiencing severe labor pain necessitating immediate pain relief, we opted to place an epidural catheter.

For patients presenting with CMI, we recommend reviewing all pertinent history and treatments of the disease as well as a thorough discussion with the patient regarding anesthetic options and the risks and benefits associated with each one. In general, neuraxial anesthesia can be performed safely in these patients and is preferred over general anesthesia given its associated fetal and maternal risks.⁵ Epidural anesthesia, if performed correctly, would be ideal as it avoids the intrathecal space. However, the risk of an accidental dural puncture must be assessed. In an anticipated difficult epidural placement, a spinal or CSE can be performed safely, and consideration should be given to using the smallest gauge needle to prevent catastrophic cerebrospinal fluid leakage.⁶ Careful neurologic assessment after neuraxial anesthesia is warranted, but imaging should be reserved for patients with changes in their neurologic status after neuraxial instrumentation.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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