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Transnasal Sphenopalatine Ganglion Block: A Novel Solution for Postdural Puncture Headaches

By

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An Independent Study
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Abstract

Title: Transnasal Sphenopalatine Ganglion Block: A Novel Solution for Postdural Puncture Headaches

Background: A 29-year-old female patient presented for treatment of a postdural postural headache (PDPH) via epidural blood patch (EBP). This patient had a history of chronic migraines and had undergone epidural anesthesia for labor 6 weeks prior. Despite numerous conservative treatment attempts, she remained in pain. Eventually an EBP was successfully performed; although, it could be argued that a transnasal sphenopalatine ganglion block (TSGB) would have been an appropriate alternative treatment modality.

Purpose: To evaluate the current data regarding TSGB for treatment of PDPH in the obstetric patient.

Process: A systematic literature review was completed using the University of North Dakota’s Harley E. French Library databases and textbooks from the Nurse Anesthesia program. Several limits were placed while searching databases, i.e. CINAHL, PubMed, and the Cochrane Library, to better pursue the most recent and relevant information. Data was compounded to create anesthetic recommendations for obstetric patients presenting with PDPHs.

Results: Although case studies discovered on the evidentiary level which specifically apply to the obstetric population are limited; there are a multitude of randomized controlled studies with supportive data regarding TSGB for treatment of chronic headaches that can be extrapolated to infer the importance of future research on treatment for PDPHs.

Implications: This independent project encourages future research into the use of a transnasal sphenopalatine ganglionic block (TSBG) for treatment of postdural puncture headaches (PDPHs) for parturients. It is important to determine recommendations for the dosage and type of local anesthetic that delivers the best pain relief with the least amount of side effects. Given that parturients are not an easily studied population; it would be prudent to recommend the development of a website to gather information regarding the events leading up to accidental dural punctures, postdural puncture headaches and effectiveness and order of treatments prior to relief. This would allow for a wide spectrum of demographic, patient, technique and provider variability that could ultimately lead to cementing a logical PDPH treatment process for parturients.

Keywords: PDPH, EBP, TSGB, obstetrics, accidental dural puncture
Background

Anesthesia providers continue to discover new ways to implement obstetric anesthetic methods that keep the parturient and fetus safe. Regional anesthesia is the preferred method of anesthesia for the majority of anesthesia related obstetric procedures. In 2016, there were 3,945,875 births in the United States of America; of those births, 2,901,486 women underwent epidural or spinal anesthesia during labor (CDC, 2018). Based on this data, we can extrapolate that a large portion, 73.5%, of laboring females undergo regional anesthesia for obstetric pain management.

While regional anesthesia is considered a safe method to facilitate a pleasant childbirth, it is not without potential complications, such as a postdural puncture headache (PDPH). A PDPH is a postural headache that occurs when a dural puncture causes a loss of cerebrospinal fluid. The brain loses its fluid cushion and drops down into the foramen magnum and causes traction on the meninges, and the associated headache, that is only relieved by laying horizontal.

Accidental dural puncture occurred 1.5% of the time in the obstetric patient population and of that population more than half of those patients experienced a postdural puncture headache (Susecon, Austin, & Gabaldon, 2016). Approximately 21,700 women experience a significant adverse effect secondary to regional anesthesia. This undesirable incident can cloud the obstetric experience, increase hospital length of stay, decrease patient satisfaction, and impede the maternal-newborn bonding experience (CDC, 2018).

The gold standard treatment for a PDPH is an epidural blood patch (EBP). While EBPs are extremely effective, they are considered an invasive treatment and subsequently so, have higher complications. An alternative, noninvasive option gaining popularity is a transnasal sphenopalatine ganglion block (TSGB). This independent project examined the benefits of
incorporating a TSGB into a treatment protocol for PDPH and was developed to answer the following question: *Among parturients who underwent regional anesthesia for labor and delivery, how does a transnasal sphenopalatine ganglion block compare to an epidural blood patch in respect to symptom relief from a postdural puncture headache?*

**Case Report**

A 29-year-old 5’2” female weighing 94 kg, BMI 37.8, presented with a PDPH. She was categorized as an ASA 2, Mallampati I with a thyromental distance of three fingerbreadths, and full range of motion of the neck. She reported allergies to the influenza vaccine and latex. Pertinent medical history included asthma and migraines, surgical history of cholecystectomy and knee surgery with no noted personal or familial anesthetic complications. She was actively using the following medications: albuterol, oxycodone, baclofen, metronidazole, ibuprofen, dulera and fluticasone.

This patient experienced a PDPH after undergoing an epidural for a vaginal delivery at an outside facility. She was a G4 P4 individual who had epidurals in her past deliveries without complications. She could not say for certain whether or not the epidural had resulted in a dural tear and leak or “wet tap,” but she did report that the epidural was positional. She returned to the outside facility post-op day 5 reporting an intractable headache that was postural in nature. She also reported left-sided sciatic pain and intermittent left leg numbness; the outside facility completed an MRI which was negative, and they treated her with morphine and intravenous fluids and sent her home. She reported to this facility post-op day 15 with a bifrontal intractable headache, postural in nature with photophobia. In addition, she had pain at the lumbar injection site and the following relevant symptoms: elevated CRP, WBC 11,000, hemoglobin of 13, heart rate 118, blood pressure 108/72 and temperature 101.6. Blood cultures, urinalysis, repeat MRI,
CT, and influenza screen were all negative. She was started on Rocephin and vancomycin. Her tachycardia resolved after 2 liters of fluid. On post-op day 16, a lumbar puncture was completed (negative) with an opening pressure of 19 cm H2O. The hospitalist team treated her headache with opioids, fluids, and gabapentin. On post-op day 17, they ruled out mastitis and added caffeine, fioricet, a lidocaine patch, baclofen and steroids to her treatment. On post-op day 20, she continued treatment with fioricet, oxycodone-acetaminophen, prednisone, baclofen and motrin; physical and occupational therapies were added at this time because her left leg weakness had worsened. She was discharged home on post-op day 21 with plans for follow up appointments and regular physical therapy.

The patient continued with physical therapy with therapists noting increased strength in the left leg. On post-op day 30 she was treated in the ER for her headache with fluids, metoclopramide and diphenhydramine; she was referred to the clinic where they stopped the fioricet, but continued the baclofen, ibuprofen and oxycodone. She was diagnosed with bacterial vaginosis and started on metrogel on post-op day 36. She saw her primary care physician on post-op day 38 and underwent battlefield acupuncture (auricular needle placement) which resulted in slight headache relief but no relief to her back pain. During post-op week 5, she also sought out alternative therapies and tried acupuncture and massage as well as saw an optometrist. Neurology saw her on post-op day 39 and recommended a bilateral occipital nerve block. On post-op day 44 she had an obstetric follow up appointment and then came to the PACU for an epidural blood patch (this referral was made during a pre-op surgical appointment).

She was interviewed regarding the development and progression of her symptoms, responses to treatments and goals for her care. Her current symptoms were an intractable bifrontal headache, which she rated a 9/10 with visual disturbances and nausea. She reported
minimal relief from the headache via medications and reported that they made her groggy and nervous about breastfeeding her newborn. The physical interventions of acupuncture, massage, and physical therapy provided little relief. She reported compliance with drinking fluids and caffeine throughout the ordeal. She understood that given the increased length of time between dural puncture and treatment with an epidural blood patch, the treatment was less efficacious. A transnasal sphenopalatine ganglion block was proposed to the anesthesiologist given that she had symptoms consistent with both a postdural puncture headache and a chronic headache; he agreed to try the block if the epidural blood patch was unsuccessful. After receiving 2 mg of IV midazolam for anxiety, the procedure commenced. 18 mL of sterile autologous blood was injected into the L2-L3 interspace without incident one space above where her previous puncture sites were. The patient was immediately laid flat for 1 hour. After the hour, she was sat up and reported a significant relief in her headache, however, it was not completely gone, but it had decreased to a tolerable 2/10. The patient returned to the hospital on post-op day 46 for a scheduled bilateral salpingectomy and inguinal hernia repair, at which time she reported that her headache had dissipated.

Literature Review

Literature Review Methods

In order to research this topic, I used available databases from the University of North Dakota’s Harley E. French Library, i.e. CINAHL, PubMed, and Cochrane Library. The University of North Dakota’s Nurse Anesthesia Program’s relevant textbooks were also perused for information. CINAHL, the Cumulative Index of Nursing and Allied Health Literature is a large nursing research database. The PubMed database was developed by the National Library of Medicine and contains Medline resources. Cochrane library contains highly evidence-based
systematic reviews. The following keywords were identified from the PICO question:
sphenopalatine ganglion block, epidural blood patch, postdural puncture headache, obstetrics,
and parturients.

A search of “postdural puncture headache” in CINAHL with the limiting factors of
published after 2007, English language, and peer-reviewed yielded 31 results, 4 of which were
especially informative (Kooten, Oedit, Bakker, & Dippel, 2008; Bezov, Lipton, & Ashina, 2010;
Bezov, Ashina, & Lipton, 2010; Stein, Cohen, Mohiuddin, Dombrovskiy, & Lowenwirt, 2014).
Searching “sphenopalatine ganglion block” on CINAHL with the same limits produced 14
articles, 2 of which were also informative (Kent & Mehaffey, 2015; Robbins, Robertson, Kaplan,
articles with the same restrictions from CINAHL. A combination of “epidural blood patch” and
“obstetrics” generated 5 articles, 1 of these was relevant and not previously found (Susecun,
Austin, & Gabaldon, 2016). All relevant articles were read and reference lists were investigated
for further sources.

Similar limits were used in the PubMed database: full text, English language, less than 10
years old, and human species. A search of “postdural puncture headache” yielded 403 results.
When combined with “sphenopalatine ganglion block,” it resulted in 7, 3 of which were not
discovered in CINAHL, and 1 of which was relevant (Nair, 2017). “Epidural blood patch”
yielded 470 results, but combined with “obstetrics” formed 47 results, 1 of which was
specifically relevant (Harrington & Schmitt, 2009). “Sphenopalatine ganglion block” yielded 61
results, 2 of which were especially relevant and not previously discovered (Schaffer, Hunger,
Ball & Weaver, 2015; Robbins et al, 2016; Mojica, Mo & Ng, 2017).
A search of the online Cochrane Library database with similar limits, 2007-2017 and English, yielded 13 results for “sphenopalatine ganglion block,” none of which are relevant. “Epidural blood patch” found 2 systematic reviews, 1 of which detailed medication therapy for PDPH (Ona, Osorio, & Cosp, 2015). Other search attempts within clinical trials of “obstetric postdural puncture headache” generated 12 results, none of which were new or relevant. Ultimately, 2 textbooks and 18 relevant articles were discovered in the literature review. Articles include systematic reviews, clinical trials, and case reports.

Discussion

Pathophysiology of PDPH

A PDPH is an adverse risk of undergoing regional anesthesia for labor and delivery. A PDPH can occur from any incident in which the dural membrane is disrupted, i.e. a lumbar puncture, myelogram, or central regional anesthesia. It can result from either spinal or epidural regional attempts; however, it is more common in epidural anesthesia. It is often the result of a “wet tap,” or an epidural needle going past the epidural space and into the dural space; the larger needle in the dural space allows for rapid outflow of cerebrospinal fluid (CSF).

There are two theories regarding the mechanism of injury revolving around a PDPH. The first is that when an accidental dural tear occurs, there is a loss in the CSF and the buoyant environment that usually supports the brain. This disruption in CSF flow, pressure and volume causes a “downward pull on pain-sensitive structures in the upright position… tension placed on meninges and blood vessels containing stretch pain sensors” (Baysinger, 2014, p. 19). This pressure-volume mismatch can only be relieved by the patient lying flat, as this relieves the downward pressure on the meninges and allows the brain to “float” in the CSF again (Sachs & Smiley, 2014). An alternative theory centers on the Monro-Kellie hypothesis: the sum of the
brain, CSF and blood volume is constant, an increase in one compartment must cause a decrease in one or two of the other compartments. When the body experiences a loss of CSF volume it responds by increasing the blood volume. To compensate for the increased blood volume, the parasympathetic nervous system is reflexively stimulated to dilate the intracranial and spinous vessels causing venous engorgement (Syed, Mirza, Pabaney, & Hassan, 2012). This pressure-volume mismatch also causes the postural headache. Current conservative treatment for PDPH include bedrest, fluids, abdominal binders, caffeine, analgesics, and time. Most PDPH are self-limiting and will resolve in 5-14 days.

**Signs and Symptoms of PDPH**

Postdural puncture headaches often present 24-48 hours after a dural tap. It is usually bifrontal in nature, described as aching or throbbing, and can radiate to the occipital portion of the cranium. It is postural in nature, it is aggravated by a vertical position and relieved by lying flat. The patient may also experience nausea, vomiting, visual changes, tinnitus, hearing changes, cranial nerve palsies, vertigo and neck pain (Nagelhout & Plaus, 2014; Susecon, Austin, Gabaldon, 2016). The diplopia and tinnitus are caused by traction on the cranial nerves (Butterworth, Mackey, & Wasnick, 2013).

**Differential Diagnosis of PDPH**

It is imperative to correctly identify and diagnose the headache as a postdural puncture headache (Sachs & Smiley, 2014; Nagelhout & Plaus, 2014). Improper diagnosis and subsequent treatment has the potential for neurological sequelae, especially in the parturient population. It is important that anesthesia providers assess the patient for signs and symptoms that do not align with a PDPH and could be indicative of a graver diagnosis.
Arachnoiditis and meningitis are infectious complications characterized by fever, back pain, and neurological symptoms; classic meningitis signs include high fever, nuchal rigidity, and a severe non-postural headache. Epidural abscesses are also an infectious complication and include fever and progressively deteriorating symptoms of back pain, nerve root pain, radicular pain, motor deficits, sensory deficits, sphincter dysfunction, paraplegia, and paralysis (Butterworth, Mackey, & Wasnick, 2013).

Spinal and epidural hematomas occur when there is trauma to an epidural vein that causes bleeding and subsequent compression to the neural tissue. This compression can negatively influence spinal cord perfusion and cause ensuing neurologic symptoms based on location but often include “sharp back and leg pain with a motor weakness and/or sphincter dysfunction” (Butterworth, Mackey, & Wasnick, 2013, p. 970).

A tension headache is band-like in nature with neck and shoulder pain, it lasts hours to days, and it does not worsen with position and activity. Pregnancy is known to decrease migraines due to the hormonal changes; however, many women suffer from a reappearance of migraines in the postpartum period. Migraines are often pulsating focal headaches with vision changes and nausea lasting several hours to days. Other potential critical etiologies that need to be ruled out with imaging include subarachnoid hemorrhage, cerebral tumor, and strokes (Sabharwal & Stocks, 2011).

**Prevalence and Risk Factors of PDPH**

The occurrence of PDPHs varies significantly based on the source: 0.2-24% (Nagelhout & Plaus, 2014), 2-70% (Kent & Mehaffey, 2015), 3-50% (Butterworth, Mackey, & Wasnick, 2013). The disparity in incidence is highly attributable to the presence or absence of risk factors. The prevalence of PDPHs are principally inversely proportional to the needle size (Kent &
Anesthesia providers should take all precautions to minimize the risk factors associated with PDPHs. Factors that increase the risk of PDPHs which are heavily influenced by the provider include previous experience, using a large epidural needle, using a cutting needle rather than a pencil-point needle, placing the bevel perpendicular to the longitudinal spine, and attempting multiple insertions. Patient risk factors include young, female, low-normal weight, abnormal anatomy, pregnant, and a previous history of postdural puncture headache (Nagelhout & Plaus, 2014; Kokki, Sjovall, Keinanen, & Kokki, 2013; Baysinger, 2014).

Non-Invasive Treatment Options for PDPH

Conservative medical treatment includes bedrest, oral and intravenous hydration, caffeine, gabapentin, hydrocortisone, theophylline, sumatriptan, pregabalin, cosyntropin, and adrenocorticotropic hormone. There is a significant decrease in PDPH persistence with intravenous caffeine. There is a significant decrease in pain scores with gabapentin, hydrocortisone, and theophylline. There is no significant change in PDPH persistence or pain with cosyntropin, pregabalin, sumatriptan, and adrenocorticotropic hormone (Ona, Osorio, & Bonfill, 2015). Bedrest will alleviate the symptoms, but it will not hasten the recovery process (Sachs & Smiley, 2014). IV hydration will not improve CSF production, but dehydration will inhibit CSF production and prolong PDPH symptoms (Nagelhout & Plaus, 2014). Some anesthesia providers have reported success with threading an intrathecal catheter for 24 hours when confronted with an accidental dural puncture, as this is thought to trigger the inflammatory process and speed the closure of the dural puncture (Baysinger, Pope, Lockhart, & Mercaldo, 2011). Despite advancements regarding non-invasive treatment options, studies concur that the gold standard of treatment remains an epidural blood patch.
Invasive Treatment Options for PDPH

Epidural Blood Patch

An epidural blood patch (EBP) is the definitive, although invasive, treatment modality for PDPH. An EBP is a sterile procedure. A patient’s arm and back are draped in the appropriate aseptic manner. Two providers are required, one to draw the autologous blood from a peripheral vein and another to achieve epidural access. Once access to the epidural space at, or below the level of the initial puncture point is confirmed with loss of resistance by the first provider, the second provider obtains 20-30 milliliters of autologous blood and, while maintaining sterility, hands it to the second provider. This autologous blood is infused into the epidural space until the patient reports pressure, usually around 15-20 milliliters. The needle is withdrawn and the patient is placed supine for 30-60 minutes. EBP aids in clot formation and provides mechanical pressure against the dural puncture point, increasing CSF pressure, which relieves meningeal tension (Butterworth, Mackey, & Wasnick, 2013; Nagelhout & Plaus, 2014).

EBP Physiology

Researchers believe that an EBP relieves a PDPH by two mechanisms: it immediately provides mechanical pressure against the dural puncture point, increasing CSF pressure, which relieves the tension on the meninges and increases intracranial pressure (Butterworth, Mackey, & Wasnick, 2013; Baysinger, 2014) and it speeds the formation of a clot as the blood adheres to the dura and seals the hole in the meninges (Sachs & Smiley, 2014; Baysinger, 2014). Given that the exact mechanism of injury remains to be fortified; it is easy to see why treatment procedures vary institution to institution.
**EBP success rate/efficacy**

EBP is a highly successful treatment modality for PDPHs with a 90-95% cure rate. If it is not successful initially, a second EBP repeated 24 hours later has a 90% cure rate. Timing of EBP greatly influences the efficacy. EBP are most efficacious if performed 48 hours after the dural puncture (Kokki, Sjovall, Keinanen, & Kokki, 2013, p.307).

**EBP Side-effects & Contraindications**

Contraindications to EBPs include systemic infection, fever, current neurologic sequelae, anticoagulation/coagulopathy abnormalities, and patient refusal or lack of cooperation (Nagelhout & Plaus, 2014; Tubben & Jain, 2018). Potential side effects are the same as those that exist when performing an epidural anesthetic: direct spinal cord injury, accidental dural puncture, cerebrospinal fluid leakage, epidural abscess, epidural hematoma, vascular injection, infection at the site, meningitis, arachnoiditis, compressive radiculopathy, cauda equina syndrome, and unintentional subarachnoid injection (Pino et al, 2014; So, Park, Lee, Kim, Lee, & Kim, 2016, p. E1117).

**EBP Variation**

Common practice among anesthesia providers is to administer 15-30 ml autologous blood as tolerated by the patient until the patient experiences intolerable pain. The “ideal blood volume to administer during an EBP remains unknown” (Booth, Pan, Thomas, Harris, & D’Angelo, 2017, p. 16), there also is no known amount of epidural blood to administer in repeat epidural blood patches. Epidural saline injection is thought to temporarily equalize the pressure between the epidural and subarachnoid spaces and allow fibrin to seal the dural hole (Suescun, Austin, Gabaldon, 2016, p.20). However, saline does not hasten the inflammatory response, and the increase in pressure that causes symptom relief is transient (Baysinger, 2014). Boonmak &
Boonmak (2010) found no statistically significant results when patients were injected with epidural or intrathecal saline boluses or infusions for treatment of PDPH.

The level at which the epidural blood patch is administered also varies between practitioners and facilities. Many anesthesia providers perform an EBP at the same or one level below the initial puncture point. Given that scanning has shown that blood moves “cephalad and caudally after injection, passes into the anterior epidural space, and passes through the intervertebral foramina into the paravertebral space… the thecal sac is compressed by blood with presumed CSF dislocation cephalad” one can appreciate that the level of injection may not have a significant effect but it best completed at or below the initial site (Baysinger, 2014, p. 31). No studies were found comparing level of injection with success rate of EBP.

**EBP Prophylaxis**

In response to prophylactic treatment for PDPH, i.e. epidural injections of saline, intrathecal injections of saline, or prophylactic blood patches; it appears the literature does not support these interventions as the potential risks outweigh the benefits (Sachs & Smiley, 2015; Susecon, Austin, & Gabaldon, 2016). Gaiser (2013) found that prophylactic EBP was not needed 40% of the time, as it did not affect incidence of severity of PDPH or the need for an EBP. This author agrees that introducing anything near the spinal cord prior to necessity is greatly countered by the risk of neuronal tissue damage. Anesthesia providers should take measures to decrease risk factors associated with accidental dural puncture: needle type, needle size, bevel direction, loss of resistance technique, provider skill, and less than ideal procedural considerations.
Transnasal Sphenopalatine Ganglion Block

Anatomy

The sphenopalatine ganglion is a cone shaped ganglion that is suspended from the maxillary nerve and then dissipates into the nasopalatine nerve, greater palatine nerve, lesser palatine nerve, lateral nasal branches, and the pharyngeal branch of the maxillary nerve, as well as the orbital branches (Robbins et al, 2016). The sphenopalatine ganglion is an “extracranial neural structure located in the pterygopalatine fossa that has both sympathetic and parasympathetic components as well as somatic sensory roots” (Kent & Mehaffey, 2015, p. 1714e1); and when activated, it causes the release of acetylcholine, peptides and nitric oxide which subsequently causes inflammation and triggering of trigeminal nociceptors (Robbins et al, 2016).

Physiology

The transnasal sphenopalatine ganglion block (TSGB) was developed by Dr. Sluder in 1908 for treatment of headaches and it continues to be an effective methodology for various chronic headache scenarios, trigeminal neuralgia, and ENT surgeries (Robbins et al, 2016; Schaffer, Hunter, Ball & Weaver, 2015). The sphenopalatine ganglion block inhibits the parasympathetic stimulation so meningeal and cerebral vessels can regulate without excess parasympathetic vasodilation and the headache dissipates (Kent & Mehaffey, 2015, p. 1714e1), it also blocks the activation of meningeal nociceptor fibers (Channabasappa, Manjunath, Bommalingappa, Ramachandra & Banuprakash, 2017). TSBG is a newly proposed alternative method to treatment of postdural puncture headaches (PDPH).
Procedure

There are several ways to administer a TSGB with varied amounts of technical expertise required, “local application of the drug, administering it using a dropper, spraying, and injecting the drug under direct visualization” (Robbins et al, 2016, p. 245). Direct drop administration usually requires less setting time (30-60 seconds per nare). Kent & Mehaffey (2016) performed the TSGB on obstetric patients in the following manner: patient placed supine with neck extended, intranasal phenylephrine spray administered, hollow cue-tips saturated with 2% viscous lidocaine were placed into each nare until reaching the posterior nasopharynx and remain there for 10 minutes; the applicators were removed, re-saturated with lidocaine, and the procedure was repeated. The patient was then sat up and evaluated. Several applicators, i.e. Tx360, SphenoCath, and Allevio, have been developed to improve proper placement and can be combined with fluoroscopy to increase success of the block and decrease the amount of local anesthetic needed to saturate the sphenopalatine ganglion. After a rest period in the supine position, the patient is sat up and pain is evaluated, if at that time there was no relief in symptoms it would be appropriate to discuss other interventions and/or perform the gold standard epidural blood patch.

Various amounts and concentrations of local anesthetics have been utilized for TSGB. The diversity in medication administration is likely due to the differences in method of administration, the acuteness or chronicity of the headache, and how soon after onset the block was performed. Providers have used 1 puff of 10% lidocaine, 6% lidocaine drops, 10% cocaine drops, 4% lidocaine drops, 0.5 ml 0.4% lidocaine, 1 ml 4% lidocaine, 2% intranasal viscous lidocaine, 20% lidocaine dipped cotton applicators, 1-2 ml 2% lidocaine, 0.5 ml 0.5%
ropivacaine, and 0.3 ml of 0.5% bupivacaine (Robbins et al, 2016). The previously listed assortment encourages further research into the best medication and dose for TSGB.

**Efficacy**

Transnasal sphenopalatine ganglion blocks have proven to be successful in treatment and prevention of chronic headaches with some patients reporting relief from cluster headaches for anywhere from 1-24 months in duration (Robbins et al, 2016). A literature review performed by Mojica, Mo & Ng (2017) found a variety of researchers’ success with TSGB for treatment of chronic headaches with a majority of patients reporting a 65-85% reduction in the intensity of their headache. TSGB is a promising, easily performed, low risk, alternative treatment for PDPH. Although several studies exist for TSGB for headache patients, very few exist for the obstetric population. Small limited studies show potential, i.e. Cohen, Sakr, Katyal, & Chopra (2009) and Kent & Mehaffey (2016).

Kent and Mehaffey (2016) offered an EBP or a TSGB to 3 obstetric patients who suffered an accidental dural puncture (ADP) and subsequent PDPH. The first patient had an ADP and successive intrathecal catheter placement. After catheter removal she developed a PDPH; despite medical management and analgesics at home, she returned to the ER at 5 days post-puncture with a 9/10 headache. This was relieved with a TSGB to 0/10 and remained 0/10 at 24 and 48 hours. Patient 2 had a PDPH develop shortly after an uneventful labor epidural catheter was removed, she received a TSGB 4 days post-puncture for an 8/10 headache that was relieved with a TSGB to 0/10, at 24 hours it was 3/10 and at 48 hours if was 2/10 and tolerable. The third patient had an accidental dural puncture and consequential intrathecal catheter placement. When the catheter was removed, she developed a PDPH, she went home on oral analgesics, returned 4
days post-puncture for an EBP which relieved pain for only 2 days; she then she returned 9 days post-puncture for a TSGB which provided immediate relief and 0/10 pain at 24 and 48 hours.

Cohen, Sakr, Katyal, & Chopra (2009) found that 11/13 obstetric patients reported relief after TSGB. It is their practice to offer a TSGB with 4% lignocaine prior to an EBP. They also offer TSGBs daily or provide instructions and supplies for the patient to complete a TSGB at home for 1 week. They do report an “unpredictable” success rate, with some patients reporting immediate and complete relief of pain while others reporting transient relief and a few that require an EBP for relief of symptoms. Cohen, Ramos, Grubb, Mellender, Mohiuddin & Chiricolo (2014) reported a 69% success rate in 32 obstetric patients with PDPH. They utilized cue-tips saturated with 5% water soluble lidocaine ointment into each nare for 10 minutes.

**PDPH Treatment Comparison**

Although EBPs are over 90% effective, they are invasive (Nagelhout & Plaus, 2014). TSGB should be studied further as an alternative noninvasive method to EBPs for treatment of PDPHs. It is a noninvasive, relatively successful block that has a mild side effect profile of only bleeding, discomfort, mouth numbness, dissatisfying taste, and a failed block; whereas, an EBP has a side effect profile including infection, dural puncture, spinal hematoma, neurological complications, and patient discomfort. TSGB is also less expensive and requires less skill to perform than an epidural blood patch. EBPs have several relative and absolute contraindications, whereas TSGB have only patient refusal and basilar skull fractures as contraindications. Overall, TSGB deserves to be investigated as an alternative approach to an EBP for treatment of PDPHs.

**Comparison of Case with Evidence**

The patient demonstrated some symptoms consistent with a PDPH; however, the timeframe was abnormal. She was 6 weeks post-epidural puncture for labor and 4 weeks post
diagnostic lumbar puncture. The anesthesia provider hypothesized that the dural tear had possibly formed a fibrin scar that encircled the dural orifice and was allowing a continuous dural leak.

The abnormal timeframe was problematic in determining the origin of the headache. She also had a history of migraines but reported that the symptomology of her migraines was vastly different than her current symptoms. The patient’s symptom profile did not fully correlate with only a PDPH. Differential diagnoses and potential etiologies of the headache had been previously addressed through imaging and labs and various specialties (neurology, physical therapy, and massage therapy). It would have been beneficial to gain access to the outside facility’s records regarding the labor epidural to assess for any immediate procedural complications or presence of a “wet tap” or dural leak.

Given the ambiguity of the symptoms and haziness regarding the labor epidural, although the EBP was successful, one can argue that a TSGB would have been a more appropriate treatment choice. It is a noninvasive, easy block with minimal side effects and a documented treatment modality for both a PDPH and a chronic headache. The patient was visibly anxious and afraid of needles. Taking the previous information into consideration and that the efficacy of a PDPH decreases with time from the dural puncture incident, perhaps a TSGB should have been attempted first.

**Anesthesia Implications**

Although case studies discovered on the evidentiary level which specifically apply to this case study are few, there are a multitude of articles with supportive data regarding TSGB for treatment of chronic headaches that can be extrapolated to infer the importance of future research on treatment for PDPHs. Anesthesia providers should anticipate the development of a PDPH
treatment algorithm that includes conservative medical management (hydration, bedrest, caffeine, analgesics) and aggressive procedural management (TSGB and EBP) for parturients.

The literature review conducted for this independent project encourages future research into the use of a TSBG for treatment of PDPHs for parturients. It is important to determine recommendations for the dosage and type of local anesthetic that delivers the best pain relief with the least amount of side effects. Given that parturients are not an easily studied population; it would be prudent to recommend the development of a website to gather information regarding the events leading up to accidental dural punctures, postdural puncture headaches, and effectiveness and order of treatments prior to relief. This would allow for a wide spectrum of demographic, patient, technique and provider variability that could ultimately lead to cementing a logical treatment process for parturients.

**Conclusion**

Parturients are a special population within the healthcare realm whose satisfaction with anesthesia services is highly influential on patient satisfaction scores and subsequently hospital length of stay, healthcare costs, and readmittance. It is imperative that anesthesia providers have a multitude of treatment modalities within their arsenal to combat adverse effects of regional anesthesia for labor. Nevertheless, experiments regarding this population are often small and retrospective for apparent reasons. Further research is required to develop the best TSGB technique, but this independent project supports the addition of TSGB into a treatment algorithm for PDPH.
References


Appendix A

Introduction

- 3,945,875 births in the US
  - 2,901,486 underwent epidural or spinal anesthesia during labor
  - 50,788 had regional anesthesia
  - 1.5% had an accidental dural puncture
  - 56% had PDPH

- 21,700 women*
  - “If mama ain’t happy...”

* CDC, 2010 Survey on Anesth, & Gynec, 2010, p. 12

Introduction - PDPH

- Pathophysiology
  - Accidental Dural Puncture
    - Pressure-volume mismatch
    - Intracranial hypotension
    - Postural headache
- Risk Factors
  - Provider related
  - Patient related
- Current Treatment
  - Conservative management
  - Invasive management

Case Information

- Procedure: Epidural Blood Patch
- Age: 28 y.o.
- Gender: Female
- Ht: 5’1”
- Wt: 94 kg
- BMI: 37.8
- ASA: 1
- OBGYN: G4P4, 6 weeks postpartum

- Current symptoms
  - 8/10 intractable bifrontal headaches, visual disturbances and nausea

Pre-operative Evaluation

- Past Medical History
  - Asthma, migraine
- Surgical History
  - Electrosurgery, knee surgery
- Current Medications
  - Albuterol, ibuprofen, acetaminophen, ibuprofen, dulox, ativan, thyroid
- Labs
  - Hct 72
  - WBC 11.9/μL, PLT 128, TSH 2.0, furosemide 0.5 mg, CT scan
- Pertinent labs/ECG/urine/RAY, etc.
  - Negative CT, MRI, LP
- Airway evaluation
  - Mallampati: TI, TM 3, Full ROM of neck, dentition normal

Anesthetic Course

- Drugs
  - 2 mg midazolam after pumping
- Technique
  - Epidural
  - 18 ml of sterile autologous blood was injected into the L2-L3 interspace without incident
  - 1 space above previous puncture sites
  - Supine for 4 hour
- Rationale
  - Gold standard for PDPH treatment
**Intraoperative Issues**
- Difficulty obtaining vascular access:
  - Initially attempted in the left hand with a 18 ga needle
  - Only able to obtain 5 ml autologous blood
- Second vascular attempt- 18ga needle in the right hand
  - Obtained 20 ml autologous blood

**PACU**
- Supine for 1 hr in PACU
- No issues
- Reported "significant" relief in headache
  - Tolerable at 1/10

**Discussion**
- **Conservative Management**
  - Intravenous caffeine
  - Significant decrease in PDPH pain scores
  - gabapentin, hydrocodone, theophylline
  - Significant decrease in PDPH pain scores
  - Cystostrin, pregabalin, sumatriptan, adrenocorticotropic hormone
  - No significant change in PDPH persistence or pain scores
  - Bedrest
  - Alleviates symptoms, but doesn't hasten recovery
  - IV hydration
  - Will not improve CSF production
  - Intraoral catheter for 24 hrs

**Discussion**
- **Epidural Blood Patch**
  - Sterile procedure
  - Access vein and epidural space
  - 2 mechanisms of action
  - Mechanical Pressure (Baron et al., 2003; Hughes & Plews, 2010)
  - Spots clot formation (Sawatzky et al., 2003)
  - Efficacy
  - 90-95% initial attempt, second EBP 90%

**Discussion**
- **Epidural Blood Patch cont.**
  - Contraindications
  - Side effects
  - Variations
  - Volume of blood
  - Blood vs. saline
  - Level

**Discussion**
- **Transnasal Sphenopalatine Ganglion Block (TSGB)**
  - Dr. Sluder in 1908
  - Extracranial neural structure
  - Efficacy
  - 65-85% in headache intensity for chronic headaches
  - 1/13 obstetric patients (Cohen, Sack, Krzydlo & Chopra, 2009)
  - 3/3 (Kent & Metzler, 2016)
  - 64% in obstetric patients (Cohen, Ramos, Grabb, Mellin et al., Mahafza & Chpan, 2014)
Discussion

- Procedure
  - Varied methods
  - Varied medication
- Kent & Mehaffey, 2015:
  - Supine, neck extension, intranasal phenylephrine spray, Q-tip saturated with 2% lidocaine, repeat
- Efficacy
  - 65-85% reduction in headache intensity (Masina, Mo., & Ng, 2019)

Recommendations

- Further research is needed in the obstetric population regarding the use of TSGB
- Encourage you to add it to your repertoire, along with conservative medical management, before utilizing EBP

Conclusion

- Comparison of Caswell vs Evidence
  - 6 weeks post epidural puncture
  - 6 weeks post diagnostic lumbar puncture
- Conservative management attempts:
  - Morphine, IV, gabapentin, carbocaps, fluricet, lidocaine patch, baclofen, steroids, Percocet, prodhax, Ingridel, physical therapy, metacaspaside, dexamethasone, battlefield acupuncture (auricular needle placement), acupuncture, massage, optometrist, ENT, neurology consult.
- Patient experienced significant relief of headache with EBP

Conclusion

- TSGB vs EBP
  - Less invasive
  - Has less complications
  - Has less contraindications
  - Requires less time
  - Is less risky
  - Requires less skill
  - And is less expensive

References
Thank You
Are There Any Questions?