

EDUCATIONAL

Obstetric-Related Neurologic Complications



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When an obstetric patient complains of back pain, headache or leg weakness, the common response is to call the anesthesiologist. An obstetrical anesthesiologist should have a thorough knowledge of obstetric as well as anesthesia-related injuries. We will discuss the assessment and differential diagnosis of common post-delivery

obstetric neurologic complications. Serious neurologic deficits associated with parturition occur in the 2-5/10,000 range.¹

Mechanism of Injury, Incidence

Injury may occur during vaginal delivery in parturients who do not receive regional or general anesthesia. Nervous tissues may become injured by direct compression or rarely, ischemic injury. The incidence of neurological deficits prior to the 1960s was up to 1 /2,100.²⁻⁴ Obstetrical management at the time included prolonged labor and the common use of forceps for instrumental delivery. Transient neurologic symptoms are more common (1/280) in obstetric patients receiving regional or general anesthesia, yet with only 20 percent documented in one study.⁵

Physical Exam and Testing

When a question or problem arises, you should perform and document a detailed neurological examination. Fully test the cranial nerves, upper and lower extremities, sensory and motor function, reflexes and Babinski sign. Careful mapping and documentation in the chart is important to good patient care and may be helpful in your future defense. Areas to specifically check on physical exam include sensory as well as motor tone of the paraspinal muscles (innervated by the posterior rami of the nerve root), tenderness to deep palpation of the spinous processes (transmits pressure to the epidural space – associated with epidural mass or abscess), localized erythema or purulence (tissue infection) and sacroiliac joint tenderness (separation, pain). Consult a dermatomal/peripheral nerve map to help determine distribution pattern of symptoms, if needed. Call a neurologist specifically familiar with obstetric and anesthesia related patterns of symptoms. Order a stat CT/MRI if considering diagnoses related to acute spinal cord compression. Electromyography (EMG) can show location, but changes do not occur for two to four weeks in the muscle response following denervation injury. Thus, changes seen immediately indicate prior disease. Nerve conduction studies can also be very helpful in pinpointing the location and extent of injury. Somatosensory and motor evoked potentials have also been useful in some circumstances (e.g., non-physiologic symptoms).

Lumbosacral Plexus Injury

The fetal head may cause direct pressure and injury to the lumbosacral plexus, especially where it crosses the ala of the sacrum or the posterior pelvic brim. The patient may have complained of persistent low-back pain during labor in spite of receiving epidural analgesia, a typical sign the fetal head may be in the occiput posterior position and pressing on the lumbosacral plexus. Lumbosacral plexus injury occurs more common in nulliparous, platypelloid pelvis (shallow), macrosomia, cephalopelvic disproportion, vertex presentation and forceps delivery.⁶⁻⁷ The injury can be unilateral (75 percent) or even bilateral (25 percent) and may involve multiple root levels. This type of injury may appear similar to injuries of the femoral or obturator nerve with sensory impair in the fourth and fifth lumbar dermatomes. The superior gluteal nerve may also be affected.

Femoral Nerve Injury

The femoral nerve may be injured as it runs under the inguinal ligament during the second stage of labor when the hips are flexed (or hyperflexed) for prolonged periods. The hips should be un-flexed (rested) between pushes. The use of the squatting bar to keep the hips hyperflexed during second stage of labor may result in femoral nerve compression injury. Femoral nerve injury would result in decreases sensation over the anterior thigh and medial calf and impairs quadriceps strength, hip flexion and patellar reflex. Proximal lesions at the level of the lumbosacral plexus also may impair hip flexion due to iliopsoas weakness. Note that mild weakness of knee extension (quadriceps muscle) can be compensated for by the intact hip extensors that permit swinging of the leg forward, then pulling back to “lock” the knee. This compensation permits walking flat (with a slightly exaggerated leg swing) but cannot provide the true quadriceps strength needed for stairs or uneven ground.

Obturator Nerve Injury

The obturator nerve may become compressed against the lateral pelvic wall or in the obturator canal, causing decreased sensation over the medial thigh and weakness in hip adduction and internal rotation.^{7,8} Electrophysiological testing will differentiate obturator nerve injury from L3-4 radiculopathy and lumbar plexopathy.

Common Peroneal Nerve Injury

Compression injuries distal (peripheral) to the sacrum may be more common. Positioning contributes to these problems and careful observation and correction during labor are important. The common peroneal nerve may be injured at the level of the fibular neck during lithotomy position or even with the legs leaning against the bed rail (especially under epidural analgesia). The Common peroneal nerve exits the popliteal fossa and winds

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around the fibular head before dividing into the deep and superficial branches. Common peroneal nerve injury produces paresthesia over the lateral calf and dorsum of the foot with foot drop and inversion, sensory loss to the dorsal foot just proximal to the first and second toes. Note that 22 percent of patients have an anomalous motor branch to the extensor digitorum brevis, which would produce a false negative on electrophysiologic testing.⁸

Lateral Femoral Cutaneous Nerve Injury

Meralgia paresthetica, or lateral femoral cutaneous nerve injury, arises when the nerve is compressed as it passes under the lateral inguinal ligament. The nerve originates from the L2-3 lumbar plexus, providing sensation to the antero-lateral part of the thigh only, with no motor involvement. Risk factors include obesity. No treatment is needed and sensation typically returns within six weeks.

Anterior Spinal Artery Syndrome

Rarely, ischemic injury may result in neurologic deficits. The spinal cord may become ischemic during severe hypotension or compression of its blood supply. The lower anterior spinal cord receives blood from the artery of Adamkiewicz (originating T9-L2). However, 15 percent of people have a high take-off of the Adamkiewicz (T5) and a branch from the iliac arteries supplies the lower anterior spinal cord. The blood supply can thus be compressed as it must cross the lumbosacral trunk.¹ Anterior spinal artery syndrome may result, causing loss of motor function, pain and temperature below the level of the lesion. The dorsal column remains intact, supplied by the vertebral arteries and providing vibration and joint sensation. Anterior spinal artery syndrome classic presentation includes sudden onset of motor block in the absence of fever, white blood count elevation, negative CT/MRI for mass and more commonly in the elderly or with preexisting hypertension.

Arteriovenous Malformation

Another rare cause of paraplegia includes arteriovenous malformation (AVM). Spinal cord venous pressure may be increased, predisposing to decreased flow and stasis during periods of moderate hypotension or compression. AVMs may be intra- or extra-dural. Cutaneous arteriovenous abnormalities are associated with a 20 percent incidence of spinal AVM at the same level.⁹⁻¹¹ Symptoms include pain (back, nerve root or more remote) in 39 percent, leg weakness in 29 percent or sensory deficit 24 percent.

Anesthesia-related Deficits

Anesthesia related deficits may occur, albeit with a lower frequency, 1/(10,000-100,000).¹

Sacroiliac, Piriformis and Other Symptoms

Other causes of post-delivery pain may include sacroiliac joint pain and piriformis.

Non-specific back pain after delivery is common and similar in incidence (44 percent) whether or not epidural analgesia was utilized,¹² with 37 percent of women having symptoms more than one year later.¹³ However, specific syndromes may also occur. One common source of pain may be due to sacro-iliac joint tenderness due to partial tearing or separation. Pain will be elicited by direct pressure over the sacroiliac joint(s). Piriformis syndrome from delivery has also

been described as frequently under diagnosed in the obstetric population with pain in the back and buttocks.¹⁴ Of note, 1.4 percent of women complained of symptoms (headache, backache, paresthesia, weakness) after being discharged home.¹⁵

Seizures

Seizures during labor or the post-partum period are most likely due to eclampsia in the absence of a seizures history. Local anesthetic systemic toxicity and seizure-like activity (rolling back of the eyes, shaking) due to severe hypotension may also be observed in this patient population. True seizures should be treated accordingly – maintenance of the airway and acute termination of the seizure with a benzodiazepine or magnesium (obstetrician may prefer).

Change in Mental Status

Subarachnoid hemorrhage may occur in the obstetric patient, especially with coexisting preeclampsia. Rapid neurologic assessment must be performed.

The hypercoagulable state of pregnancy may lead to Cortical Vein Thrombosis, with persistent, non-positional headache. Cortical vein thrombosis may progress to cause arterial stasis, stroke and/or decreased mental status. Many institutions have a “code brain” for suspected acute neurologic changes, which helps assist in rapid diagnosis and management of acute neurologic problems.

Conclusion

Familiarity with obstetric as well as anesthetic-related neurologic complications helps to provide good patient care and improved consultations. Fortunately, obstetric-related causes are more common than anesthetic-related nerve injuries. Rapid

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assessment, testing and good management will help to optimize patient outcomes and reduce risk of lawsuits.

References:

1. Zakowski M. Postoperative Complications Associated with Regional Anesthesia in the Parturient. In: M N, editor. *Obstetric Anesthesia*. Philadelphia: Lippincott Williams & Wilkins; 1999. p. 723-48.
2. Tillman A. Traumatic neuritis in the puerperium. *Am J Obstet Gynecol*. 1935;29.
3. Murray R. Maternal obstetrical paralysis. *Am J Obstet Gynecol*. 1964;88.
4. Hill E. Maternal obstetric paralysis. *Am J Obstet Gynecol*. 1962;83.
5. Ong B. Paresthesia and motor dysfunction after labor and delivery. *Anesth Analg*. 1987;66.
6. Cole J. Maternal obstetric paralysis. *Am J Obstet Gynecol*. 1946;52.
7. Graham J. Neurological complications of pregnancy and anaesthesia. *Clin Obstet Gynaecol*. 1982;9.
8. Redick L. Maternal perinatal nerve palsies. *Postgrad Obstet Gynecol*. 1992;12.
9. Symon L, Kuyama H, Kendall B. Dural arteriovenous malformations of the spine. Clinical features and surgical results in 55 cases. *J Neurosurg*. 1984 Feb;60(2):238-47.
10. Doppman JL, Wirth FP, Jr., Di Chiro G, Ommaya AK. Value of cutaneous in the arteriographic localization of spinal-cord arteriovenous malformations. *N Engl J Med*. 1969 Dec 25;281(26):1440-4.
11. Hirsch NP, Child CS, Wijetilleka SA. Paraplegia caused by spinal angioma—possible association with epidural analgesia. *Anesth Analg*. 1985 Sep;64(9):937-40.
12. Breen T. Factors associated with back pain after childbirth. *Anesthesiology*. 1994;81:29-34.
13. Howell CJ, Dean T, Lucking L, Dziedzic K, Jones PW, Johanson RB. Randomised study of long term outcome after epidural versus non-epidural analgesia during labour. *BMJ*. 2002 Aug 17;325(7360):357.
14. Vallejo MC, Mariano DJ, Kaul B, Sah N, Ramanathan S. Piriformis syndrome in a patient after cesarean section under spinal anesthesia. *Reg Anesth Pain Med*. 2004 Jul-Aug;29(4):364-7.
15. Hayes NE, Wheelahan JM, Ross A. Self-reported post-discharge symptoms following obstetric neuraxial blockade. *Int J Obstet Anesth*. 2010 Oct;19(4):405-9.