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Treatment of post-dural puncture headache: current strategies and literature review

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Abstract

Introduction and purpose

Post-dural puncture headache (PDPH) is an iatrogenic complication of lumbar puncture and neuraxial procedures, characterized by an orthostatic headache that typically develops within 48–72 hours following dural puncture. The pathophysiology of PDPH is primarily associated with cerebrospinal fluid leakage, leading to decreased intracranial pressure, traction of pain-sensitive intracranial structures, and secondary cerebral vasodilation. The incidence of PDPH depends on patient-related factors as well as technical aspects of the procedure, with the highest risk observed in young women, particularly in the obstetric population. Diagnosis is based on the characteristic clinical presentation in temporal association with a recent neuraxial intervention. Management includes conservative and pharmacological approaches; however, in refractory cases, the epidural blood patch remains the most effective therapeutic intervention. Alternative treatment modalities demonstrate variable efficacy and require further investigation before widespread clinical adoption. Despite advances in neuraxial techniques, PDPH continues to represent a significant clinical challenge for anesthesiologists and neurologists. The condition may lead to prolonged hospitalization, delayed recovery, and reduced patient satisfaction. A comprehensive understanding of current preventive and therapeutic strategies is therefore essential for optimizing patient outcomes. This review aims to summarize contemporary evidence regarding the treatment of PDPH, with particular emphasis on emerging therapeutic options.

Material and methods

The literature available in Pubmed and Google Scholar databases was conducted using the key words.

Results

The literature review indicates that post-dural puncture headache remains a common complication following dural puncture procedures. Conservative management, including bed rest, hydration, caffeine administration, and analgesics, is often effective in mild cases. In patients with persistent or severe symptoms, interventional methods—most notably the epidural blood patch—demonstrate high efficacy and rapid symptom relief. Emerging therapeutic options, such as sphenopalatine ganglion block and pharmacological alternatives, show promising results but require further investigation.

Conclusions

Post-dural puncture headache is a clinically significant condition that may substantially affect patient comfort and recovery. Current evidence supports a stepwise approach to treatment, beginning with conservative measures and progressing to interventional therapies when necessary. The epidural blood patch remains the gold standard for refractory cases. Ongoing research is essential to optimize treatment strategies and to evaluate the safety and effectiveness of newer therapeutic modalities.

Keywords

post-dural puncture headache; PDPH; dural puncture; epidural blood patch; headache treatment

Introduction

Lumbar punctures in anesthesiology involve the insertion of a needle or catheter to access the subarachnoid or epidural space, used in many surgical procedures and childbirth. These procedures provide effective anesthesia and pain control, but they are also associated with the risk of complications, such as pain at the puncture site, hypotension, postdural puncture headache, post-puncture hematomas, abscesses, meningitis, and transient neurological disorders [1].

Material and methods

This paper is a narrative review. Scientific publications concerning post-dural puncture headache were analyzed, including epidemiology, clinical presentation, pathophysiology, diagnostic methods, and available treatment options. Source material was obtained from databases such as PubMed and Google Scholar using relevant keywords. The review includes original research articles, review papers, and current guidelines issued by scientific societies, published mainly within the last two decades. In addition, both classic and more recent studies cited in the analyzed literature were included. The selection of publications was based on their relevance, reliability, and clinical applicability of the presented data.

Description of the state of knowledge

Definition

Postdural puncture headache (PDPH) is an undesirable, iatrogenic complication of central blockade, occurring after accidental puncture of the dura mater during epidural or spinal anesthesia [2]. PDPH is defined as any post-lumbar puncture headache that worsens within 15 minutes of sitting or standing and subsides within 15 minutes of lying down. Most PDPHs occur within three days of the procedure, with more than 50% beginning within 48 hours [3]. It is characterized by a throbbing headache in the frontal or occipital region, worsening with standing and relieving with lying down. The course of PDPH is often variable. Accompanying symptoms include dizziness, neck stiffness, tinnitus, hearing loss, photophobia, and nausea, although the patient may not experience the classic symptoms. Other features, such as the location and duration of the pain, are difficult to predict. PDPH usually resolves spontaneously within 2 weeks or after epidural injection of the patient's own blood (EBP) [3,4,5,6]. Central blockade is a beneficial method of anesthesia that is effective for a wide range of surgical procedures. Central blockade allows for many major procedures to be performed in awake patients. PDPH is one of the most common complications of spinal anesthesia. Among anesthetics, PDPH most frequently occurs in obstetric anesthesia, followed by regional anesthesia for surgical procedures [2,7].

Pathophysiology

Reduced cerebrospinal fluid (CSF) pressure and volume, along with compensatory intracranial vasodilation, are thought to be responsible for the pathophysiology of PDPH [2]. However, the mechanism of PDPH development has not been fully established. It is known that puncture of the dura mater may cause leakage of CSF from the subarachnoid space, which results in a reduction in CSF volume and pressure [3]. The average CSF filling the cranial cavity and spinal cord in an adult is 150 ml. CSF hypotension occurs when there is significant CSF loss that exceeds CSF production. Postural headaches can occur when CSF loss exceeds 10% [8]. Loss of CSF volume can cause decreased intracranial pressure and traction on pain-sensitive structures, which may explain the occurrence of PDPH [8]. Traction of the cervical nerves C1 to C3 causes pain in the neck and shoulders. Frontal headaches are caused by traction of the fifth cranial nerve. Traction of the ninth and tenth cranial nerves causes pain in the occipital region [9]. A decrease in CSF volume may cause an increase in blood flow, which leads to cerebral vasodilation, which may also result in PDPH. Vasodilation occurs to compensate for the loss of CSF and maintain a constant total intracranial volume [8]. The role of substance P (a neurotransmitter involved in pain perception) and the regulation of neurokinin 1 receptors (NK1Rs) is attributed to the third mechanism of PDPH formation [3].

Epidemiology

PDPH is one of the most common complications of diagnostic, therapeutic or accidental lumbar punctures [3]. The epidemiology of PDPH varies greatly depending on the type of procedure, technique, and needle used. For example, PDPH during epidural anesthesia is most often caused by inadvertent puncture of the dura mater [3]. In some cases, intentional damage is required to ensure adequate CSF flow. This technique is used in diagnostic or therapeutic lumbar punctures [3]. The incidence of PDPH is estimated to range from less than 10% after spinal anesthesia to 36% after diagnostic lumbar puncture. However, in obstetric patients who had an accidental puncture of the dura mater during the active phase of labor, PDPH is up to 81% [3]. According to Kim et al. 2021, in dural puncture procedures, the incidence of PDPH was 2.96%, and the risk factors were younger age, female gender, and lumbar puncture [10]. The diameter of the needle used for puncture influences the incidence of PDPH. The incidence of PDPH was higher after lumbar puncture with an 22 G Tuohy needle (4.63%) than after lumbar CSF drainage with an 18 G Tuohy needle (3.05%) [10].

In the study by Al-Hashel et al., 2022, the prevalence of PDPH was 29.5%, and younger age, female gender, lower BMI, pre-procedure headache, previous history of PDPH, and number of LP attempts were found to be independent risk factors for the development of PDPH [11].

Weji et al., 2020 showed a 28.7% prevalence of PDPH. This study found that needle size, number of CSF drops, and multiple attempts were significant independent predictors of post-dural puncture headache [12].

Risk Factors

Among the risk factors for post-puncture headaches, we can distinguish those related to individual and demographic predispositions, such as gender or age, and those related to clinical aspects, such as previous episodes of headaches, low BMI or co-occurring diseases, as well as procedural factors.

Individual Predisposition

Starting with individual predispositions, numerous studies have confirmed that women are significantly more likely to experience post-lumbar puncture headaches. In a prospective cohort study conducted in Kuwait at the turn of 2019 and 2020, among 285 patients undergoing post-lumbar puncture headaches, 84 experienced post-lumbar puncture headaches, 89.3% of whom were women. Furthermore, younger age was shown to be another predisposing factor to this complication. This conclusion can also be drawn from the same study, which found that the average age of patients who experienced post-lumbar puncture headaches was 28.3 years, while in the group who did not experience this complication, the average age was 34.8 years. Looking at these data, we can clearly conclude that young women are a group most likely to experience post-lumbar puncture headaches [11].

Clinical Factors

Among clinical factors, BMI (body mass index) is a significant factor. Obesity increases intraabdominal and intradural pressure, which reduces the pressure gradient between the subarachnoid and epidural spaces, which in turn reduces cerebrospinal fluid leakage through the needle hole. This causal relationship demonstrates that obesity, along with a high BMI, inversely correlates with the development of PDPH, making patients with a low BMI more likely to develop this complication [13]. Pregnant women are another clinical condition in which PDPH is most likely to occur. Estrogen, with its elevated levels, is considered a significant factor. Estrogen affects cerebral vessels, causing their dilation, which correlates with hypotension in the CSF, leading to more severe headache symptoms. A suspected role in the development of PDPH may be attributed to vaginal delivery due to the enlarged needle hole and subsequent loss of cerebrospinal fluid (CSF). However, research is inconclusive [14]. Another clinical factor predisposing to PDPH is a pre-existing history of headaches. According to a study of 285 patients of the 84 patients with a previous history of headaches, 64 experienced PDPH, which clearly indicates a correlation between these two clinical conditions. Each patient with a previous episode of PDPH has a two-thirds increased risk of experiencing a subsequent episode [11]. Certain comorbidities may increase the susceptibility of the dura mater to damage or affect the compensatory mechanisms in the CFS system. Connective tissue diseases, such as Ehlers-Danlos disease, are distinguished, which causes increased tissue elasticity and extensibility, resulting in larger post-puncture defects. Another group of conditions includes orthopedic and neurological conditions such as scoliosis and spinal deformities, which may result in more difficult puncture techniques and a higher number of attempts. Previous spinal surgery or trauma may also lead to difficulties with puncture, resulting in a higher risk of complications [12].

Procedural factors

Procedural factors are the strongest and best-documented factor predisposing to PDPH. Needle size is considered a potential procedural factor predisposing to PDPH. Studies suggest that larger needle diameters are associated with greater CSF leakage and a higher risk of PDPH, which led to patients undergoing lumbar puncture with a 22-gauge needle experiencing a higher incidence of PDPH than those undergoing 18-gauge lumbar puncture [10]. This means that using the smallest technically feasible needle reduces the risk, especially in repetitive procedures. In addition to needle size, the type of needle blade is also important. Comparisons have been made between automatic blades (pencil point) and cutting needles, such as Quinicke. Studies show that the use of automatic needles significantly reduces the risk of PDPH. In turn, the use of automatic needles such as Whitecare or Sprotte reduces the risk of PDPH proportionally. For this reason, needle type is one of the most important predictors of PDPH. A 2017 Cochrane Review demonstrated a 50-70% reduction in the risk of PDPH with the use of automatic needles [3]. The orientation of the blade relative to the longitudinal fibers of the dura mater also influences the risk of PDPH. Parallel blade orientation is preferred because it spreads the fibers rather than cutting them, resulting in a smaller, more easily closed defect after needle withdrawal. This results in less CSF leakage and a lower risk of PDPH. A transverse blade orientation is associated with a high risk of PDPH, which causes greater and more permanent damage to the dura by cutting the fibers, and the resulting hole is less likely to close and remain patent after needle withdrawal. The incidence of PDPH in patients punctured with a parallel blade was 3.8%, while in those with a transverse blade, it was 22.6% [15]. Regarding the number of puncture attempts, each additional puncture attempt increases the risk of PDPH because it causes further damage to the dura mater. This relationship is linear. Less experienced operators have a higher number of attempts, and therefore a higher risk of complications. This means that experienced operators have a better chance of avoiding complications in patients with PDPH [12]. The type of procedure is also important, as subarachnoid and epidural procedures have a higher risk of PDPH than diagnostic procedures. Reinsertion of the stylet is also important, as failure to insert the stylet during needle withdrawal can result in dural fiber retraction and increased CSF leakage [16]. The final procedural factor is patient position. Sitting position increases the pressure gradient between the lumbar spine and the skull, which promotes greater CSF leakage and a slightly higher risk of PDPH compared to the supine position [14].

Diagnostics

The diagnosis of post-puncture headache (PDPH) is primarily based on a thorough clinical history, physical examination and assessment of typical pain characteristics, taking into account the correlation between time and the onset of symptoms [17]. Imaging tests are reserved for atypical or chronic cases [18]. An important diagnostic element is the temporal relationship between the procedure and the onset of symptoms. PDPH symptoms usually appear within 24-72 hours after the procedure, but according to the ICHD-3 criteria, they may occur up to 5 days after the procedure [13,17]. A characteristic clinical feature of PDPH is the orthostatic nature of the headache, which worsens when standing or sitting and resolves or significantly improves when lying down. Other accompanying clinical symptoms include nausea, dizziness, neck pain, visual disturbances, and sometimes tinnitus, hearing loss, or radicular symptoms radiating to the arms [18]. According to current guidelines, the diagnosis of PDPH is mainly clinical, however, if the headache pattern is atypical, changes over time, or symptoms appear that cannot be explained by cerebrospinal fluid loss or that raise suspicion of serious complications, imaging, in particular magnetic resonance imaging (MRI) or computed tomography (CT), is recommended [13,19]. Transorbital ultrasonography to measure the optic nerve sheath diameter (ONSD) may potentially assist in the diagnosis and monitoring of PDPH, as changes in cerebrospinal fluid pressure are transmitted along the optic nerve sheath [19]. Differential diagnosis, including migraine, tension headache and meningitis, also remains an important part of the diagnostic process. Unlike post-lumbar puncture headaches, these conditions do not exhibit positional pain[13,18].

Secondary preventions

Prophylactic intrathecal catheter placement

Accidental dural puncture (ADP) is associated with a high risk of complications; therefore, one method of secondary prophylaxis is the placement of an intrathecal catheter [4]. This procedure contributes to reducing cerebrospinal fluid (CSF) leakage and enhancing the efficiency of repair processes following the disruption of dural integrity [4]. Currently, studies regarding the effectiveness of this method in reducing the incidence of post-dural puncture headache (PDPH) remain inconsistent.

A 10-year analysis conducted by Rutter et al. demonstrated a decreased incidence of PDPH and a reduced need for an epidural blood patch (EBP) in patients with an inserted intrathecal catheter [20]. Another study, based on 29,749 anesthesia records, also showed a significant impact of the procedure on reducing the incidence of PDPH [21]. Conversely, Binyamin et al. demonstrated that intrathecal catheter placement may reduce the necessity of performing a subsequent EBP—the "gold standard" in PDPH treatment, which is, however, an invasive procedure carrying the risk of a subsequent ADP and, consequently, exacerbation of the headache [4,22]. In their study, they also positively assessed the impact of intrathecal saline injection on reducing the occurrence of PDPH following an ADP [22]. However, they did not observe a significant effect of intrathecal catheter placement itself on reducing the incidence of post-dural puncture headaches [22]. Heesen et al., in their meta-analysis, also note a significant decrease in the need for EBP thanks to this method [23].

Current research leaves certain aspects of intrathecal catheterization, as a management strategy in secondary PDPH prophylaxis, unexplained. One such aspect is the duration for which the catheter should be left in place. Doubts have arisen regarding the possible benefits that might result from leaving the intrathecal catheter in place for 24 hours [20]. Although some studies do not show a significant correlation between catheter placement and a reduction in PDPH incidence, they do indicate a lower need for EBP in patients with an intrathecal catheter [4,20,22]. Furthermore, intrathecal saline infusion also reduces the severity of the complication in question [22]. Prophylactic intrathecal catheter placement, as a method of secondary PDPH prophylaxis, represents a promising approach that warrants further observation and analysis [23].

Epidural injections

Epidural blood patch (EBP), in which the patient's autologous blood is injected into the epidural space to mechanically seal the site of cerebrospinal fluid leakage and restore normal cerebrospinal fluid pressure is considered the most effective invasive method used in the treatment and secondary prevention of post-dural puncture headache, especially in patients with severe or persistent symptoms despite conservative treatment[4].

A retrospective single-centre study involving 85 patients giving birth under neuraxial anaesthesia showed that the use of prophylactic EBP significantly reduced the incidence of PDPH compared to conservative treatment (52.6% vs 84%), confirming the effectiveness of this method in secondary prevention. No significant difference was found between the prophylactic EBP group and the prophylactic HES (hydroxyethyl starch) epidural anaesthesia group. Furthermore, compared to the conservative treatment group, therapeutic EBP was used significantly less often in the prophylactic EBP and prophylactic HES epidural anaesthesia groups ($P < 0.05$), which proves that the use of this form of secondary prevention reduces the need for subsequent treatment and the risk of complications[24].

Other pharmacological substances

The pharmacological approach to secondary prevention of post-puncture headaches (PDPH) includes various drugs such as aminophylline (AMP), dexamethasone, gabapentin/pregabalin (GBP/PGB), hydrocortisone, magnesium, ondansetron (OND) and propofol (PPF). These drugs aim to reduce the frequency and severity of symptoms through various mechanisms of action. However, their effectiveness in preventing PDPH remains controversial, which is why clinical trials are still attempting to determine which pharmacological strategies are most effective [25]. A meta-analysis published in 2023, covering 22 randomised controlled trials involving 4,921 pregnant women (including 2,723 patients receiving prophylactic pharmacological therapies), showed that PPF, OND and AMP may be more effective in reducing the incidence of PDPH compared to the placebo group. However, the authors emphasised that more standardised studies are needed to verify these findings [25]. In a randomised, double-blind clinical trial by Hadavi et al. (2024) involving patients who were candidates for caesarean section, prophylactic administration of a combination of acetaminophen (500 mg) and caffeine (65 mg) before and after surgery reduced the risk of PDPH by approximately 70%. The study participants also experienced significantly milder headaches at 18, 48 and 72 hours and reported higher levels of satisfaction at the end of the study. No side effects related to the intervention were reported.

The study by Fattahi et al. (2015) evaluated the effect of ondansetron, a 5-HT3 receptor antagonist commonly used in the prevention of nausea and vomiting, on the incidence of PDPH. The study included 210 women in labour who were scheduled for caesarean section under spinal anaesthesia. The intervention group received 0.15 mg/kg of ondansetron and the control group received 5 ml of saline. Heart rate and mean arterial pressure (MAP) were monitored during surgery, and PDPH and post-operative nausea and vomiting (PONV) were recorded for 3 days after surgery. The incidence of PDPH and PONV was significantly lower in the intervention group compared to the control group, while MAP was higher in the ondansetron group. No significant differences in heart rate were found between the groups [27].

The results of the studies therefore suggest that pharmacological interventions such as the administration of a combination of acetaminophen and caffeine or ondansetron may effectively reduce the incidence of PDPH in patients after caesarean section, but further studies are needed to determine the optimal doses and treatment protocols [26,27].

Pharmacologic management of PDPH

Pharmacological treatment of post-dural puncture headache (PDPH) is primarily symptomatic and conservative, and its effectiveness is limited compared with interventional methods, as emphasized in international clinical guidelines[13]. According to current clinical recommendations, multimodal analgesia is the treatment of choice. The use of paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) is recommended as first-line therapy in patients with mild to moderate PDPH. In cases of insufficient response, short-term administration of opioid analgesics may be considered [13]. At the same time, systematic reviews indicate that there is a lack of large randomized controlled trials evaluating the effectiveness of paracetamol or NSAIDs as monotherapy specifically for PDPH, and recommendations for their use are based mainly on expert consensus and clinical practice [28]. The effectiveness of caffeine, administered orally or intravenously, has been demonstrated to provide short-term reduction in pain intensity and a decrease in the number of patients with persistent PDPH symptoms compared with placebo [28]. According to current recommendations, caffeine should be administered within 24 hours of symptom onset at a dose of up to 900 mg/day [13]. In addition, other agents such as gabapentin, hydrocortisone, and theophylline have been shown to reduce pain intensity as assessed by the Visual Analog Scale (VAS) [28]. However, current guidelines do not recommend their routine use[13]. Theophylline and aminophylline are effective in the treatment of PDPH but have not been shown to be useful in its prevention[29]. In studies published in 2025, VAS scores were also significantly lower with inhaled dexmedetomidine administered to patients after cesarean section [30].

Interventional Management

Epidural Blood Patch

The epidural blood patch (EBP) has been regarded for many years as the gold standard for the treatment of post-dural puncture headache (PDPH). This technique involves the injection of autologous blood into the epidural space in order to achieve rapid resolution of clinical symptoms. EBP remains the treatment of choice for PDPH refractory to conservative management, as reflected in current clinical guidelines [4].

Qualification of a patient with post-dural puncture headache for invasive treatment with EBP is primarily based on the lack of response to conservative therapy and significant symptom severity. The indication for EBP includes the persistence of a characteristic headache with an orthostatic component that does not resolve despite rest, adequate hydration, and pharmacological treatment, particularly when symptoms limit daily activity and reduce quality of life [31]. In many clinical centers, the procedure is performed after 24–48 hours from symptom onset, as earlier intervention may be associated with lower efficacy and a higher likelihood of requiring repeat procedures; however, earlier consideration may be justified in severe cases [2, 4].

The exact mechanism of action of EBP has not been fully elucidated; however, it is generally believed to involve a combination of mechanical and physiological effects. Following the injection of autologous blood into the epidural space, clot formation may occur, leading to mechanical sealing of the cerebrospinal fluid (CSF) leak and limiting further CSF loss. Concurrently, a transient physiological effect has been described, consisting of increased pressure within the epidural space and the dural sac, which is thought to account for the rapid reduction of the orthostatic component of headache. This mechanism explains the clinically observed symptom improvement that often precedes complete closure of the CSF leak. Imaging studies suggest potential contact between the clot and the dura mater, supporting the hypothesis of mechanical sealing, although these findings are not definitive [2,4,32]. Consequently, the combination of a short-term pressure effect and a potentially sustained mechanical effect is considered the most plausible explanation for the clinical efficacy of EBP in the treatment of PDPH.

The effectiveness of epidural blood patch in the treatment of post-dural puncture headache is considered high, with reported success rates ranging from approximately 70% to 98%, particularly when the procedure is performed at least 24 hours after dural puncture. In cases of incomplete response to the initial procedure, repeat EBP is associated with comparable effectiveness, although failures of subsequent attempts have also been reported [33]. Literature data indicate that the administration of approximately 20 mL of autologous blood may increase therapeutic success rates to as high as 96% compared with smaller volumes [4,34]. Clinical outcome is also influenced by procedural accuracy. Targeted EBP, involving blood injection at a level corresponding to the site of CSF leakage, has been shown to be more effective than non-targeted techniques[35]. A lack of significant clinical improvement within 48 hours after EBP is generally considered indicative of procedural failure or suboptimal technique and warrants reassessment of further management [34].Epidural blood patch is generally a safe procedure, and most adverse effects are mild and self-limiting. The most commonly reported complication is transient low back pain at the injection site, often correlated with the volume of injected blood, as well as short-term exacerbation of pain or radicular symptoms, which typically resolve with simple analgesic treatment. Serious and long-term complications, such as arachnoiditis, intracranial or spinal hematomas, central nervous system infections, or cauda equina syndrome, are rarely reported and are considered incidental [2,36]. Available evidence suggests that prior EBP does not significantly affect the efficacy of subsequent epidural anesthesia, which remains effective in more than 96% of patients. Absolute contraindications to EBP include coagulation disorders, active infection, bacteremia or sepsis, and patient refusal, whereas relative contraindications include significant anatomical deformities and severe immunodeficiency states. Although some reports describe the safety of EBP at platelet counts above 75,000/mm², most authors recommend caution and avoidance of the procedure when platelet levels are below 100,000/mm² [37].

Alternative Epidural Injections

As part of alternative epidural injection therapies, morphine, dextran, and gelatin have been investigated. However, their effectiveness in the treatment of post-dural puncture headache was found to be limited [38]. Epidural injections of normal saline have also been studied; their mechanism of action is based on increasing intracranial pressure, thereby providing pain relief to patients. Beneficial effects have been observed both with repeated administration and with continuous infusion using an infusion pump. Nevertheless, this method is currently not recommended for routine clinical use, and its efficacy and safety require further confirmation in future studies [2,39,40].

Another invasive treatment method involves the use of fibrin glue, which acts by inducing coagulation, leading to the formation of a clot with hemostatic and sealing properties that promotes tissue regeneration and healing processes [41]. However, this technique carries a risk of viral infection as well as aseptic meningitis [42]. In addition, cases of anaphylactic reactions have been reported in patients who received repeated applications of fibrin glue. The use of fibrin glue as a therapeutic option should therefore be limited to cases of post-dural puncture headache that do not respond to treatment with an epidural blood patch. Due to the limited amount of available data, this technique should not be considered a first-line treatment [13].

Therapeutic use of local anesthetics

The use of local anesthetics aimed at reducing post-dural puncture headache (PDPH) includes short-acting agents that exert their effect through modulation of the autonomic nervous system. Sphenopalatine ganglion block and greater occipital nerve block are two techniques employing local anesthetics that have been included in clinical guidelines [4].

Sphenopalatine ganglion block

Sphenopalatine ganglion block (SPGB) is used in the treatment of headaches of various etiologies, facial neuralgia, and craniofacial pain syndromes. Sensory and autonomic fibers passing through the sphenopalatine ganglion play a key role in the pathogenesis of headache and neck pain syndromes [43]. Reduction of parasympathetic impulse frequency resulting from the block leads to alleviation of headaches whose underlying mechanism involves intracranial vasodilation [44].

Multiple techniques for SPGB have been described. One method involves inserting a cotton-tipped applicator soaked with 0.5 ml of anesthetic (4% lidocaine or 0.5% ropivacaine) into each nostril along the superior border of the middle nasal turbinate toward the posterior pharyngeal wall. The applicators are left in place for approximately 10 minutes and then removed. During the procedure, the patient remains in the supine position [45].

Another technique involves intranasal nebulization of lidocaine (30–60 mg per nostril) using a mucosal atomization device. In obstetric patients, this method has been shown to rapidly reduce the intensity of PDPH [46].

The number of studies describing the efficacy of SPGB in both adult and pediatric populations is increasing; however, the technique is not yet routinely used in clinical practice [4]. A study conducted in patients who developed PDPH following urological procedures under spinal anesthesia compared SPGB using 0.25% ropivacaine with conservative management. The block significantly increased patient satisfaction, and the mean onset time of analgesia was rapid, averaging 12 minutes [47].

In another study, women with PDPH treated with SPGB were compared with those treated with an epidural blood patch (EBP). Patients receiving SPGB experienced faster symptom resolution and a lower rate of treatment-related complications [48].

A recently published meta-analysis emphasized that the evidence supporting the effectiveness of SPGB in the treatment of PDPH is of very low to moderate quality, and that the analgesic effect does not persist beyond 6 hours. The authors highlight the need for further large-scale randomized controlled trials [49].

Greater occipital nerve block

Greater occipital nerve block is a simple and effective technique that has been used in the treatment of migraine, cluster headache, and PDPH. Several approaches to this block have been described. Typically, the patient is positioned sitting with their back facing the clinician. The block may be performed at the level of the Arnold nerve, more proximally 2–3 cm below the occipital protuberance, or at the C2 level. Ultrasound guidance is often used to identify the nerve, which lies above the obliquus capitis muscle. Caution is required due to the proximity of the occipital artery running lateral to the nerve. Local anesthetics such as lidocaine, mepivacaine, or bupivacaine are used, sometimes in combination with glucocorticoids [50].

A study comparing changes in pain intensity among patients with PDPH who received bilateral greater occipital nerve block using either a distal or proximal approach demonstrated pain reduction in both groups after 24 hours. However, the proximal approach was more effective in reducing the need for additional analgesic medication [51]. Another study showed sustained clinical benefit of the block in obstetric patients with PDPH over a 24-week follow-up period [52].

Consensus statements indicate that the effectiveness of greater occipital nerve block following dural puncture with larger-gauge needles remains uncertain. In patients who underwent spinal anesthesia using smaller-gauge needles (≤22G), the block may be considered; however, headache recurrence occurs in a substantial proportion of cases [13].

Both sphenopalatine ganglion block and greater occipital nerve block are regarded as novel therapeutic options and require further high-quality studies to confirm their efficacy [4].

Conclusions

Post-dural puncture headache (PDPH) is a common complication of lumbar puncture and neuraxial anesthesia. It typically presents as an orthostatic headache that worsens when upright and improves in the supine position, usually within 48–72 hours after dural puncture. PDPH can significantly reduce patient comfort, prolong hospitalization, and increase healthcare costs. The underlying mechanism involves cerebrospinal fluid leakage through the dural defect, leading to reduced intracranial pressure, traction on pain-sensitive structures, and compensatory cerebral vasodilation. The incidence varies depending on patient-related and procedural factors, with the highest risk observed in young women, particularly in obstetric patients after accidental dural puncture. Key risk factors include young age, female sex, pregnancy, low BMI, prior headache disorders, and previous PDPH. Procedural factors—such as needle size and type, puncture technique, and operator experience—play a major role. Risk reduction strategies include using small-gauge, atraumatic needles and ensuring proper technique by experienced clinicians.Diagnosis is based on typical symptoms following a recent neuraxial procedure and exclusion of other causes. Management begins with conservative treatment, including acetaminophen, NSAIDs, and short-term caffeine use. For cases refractory to conservative therapy, the epidural blood patch remains the gold standard. Other interventions exist but require further evidence before routine use.

Disclosures

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