Sphenopalatine Ganglion Block to Treat Shoulder Tip Pain After Thoracic Surgery: Report of 2 Cases

Gilbert J. Grant, MD,* Ghislaine C. Echevarria, MD,* Jerome Lax, MD,* Harvey I. Pass, MD,† and Michael L. Oshinsky, PhD‡

Shoulder tip pain may occur after thoracic surgical procedures. The pain is caused by diaphragmatic irritation and is referred to the shoulder. Shoulder tip pain is often resistant to treatment with conventional analgesics. The sphenopalatine ganglion block has been described to manage many painful conditions. We report here the first use of this block to treat shoulder tip pain in 2 thoracic surgical patients. In both patients, the block produced rapid and sustained relief of the shoulder tip pain. We suggest that sphenopalatine ganglion block be considered to treat postoperative shoulder tip pain after thoracic surgical procedures. (A&A Practice. 2018;11:90–2.)

Thoracic surgical procedures may cause severe postoperative pain. Incisional chest pain after thoracotomy can be well controlled with epidural or paravertebral techniques, while chest pain after thoracoscopic surgical procedures is more commonly managed with intravenous (IV) opioids. Thoracic surgery patients may also experience ipsilateral shoulder pain, which is "referred" from irritation of tissues supplied by the phrenic nerve. This is known as shoulder tip pain (STP),[1] to differentiate it from pain originating in the shoulder itself. The reported incidence of STP after thoracic surgical procedures is 31%–85%.[2] The STP does not respond to epidural analgesia,[3] and it is not reliably relieved with systemic analgesics such as opioids and/or nonsteroidal anti-inflammatory drugs.[4]

Block of the sphenopalatine ganglion (SPG) was first reported in 1908 as a treatment for cluster-type headache[5] and has since been used to treat a wide variety of pains and ailments.[6] We describe here the first report of SPG block to effectively treat STP in 2 patients after thoracic surgical procedures. Written consent for publication has been obtained from the patients.

DESCRIPTION OF THE CASES

Case No. 1

A 64-year-old man underwent resection of a pleural-based mass in the left lung apex, left upper lobectomy, and resection of the transverse processes and portions of the posterior first, second, and third ribs. The surgery was performed under general and thoracic epidural anesthesia (catheter inserted at T7–T8 level). A left chest tube was placed to underwater seal drainage. Postoperative pain was managed using epidural patient-controlled analgesia (PCA) with bupivacaine 0.06% and fentanyl 2 μg/mL with a basal infusion of 4 mL/h and a 4 mL PCA dose with a lockout of 15 minutes. The epidural PCA provided excellent incisional pain relief, but the patient experienced left STP (Numerical Rating Scale [NRS] 5/10) that did not respond to ketorolac 30 mg IV every 6 hours or Dilaudid 0.5 mg IV. On postoperative day 2, a left transnasal SPG block was performed. A 15-cm hollow plastic cotton-tipped applicator (Puritan Products, Guilford, ME) was attached to a 1-mL Luer-lock syringe by interposing a 10-cm section of polyethylene IV extension tubing (B. Braun Medical, Bethlehem, PA). The system was primed with 4% lidocaine to saturate the cotton tip, and the syringe was loaded with 4% lidocaine. The applicator was slowly advanced via the left nare perpendicular to the frontal plane of the face until distinct resistance was encountered, which correlates with the tip resting against the lateral wall of the nasal cavity posterior to the middle turbinate. After it was positioned, a total of 0.7 mL of 4% lidocaine was administered in 0.1-mL increments at 3-minute intervals to maintain the cotton tip moist, and then the applicator was removed. The patient reported that his pain improved within a few minutes of initiating the block and was completely relieved (NRS 0/10) at 20 minutes. The applicator was removed and his STP did not recur.

Case No. 2

A 77-year-old woman underwent resection of a left upper lobe pulmonary nodule via left video-assisted thoracoscopic surgery. Incisions in the fourth and eighth intercostal spaces were used to perform a wedge resection of the nodule, lymph node resection, and left hemithymectomy. Two chest tubes were placed to underwater seal drainage, and liposomal bupivacaine, 1–2 mL, was instilled into both incisions. Postoperative pain was managed using hydromorphone IV PCA with no basal rate, a 0.1-mg PCA dose, and a lockout of 10 minutes. Acetaminophen 650 mg per os and ketorolac 15 mg IV were administered every 6 hours, as were 2 doses of pregabalin 75 mg every 12 hours. On postoperative day #1, she experienced only mild pain from her chest incisions, but severe left STP, NRS 7/10. Removal of the chest tube on postoperative day #1 did not ameliorate her STP. A left-sided SPG block was performed as in case no. 1, but instead of manual incremental dosing, small-bore extension tubing was used to connect the applicator to a syringe pump, and

From the Departments of *Anesthesiology, Perioperative Care and Pain Management, and †Cardiothoracic Surgery, New York University School of Medicine, New York, New York; and ‡National Institute of Neurological Disorders and Stroke, National Institutes of Health, Bethesda, Maryland.

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Address correspondence to Gilbert J. Grant, MD, Department of Anesthesiology, Perioperative Care and Pain Medicine, New York University School of Medicine, 560 First Ave, New York, NY 10016. Address e-mail to gilbert.grant@nyumc.org.

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lidocaine 4% was infused at 1.5 mL/h to maintain the cotton tip moist. After 5 minutes, she stated that her left shoulder pain had decreased to 5/10. By 20 minutes, her pain had decreased to NRS 2/10. At 30 minutes, the pain remained at this level, which she characterized as "barely noticeable," so the applicator was removed. Her STP did not recur.

DISCUSSION

To our knowledge, this is the first report of SPG block to treat STP, a symptom that occurs when tissues innervated by the phrenic nerve are irritated. In thoracic surgical procedures, these tissues include the pericardium and parietal pleural surfaces of the mediastinum and diaphragm. Diaphragmatic irritation is perceived as STP because of convergence of nociceptive afferents in the dorsal horn of the cervical spinal cord. Primary general visceral afferents from the diaphragm accompany the phrenic nerve (C4 root with contributions from C3 and C5), while primary somatic afferents from the shoulder region travel via the suprascapular nerve (C3 and C4 roots). Convergence of these afferents in the same segments of the cervical spinal cord activates second-order neurons that ascend to the thalamus and ultimately project to the sensory cortex. STP occurs because the nociceptive phrenic input is perceived to be originating from the shoulder, as the diaphragm has no cortical representation.[1]

The SPG is the largest collection of neurons in the cranium, outside of the central nervous system. The SPG has multiple connections to trigeminal, facial, sympathetic, and parasympathetic systems. The most likely explanation for our observation of SPG block amelioration of STP is activation of descending inhibitory pathways. These pathways are known to rapidly produce pain relief by modulating nociceptive traffic in the dorsal horn of the spinal cord. Descending inhibitory pathways originate in the periaqueductal gray-rostral ventromedial medulla system, the dorsal reticular nucleus, and venterolateral medulla.[7] The precise connection between the SPG and these brainstem inhibitory centers is currently unknown.

The trigeminal nucleus extends through the brainstem and as low as the third or fourth segments of the cervical spinal cord[8] (spinal trigeminal nucleus caudalis). Clinical evidence suggests convergence between trigeminal and upper cervical sensory afferents so that sensory activation of the occipital nerve produces symptoms in the trigeminal distribution as well, and vice versa.[9,10]

A less likely explanation of our observations of STP relief was systemic lidocaine absorption. IV lidocaine is known to relieve acute pain.[11] However, the dose of lidocaine used to achieve this effect, typically 1.5 mg/kg followed by 1.5–3 mg/kg/h, is much greater than the lidocaine doses that our patients received. In case no. 1, the total lidocaine administered was 28 mg over 20 minutes. In case no. 2, the patient began to experience pain relief in 5 minutes, after only 5 mg lidocaine had been administered, and had near complete relief after 20 mg was given. Even with 100% absorption, an unlikely circumstance with transnasal SPG block, the dose is only a small fraction of the "standard" IV lidocaine dose reported to produce analgesia.

Pain after thoracic surgical procedures may contribute to delayed recovery and postoperative complications. While incisional pain can be managed with regional techniques and systemic analgesics, STP does not usually respond well to these conventional treatment modalities. Moreover, systemic analgesics such as opioids and nonsteroidal anti-inflammatory drugs may have untoward effects. Both of our patients had minimal chest pain, but experienced moderate to severe STP, which was a barrier to postoperative recovery.

Transnasal SPG block effectively relieved STP, a condition that has heretofore been challenging to treat. Furthermore, SPG block is a simple and minimally invasive procedure with few contraindications, for example, a deviated septum that could inhibit passage of the applicator. In our patients, the transnasal SPG block procedure was well tolerated. The precise duration of time needed for the applicator to be in place to relieve STP remains to be defined. In case no. 1, although the patient stated that the pain was improved within a few minutes after the block was initiated, we chose to maintain the applicators in place for 20 minutes. In case no. 2, because the patient reported that she still perceived some mild STP at 20 minutes (NRS 2/10), we chose to leave the applicator in place for an additional 10 minutes. At that time, she said the pain was "barely noticeable," but still assigned an NRS of 2/10.

A limitation was the potential for a placebo effect, as each patient was informed that based on the authors' previous observations, the SPG block was likely to relieve their STP. It is improbable that the STP spontaneously resolved in these patients coincident with the performance of the SPG blocks, as both patients had been experiencing STP for more than 24 hours before receiving the blocks. Furthermore, the STP had not responded to systemic analgesics.

In summary, we report here the successful use of SPG block to alleviate moderate to severe STP in 2 patients after thoracic surgical procedures. We suggest that this technique be considered to provide relief of STP for patients who fail to respond to standard analgesics.

DISCLOSURES

Name: Gilbert J. Grant, MD.
Contribution: This author helped perform the block, follow the patients, analyze the data, and write the manuscript.
Name: Ghislaine C. Echevarria, MD.
Contribution: This author helped perform the block, follow the patients, analyze the data, and write the manuscript.
Name: Jerome Lax, MD.
Contribution: This author helped perform the block, follow the patients, analyze the data, and write the manuscript.
Name: Harvey I. Pass, MD.
Contribution: This author helped identify the patients, analyze the data, and write the manuscript.
Name: Michael L. Oshinsky, PhD.
Contribution: This author helped analyze the data and write the manuscript.
This manuscript was handled by: Raymond C. Roy, MD.

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