Peripheral Nerve Blocks for Postdural Puncture Headache: A New Solution for an Old Problem?

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Abstract. Background/Aim: Postdural puncture headache (PDPH) is one of the earliest recognized complications of regional anesthesia after inadvertent dural puncture. Epidural blood patch (EBP) is the “gold standard” for the treatment of PDPH. Several alternatives have been suggested as peripheral nerve blocks. The aim of this systematic review was to find out the potential efficacy and safety of peripheral nerve blocks for the treatment of PDPH. Materials and Methods: The main databases were systematically searched in September 2020 for studies examining regional anesthesia and PDPH. Results: Nineteen studies were identified, including a total of 221 patients. Sphenopalatine ganglion block, greater occipital nerve block, and lesser occipital nerve block were performed. All participants reported a numeric rating scale (NRS) <4 after peripheral nerve blocks at 1, 24 and 48 h. Only patients with PDPH after diagnostic lumbar puncture reported NRS ≥4 after 48 h. No major adverse events were reported. Approximately, 17% of patients underwent a second or more peripheral nerve blocks. In 30 participants, EBP was required. Conclusion: To our knowledge, this is the first systematic review on the use of peripheral nerve blocks to treat PDPH. Peripheral nerve blocks can be considered as analgesic options in the management of PDPH.

The postdural puncture headache (PDPH) is one of the first recognized complications of regional anesthesia. It was described in 1898 by Dr. August Bier in the first patient to receive successful spinal anesthesia (1). PDPH is one of the most common complications after accidental dural puncture (DP). The incidence of dural puncture, in the literature, ranges between 0.16% and 1.3% according to the experience of the provider (2). The development of PDPH depends on several factors, patient-related such as young age, female sex and pregnancy, and needle-related such as design, size and direction (3-5). After DP, the incidence of PDPH ranges from 16% to 86% of cases (6).

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. It remits spontaneously within 2 weeks or after sealing of the leak with autologous epidural lumbar patch” (7). Management of PDPH is often challenging for anesthesiologists. For years, bed rest and aggressive hydration have been the cornerstone of the treatment of PDPH. No benefit has been demonstrated from these practices and they are not currently recommended (3-5, 8). A number of therapeutic agents have been suggested: analgesics, such as acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs) or opiates, and methylxanthines, such as caffeine, are commonly used, yet the relief obtained is often inadequate, especially with severe headaches (3-5, 8). Other medications, such as adrenocorticotropic hormone (ACTH) and its analogues, hydrocortisone, triptans, and gabapentinoids, have been suggested to be beneficial in the management of PDPH but there is currently insufficient evidence (3-5, 8).

During the past several decades, the epidural blood patch (EBP) has been proposed as the “gold standard” for the treatment of PDPH (9). The exact mechanism by which the EBP relieves PDPH is still not precisely defined. The first mechanism of action is the “plug effect” when the blood...
arrives at the cerebrospinal fluid (CSF) leak. The blood clotting closes the defect in the meninges and stops further CSF loss. The second is the “mass effect”: the blood injected in the epidural space leads to the cephalad displacement of CSF increasing liquid pressure. Recent evidence suggests that complete and permanent relief of symptoms following a single EBP occurs in up to one third of cases. It provides complete or partial relief in around 50-80% of the cases. Possible complications of the EBP include chances of another DP, infection, and neurological sequelae such as meningitis, arachnoiditis, seizures, loss of hearing or vision, radicular pain, and neural deficits (3-5).

Several alternatives to EBP have been proposed as peripheral nerve blocks, such as sphenopalatine ganglion block (SPGB), greater occipital nerve block (GONB) and lesser occipital nerve block (LONB) (10).

As only a few randomized controlled trials (RCTs) investigating the use of these three peripheral nerve blocks have been published to our knowledge, assessment of their safety in humans relies, in part, on observational studies. In the absence of rigorous cohort studies, the best available evidence may be provided by case reports and observational studies describing efficacy in individuals suffering PDPH who were treated with peripheral nerve blocks.

The publications included in this review evaluated adult patients clinically diagnosed with PDPH who were treated with peripheral nerve blocks.

**Eligibility criteria.** The population, intervention, comparison, and outcome (PICO) criteria were applied to the research question. Patients of at least 18 years diagnosed with PDPH were considered as the population (P); the intervention (I) was PDPH treatment using peripheral nerve blocks; the comparison (C) concept was not applicable to the research question; pain intensity, adverse events (AEs) and need for other therapeutic interventions after regional anesthesia for PDPH management were considered the outcomes (O) for this systematic review. PICO criteria are summarized in Table I.

**Materials and Methods**

**Protocol and registration.** We performed a systematic review based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (11). This article is based on previously conducted studies and does not contain any studies with human participants or animals performed.

**Table I. PICO criteria for including studies.**

| Population | Patients of at least 18 years diagnosed with PDPH. |
|------------|--------------------------------------------------|
| Intervention | Regional anesthesia blocks (sphenopalatine ganglion block, greater occipital nerve block, lesser occipital nerve block). |
| Comparator | No comparator. |
| Outcomes | Pain intensity, adverse events, need for other therapeutic interventions. |
| Study type | Case report, observational study, clinical trial, randomized clinical trial. |
| Time | No time limitation. |

**PDPH:** Postdural puncture headache; **PICO:** population, intervention, comparison, and outcome.
Statistical analysis. Data were analyzed using standard computer program (Excel, 2016). Results are reported as mean±standard deviation (SD). We tested the consistence of our data using Chi-square test and 95% confidence level. Comparisons were performed using Student \( t \)-test and the level of statistical significance was \( p<0.05 \).

Results

The flow diagram (Figure 1) shows the results from the literature search and the study selection process. Nineteen publications met the eligibility criteria. Table II displays the nineteen papers included in this review.

According to the COSMIN checklist, all publications included in this review showed an adequate-to-doubtful quality. Most clinical trials had a high-to-moderate risk of bias. This is due to the design of the included studies, mainly case reports and observational studies. According to the “Chauvenet’s criterion”, almost all data lie within one standard deviation of the mean and can be considered reliable, without the risk of outliers (Figure 2).

In the included publications, 221 patients were diagnosed with PDPH and treated with peripheral nerve blocks: 97 received SPNB, 58 received GONB, whereas the other patients received a combination of nerve blocks [42 received both SPNB and GONB in (26), 24 received both GONB and LONB in (30)]. Compared with the manuscript of Katz and Beilin (10), 7 more publications focusing exclusively on the obstetric population had been published in the meantime and they are included in this review.

Except for 33 patients [6 males (17); 6 males (20); 1 male (25); 1 male (27); 13 males (28); 1 male (29); 5 males (31)], all others included in the review were female. Niraj et al., did not report the sex of patients (31). The mean age was of 32.87±5.16 years (24, 29, 31 did not report age of participants).

The largest publications involved 42 patients (16, 26), whereas the smallest consisted of single case report (15, 19, 23, 25, 27). All analyzed studies were conducted in inpatient settings.

Patients underwent various operations; the most common surgeries were labor pain/delivery [8 studies (16, 18, 19, 22, 23, 25, 27)].
Table II. Publication’s characteristics.

| Study, year | Center, No. | Design | No. | Surgery | Nerve blocks |
|-------------|-------------|--------|-----|---------|--------------|
| Cardoso JL et al. (14), 2017 | Portugal, 1 | Case Report | 1 | Sling procedure | SPGB |
| Channabasappa SM et al. (15), 2017 | India, 1 | Case Report | 1 | Total abdominal hysterectomy | SPGB |
| Cohen S et al. (16), 2018 | US, 1 | Observational Study | 42 | Labor pain/Delivery | SPGB |
| Dubey P et al. (17), 2018 | India, 1 | Case Series | 11 | Urological procedures or cesarean section | SPGB |
| Furtado et al. (18), 2018 | Portugal, 1 | Case Series | 4 | Labor pain/Delivery | SPGB |
| Goncalves et al. (19), 2018 | Portugal, 1 | Case Report | 1 | Labor pain/Delivery | SPGB |
| Jespersen MS et al. (20), 2020 | Denmark, 5 | Randomized Controlled Trial | 40 | ? | SPGB |
| Kent S et al. (21), 2015 | US, 1 | Case Series | 3 | Diagnostic | SPGB |
| Kent S et al. (22), 2016 | US, 1 | Case Series | 3 | Labor pain/Delivery | SPGB |
| Murphy CA et al. (23), 2020 | US, 1 | Case Report | 1 | Diagnostic | SPGB |
| Putheveettil N et al. (24), 2018 | India, 1 | Observational Study | 9 | Labor pain/Delivery | SPGB |
| Singla D et al. (25), 2018 | India, 1 | Case Report | 1 | Femur reduction and fixation | SPGB |
| Xavier J et al. (26), 2020 | Portugal, 1 | Observational Study | 42 | Labor pain/Delivery | SPGB±GONB |
| Akin Takmaz S et al. (27), 2009 | Turkey, 1 | Case Report | 1 | Inguinal hernia repair | GONB |
| Akyol F et al. (28), 2015 | Turkey, 1 | Observation Study | 21 | ? | GONB |
| Matute E et al. (29), 2008 | Spain, 1 | Case Series | 2 | Umbilical herniorrhaphy/Labor pain | GONB |
| Naja et al. (30), 2009 | Lebanon, 1 | Randomized Controlled Trial | 47 | Lower extremity fracture/Arthroscopy/Cesarean section | ONB±LONB |
| Niraj G et al. (31), 2014 | UK, 1 | Observation Study | 18 | Labor pain/Delivery or non-obstetric procedures | GONB |
| Türkyilmaz EU et al. (32), 2016 | Turkey, 1 | Observation Study | 16 | Labor pain/Delivery | GONB |

SPGB: Sphenopalatine ganglion block; GONB: greater occipital nerve block; LONB: lesser occipital nerve block; US: United States; UK: United Kingdom.

24, 26, 29, 31, 32], followed by gynecological [3 studies (15, 17, 30)], abdominal [2 studies (27, 29)], diagnostic [2 studies (21, 23)], urological [2 studies (14, 23)], and orthopedic procedures [2 studies (25, 30)]. Two studies (20, 28) did not report the intervention.

Concerning anesthesia technique, peridural anesthesia was performed 10 times (14, 16, 18-21, 24, 26, 29, 31); subarachnoid anesthesia was reported in ten studies (17, 20, 25-32); combined spinal-epidural (CSE) technique was performed in three studies (15, 18, 26); finally, in two studies (21, 23) patients underwent diagnostic lumbar puncture (LP).

Not all publications reported the type of needle used to administer anesthesia. Where data are available, peridural was administered using 16-gauge or 18-gauge Tuohy needles; 25-gauge or 27-gauge Quincke and 27-gauge Whitacre needles were used for spinal anesthesia. In the study by Türkyilmaz et al., spinal blocks were performed using 26-gauge needles with an atraumatic bevel (Atracan®, B-Braun, Melsunger, Germany) (32). PDPH appeared between the first (18, 22, 23, 27, 29) and seventh (14) day after the anesthetic procedure.

In some publications, patients referred the associated symptoms of nausea (14, 16, 17, 19, 23, 30), vomiting (14, 17, 30), photophobia (16, 17, 30), phonophobia (16, 30), dizziness (19, 30), blurry vision (21, 30), loss of appetite (30), and ataxia (30).

Conservative treatment was administered and consisted of bed rest and postural measures, oral and intravenous hydration, caffeine and multimodal analgesia (acetaminophen, NSAIDs and opioids). Three studies (16, 17, 22) did not report conservative management.

Peripheral nerve blocks. Sphenopalatine ganglion block was performed using cotton-tip applicators dipped into local anesthetic: 0.5% levobupivacaine (14), 2% lidocaine (21, 22, 24), 4% lidocaine (16, 23), 0.75% ropivacaine (18, 19), and a mixture of 4% lidocaine and 0.5% ropivacaine (20). In two studies (15, 25), 0.75% ropivacaine was respectively injected using a spinal needle and an epidural catheter. Xavier et al. performed SPGB with 1% ropivacaine both using cotton-tip applicators or an epidural catheter (26). Dubey et al. used intranasal lidocaine spray (17).

Greater occipital nerve block consisted of injecting local anesthetic lateral to external occipital protuberance. Akin Takmaz et al. (27) used 0.5% ropivacaine, Akyol et al. (28) 0.25% levobupivacaine, Matute et al. 0.5% bupivacaine and tramcinolone, Naja et al. (30) 1% lidocaine, Niraj et al. (31) 1% lidocaine and dexamethasone, Türkyilmaz et al. (32) 0.25% levobupivacaine and dexamethasone, and Xavier et al. (26) 1% ropivacaine.

In Naja et al. (30), lesser occipital nerve block was performed injecting 1% lidocaine at the superior third of the posterior limit of the sternocleidomastoid muscle.

Table III summarizes the techniques used.
Pain intensity. Different investigators recorded pain intensity on different scales and at different intervals. We normalized all NRS to a zero to 10 range (Table IV). The majority of authors reported pain intensity before performing SPGB, GONB or LONB and 1, 24 and 48 h after treatment. Pain intensity before the procedure was reported in 13 publications, which involved 170 patients with PDPH. All participants reported NRS ≥ 8, except in Akyol et al. (28), (NRS 6.26) and Naja et al. (30) (NRS 7).

After 1 h, NRS was lower than 4 in all publications except for Jespersen et al. (20) NRS ≥ 4 was only reported in Kent et al. (21) and Naja et al. (30) at 24 h after nerve block, and in Murphy et al. (23) at 48 h.

Pain intensity before the procedure was 8.59 ± 1.06. NRS was 1.05 ± 0.28 after 1 h, 1.78 ± 1.83 after 24 h, and 1.71 ± 1.79 after 48 h. Cohen et al. (16) did not report pain evaluation. Approximately, 71.4% of patients experienced headache relief 1 h after SPGB after the EBP treatment. After 24 and 48 h, SPGB was effective in 85.7% and 92.9% of cases, respectively.

We made the hypothesis that these results can be well described by a single number, determining the weighted mean of the measurements. We performed Chi-square test using 95% confidence level for available data before ($x^2/ν=6.57/5≈1.31; α=0.25$), at 1 h ($x^2/ν=0.44/4≈0.11; α=0.98$), 24 h ($x^2/ν=6.06/6≈1.01; α=0.42$) and 48 h.
In five patients, the procedure had to be repeated after 1 h (17). A second SPGB was performed in 2 patients after 24 h with relief in the next hour (18); two other patients received EBP. In Jespersen et al. (20) from 1 h to 7 days after the block, 13 patients received a rescue block and 10 received an EBP.

Xavier et al. (26) reported 2 courses in 15 patients; among these, nine patients required EBP due to treatment failure with peripheral nerve block. Kent et al. (21) reported EBP after 12 h with complete resolution of headache.

A total of 3 patients treated with GONB (27, 32) received a second nerve block with pain resolution. Türkyilmaz et al. (32) reported a patient’s NRS did not change two hours after primary GONB and an EBP was performed. Following occipital block (30), the headache was completely relieved in 68.4% of patients after one to two injections; the remaining 31.6% of patients experienced relief only after the third or fourth injection. In Niraj et al. (31), six patients reported partial resolution of the symptoms after GONB and all received EBP.

### Discussion

In this review, several publications describe the use of peripheral nerve blocks as a treatment for PDPH, most with

| Peripheral nerve blocks techniques |
|-----------------------------------|
| Cardoso JL et al. (14), 2017      |
| Channabasappa SM et al. (15), 2017|
| Cohen S et al. (16), 2018         |
| Dubey P et al. (17), 2018         |
| Pertado et al. (18), 2018         |
| Goncalves et al. (19), 2018       |
| Jespersen MS et al. (20), 2020    |
| Kent S et al. (21), 2015          |
| Kent S et al. (22), 2016          |
| Murphy CA et al. (23), 2020       |
| Puthenveetil N et al. (24), 2018  |
| Singla D et al. (25), 2018        |
| Xavier J et al. (26), 2020        |
| Akin Takmak S et al. (27), 2009   |
| Akyol F et al. (28), 2015         |
| Matute E et al. (29), 2008        |
| Naja et al. (30), 2009            |
| Niraj G et al. (31), 2014         |
| Türkyilmaz EU et al. (32), 2016   |

**Adverse events (AEs).** An adverse event is defined as any undesirable experience associated with the use of a medical product in a patient. No AE was reported after the execution of SPGB, GONB or LONB, except in Jespersen et al. (20) and Murphy CA et al. (20). In the first study, AEs were recorded in 10 patients: one patient reported severe nasal discomfort and nausea during the insertion, and five patients reported light pain or discomfort during the insertion. Throat discomfort, light left ear pain during insertion and tingling sensation in the left cheek during insertion were also reported after receiving the block. In Murphy CA et al. (20), the patient described an unpleasant taste after dropping the lidocaine into nostril.

**Other therapeutic interventions.** A total of 38 patients needed to receive a second or more nerve blocks, SPGB, GONB or LONB, and 30 patients an EBP.

\[(x^2/n =0.57/1 = 0.57; \alpha=0.45)\] after peripheral nerve blocks. We have therefore no good reason to reject the hypothesis and conclude that the measurements are consistent with each other.

We performed Student t-test between NRS before treatment and after 1 h (p<0.05), 24 h (p<0.05), and 48 h (p<0.05). No statistical difference was found between NRS after 1 and 24 h (p=0.37), and after 24 and 48 h (p=0.52).
a sphenopalatine ganglion block, greater occipital nerve block, and lesser occipital nerve block.

The sphenopalatine ganglion (SPG) is the largest of the four parasympathetic ganglions of the head. It is located in the pterygopalatine fossa between the middle nasal concha posteriorly and the pterygoid canal anteriorly (33). SPG receives sensory, sympathetic and parasympathetic fibers. It activates cerebral vasodilatation and increases cerebral blood flow. SPG activation may result in the release of several peptides increasing plasma protein extravasation with neurogenic inflammation and activation of trigeminal nociceptors contributing to pain and triggering headache (34).

Since Dr. Greenfield Sluder described the SPG as a pain originator and transmitter in 1908 (35, 36), it has been blocked using different techniques. SPG may absorb local anesthetic via the middle turbinate and lateral nasal mucosa from a cotton-tipped applicator, the so-called “intranasal approach” (33). SPGB has been reported in the management of cluster headache (37), migraine (38), trigeminal neuralgia (39), herpes zoster involving the ophthalmic nerve (40), paroxysmal hemicrania (41), and neck cancer pain (42), atypical facial pain (43), complex regional pain syndrome (CRPS) (44), temporomandibular disorder (45), nasal contact point headache (46), and vasomotor rhinitis (47).

The greater occipital nerve (GON) is the superficial branch of the cervical plexus and it is formed by fibers of ventral rami of C2 and C3. It is responsible for the innervation of the lateral part of the occiput. The nerve is located at the lateral third of a hypothetical line between the mastoid process and occipital protuberance (48). The GONB is usually performed together with the GONB to treat headache of the lateral portion of the occipital region. In this analysis, the intranasal approach was commonly performed for SPGB. The advantage of this approach is that it may be performed in an ambulatory setting. Dubey et al. (17) hypothesized that lidocaine nasal spray should also be effective in achieving SPG anesthesia. The classical landmark technique was used for GONB, except in Akyol et al. (28), and LONB. However, the ultrasound guided technique is more target specific and it should be preferred (53). Lidocaine, levobupivacaine, bupivacaine, or ropivacaine were the local anesthetics of choice.

Pain intensity. Pain intensity on the NRS was <4 in all participants after peripheral nerve blocks at 1, 24 and 48 h, with the exception of the results reported by Jespersen et al.
Among these, sixteen patients reported complete resolution with nerve blocks, and other therapeutic interventions. We considered NRS ≤4 as optimal cut-off point between mild and moderate pain. This cut-off was identified as the tolerable pain threshold (54). Jespersen et al. (20) and Naja et al. (30) showed NRS lower than 4 in the subsequent surveillance intervals.

Kent et al. (21) and Murphy et al. (23) reported the first case series in which SPGB was offered to patients who have received diagnostic LPs and then presented to the emergency department (ED) with PDPH. Postdural puncture headache occurs in 10% to 40% of subjects after LP (55). The more serious symptoms could depend on the greater CSF leakage, according with Bier’s hypothesis that continued CSF leakage through the lumbar puncture site could be an important contributing factor for PDPH (56, 57).

Safety. No AEs were reported after the execution of SPGB or GONB, except in Jespersen et al. (20) and Murphy et al. (23). Discomfort related to the insertion of cotton-tip applicators intranasally was reported.

The most common AEs related to SPGB are: epistaxis secondary to aggressive placement of a cotton-tipped applicator into the nasal passage; local or retro-orbital hematoma can result from puncturing the venous plexus overlying the pterygopalatine fossa or maxillary artery, including branches; infection may occur without aseptic technique (33).

The most frequent side effects of GONB include pain at the injection site and numbness. Lightheadedness and syncope may also occur, as well as local hematoma, local infection, and nausea. Skin atrophy, hyperpigmentation or hypopigmentation of the skin, and local alopecia have also been reported when GON block is used in conjunction with steroids (44).

However, these peripheral nerve blocks seem to be safe and well-tolerated compared to other treatments and their side effects.

Compared to these relatively safe techniques, EBP includes chances of another possible DP, infection, and neurological sequelae such as meningitis, arachnoiditis, seizures, loss of hearing or vision, radicular pain, and neural deficits (3-5). Furthermore, a higher prevalence of low back pain (LBP) has recently been highlighted (58). Peripheral nerve blocks seem to improve the care provided to patients and further reduce levels of perceived pain in the postoperative period (59).

Other therapeutic interventions. A total of 38 patients (17% of total: 19 SPGB, 4 GONB, 15 SPGB + GONB) underwent a second peripheral nerve block due to uncontrolled pain. Among these, sixteen patients reported complete resolution of symptoms after the second course.

In 30 participants (13% of total), epidural blood patch was required. Two patients required a second EBP (18), while a second GONB was necessary after unsuccessful EBP in Niraj et al. (31). The remaining patients showed complete pain resolution following the rescue procedure.

All cases of PDPH requiring EBP followed epidural block or CSE. Dural puncture with a Tuohy needle is the most likely culprit of PDPH with severe symptoms requiring EBP, both as first-line treatment or as rescue therapy after a less invasive treatment has failed (60). None of the cases of PDPH following spinal anesthesia required EBP for satisfactory treatment, expect in Türkyılmaz et al. (32).

EBP might be avoidable in cases of PDPH after subarachnoid block, in favor of less invasive techniques such as SPGB, GONB or LONB, in addition to standard conservative treatment. On the other hand, PDPH may be successfully treated with peripheral nerve blocks, but occasionally EBP could be required.

Limitations. This review has some limitations. First, a major limitation is the use of case series and observational studies in this review. Due to the greater potential for bias, they are often excluded from systematic reviews of treatments. In a typical systematic review of a rapidly developing technology, that are peripheral nerve blocks for the treatment of PDPH, case series and observational studies contribute substantially to the available evidence, and their results supplement the limited evidence available from other studies. Second, the lack of RCT assessing the efficacy of peripheral nerve blocks in the management of PDPH is a major limitation to this work. PDPH usually improves over time and so it is difficult to establish whether the nerve block itself relieved symptoms or whether this improvement would have occurred without intervention.

Third, patients presenting for peripheral nerve blocks were both male and female of varying age, some were obstetric while others were post-surgical or presented with PDPH following diagnostic lumbar puncture. The needles used were of different size and design. A variety of the other therapies were used in addition to peripheral nerve blocks. The length of time for which patients were followed-up also varied. The technique of SPGB and GONB varied between reports. Consequently, there is great heterogeneity in patients and techniques included in this review. Finally, other potential biases should be taken into account, such as: biases inherent in this study design; over representation of specialist centers with better results than routine clinical practice; publication bias; possible multiple publication of results from the same patients in several series (61).

Conclusion

This is the first systematic review on the use of peripheral nerve blocks to treat PDPH. Peripheral nerve blocks can be considered as analgesic options in the management of PDPH,
as not all cases of PDPH require EBP for successful treatment. The purpose of peripheral nerve blocks is to relieve the distressing headache experienced by a patient who had a dural puncture.

Treatment of PDPH with peripheral nerve blocks is a minimally invasive, easy and effective method, which could be offered to patients when conservative management is ineffective. Even after a partially successful block, SPGB, GONB or LONB could be repeated. Nerve blocks could also be offered to patients who did not receive complete pain relief after an EBP and are not willing to undergo a repeated EBP. The injection does not address the ongoing CSF leak, therefore other supportive measures like bed rest, hydration and analgesics should be continued.

Given the nature of the publications available to date, we cannot provide any recommendations on the use of peripheral nerve blocks in the treatment of PDPH. Well-designed controlled studies are needed to assess the role of these peripheral nerve blocks in the treatment of PDPH.

Conflicts of Interest

The Authors declare that they have no competing interests in relation to this study.

Authors’ Contributions

LGG helped design the study, conduct the study, analyse the data, and write the manuscript; CA helped design the study and analyse the data; FC helped design the study and analyse the data; MCP helped design the study and analyse the data; VP helped design the study and analyse the data. All Authors have read and approved the manuscript.

References

1 Bier A: Experiments regarding the cocainization on the spinal cord. Zeitschrift für Chirurgie 51: 361-368, 1899.
2 Reynolds F: Dural puncture and headache: avoid the first but treat the second. Brit Med J 306(882): 874-876, 1993.
3 Kwak KH: Postdural puncture headache. Korean J Anesthesiol 70(2): 136-143, 2017. PMID: 28367283. DOI: 10.4097/kjane.
2017.70.2.136
4 Patel R, Urits I, Orhurhu V, Orhurhu MS, Peck J, Ohuaobunwa E, Sikorski A, Mehrabani A, Manchikanti L, Kaye AD, Kaye RJ, Helmstetter JA and Viswanath O: A comprehensive update on the treatment and management of postdural puncture headache. Curr Pain Headache Rep 24(6): 24, 2020. PMID: 32323013. DOI: 10.1007/s11916-020-00860-0
5 Ghaleb A: Postdural puncture headache. Anesthesiol Res Pract 2010: 102967, 2010. PMID: 20814596. DOI: 10.1155/2010/102967
6 Liu S, Carpenter RL and Neal JM: Epidural anesthesia and analgesia. Their role in postoperative outcome. Anesthesiology 82(6): 1474-1506, 1995. PMID: 7793661. DOI: 10.1097/00000542-199506000-00019
7 International Headache Society (IHS) Classification ICHD 3. Available at: https://ichd-3.org/7-headache-attributed-to-nonvascular-intracranial-disorder/7-2-headache-attributed-to-low-cerebrospinal-fluid-pressure/7-2-1-post-dural-puncture-headache/ [Last accessed on September 2, 2020]
8 Russell R, Laxton C, Lucas DN, Niewiarowski J, Scruton M and Stocks G: Treatment of obstetric post-dural puncture headache. Part 1: conservative and pharmacological management. Int J Obstet Anesth 38: 93-103, 2019. PMID: 30711240. DOI: 10.1016/j.ijsa.2018.12.006
9 Russell R, Laxton C, Lucas DN, Niewiarowski J, Scruton M and Stocks G: Treatment of obstetric post-dural puncture headache. Part 2: epidural blood patch. Int J Obstet Anesth 38: 104-118, 2019. PMID: 30711239. DOI: 10.1016/j.ijsa.2018.12.005
10 Katz D and Beilin Y: Review of the alternatives to epidural blood patch for treatment of postdural puncture headache in the parturient. Anesth Analg 124(4): 1219-1228, 2017. PMID: 28079587. DOI: 10.1213/ANE.0000000000001840
11 Moher D, Liberati A, Tetzlaff J, Altman DG and PRISMA Group: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J Clin Epidemiol 62(10): 1006-1012, 2009. PMID: 19631508. DOI: 10.1016/j.jclinepi.
2009.06.005
12 Terwee CB, Mokkink LB, Knol DL, Ostelo RW, Boumer LM and de Vet HC: Rating the methodological quality in systematic reviews of studies on measurement properties: a scoring system for the COSMIN checklist. Qual Life Res 21(4): 651-657, 2012. PMID: 21732199. DOI: 10.1007/s11136-011-9960-1
13 Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, Boumer LM and de Vet HC: The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res 19(4): 539-549, 2010. PMID: 20169472. DOI: 10.1007/s11136-010-9606-8
14 Cardoso JM, Sá M, Graça R, Reis H, Almeida L, Pinheiro C and Machado D: [Sphenopalatine ganglion block for postdural puncture headache in ambulatory setting]. Rev Bras Anestesiol 67(3): 311-313, 2017. PMID: 28364968. DOI: 10.1016/j.jbrs.
2017.02.003
15 Channabasappa SM, Manjunath S, Bommalingapp A, Ramachandra S and Banuprakash S: Transnasal sphenopalatine ganglion block for the treatment of postdural puncture headache following spinal anesthesia. Saud J Anaesth 11(1): 362-363, 2017. PMID: 28757848. DOI: 10.4103/sja.SJA_59_17
16 Cohen S, Levin D, Mellender S, Zhao R, Patel P, Grubb W and Kiss G: Topical sphenopalatine ganglion block compared with epidural blood patch for postdural puncture headache management in postpartum patients: a retrospective review. Reg Anesth Pain Med 43(8): 880-884, 2018. PMID: 30063655. DOI: 10.1097/AAP.0000000000000840
17 Dubey P and Dubey PK: Intranasal lignocaine spray for sphenopalatine ganglion block for postdural puncture headache. Saud J Anaesth 12(2): 364-365, 2018. PMID: 29628865. DOI: 10.4103/sja.SJA_680_17
18 Furtado I, Lima IF and Pedro S: [Ropivacaine use in transnasal sphenopalatine ganglion block for post dural puncture headache in obstetric patients - case series]. Braz J Anaesthesiol 68(4): 421-424, 2018. PMID: 29402441. DOI: 10.1016/j.bjan.
2017.11.007
47 Prasanna A and Murthy PS: Vasomotor rhinitis and sphenopalatine ganglion block. J Pain Symptom Manage 13(6): 332-338, 1997. PMID: 9204653. DOI: 10.1016/s0885-3924(97)00008-0

48 Uygunoglu U and Siva A: Greater occipital nerve and lesser occipital nerve blocks. In: Peripheral Interventional Management in Headache. Özge A, Uludüz D, Karadaş Ö, Bolay H (eds.). Springer, Cham, Switzerland, 2019.

49 Juškys R and Šustickas G: Effectiveness of treatment of occipital neuralgia using the nerve block technique: a prospective analysis of 44 patients. Acta Med Litu 25(2): 53-60, 2018. PMID: 30210238. DOI: 10.6001/actamedica.v25i2.3757

50 van Suijlekom H, Van Zundert J, Narouze S, van Kleef M and Mekhail N: 6. Cervicogenic headache. Pain Pract 10(2): 124-130, 2010. PMID: 20415729. DOI: 10.1111/j.1533-2500.2009.00354.x

51 Shauly O, Gould DJ, Sahai-Srivastava S and Patel KM: Greater occipital nerve block for the treatment of chronic migraine headaches: a systematic review and meta-analysis. Plast Reconstr Surg 144(4): 943-952, 2019. PMID: 31568309. DOI: 10.1097/PRS.0000000000006059

52 Blumenfeld A, Ashkenazi A, Grosberg B, Napchan U, Narouze S, Nett B, DePalma T, Rosenthal B, Tepper S and Lipton RB: Patterns of use of peripheral nerve blocks and trigger point injections among headache practitioners in the USA: Results of the American Headache Society Interventional Procedure Survey (AHS-IPS). Headache 50(6): 937-942, 2010. PMID: 20618812. DOI: 10.1111/j.1526-4610.2010.01676.x

53 Palamar D, Uluduz D, Saip S, Erden G, Unalan H and Akarirmak U: Ultrasound-guided greater occipital nerve block: an efficient technique in chronic refractory migraine without aura? Pain Physician 18(2): 153-162, 2015. PMID: 25794201.

54 Gerbershagen HJ, Rothaug J, Kalkman CJ and Meissner W: Determination of moderate-to-severe postoperative pain on the numeric rating scale: a cut-off point analysis applying four different methods. Br J Anaesth 107(4): 619-626, 2011. PMID: 21724620. DOI: 10.1093/bja/aer195

55 van Oosterhout WP, van der Plas AA, van Zwet EW, Zielman R, Ferrari MD and Terwindt GM: Postdural puncture headache in migraineurs and nonheadache subjects: a prospective study. Neurology 80(10): 941-948, 2013. PMID: 23390176. DOI: 10.1212/WNL.0b013e3182840bf6

56 Wang YF, Fuh JL, Lirng JF, Chen SP, Hsee SS, Wu JC and Wang SJ: Cerebrospinal fluid leakage and headache after lumbar puncture: a prospective non-invasive imaging study. Brain 138(Pt 6): 1492-1498, 2015. PMID: 25688077. DOI: 10.1093/brain/awv016

57 Raskin NH: Lumbar puncture headache: a review. Headache 30(4): 197-200, 1990. PMID: 2186014. DOI: 10.1111/j.1526-4610.1990.hed304197.x

58 Urits I, Cai V, Aner M, Simopoulos T, Orhurhu V, Nagda J, Viswanath O, Kaye AD, Hess PE and Gill J: Post dural puncture headache, managed with epidural blood patch, is associated with subsequent chronic low back pain in patients: a pilot study. Curr Pain Headache Rep 24(1): 1, 2020. PMID: 31916041. DOI: 10.1007/s11916-020-0834-5

59 Sansone P, Pace MC, Passavanti MB, Pota V, Colella U and Aurilio C: Epidemiology and incidence of acute and chronic Post-Surgical pain. Ann Ital Chir 86(4): 285-292, 2015. PMID: 26343897.

60 Turnbull DK and Shepherd DB: Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth 91(5): 718-729, 2003. PMID: 14570796. DOI: 10.1093/bja/aeg231

61 Chambers D, Rodgers M and Woolacott N: Not only randomized controlled trials, but also case series should be considered in systematic reviews of rapidly developing technologies. J Clin Epidemiol 62(12): 1253-1260.e4, 2009. PMID: 19349144. DOI: 10.1016/j.jclinepi.2008.12.010

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