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Transnasal Sphenopalatine Ganglion Block for Management of Postdural Puncture Headache in Non-Obstetric Patients

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Background: This study investigated the efficacy and safety of transnasal sphenopalatine ganglion block (SPGB) for treatment of postural puncture headache (PDPH) in non-obstetric patients.
Methods: This retrospective study was conducted at the Ankara Research and Educational Hospital, in Turkey, and included 26 non-obstetric patients (age, ≥ 18 years) who were diagnosed with PDPH and unresponsive to conservative therapy or unable to continue it because of side effects. Transnasal SPGB was performed in each nostril. Pain severity was assessed with the Visual Analogue Scale (VAS) at 15 min, 30 min, 24 h, and 48 h after the procedure, while patients were seated. The patients were monitored for 48 h for adverse effects (AEs). Patient treatment satisfaction was assessed at 48 h after the procedure by using the Patient Global Impression of Change (PGIC) scale.
Results: Headache at 15 min post-procedure was relieved rapidly. At 24 h post-procedure, nearly half of patients (42.3%) had no pain, and all patients (100%) had a VAS score of <3. Nasal discomfort, throat numbness, and nausea were AEs reported after SPGB; however, these AEs were completely relieved at 24 h after the procedure. According to the PGIC scale scores at 48 h post-procedure, 73.1% of patients evaluated themselves as "much improved" and 26.9% evaluated themselves as "very much improved".
Conclusion: When PDPH does not respond to conservative treatment, it may be treated effectively with transnasal SPGB, which is a noninvasive, safe, well-tolerated, and straightforward method with a low complication rate. (J Nippon Med Sch 2021; 88: 291–295)

Key words: sphenopalatine ganglion block, postdural puncture headache, epidural blood patch

Introduction

Postdural puncture headache (PDPH) common severe complication after dural puncture. Dural (or lumbar) puncture is a procedure for accessing the cerebrospinal fluid (CSF)-filled subarachnoid space passing through the dura mater and is frequently performed in many disciplines for diagnostic and therapeutic purposes. In anesthesia practice, dural puncture occurs intentionally, during subarachnoid block, or unintentionally, during epidural anesthesia[1]. It has been reported that while the incidence of PDPH after an unintentional dural puncture is 0.7% to 1.5% in the obstetric population, it is 50% to 60% after an unintentional dural puncture performed using a large-bore needle[2]. For PDPH, patient-related risk factors include younger age, female sex, vaginal delivery, and low body mass index, and procedure-related risk factors include type of needle, operation technique, and experience of the operator[3,4]. Prophylaxis and treatment of PDPH include conservative approaches such as bed rest, hydration, and caffeine. Epidural blood patch (EDBP) is a widely used technique and the most effective therapeutic option in patients for whom conservative therapy fails[4]. The efficacy of EDBP in the treatment of PDPH has been reported to be 61% to 98%[4,5]. Nevertheless, as an invasive method, it is likely to result in permanent neurological sequelae including early and late

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back pain, radiculopathy, hematoma (spinal subdural or subarachnoid or cranial subdural hematoma), arachnoiditis, and infective complications[6].

In recent years, sphenopalatine ganglion block (SPGB) has been recommended as an alternative method for treatment of PDPH. SPGB has been demonstrated to be effective in treating migraine, acute and chronic cluster headache, trigeminal neuralgia, atypical facial pain, and various other types of facial neuralgia.[7] Few studies have investigated the efficacy and safety of SPGB in the treatment of PDPH, and further studies are needed[2]. Moreover, previous studies have generally enrolled postpartum women. We therefore investigated the efficacy and safety of transnasal SPGB for treatment of PDPH in non-obstetric patients. Patients undergoing transnasal SPGB were evaluated for pain severity, frequency of adverse effects (AEs), and patient treatment satisfaction.

Materials and Methods

This study was approved by the Ethics Committee of Ankara Research and Educational Hospital (approval number: 101; date: 10 January 2019). The study included 26 non-obstetric patients (age, ≥ 18 years) who were diagnosed with PDPH in our hospital between February 2015 and February 2019 and were unresponsive to conservative therapy or unable to continue it because of side effects. Patient data were obtained by reviewing the medical files of patients during the relevant period. We are planning a study of a continuous response variable from matched pairs of study subjects. Prior data showed that the difference in the responses of matched pairs was normally distributed, with standard deviation of 2. If the true difference in the mean response of matched pairs is 1.15, we would need to study 26 pairs of subjects to be able to reject the null hypothesis that the response difference is zero with a probability (power) of 0.8. The Type I error probability associated with this test of the null hypothesis is 0.05.

PDPH was diagnosed by using the criteria of the Ad Hoc Committee on Classification of Headache and the Headache Classification Subcommittee of the International Headache Society (International Classification of Headache Disorders-2 [ICHD-2])[8]. Transnasal SPGB was performed in each nostril with the patient in the supine position and their head extended. Sterile 10-cm cotton-tipped applicators dipped in 2% lidocaine were used. Both applicators remained in the nostrils for 15 minutes, and the procedure was repeated once if analgesia was inadequate. With the patient seated, pain severity was assessed with the Visual Analogue Scale (VAS) at 15 min, 30 min, 24 h, and 48 h after SPGB. A VAS score of <3 was accepted as adequate analgesia. The patients were monitored for 48 h for AEs. Patient treatment satisfaction was assessed using the Patient Global Impression of Change (PGIC) scale at 48 h after the procedure. The PGIC scale is a 7-point self-reported scale reflecting the patient's assessment of the degree of overall improvement and the efficacy of treatment. Patients rate change as "very much improved", "much improved", "minimally improved", "no change", "minimally worse", "much worse", or "very much worse"[9].

Table 1 General characteristics of patients with postdural puncture headache

Characteristics	
Sex, n (%)	
Female	10 (38.5)
Male	16 (61.5)
Age, years, Mean±SD	36.58±7.89
Height, cm, Mean±SD	170.50±6.79
Weight, kg, Mean±SD	75.12±9.56
ASA score, Mean±SD	1.46±0.51

ASA, American Society of Anesthesiologists.

Results

The mean age of the 26 patients with PDPH was 36.58 ± 7.89 years and 61.5% of them were men. The general characteristics of the patients are summarized in **Table 1**.

SPGB was successfully performed in all patients. No change was observed in the blood pressure or pulse rate of patients during SPGB or the 48-h monitoring period. Headaches observed at post-procedure 15 min were relieved rapidly, and the treatment effect persisted to 48 h after the procedure in all patients. Nearly half the patients (42.3%) had no pain at 24 h after the procedure, and a VAS score of <3 was achieved in all patients (100%) (**Table 2**). Nasal discomfort, throat numbness, and nausea were reported as AEs after SPGB; all completely resolved by 24 h after the procedure （**Table 3**）.

At 48 h, 19 (73.1%) patients evaluated themselves as "much improved" and 7 (26.9%) as "very much improved" on the PGIC scale (**Fig. 1**).

Discussion

In the present study, in which the efficacy and safety of transnasal SPGB were investigated for treatment of PDPH in non-obstetric patients, SPGB was successfully performed in all patients. Headaches occurring after the

Table 2 Pain severity of patients with postdural puncture headache after sphenopalatine ganglion block

Pain severity	15 min after SPGB	30 min after SPGB	24 h after SPGB	48 h after SPGB
	n (%)	n (%)	n (%)	n (%)
Pain-free	10 (38.5)	12 (46.2)	11 (42.3)	11 (42.3)
VAS <3	24 (92.3)	24 (92.3)	26 (100.0)	26 (100.0)

SPGB, sphenopalatine ganglion block; VAS, Visual Analogue Scale

Table 3 Adverse effects after sphenopalatine ganglion block in patients with postdural puncture headache

	15 min after SPGB	30 min after SPGB	24 h after SPGB
	n (%)	n (%)	n (%)
Throat Numbness	26 (100.0)	9 (34.6)	0 (0.0)
Nasal Discomfort	3 (11.5)	2 (7.7)	0 (0.0)
Nausea	2 (7.7)	0 (0.0)	0 (0.0)

SPGB, sphenopalatine ganglion block.

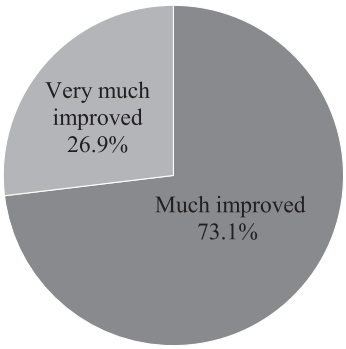

Fig. 1 Patient status at 48 h post-procedure, as indicated by self-evaluation using the Patient Global Impression of Change (PGIC) scale.

procedure were relieved rapidly; nasal discomfort, throat numbness, and nausea were reported as AEs but had completely resolved at 24 h; and a substantial proportion of the patients reported an improvement.

Postdural puncture headache in patients undergoing dural puncture for any reason is a compelling situation for patients and clinicians. The pathophysiological mechanism of PDPH is unclear; however, various theories have been suggested. It is assumed that headache is caused by cerebral vasodilatation, which occurs to compensate for decreased CSF volume with the procedure. In addition, traction on pain-sensitive structures and meningeal tension in the upright position in the presence of decreased CSF volume may be important[1]. PDPH may occur in hours or days after dural puncture. Despite prophylaxis, PDPH continues to occur and causes considerable morbidity. PDPH can be unbearable if it is severe and chronic[1]. Therefore, PDPH prevention and treatment are critical.

The underlying mechanism of PDPH has been explained by the Monro-Kellie hypothesis, as follows: intracranial pressure is kept constant by the sum of three components-the volume of the brain itself, the volume of CSF, and the volume of intracranial circulating blood. A compensatory mechanism is involved in maintaining the balance when the volume of one of these components changes; that is, if the volume of one component decreases, the volume of the other one or two components increases (or vice versa)[10].

CSF volume decreases after dural puncture. In such cases, blood circulation would increase via intracranial vasodilatation, to keep the volume constant. An increase in brain volume-the other component-is impossible. Thus, vasodilatation appears to be responsible for PDPH. The sphenopalatine ganglion is an extracranial nervous structure found in the pterygopalatine fossa and contains somatic sensory roots in addition to parasympathetic and sympathetic components[11]. Activity of parasympathetic neurons in the sphenopalatine ganglion contributes to the above-mentioned vasodilatation. This vasodilation is responsible for headaches that develop after dural puncture. This uncontrolled mechanism results in an unbearable headache. A contributor to this vasodilation is the parasympathetic activity of neurons with synapses in the sphenopalatine ganglion. SPGB treats headache by decreasing parasympathetic activity. The main mechanism

of the effectiveness of the SPG block in the treatment of postdural headache is explained by this hypothesis[12].

Conservative therapies for treatment of PDPH aim to reduce CSF leakage through the hole in the dura and to restore CSF via additional fluid intake; however, these therapies have limited efficacy. The efficacies of various medications remain unproven[5]. The EDBP technique, which is widely used for treatment of PDPH, helps with the closure of the dural hole to prevent further CSF leakage. This allows CSF to increase to normal level and prevents brain prolapse[13]. Nevertheless, this technique requires a needle to be inserted into the epidural space and thus is also associated with certain risks. In addition, blood clotting can be affected in those receiving blood thinners or anti-inflammatory drugs prior to the procedure, which increases the risk of hemorrhage. Moreover, the procedure can fail in some cases and may need to repeated[13]. Complications of EDBP include needle trauma, accidental dural puncture, back pain, PDPH, infection, and epidural or subdural hematoma[13,14]. Therefore, more effective, reliable, and noninvasive methods are needed. The SPGB technique, which has been successfully used in relieving head and facial pain, has thus been used to treat PDPH. SPGB can be performed via a transnasal, transoral, or lateral infratemporal approach. Medications applied in this technique include local anesthetics (4% cocaine, 2% to 4% lidocaine, or 0.5% bupivacaine), depot steroids, or 6% phenol[11]. Intranasal application of local anesthetics is the simplest, best tolerated technique. Intranasal topical application is a noninvasive technique and should be considered before suggesting invasive surgical approaches. Anesthetic is applied on the nasopharyngeal mucosa posterior to the middle turbinate with a cotton-tipped applicator. Various modifications of the conventional intranasal technique have been developed[11]. In the present study, we used a cotton-tipped applicator and 2% lidocaine for analgesia while performing transnasal SPGB.

The SPGB technique has been used for painful conditions such as trigeminal neuralgia, chronic migraine headache, postherpetic neuralgia, and cluster headache, and successful outcomes have been reported[15–18]. Cohen et al.[19] found SPGB to be effective for 22 obstetric patients with tension headache, migraine, back pain, and neck pain and, based on this finding, they reported that they planned to use this technique for treatment of PDPH. Eight years later, in 2009, Cohen et al.[20] published the first article on the use of SPGB for treatment of PDPH. They reported immediate and/or complete relief of headache in 11 of 13 patients with moderate-to-severe PDPH. After this successful experience with obstetric patients, the efficacy of SPGB in alleviating PDPH has been examined in case reports[21–24]. As in obstetric patients, the efficacy of SPGB was demonstrated in non-obstetric patients[24–31]. In brief, current evidence of the efficacy of SPGB is based on a limited number of case reports and case series; there have been few controlled or comparative studies. Cohen et al.[32] conducted a retrospective study of obstetric patients and compared the outcomes of 42 patients undergoing SPGB for treatment of PDPH with those of 39 patients undergoing EDBP. The results revealed that pain was relieved faster, without complications, in patients undergoing SPGB and that the technique was safe, cheap, and well-tolerated. In addition, they encouraged further clinical studies, to determine if SPGB should be recommended before EDBP for treatment of PDPH[32].

This study investigated the efficacy and safety of SPGB for non-obstetric patients with PDPH who were unresponsive to conservative therapy or unable to continue such therapy because of side effects. SPGB was successfully performed in all patients. Analgesia was achieved in all patients within 48 h, and no patient required treatment with EDBP. Although patients developed AEs such as nasal discomfort, throat numbness, and nausea, all these AEs resolved with 24 h after the procedure. Patient treatment satisfaction was high. In our study, as in past studies, PDPH responded to treatment in all patients. These data suggest its efficiency is sufficient for PDPH.

In conclusion, when PDPH does not respond to conservative treatment, it may be treated effectively with transnasal SPGB, a noninvasive, safe, well-tolerated, and straightforward method with a low complication rate. Transnasal SPGB should be considered before application of EDBP, which is an invasive method with potential for morbidity.

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