Statement on Post-Dural Puncture Headache Management

Committee of Origin: Obstetric Anesthesia

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The postpartum period is characterized by numerous changes such as sleep deprivation, irregular food intake and dehydration. Headache in the post-partum period is common, up to 39% in one prospective study with only 4.7% of headaches anesthesia related. Epidural analgesia is commonly used to alleviate labor pain with a reported rate of over 50% at many institutions in the United States and over 85% in tertiary care labor and delivery centers with 24-hour obstetric anesthesia coverage. However, labor epidural analgesia is not without complication; the most common complication of labor epidural catheter placement is unintentional dural puncture (UDP) with an approximate incidence of 0.51-1.5% in obstetric patients, and 50-80% of patients may develop a post-dural puncture headache (PDPH). Spinal anesthesia may also result in a PDPH incidence of 0.8-5% in the highest pregnancy risk group, with lower incidences for pencil point needle tip design and smaller gauges. In one report, PDPH was involved in 12% of obstetric closed claims. Postpartum morbidity following PDPH include readmission (5.2%), increased relative risk for cerebral venous thrombosis (aOR = 11.4) and subdural hematoma (aOR = 76.7). Recent articles have found an increase in persistent headache (aOR 6.4) and backache (aOR 4.4) one year later as well as an increased incidence of postpartum depression, post traumatic steres disorder, and a decrease in breastfeeding (p<.0001).

PDPH Definition

The International Headache Society (IHS) defines PDPH as a headache occurring within 5 days of a lumbar puncture, caused by cerebrospinal fluid (CSF) leakage through the dural puncture. It is usually accompanied by neck stiffness and/or subjective hearing symptoms. The PDPH usually remits spontaneously within 2 weeks, or after sealing of the leak with an autologous epidural lumbar patch. The headache usually starts within 48 hours of an epidural UDP and if left untreated, resolves spontaneously in about 2-weeks in most women but may last longer in some women. Smaller gauge dural punctures with spinal anesthesia typically resolve in 2-3 days. Even though the PDPH is associated with a postural component, a postural component may not be present in up to 5% of cases of PDPH. Additionally, in one third of cases, an epidural dural puncture may not have been recognized at all. Factors influencing the incidence of PDPH includes age, gender, previous history of headache, needle characteristics, number of attempts and clinical experience of the provider.

If a PDPH is suspected, a member of the anesthesia team should see the patient within 24 hours. The intensity of maternal symptoms may dictate the need for an Epidural Blood Patch (EBP). When PDPH is less severe, which may reflect a smaller dural tear with less CSF leak, conservative therapy may be preferred in the expectation the headache resolves without the need for an EBP. If headache is more significant such that activities of daily life and caring for the baby are compromised, an EBP should be considered.

PDPH Diagnosis

The diagnosis of PDPH is based on both the clinical presentation (documented dural puncture and severe postural headache being most characteristic) and a detailed history and physical
examination. The differential diagnosis of PDPH in an obstetric patient includes caffeine withdrawal, migraines, meningitis, sinus related, preeclampsia, pneumocephalus and intracranial pathology such as an intracranial subdural hematoma and posterior reversible encephalopathy syndrome.\textsuperscript{15}

It should be noted there is an increased risk for an intracranial subdural hematoma after a PDPH with an incidence of 1.5 per 100,000 deliveries.\textsuperscript{16} Posterior reversible encephalopathy syndrome should be considered in patients presenting with headache, elevated blood pressure and proteinuria as this syndrome is seen in preeclamptic patients.\textsuperscript{17} A patient presenting with severe unexpected, atypical PDPH features, needs full neurological evaluation including a neurology consult and radiological imaging (e.g., CT Scan, MRI).

Additionally, emerging data from 5 retrospective and 3 prospective studies support an association between PDPH, especially after unintentional dural puncture with an epidural needle, with chronic headache sequelae.\textsuperscript{3, 8, 9, 18-22}

\textbf{PDPH Pathophysiology}

Low intracranial CSF volume or intracranial hypotension may develop due to an intentional (spinal anesthesia) or unintended\textsuperscript{1} dural puncture (UDP) causing a loss of CSF into the epidural space through the dural hole leading to a fall in CSF pressure. The headache is postulated to be caused by traction on pain sensitive structures in the cranium\textsuperscript{23}; another etiology may be due to increased cerebral blood flow in response to decreased intracranial cerebral spinal fluid. The proposed mechanism regarding the formation of an intracranial subdural hematoma after UDP is from decreased intracranial pressure placing traction on the bridging veins between the dura and arachnoid, resulting in their tearing and subsequent hematoma formation.\textsuperscript{16}

\textbf{PDPH Treatment Options}

The personal pain, discomfort, and distress may interfere with maternal-neonatal bonding; thus, intervention is frequently needed. Management options can be divided into conservative and invasive measures.

\textbf{Conservative Measures}

Conservative management in the form of supportive therapy includes bed rest, rehydration, abdominal binders, oral caffeine, and analgesics (nonsteroidal anti-inflammatory drugs, aspirin, acetaminophen, and oral opioids e.g., oxycodone) for the first 24-48 hours and consideration of a therapeutic epidural blood patch (EBP) if conservative management fails (PDPH symptoms not getting better or progressively worse).\textsuperscript{3, 24} Supportive therapy including rehydration and analgesics may control the symptoms but usually do not provide complete relief. Bed rest, supine posture, and abdominal binders may have no benefit or are impractical in the setting of a parturient caring for a newborn, and prolonged bed rest is not recommended as it may increase the risk of thromboembolic complications.\textsuperscript{25}

\textsuperscript{1} Some articles use the term “accidental” dural puncture (ADP)
Pharmacological Treatment

A component of headache is believed to be dilated cerebral blood vessels, which expand at least in part due to a decrease in intracranial CSF volume. Cerebral vasoconstrictors have been used to reduce symptoms of headache – one of the most popular amongst these is caffeine. It is assumed to relieve headache by vasoconstriction of the dilated cerebral blood vessels. Oral caffeine in the dose of 300-500 mg is recommended once or twice a day. Intravenous caffeine can be given if the parturient is unable to drink. If used, treatment with caffeine should not exceed 24 hours, oral therapy is preferred, and doses should not exceed 300 mg, with a maximum of 900 mg in 24 hours. A lower maximum dose of 200 mg in 24 hours should be considered for women who are breastfeeding, particularly those with low birth weight or premature infants. Women receiving caffeine therapy should have their intake of caffeinated drinks monitored and the recommended daily dose should not be exceeded. It should be noted the effects of caffeine do not change the underlying course; it is only for short term symptomatic treatment.

Other agents used with insufficient evidence include aminophylline, theophylline, adrenocorticotropic hormone (ACTH), desmopressin (DDAVP), hydrocortisone, dexamethasone, methylprednisolone, triptans, gabapentinoids, methylergonovine, ondansetron, mannitol, and neostigmine and atropine in the treatment of obstetric PDPH.24-26

Invasive Procedures

Therapeutic Epidural Blood Patch (TEBP)

Treatment of PDPH with an EBP was first described by Gormley in 1960. It is postulated that blood injected in the epidural space increases the subarachnoid pressure by causing compression of the thecal sac and forces CSF cephalad. The clot formed seals the dural puncture thereby preventing further leak of CSF. EBP was more often used in patients with greater initial headache intensity.

TEBP Efficacy

Blood patches placed after an initial observation period of greater than 24 hours have a higher success rate approaching 93% after one EBP and 97% after a second EBP. Success was greater with a longer interval between dural puncture and EBP. Women should be informed that performing an EBP within 48 hours of dural puncture is associated with a reduction in its efficacy and a greater requirement for a repeat EBP. However, in severe obstetric PDPH, an EBP within 48 hours of dural puncture may be considered for symptom control, although it may need to be repeated. Severity of symptoms should dictate the timing of the EBP. However, in those parturients with acute cranial nerve involvement (e.g., blurred vision, tinnitus, diplopia), an immediate EBP is recommended to prevent chronic complications. However, Chambers et al. in an analysis of 43 case reports noted that not all patients had permanent resolution of cranial nerve symptoms.

Most recent prospective studies suggest complete and permanent relief of headache after one EBP in up to one third of women with PDPH following dural puncture with an epidural needle. Complete or partial relief may be seen in 50–80%. Up to 20% of women receive little or no relief from an EBP, even if repeated. There is currently no evidence that imaging is needed before performing an EBP in the setting of UDP with classic symptoms. If the character of the
headache changes, or when associated with focal neurological signs, then imaging would be indicated prior to performing an EBP.

**Second Therapeutic Epidural Blood Patch**

In cases of partial or no relief, a second EBP may be performed after consideration of other causes of headache.\(^1\)\(^1\) Studies in vitro have shown both lidocaine and CSF have a detrimental effect on coagulation.\(^1\)\(^1\),\(^3\)\(^2\),\(^3\)\(^3\) Increasing concentrations of lidocaine cause hypocoagulability and fibrinolysis\(^3\)\(^2\) whilst CSF has both procoagulant and clot destabilizing effects.\(^1\)\(^1\),\(^3\)\(^3\) EBP reduced headache intensity quickly, but about 20% of patients needed a second EBP. After 7 days, most patients had no or mild headache.\(^2\)\(^8\)

When a second EBP is performed, there is no evidence on the optimum time interval between the first and second EBP.\(^1\)\(^1\) A second EBP may be performed once other causes of headache have been excluded. Where the diagnosis of obstetric PDPH is likely and an EBP has produced resolution of symptoms but headache subsequently returns, a second EBP may be offered as it is likely to be of benefit. If an EBP has produced some improvement in symptoms but the headache persists, a second EBP can be considered as it may be of benefit. In cases where an EBP has no effect on headache, or if the diagnosis of obstetric PDPH is less certain, or the nature of headache has changed, discussion with other specialties including obstetrics, neurology and neuroradiology should take place before a second EBP is performed. If two EBPs have failed to relieve symptoms, other causes of headache must be considered, and involvement of other specialties is recommended before performing a third EBP. There is insufficient evidence to state the optimum timing for efficacy and safety of a repeat EBP.\(^1\)\(^1\)

**Alternative Invasive Procedures**

**Prophylactic Epidural Blood Patch (PEBP)**

Up to 20 ml of blood is injected into the epidural space before catheter removal. The success rate of the PEBP is not as high as the TEBP, and may not prevent development of a PDPH, but may reduce the length and severity of symptoms.\(^3\)\(^4\) PEBP is not routinely recommended at this time.

**Intrathecal Catheter Placement after UDP**

Following an UDP, an intrathecally placed catheter is left in situ for 24 hours. Evidence in support of leaving an intrathecal catheter in place for 24 hours after delivery, or infusion of intrathecal saline is equivocal.\(^3\)\(^5\)-\(^3\)\(^9\) The risk of inadvertent epidural dosing of an intrathecal catheter and risk of infection should also be considered.

**Other Alternative Invasive Techniques**

There is currently insufficient evidence to recommend the use of acupuncture, greater occipital nerve blocks, sphenopalatine ganglion blocks, epidural morphine, and prophylactic intrathecal morphine via an intrathecal catheter after UDP in the treatment of obstetric PDPH.\(^4\),\(^2\)\(^4\),\(^2\)\(^5\)

An epidural patch using agents such as saline, epidural dextran infusion, epidural hydroxyethyl starch infusion, epidural gelatin, or fibrin glue has also been proposed but seldom used due to lack of sufficient studies. An epidural bolus administration of these agents may improve symptoms, but the effect is only transient.\(^2\)\(^4\)
EBP Efficacy

Complete relief of symptoms following a single epidural blood patch is likely to occur in up to one third of cases, with complete or partial relief seen in 50–80%. Around 10% of those who received EBP had recurrence of headache within 24 hours. In cases of partial or no relief, a second epidural blood patch may be performed after consideration of other causes of headache. If two EBPs have failed to relieve symptoms, other causes of headache must be considered, and involvement of other specialties is recommended before performing a third EBP. Other causes of headache in the parturient are provided above under PDPH diagnosis.

EBP Risks and Side Effects

Back pain during and for several days after EBP is common and can be significant. Rare complications include nerve damage, bleeding, and infection. Back pain during an EBP may occur in 50% of women, and at 24 hours post EBP, more than 80% of women may experience back pain. This can continue for several days but severity usually decreases over a few days, with resolution for most women by four weeks. There is no evidence to suggest there is an increased rate for chronic back pain after an EBP. However, Gupta has noticed that backache, headache, and analgesic use are more common at 3 months in patients receiving an EBP. As back pain both during and after an EBP is common, and in some cases severe, it should be discussed as part of the consent process. Neurological symptoms may occasionally develop after an EBP, but their incidence is unknown and the relationship between an EBP and neurological symptoms may not be causative. Given the severity of some neurological symptoms, their development should also be discussed as part of the consent process.

EBP Technique

The major effect of an EBP appears to be within a few segments of the site of injection. Blood injected during an EBP spreads predominantly cranially. It is therefore recommended that an EBP is performed at the same level or one space lower than that at which the original dural puncture occurred. A volume of blood of 20 mL is recommended when performing an EBP. However, injection should stop before 20 mL if not tolerated by the patient.

A full aseptic technique should be employed for both the epidural component and venesection. The epidural space should be located before venesection is performed and a peripheral intravenous catheter placement may be preferred after venesection. Blood should be injected immediately into the epidural space through the epidural needle. Throughout the EBP procedure, regular observations of maternal pulse, blood pressure and temperature should be recorded in the medical record.

Patients with persistent symptoms after a second blood patch should be considered for a detailed neurological work-up before any further intervention. The differential diagnosis of headache in the parturient is presented in PDPH diagnosis above.

Consent

Before performing an EBP, written information should be offered to women to aid the consent
An EBP is a therapeutic intervention and written consent is recommended. An appropriate amount of time should elapse before neuraxial instrumentation in women receiving anticoagulation therapy. Maternal systemic infection and ‘red-flag’ symptoms suggesting an alternative diagnosis should be excluded. There is a risk of further inadvertent dural puncture during an EBP and this should form part of the consent process. After 6 weeks, chronic headache (35%), backache (58%), and neckache (14%) sequelae persist in the obstetrical population after UDP. When parturients are considering labor epidural analgesia, long-term sequelae should be discussed in the informed consent decision-making process.

Post EBP Management

Immediately after an EBP, the patient should be kept in the supine position for up to 1-2 hours for best results. Regular observations of maternal pulse, blood pressure and temperature need to be documented following the procedure. The frequency and duration of these observations should be decided by individual unit protocols considering maternal safety and health. Patients should be seen before hospital discharge after the EBP. Women who remain in hospital should be reviewed daily until discharge or until symptoms resolve.

All women who experience dural puncture with an epidural needle or PDPH after a spinal block should be reviewed daily by a member of the anesthetic team while in the hospital until symptoms have resolved. Ideally, when a woman experiences PDPH, follow-up should continue until the headache resolves.

Persistent Headache Post EBP

After a failed EBP, alternative causes of headache should be considered. If the headache changes in nature, neurological signs develop, consciousness level reduces, headache is atypical in nature or when two EBPs have been unsuccessful, urgent consideration should be given to further investigation and imaging and consultation with neurology or neurosurgery. Some other potential causes of headache are listed above under PDPH Diagnosis.

Follow-up

Following discharge from the hospital, all women who experience a recognized dural puncture with an epidural needle or have a PDPH diagnosed require follow-up, regardless of whether an EBP is performed. Follow-up should occur on a regular basis until symptoms resolve. Before discharge, women should be given verbal and written advice on when and how to contact the hospital should headache return, or if other symptoms develop.

Key Points

- PDPH needs to be evaluated and diagnosed when symptomatic
- Mild symptoms may be managed conservatively whereas with severe symptoms, an EBP should be offered
- A second EBP may be offered if the clinical history is clearly UDP related; other causes of HA need to be considered in the differential diagnosis
● Post discharge, a telephone follow-up is essential with appropriate documentation in the medical record
● PDPH education should be provided to the parturient along with long-term follow-up for those with persistent headache

Summary Recommendations

1. All patients with a confirmed or suspected UDP or PDPH need a brief physical exam for the presence or absence of neurologic symptoms (e.g., cranial nerve function, motor reflexes). Patient follow-up should occur within 24-48 hours after an UDP.
2. In the first 24-48 hours, conservative measures for symptomatic relief (e.g., non-opioid analgesics, opioids for severe breakthrough pain, lying flat, adequate hydration) are recommended initially before initiating a TEBP. If the PDPH is severe enough or affects the mother-child interaction, a TEBP should not be delayed.
3. Conservative treatment may be used for a mild PDPH. TEBP can be used for definitive treatment.
4. For persistent or severe PDPH, the most successful intervention is a TEBP.
5. Some patients may require a second TEBP with a classic clinical history for PDPH and a partial or temporary response to the first TEBP.
6. In those parturients whose headache is not getting better or progressively getting worse, further neurological workup or neurological consultation including brain imaging should be considered.
7. Prior to a third TEBP, further investigation including a neurological consult needs to be considered.
8. All patients with confirmed or suspected PDPH should receive PDPH education regarding if symptoms occur or worsen, to follow-up with a physician.

References:


