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Session: L067

Labor Analgesia and Postpartum Tubal Ligation in a Patient with a History of Spinal Instrumentation

Michael Hofkamp, M.D.
Baylor Scott & White Health, Temple, TX

Disclosures: This presenter has no financial relationships with commercial interests

Stem Case and Key Questions Content

A 24 year old G2P1 presents to the labor and delivery unit after spontaneous rupture of membranes at 39 weeks gestation. Her cervical exam is 4 cm dilation and 100% effacement. Her height is 163 cm and her mass is 95 kg. At the age of 16, she underwent corrective surgery for scoliosis and had “rods” placed. The patient has recently moved to your city and does not have copies of radiological or operative reports from her previous surgery. The patient states that during her last vaginal delivery two years ago, she had an epidural placed that did not work well. She remembered discrete areas on her abdomen and legs that were especially painful during contractions. Additionally, she doesn’t remember much pain when the baby was being delivered. Examination of the back reveals a well healed midline vertical scar extending from approximately T8 to L1. She is interested in learning about options for labor analgesia. She also desires a post-partum tubal ligation immediately after delivery of her baby.

Why do you think the epidural didn’t work during the patient’s last delivery?

How can you tell if the patient has indwelling hardware (e.g. plates, screws) from her spinal surgery? Does it matter?

What are the patient’s neuraxial options for labor analgesia?

What are the patient’s non-neuraxial options for labor analgesia?

What are the patient’s non-pharmacological options for coping with labor pain?

After much thought, the patient decides to try a labor epidural. The labor epidural is placed at the L4/L5 interspace. Loss of resistance was measured at 9 cm and the epidural catheter was threaded 5 cm into the epidural space. Aspiration of the catheter was negative for blood and cerebral spinal fluid. A test dose of 3 ml lidocaine 1.5% with epinephrine 1:200,000 was administered without obvious signs of tachycardia or motor block. Three minutes after the test dose, 100 mcg of fentanyl (2 ml) was given along with 8 ml of ropivacaine 0.2% in divided doses. A continuous infusion of ropivacaine 0.2% containing fentanyl 2 mcg/ml was started at 10 ml/hr. Approximately 30 minutes after epidural placement you are called to evaluate the patient for a complaint of inadequate analgesia. According to her nurse, the patient’s cervical exam is unchanged at 4 cm dilation and 100% effacement.

What would you ask the patient?

What kind of physical exam would you do?

The patient states that there are discrete areas on her abdomen and legs that are painful during contractions. During her next contraction, she points to one of these spots with her finger. Pinprick exam reveals roughly a T10 analgesic level with small patches of full pinprick sensation below.

What do you think is going on?

Should a bolus be administered through the epidural catheter?

Should the epidural be replaced?

Should an alternative neuraxial technique be attempted? What about an intrathecal catheter?

Should intravenous pain medication be offered?

The patient says that one of her friends who lived in another city had “laughing gas” for her delivery. Is this a good idea?

A bolus of 5 ml bupivacaine 0.125% is administered through the epidural catheter after negative aspiration for blood and cerebral spinal fluid. The patient reports no relief. However, the patient expresses confidence in your abilities and allows you to remove the epidural and perform a combined spinal epidural. A 17 gauge Touhy needle specifically designed to perform a combined spinal epidural is inserted at the L3/L4 interspace with a loss of resistance measured at 9 cm. A 25 gauge pencil point spinal needle is inserted through the Touhy needle and a loss of resistance through the dura is felt. Continuous, clear flowing liquid appears through the spinal needle. After smooth aspiration of what is presumed to be cerebral spinal fluid, 1 ml of ropivacaine 0.2% containing fentanyl 10 mcg is slowly injected through the spinal needle. An epidural catheter is then advanced 5 cm into the epidural space. Aspiration of the epidural catheter is negative for blood and cerebral spinal fluid. A continuous infusion of ropivacaine 0.2% containing fentanyl 2 mcg/ml was started at 10 ml/hour. The patient reported immediate pain relief. Approximately two hours later, you are called to see the patient for a complaint of inadequate analgesia. According to her nurse, her cervical exam is 7 cm dilation with 100% effacement.

What would you ask the patient?

What kind of physical exam would you do?

The patient states that her pain relief was “perfect” after you performed the combined spinal epidural. Over the past 30 minutes, the contraction pain has started to come back. Although the pain with contractions wasn’t as bad as before, she is still reporting that there are some spots on her abdomen and legs that are painful during contractions. Pinprick exam reveals a T8 analgesic level with some discrete areas below that are a “little dull” to pinprick sensation.

What do you think is going on?

Should a bolus be administered through the epidural? Is this situation different from the previous bolus?

Should the epidural catheter be replaced?

Should intravenous medication be offered? Which one(s)?

The patient decides that she wants to keep the existing epidural in place. The obstetricians predict that she is at least one hour away from delivering and she is given fentanyl 50 mcg intravenously. The patient reports some pain relief with the fentanyl. Approximately two hours

pass before you receive a call that the patient has delivered her baby uneventfully.

The patient appeared to have good pain relief during the second stage of labor. Why do you think that was?

The patient's obstetrician has concert tickets for later that night and would like to start the postpartum tubal ligation as soon as possible.

Is it a good idea to immediately proceed with a postpartum tubal ligation?

Upon talking to the patient, she is adamant about having a postpartum tubal ligation as soon as possible. She understands that it is still too early to tell if there is anything wrong with her newborn, but she is intent on not having any more children. She also says she is "finished with getting her back stuck" and wants you to either use the epidural catheter that is already in place or to administer general anesthesia. She has a Mallampati Class III airway with three fingerbreadths thyromental distance. She has full range of motion of her neck.

Would you use the existing epidural?

What do the ASA Practice Guidelines on Obstetrical Anesthesia say about doing a general anesthetic on an elective postpartum tubal ligation?

What happens to patients whose requests for postpartum tubal ligations are not fulfilled?

Are there alternative permanent sterilization techniques available?

Is this patient best served by proceeding with a postpartum tubal ligation under general anesthesia?

Model Discussion Content

Conceptually, the epidural space can be thought of as a tank that needs to be filled with local anesthetic solution to accomplish the goals of labor analgesia. Forceful uterine contractions cause uterine ischemia which in turn causes pain. The uterus is innervated by spinal roots T10-L1,¹ thus it is logical that one would need at least a T10 dermatome level to provide adequate analgesia during the first stage of labor. This level can be confirmed by checking pinprick sensation at the level of the umbilicus which corresponds to the T10 dermatome. During the second stage of labor, the fetus descends through the birth canal and this pain is mediated by the sacral nerve roots. It is difficult, if not impossible, to confirm pinprick sensation in the sacral dermatomes. Below is a diagram that conceptually illustrates a well working epidural:² Providing effective labor analgesia for a patient with a history of spinal instrumentation presents a special challenge to the anesthesiologist. These patients often have unpredictable responses to neuraxial techniques because spinal surgeries can distort the epidural space due to surgical alteration and post surgical adhesions.³ These changes in the epidural space can prevent diffusion of local anesthetic to the targeted spinal nerve roots which may cause inadequate analgesia. Below is a diagram that conceptually illustrates an inadequately working labor epidural due to post surgical changes from spinal surgery:⁴

Other complications of epidural anesthesia in a patient with a history of spinal surgery include difficulty placing the epidural catheter, increased risk of dural puncture and introduction of infection of foreign bodies such as Harrington rods.³ The same study showed that continuous lumbar epidural anesthesia was successful in 20 out of 21 attempts in patients with a history of

spinal surgery. A smaller study showed that lumbar epidural anesthesia was successful in 7 out of 9 attempts in patients with a history of Harrington rod placement.⁵

This patient's neuraxial options for labor analgesia include a continuous epidural catheter, a one dose subarachnoid injection, a combined spinal-epidural technique and a continuous intrathecal catheter. The advantages to the continuous epidural catheter are that it can be titrated to effect and as can be used for an indefinite period of time. Disadvantages of a continuous epidural catheter include risk of a dural puncture causing a postdural puncture headache and an unreliable block due to unpredictable spread of local anesthetic in the epidural space. A one time subarachnoid injection produces a reliable analgesic block but has a limited duration and must be timed appropriately. A combined spinal epidural has the advantages of a reliable subarachnoid block coupled with the longer duration of an epidural catheter but the efficacy of the epidural catheter will not be apparent until the effects of the subarachnoid dose have subsided.⁶ A continuous spinal catheter has the advantages of producing a reliable analgesic block that can be maintained indefinitely but significant disadvantages include increased risk of infection, incorrect dosing if mistaken for an epidural catheter and postdural puncture headache. Obstetricians have a few peripheral nerve blocks in their armamentarium that can provide labor analgesia. The paracervical block can be used for the first stage of labor but has a limited duration and does not help for the second stage of labor; its use has fallen out of favor in contemporary obstetrical practice. The pudendal nerve block can provide effective analgesia for the second stage of labor, but it must be well timed to coincide with delivery.⁷ Perineal infiltration or topical application of eutectic mixture of local anesthetic (EMLA) can supplement an inadequate pudendal or epidural block and can be particularly helpful with an extensive vaginal repair and/or episiotomy after a traumatic vaginal delivery.⁸

Systemic medications including intravenous opioids can also be used for labor analgesia. An intravenous dose of one milligram butorphanol reduced pain intensity during active labor in one study.⁹ Another study demonstrated that fentanyl given in two doses of 50 mcg separated by an hour had a significant decrease in pain score and reduced the duration of the active phase of the first stage of labor.¹⁰ Remifentanyl is an ultra-short acting opioid that can be administered via patient controlled analgesia but is not as efficacious as a combined spinal epidural.¹¹ Some centers in the United States use nitrous oxide for labor analgesia but data supporting its efficacy and safety are lacking.¹²

Aside from interventional and pharmacologic labor analgesic modalities, non-pharmacologic techniques are available. The motivated patient can learn coping strategies in antenatal education to deal with labor pain.¹³

One of the challenges in managing neuraxial techniques for labor analgesia is what to do next when the chosen technique fails. The first step should be a focused history and physical examination, gathering clues about what exactly went wrong. Oftentimes, the "epidural tank" is not filled appropriately and there are maneuvers one can employ to "fill it up". A continuous labor epidural catheter typically utilizes only the distal port of a multi-orifice epidural catheter due to its slow rate of infusion. A patient or clinician delivered bolus produces back pressure at the distal port and takes advantage of the side ports of the catheter, distributing the local anesthetic in different dimensions in the epidural space.¹⁴ This intervention could potentially increase the efficacy of an otherwise inadequate epidural catheter. The following diagram conceptually describes this idea:¹⁵

A combined spinal-epidural technique has the immediate benefit of a single subarachnoid dose and a potentially enhanced epidural effect. It is thought that the small dural puncture from the spinal injection facilitates entry of local anesthetic from the epidural space into the subarachnoid space. One study demonstrated that puncture of the dura with a 26 gauge needle prior to epidural injection increased caudal spread of analgesia by epidural local anesthetics.¹⁶ The following diagram illustrates this concept:¹⁷

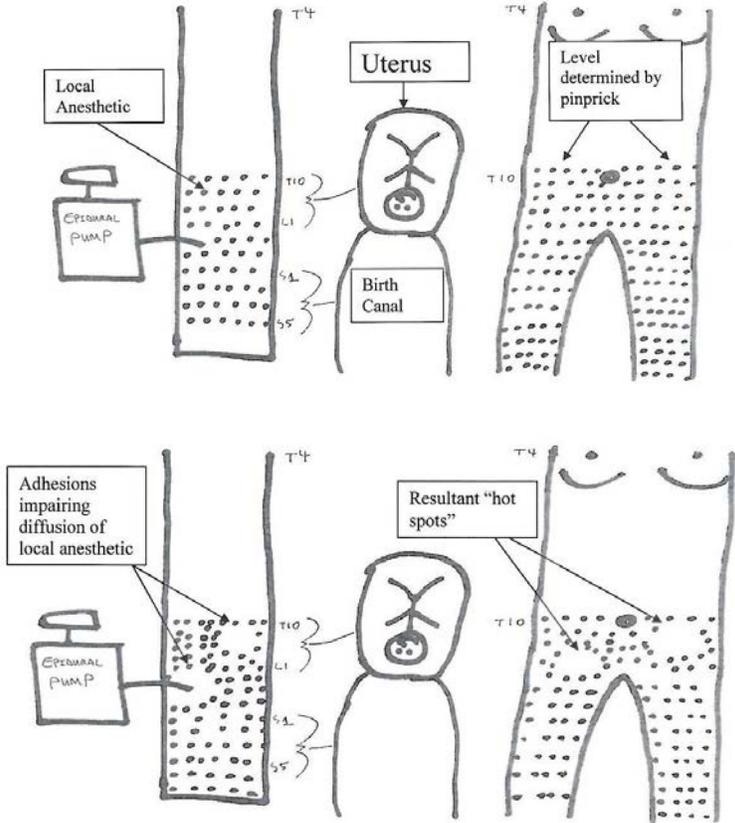
However, the idea that the dural puncture from a combined spinal epidural improves the function of epidural catheters is controversial. One study failed to show a difference in quality of labor analgesia when regular epidural catheters were compared to combined spinal epidural anesthetics.¹⁸ A recent meta-analysis concluded that there were no significant benefits of combined spinal epidural labor analgesia compared to regular epidural analgesia.¹⁹

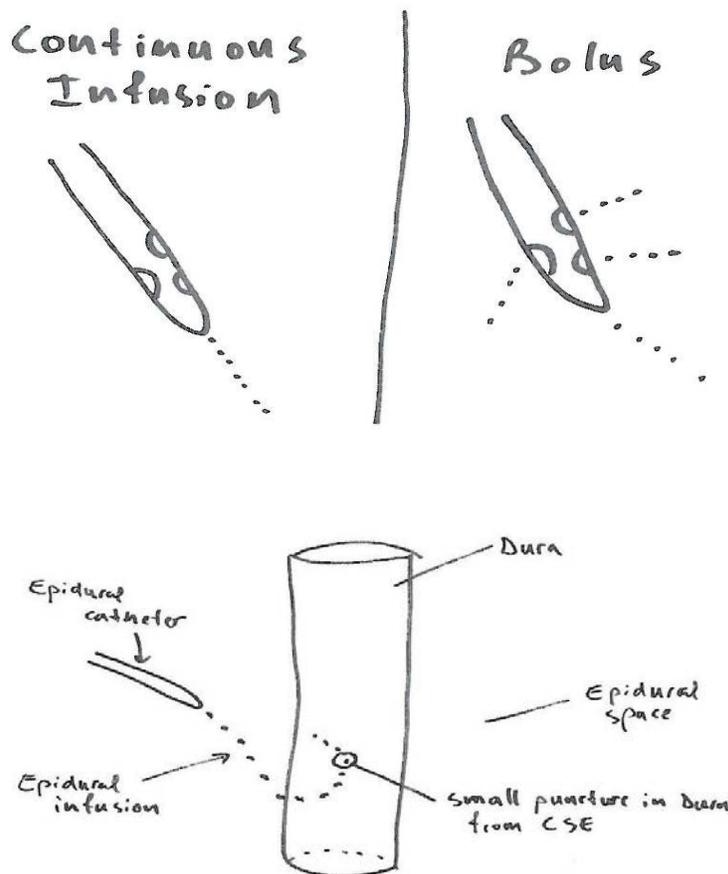
The American Society of Anesthesiologists (ASA) Task Force on Obstetric Anesthesia agreed that neuraxial anesthesia for postpartum tubal ligation reduces anesthetic complications compared to general anesthesia. The ASA Practice Guidelines for Obstetric Anesthesia state that the timing and the anesthetic technique for a postpartum tubal ligation “should be individualized, based on anesthetic risk factors, (e.g. blood loss), and patient preferences.”²⁰ General anesthesia can be performed for postpartum tubal ligations when regional anesthesia fails or is contraindicated. However, the risk of aspiration is increased in this patient population. One study showed that 11 out of 28 properly fasted patients (mean 13.5 hours from last meal) presenting for postpartum tubal ligation had food particles in stomach determined by ultrasound compared to no patients from a non-pregnant/postpartum cohort presenting for elective gynecologic surgery.²¹ The airway changes of pregnancy including edema of larynx and oropharynx can persist into the immediate postpartum period.²² In one center, the rate of difficult tracheal intubation was 4.7% of all patients receiving general anesthetics in the peripartum period.²³ Of note, there were only two failed airways in this study (0.08%) and both occurred during postpartum tubal ligations. Maternal age greater than 35 years, weight at delivery 90-99 kg and absence of labor were predictive of increased risk of failed intubation. Video laryngoscopy is an emerging technique that can be effective in dealing with the obstetric airway.²⁴ The Proseal™ laryngeal mask airway has been shown to be safe for use in fasted patients who underwent postpartum tubal ligation under general anesthesia.²⁵

Obstetrical risks and benefits must also be taken into account in deciding to proceed with a postpartum tubal ligation. Tubal sterilization is a safe, effective procedure independent of the surgical technique.²⁶ A Swiss study showed although there was a statistically higher complication rate for postpartum tubal ligations performed by minilaparotomy compared to interval laparoscopic tubal ligation, the difference between the nominal complication rates (0.39% and 0.10%, respectively) were not clinically meaningful.²⁷ A study in an urban center in Texas showed that the one year pregnancy rate for patients who desired postpartum tubal ligations but did not receive them was 46.7% while the pregnancy rate for patients who did not express a desire for postpartum tubal ligation was 22.3%.²⁸ Barriers to postpartum sterilization include last-minute misgivings, maternal medical complications and lack of a valid Medicaid consent form.²⁹ Hysteroscopic sterilization using an Essure device does not require general anesthesia but requires alternative forms of contraception during the first three months following insertion.³⁰ A long term study showed that the pregnancy rate of Essure devices was 0.25% with all of those pregnancies occurring in the first year after insertion.³¹

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