Introduction

Anatomy

Because the sphenopalatine ganglion (SPG) has diffuse and extensive anatomical connections within the trigemino-autonomic (parasympathetic) reflex, it is of great interest to clinicians who treat pain conditions [1]. The SPG is a large extra cranial parasympathetic ganglion with multiple neural roots, including autonomic, sensory, and motor [2,3]. The SPG is a five-mm triangular shaped parasympathetic ganglion, located superficially and anterior to the pterygoid canal in the pterygopalatine fossa at the level of the middle nasal turbinate bilaterally. It is also known as the pterygopalatine, nasal or Meckel’s ganglion [4]. It is enclosed in mucous membrane and a thin layer (1 to 1.5mm) of connective tissue. It is denoted as parasympathetic because preganglionic parasympathetic fibers synapse within the SPG. It is the largest peripheral parasympathetic ganglion with manifold connections to general sensory fibers and the internal carotid plexus [5-7]. The preganglionic fibers of the parasympathetic system are in the superior salivatory nucleus of the pons and pass through the nervus intermedius of the facial nerve and enter the SPG as a branch of the greater petrosal nerve. The preganglionic sympathetic neurons leave the spinal gray matter at the level of the first and second thoracic vertebrae (T1-T2). They then traverse the cervical sympathetic nerves and enter the superior cervical ganglion and synapse. The superior cervical ganglion relates to upper cervical nerve roots (C1, C2, and C3) and thus connects with SPG [7]. Preganglionic neurons then enter the cranium after following the internal carotid artery as the deep petrosal nerve.

Sympathetic fibers synapse in the superior cervical ganglion. Post-ganglionic sympathetic fibers, after traversing with the parasympathetic nerves in the vidian nerve (formed by the greater and deep petrosal nerves), pass through the SPG without synapsing [2]. The SPG has an extensive distribution with links to the trigeminal nerve, facial nerve and internal carotid artery plexus via the sphenopalatine nerves, the greater superior petrosal nerve and the great deep petrosal nerve, respectively. Thus, it is connected directly to the superior cervical sympathetic ganglion. Postganglionic parasympathetic postganglionic projections supply the lacrimal and nasal glands as well as paranasal sinuses, palate, and upper pharynx areas via the opthalmic and maxillary divisions of the trigeminal nerve [8,9]. Orbital projections from the SPG provide postganglionic parasympathetic and sympathetic innervation of the major cerebral and meningeal vasculature [2,8,10]. The pterygopalatine nerves or ganglionic nerves are afferent neural projections of the maxillary division of the trigeminal nerve that pass through the SPG, and these nerves form the sensory component of the SPG [8]. The sensory fibers connect the maxillary nerve to the SPG by way of five branches that extend from the nasopharynx, nasal cavity, palate, and orbit [9,11,12]. The SPG is a crossroads for the trigeminal, facial, and autonomic nerves and with possible distant autonomic actions [13].
Techniques

The SPG block can be performed with topical anesthetic or by injection because of its superficial location in the nasal cavity [14,15].

Waldman cites three approaches for SPG block:

i. Trans nasal application of topical anesthetic with a cotton-tipped applicator to the nasopharyngeal mucosa posterior to the middle turbinate;

ii. Trans oral approach via the sphenopalatine foramen through the posterior palatine canal and;

iii. The lateral approach via the pterygopalatine fossa through the infra-temporal fossa [16].

The trans nasal approach is effective, very safe and very easy [17]. The trans oral and lateral approach are invasive and require time, training, sedation for some patients, use of fluoroscopy, and an operating room to facilitate, whereas the trans nasal approach is simple, minimally invasive and can be done at bedside [18]. Yang and Oraee summarize the development of various techniques of SPG block [19]. Sluder first used cocaine to trans nasally block the SPG in 1908 for headache and facial pain [20] and first used the term sphenopalatine neuralgia. He observed mucosal congestion, rhinorrhea, and lacrimation indicative of parasympathetic hyperactivity [21]. In 1911, he used a trans nasal needle for the injection of phenol [22]. The transoral and the lateral injection approaches were introduced by Ruskin [23,24] and treated tic doloureux [25]. Transnasal endoscopic technique was developed for direct vision injection using rigid sinuscope [26]. For safety, image guidance is required for the transoral and lateral approaches [27-30].

The transnasal topical technique remains the most popular approach for the block because of its simplicity, minimal side effects, safety and general effectiveness [7,31-34]. It can be easily done [2,7]. Cotton-tipped applicators with local anesthetics can be placed near the SPG [35]. Although even with a properly placed applicator, the SPG block may be less than adequate because local anesthetic distribution and penetration is not a certainty [36]. In addition, some patients do not tolerate cotton tip applicators very well. Thus, various modifications have been introduced [37]. These include new modifications of the trans nasal technique with new applicators such as SphenoCath®, Allevio™ SPG Nerve Block Catheter, Tx360 Nasal Applicator® [34,38,39] or the modification of an intravenous administration set by Windsor and Jahnke [6] or by Mingi’s modification [40].

Indications

The sphenopalatine ganglion block has been used to treat a wide variety of painful disorders. With Sluder [21] and Ruskin [25], Byrd [41] also used SPG block to treat a vast spectrum of musculoskeletal, vascular and neurogenic pain syndromes. SPG block via the transnasal route is a simple, safe, effective and valuable technique that has been overlooked. Home based application of SPG block is an easy, safe and cost-effective method of management of acute, chronic and breakthrough pain which provides immediate relief and minimal side effects. It can be taught to caregivers, so it can be performed safely and effectively at home or can be used in the ER department, hospital or surgery center, office or clinic [6,7,18,19,22,35,42]. Health care extenders can perform the SPG block as well. As such, it is cost-effective therapy. We believe that this technique should be more widely applied in practice of pain therapy [22,42]. Indications for the SPG block include musculoskeletal, vascular and neurogenic pain. Head and neck cancer pain and low back pain, visceral pain as well as angina, sciatica, and arthritis have been treated [7,15,17,42-44]. It has been used effectively for oro-facial pain in the management of temporomandibular joint (TMJ) pain, chronic and episodic headache due to migraine, tension or cluster, tic doloureux, dysmenorrhea, trigeminal neuralgia, broncho-spasm and chronic hiccup, postoperative pain relief for ear, nose and throat surgeries [14,18,32,35,42,45].

Oluigbo et al. [42] found SPG blocks indicated for facial and head pain of acute and chronic duration. Disorders treated included cluster headaches, trigeminal neuralgia, temporomandibular joint pain, post-herpetic neuralgia, Sluder’s neuralgia, paroxysmal hemicranias, atypical facial pain, pain due to head and neck cancer, complex regional pain syndrome I and II, and vasomotor rhinitis. Surgical anesthesia and post-operative analgesia can be obtained for oro-facial surgery [43,44]. Others have reported its use in diverse ailments such as convulsive disorders; blindness; glaucoma; metallic taste in the mouth; earache; ophthalmoplegic migraine; sciatica; pain in the abdomen, neck, shoulder, upper extremity, and low back; asthma; angina; intractable hiccup; diarrhea; dysmenorrhea; and hyperthyroidism [45-50]. Saberski et al. [32] treated sinus arrest in post herpetic neuralgia with SPG block.

Sphenopalatine ganglion blockade has been successfully used in the treatment of trigeminal neuralgia unresponsive to medical therapy [51]. It has also been used to treat tension headache in labor and postpartum period and low back and neck pain as well in the postpartum period [21,52].

Of interest to anesthesiologists, SPG has recently been used to treat post dural puncture headache (PDPH) (post-spinal headache) in parturient as well as other patients. The SPG block appears to be a simple, minimally invasive block which can be done bedside to treat PDPH [18]. It has been shown to be as effective as epidural blood patch in relieving headache with no risk of spinal infection or neurologic complication and requires no needle or blood injection. It can be done at bedside without imaging and may have immediate onset of pain relief allowing discharge home. However, larger, prospective studies need yet to be performed to determine efficacy and safety when compared to the gold standard of PDPH care: the epidural blood patch [53-55].

Conclusion

In summary, the SPG block is an easy, safe and effective method but is currently underutilized in the treatment of painful conditions of the head and face and other indications where it has proven effective.
With new applications for trans nasal SPG block available, pain therapists should consider using it for the management of pain.

References

44. (2017) Sphenocath.


