JATI

ISSN 3090-3580

CASE REPORT

Epidural Anesthesia for Cesarean Section in a Parturient with Chiari I Malformation: a Case Report

I Wayan Ade Punarbawa, Nyoman Bendhesa Wiranaggala

Department of Anesthesiology and Intensive Therapy, Bunda Hospital, Denpasar, Indonesia

Corresponding Author
I Wayan Ade Punarbawa, MD
Department of Anesthesiology and Intensive Therapy, Bunda Hospital, Denpasar 80117, Indonesia
roysandoo@gmail.com

Submitted: 05-Jan-2026
Revised: 15-Feb-2026
Accepted: 09-Apr-2026
Published: 12-Aug-2026

This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms

How to cite this article:
Punarbawa IWA, Wiranaggala NB. Epidural anesthesia for cesarean section in a parturient with Chiari I malformation: a case report. Jurnal Anestesiologi dan Terapi Intensif. 2026;2(2):137-141. doi:10.24843/kr9sdk52.

Abstract

Chiari I malformation is a congenital neurological condition characterized by caudal herniation of the cerebellar tonsils, which may alter cerebrospinal fluid dynamics and complicate anesthetic management during pregnancy. The optimal anesthetic approach for parturients with this condition remains controversial, particularly regarding the safety of neuraxial anesthesia. We report the case of a 28-year-old woman with a known Chiari I malformation who presented at term gestation and underwent an urgent cesarean section after the onset of regular uterine contractions. Preoperative neurological evaluation and imaging demonstrated stable cerebellar tonsillar herniation without syringomyelia or signs of increased intracranial pressure. Following multidisciplinary consultation, epidural anesthesia was selected to minimize abrupt cerebrospinal fluid pressure changes and maintain hemodynamic stability. Epidural anesthesia was performed using 15 mL of 0.5% plain bupivacaine, achieving a T6 sensory block level. A healthy neonate was delivered with APGAR scores of 8 and 9 at 1 and 5 minutes, respectively. The procedure was performed uneventfully, with stable intraoperative parameters and no neurological complications. Postoperative recovery was smooth, and no neurological deterioration was observed during follow-up. This case highlights that carefully planned and titrated epidural anesthesia may be a feasible anesthetic option for cesarean section in selected parturients with Chiari I malformation following thorough multidisciplinary assessment.

Keywords: Chiari malformation type I; Cesarean section; Epidural anesthesia; Pregnancy

Introduction

Chiari I malformation is a congenital neurological condition characterized by caudal herniation of the cerebellar tonsils through the foramen magnum, which may disrupt cerebrospinal fluid (CSF) circulation and result in craniospinal pressure dissociation.[1] Advances in neuroimaging have led to increased detection of this condition, revealing that many individuals remain asymptomatic until adulthood and are often diagnosed incidentally. Nevertheless, physiological changes during pregnancy, including increased intra-abdominal and intrathoracic pressures, may influence CSF dynamics and raise concerns regarding neurological stability during labor and delivery.[2] The anesthetic management of parturients with Chiari I malformation remains challenging, particularly with respect to the use of neuraxial anesthesia.

Theoretical risks include cerebellar tonsillar herniation and neurological deterioration following dural puncture or sudden alterations in CSF pressure gradients. Conversely, general anesthesia avoids neuraxial manipulation but may be associated with airway difficulties, hemodynamic instability, and increases in intracranial pressure during laryngoscopy and intubation.[3] Due to the rarity of this condition, current evidence guiding anesthetic decision-making is limited and primarily derived from case reports and small retrospective studies, resulting in variability in clinical practice.[4]

Despite increasing reports of successful neuraxial anesthesia in parturients with Chiari I malformation, the available evidence remains limited to case reports and small retrospective studies, with no standardized guidelines to support anesthetic decision-making. This case contributes additional clinical evidence by illustrating the use of carefully titrated epidural anesthesia in a neurologically stable parturient with spontaneous labor onset requiring urgent cesarean section.

Case Presentation

A 28-year-old woman, primigravida at 39 weeks of gestation, presented to the emergency department with regular uterine contractions occurring two to three times every 10 minutes. She reported no vaginal bleeding, no abnormal discharge, and normal fetal movements. There were no accompanying symptoms such as fever, cough, headache, visual disturbance, limb weakness, or sensory changes. Her antenatal course had been uneventful, with regular obstetric follow-up throughout pregnancy. Initially scheduled for elective cesarean section, the patient experienced regular contractions at 39 weeks of gestation, and the procedure was converted to an urgent cesarean section to avoid prolonged labor.

The patient had a known history of Chiari I malformation diagnosed during adolescence following evaluation for intermittent neck discomfort. Previous prepregnancy magnetic resonance imaging (MRI) demonstrated cerebellar tonsillar herniation measuring approximately 13 mm below the foramen magnum without evidence of brainstem compression or syringomyelia. She had no history of progressive neurological deficits, raised intracranial pressure symptoms, or previous neurosurgical intervention. Additional medical history included mitral valve prolapse and a thyroid cystic goiter, both of which were asymptomatic and managed conservatively. There was no relevant family history of neurological disorders, and she did not report any psychosocial issues. She was not receiving regular neurological medication.

During the antenatal period, the patient underwent multidisciplinary evaluation involving obstetrics and gynecology, neurology, anesthesiology, cardiology, and internal medicine to determine the optimal mode of delivery and anesthetic strategy. Neurological assessment confirmed stable neurological status with no focal deficits. The neurologist recommended cesarean delivery to minimize the risk of increased intracranial pressure associated with prolonged labor and forceful pushing. Cardiological evaluation, including echocardiography, revealed preserved left ventricular systolic function with no significant valvular abnormalities requiring intervention. Thyroid function tests were within normal limits.

Upon admission, cardiotocography showed a reassuring fetal status. The patient had stable vital signs, a Mallampati class II airway, a thyromental distance of more than 6 cm, and full neck mobility despite the presence of a cystic thyroid goiter. A comprehensive neurological examination revealed intact cranial nerve function, normal motor strength of 5/5 in all extremities, preserved sensation, normal deep tendon reflexes, and no clinical signs of increased intracranial pressure. The patient was classified as American Society of Anesthesiologists physical status II. Urgent cesarean section was performed under epidural anesthesia, based on the previously established multidisciplinary plan. The anesthetic goal was to maintain hemodynamic stability and avoid abrupt changes in cerebrospinal fluid pressure.

Standard monitoring was applied in the operating room, including non-invasive blood pressure, electrocardiography, pulse oximetry, respiratory rate, and temperature monitoring. Epidural anesthesia was performed by an experienced anesthesiologist under strict aseptic conditions with the patient in the lateral decubitus position. The epidural space was identified at the L3-L4 lumbar level with an 18G Tuohy needle using loss of resistance (LOR) to saline at 4 cm depth, and the catheter was secured at 9 cm at the skin. A 3 mL epidural test dose was administered, consisting of 1.8 mL lidocaine 2% and 1.2 mL of a commercial lidocaine–epinephrine preparation (Pehacaine®, lidocaine 2% with epinephrine 1:80,000), to detect inadvertent intravascular or intrathecal catheter placement. The main dose of 15 ml 0.5% plain bupivacaine was administered in 5 ml increments every 5 minutes to ensure hemodynamic stability and avoid sudden sympathetic blockade. The sensory block reached T6, while the Bromage score remained 0, indicating no motor block. The cesarean section proceeded uneventfully without additional epidural doses. A healthy neonate was delivered with Apgar scores of 8 and 9 at 1 and 5 minutes, respectively, and a birth weight of 3500 grams. No complications such as accidental dural puncture or high block were observed. Fluid management included a co-load of 500 ml Ringer's Lactate. No vasopressors were required. Oxytocin 10 IU was administered as an infusion following delivery. Estimated blood loss was 400 ml.

Postoperatively, analgesia was administered via an epidural catheter using 0.1% bupivacaine, with a 10 mL bolus given when the pain score (VAS) exceeded 5. In addition, systemic analgesia was provided using an infusion consisting of fentanyl 400 mcg combined with ketamine 20 mg in 50 mL of normal saline, administered at a rate of 2.1 mL/hour. The patient was closely monitored for neurological symptoms, including headache, neck pain, sensory disturbances, or motor weakness. During the postoperative period, she remained neurologically intact, reported adequate pain control, and experienced no nausea or vomiting. Early mobilization was initiated on the first postoperative day.

The patient's postoperative course was uncomplicated. She demonstrated full neurological function and stable vital signs throughout her hospital stay. She was discharged on the second postoperative day in good condition, with no evidence of neurological deterioration or anesthetic-related complications at follow-up. The patient's status was evaluated seven days and six weeks after surgery, and she reported no neurological symptoms or pain.

Discussion

The anesthetic management of parturients with Chiari I malformation poses a significant clinical challenge due to altered cerebrospinal fluid (CSF) dynamics and the potential risk of neurological deterioration during labor and delivery. In the present case, epidural anesthesia was selected for cesarean section following comprehensive multidisciplinary evaluation, with the primary aim of maintaining intracranial pressure stability and avoiding abrupt changes in CSF pressure gradients.

Chiari I malformation is characterized by impaired CSF flow at the level of the foramen magnum, which may result in craniospinal pressure dissociation and altered intracranial compliance.1 Physiological changes associated with pregnancy, including increased intra-abdominal and intrathoracic pressures as well as painful uterine contractions, may further exacerbate fluctuations in CSF and intracranial pressures. These factors have historically raised concerns regarding the safety of neuraxial anesthesia in this patient population, particularly in the context of accidental dural puncture or rapid CSF leakage.[2]

The role of neuraxial anesthesia in parturients with Chiari I malformation remains controversial. Theoretical risks include cerebellar tonsillar herniation and worsening neurological symptoms following sudden alterations in CSF pressure. However, contemporary evidence suggests that neuraxial techniques may be safely considered in selected patients without signs of raised intracranial pressure or progressive neurological deficits. Neuraxial anesthesia is not an absolute contraindication in patients with intracranial pathology when careful patient selection and vigilant monitoring are applied.[3] More recent reviews have further supported this approach, highlighting that neuraxial anesthesia can be safely performed in parturients with stable intracranial pathology when meticulous technique and multidisciplinary planning are employed.[6] Furthermore, a multicenter retrospective study demonstrated favorable maternal and neurological outcomes in parturients with Chiari I malformation who received neuraxial anesthesia, supporting its feasibility in appropriately selected cases. [4]

In this case, the patient had a 13 mm cerebellar tonsillar herniation. Although tonsillar descent greater than 5 mm is generally considered radiologically diagnostic of Chiari I malformation, the extent of herniation does not necessarily correlate with clinical severity or predict neurological deterioration during neuraxial anesthesia. The decision to perform epidural anesthesia was based on the patient's stable neurological status, the absence of syringomyelia, and the lack of signs of increased intracranial pressure. Although spinal and combined spinal-epidural techniques have also been reported successfully in selected patients with Chiari I malformation, epidural anesthesia was preferred in this case because it allowed gradual titration and avoided intentional dural puncture. In contrast, general anesthesia, while avoiding neuraxial instrumentation, may still pose risks related to airway manipulation, hemodynamic instability, and transient increases in intracranial pressure during laryngoscopy and intubation.[5]

The strengths of this case include meticulous multidisciplinary planning, careful patient selection, and a conservative

anesthetic technique tailored to the underlying neurological condition. Nevertheless, this report is limited by its single-case design and the absence of direct intracranial pressure monitoring. In addition, long-term neurological follow-up was limited, which precludes definitive conclusions regarding delayed neurological outcomes.

In conclusion, Carefully titrated epidural anesthesia may be a feasible option for cesarean delivery in neurologically stable patients with Chiari I malformation after multidisciplinary assessment. While higher-quality prospective data remain limited, this report adds contemporary clinical evidence to guide individualized anesthetic decision-making in this challenging patient population.

Acknowledgement

None.

Declaration of Patient Consent

The authors confirm that all necessary patient consent forms have been obtained. In these forms, the patient(s) provided informed consent for the publication of their images and relevant clinical information in the journal. The patients have been informed that while their names and initials will not be published and reasonable efforts will be made to protect their identity, complete anonymity cannot be guaranteed.

Funding

None reported.

Conflict of Interest

The author(s) report no conflict of interest.

Data Availability Statement

Deidentified patient data from this case report/series will be made available upon reasonable request to the corresponding author following publication, subject to institutional data-sharing policies and ethics approval.

Author's Contributions

Conceptualization: BW. Data curation: AP. Investigation: AP, BW. Writing – original draft: AP. Writing – review & editing: BW. Supervision: BW. All authors have read and approved the final version of the manuscript.

References

1. Toader C, Ples H, Covache-Busuioc RA, Costin HP, Bratu BG, Dumitrascu DI, Glavan LA, Ciurea AV. Decoding Chiari malformation and syringomyelia: from epidemiology and genetics to advanced diagnosis and management strategies. Brain Sci. 2023;13(12):1658. doi:10.3390/brainsci13121658
2. Mueller DM, Oro J. Chiari I malformation with or without syringomyelia and pregnancy: case studies and review of the literature. Am J Perinatol. 2005;22(2):67-70. doi:10.1055/s-2005-837271
3. Leffert LR, Schwamm LH. Neuraxial anesthesia in parturients with intracranial pathology: a comprehensive review and reassessment of risk. Anesthesiology. 2013;119(3):703-718. doi:10.1097/ALN.0b013e31829374c2
4. Gruffi TR, Peralta FM, Thakkar MS, Arif A, Anderson RF, Orlando B, Coffman JC, Nathan N, McCarthy RJ, Toledo P, Habib AS. Anesthetic management of parturients with Arnold Chiari malformation-I: a multicenter retrospective study. Int J Obstet Anesth. 2019;37:52-56. doi:10.1016/j.ijoa.2018.10.002
5. Coviello A, Golino L, Posillipo C, Marra A, Tognù A, Servillo G. Anesthetic management in a patient with Arnold-Chiari malformation type 1,5: a case report. Clin Case Rep. 2022;10(2):e05194. doi:10.1002/ccr3.5194
6. Acharya U, Yadav RK. Transient severe hypertension following spinal anesthesia in a patient undergoing caesarean delivery: a rare experience. Bali J Anesthesiol. 2021;5(2):143-144. doi:10.4103/bjoa.bjoa_228_20