

Clinical Question

- Are Chiari malformations associated with adverse outcomes during administration of different types of anesthesia?
- Why I choose this topic?
 - Adverse event of a dural puncture in one of the L&D patients on the floor. Safety rounds discussion revolved around signs of dural puncture and how it results in brain herniation and CSF flow obstruction. This got me thinking about how certain brain conditions that already have these characteristics of a “dural puncture”, such as brain herniation and obstruction of CSF flow, are managed during anesthesia administration.



Background (Neuro Aspect)

- Chiari Malformations are a spectrum of brain conditions. Chiari 1: herniation of the cerebellar tonsils below the foramen magnum, associated with a syringomyelia.
- Symptoms secondary to
 - Brainstem compression (autonomic symptoms, blurry vision, syncope, dyspnea)
 - Cerebellar compression (truncal ataxia)
 - Obstruction of CSF flow; Hydrocephalous
 - Syringomyelia (muscle atrophy/ weakness, urinary incontinence, scoliosis)
 - Drop attacks, dysphagia
 - Occipital HA, tinnitus, hearing loss

Background (OB Aspect)

- During labor, whether NSVD or C-section, there are several options for pain management.
 - Epidural
 - Spinal
 - General Anesthesia (GA)
 - Natural!
- Key labor points:
 - Pregnancy → physiologic increase in CSF pressure; delivery → increase in ICP
 - Avoid increase in ICP to avoid herniation of cerebellum and brainstem or worsening of syrinx.
 - C-section is a good way to avoid increases in intrathoracic pressure or Valsalva maneuvers, common in NSVD.

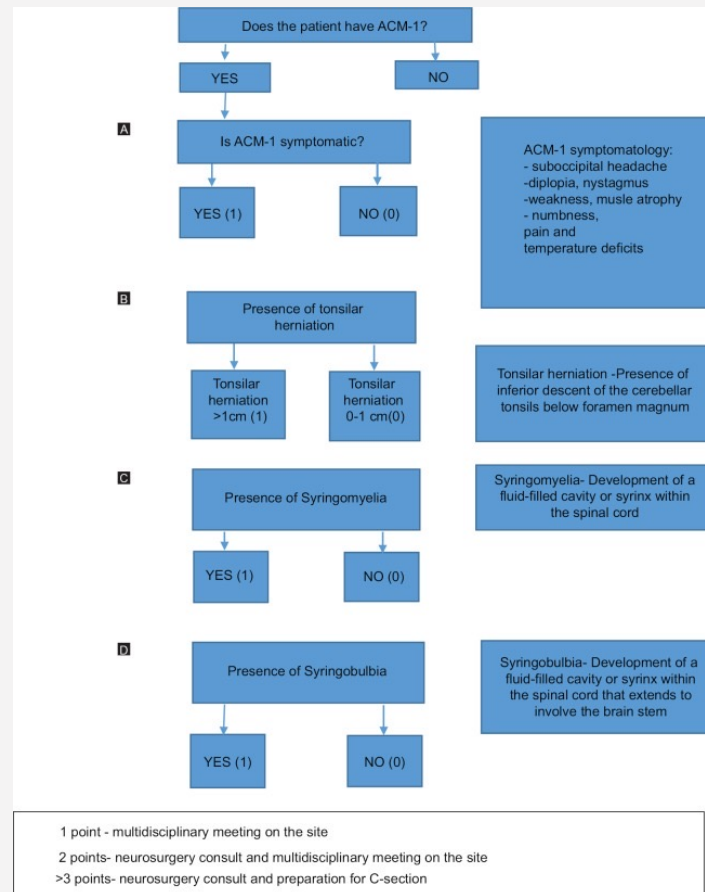
Ghaly, RF, Tverdohle T, Candido KD, Knezevic NN. Management of parturients in active labor with Arnold Chiari malformation, tonsillar herniation, and syringomyelia. Surg Neurol Int. 2017; 8:10. doi:10.4103/2152-7806.198737
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5288887/>

MANAGEMENT OF PARTURIENTS IN ACTIVE LABOR WITH ARNOLD CHIARI MALFORMATION, TONSILLAR HERNIATION, AND SYRINGOMYELIA

- GA:
 - +’s: no risk of dural puncture; can regulate increase in ICP via hyperventilation and BP control
 - –’s: laryngeal manipulation and endotracheal intubation → increased ICP (alternative is performing awake intubation with local airway anesthesia)
- Spinal anesthesia:
 - complications with neurologic symptoms
- Epidural anesthesia:
 - injection does cause an increase in ICP in nonpregnant pts, both those with an elevated and non elevated ICP.
 - Dural puncture → so use small bolus doses (associated with smaller effect on increasing ICP)

Age	24
OB hx	G1P0, full term
Mode of Delivery	Elective c-section
Anesthesia	GA
Chiari Surgery	Not mentioned; 1.7cm transtonsillar herniation + syrinx C1-C5

Ghaly Obstetric Guide to
Arnold-Chiari Malformation
Type 1 (GOGAC-1)



COMBINED SPINAL-EPIDURAL ANALGESIA FOR LABORING PARTUARENT WITH ARNOLD-CHIARI TYPE I MALFORMATION: A CASE REPORT AND A REVIEW OF THE LITERATURE

- Why CSE?
 - Spinal allows for immediate analgesia and epidural is useful for intermittent boluses of analgesia. CSE decreases painful uterine contractions → limits intraabdominal pressure → decreases CSF pressure.
- Vacuum assistance during VD → reduces ICP elevation
- Key points:
 - Uterine contractions L2 increase in ICP
 - Spinal > epidural: puncture can L2 similar manifestations but the size is smaller.
 - epidural can L2 dural puncture L2 tentorial herniation
 - GA> epidural and spinal: because of high ICP in Chiari patients. Although, GA can also increase ICP 2/2 intubation (difficult intubation → hypoxia → increase in ICP).
 - Things to do: use smaller needles

Age	17
OB hx	G1P0
Mode of Delivery	Vacuum-assisted VD
Anesthesia	CSE (combined spinal-epidural)
Chiari Surgery?	Not mentioned; 7mm cerebellar tonsil herniation wo/ syringomyelia

SPINAL NEURAXIAL ANESTHESIA FOR CAESAREAN SECTION IN A PARTURIENT WITH TYPE I ARNOLD-CHIARI MALFORMATION AND SYRINGOMYELIA

- Key points:
 - Poor data on what an ideal labor should look like, both delivery mode and anesthesia usage
 - GA:
 - +’s: avoids changes in CSF and ICP levels
 - -’s: CSF and ICP increases during airway management. Pts’ sensitive to non-depolarizing neuromuscular blockers due to hx of muscle atrophy.
 - Epidural:
 - small doses > a big bolus since it can L2 an increase in ICP (bolus introduced into the epidural area → dural compression → CSF moves into the brain region → increased ICP).
 - Neuro assessment: monitor for autonomic neuropathy (i.e tachyarrhythmias 2/2 stress).

Age	40
OB hx	G1P0, 38w/ Term
Mode of Delivery	C-section
Anesthesia	Spinal anesthesia
Chiari Surgery	Yes; residual syringomyelia

SPINAL ANESTHESIA FOR CAESARIAN DELIVERY IN A WOMAN WITH A SURGICALLY CORRECTED TYPE 1 ARNOLD CHIARI MALFORMATION

Recommendations/ Approach:

- Surgical correction → spinal anesthesia
 - Concerns: dural puncture L2 increased ICP
- No surgical correction + no signs of ICP → epidural anesthesia
- Signs of elevated ICP → general anesthesia
 - Concerns: Ensure no hyperextension of neck → may cause brainstem compression

AGE	31
OB Hx	G2P1, 37 w
Mode of Delivery	Repeat c-section
Anesthesia	Spinal anesthesia
Chiari Surgery	Yes

Guidelines

- No official guidelines, still an evolving field of research
 - Lack of data; most information presented were case reports
- An interdisciplinary team is vital to patient care!
- There are pros and cons to each type of pain management. Weigh out what is best for your patient.
 - Each patient is unique!
- Case Reports show majority of C-section. If NSVD, then vacuum assisted to prevent increase in ICP.
- Case Reports show majority of spinal anesthesia.

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