Minimizing Risks with Stellate Ganglion Blocks

Mathew Saffarian, DO¹, Ryan Mattie, MD², and Clark C. Smith, MD, MPH³ behalf of the Spine Intervention Society’s Patient Safety Committee

¹Michigan State University, Department of Physical Medicine and Rehabilitation, East Lansing, Michigan, USA;
²Providence Medical Institute, Department of Interventional Pain Management, Providence Cedars-Sinai Tarzana Medical Center, Los Angeles, California;
³Columbia University Medical Center, Rehabilitation and Regenerative Medicine, New York, New York, USA

Myth: Stellate ganglion blocks (SGB) pose minimal risk when performed blind, using a landmark-based approach without imaging guidance.

Fact: Evidence suggests that fluoroscopic or ultrasound guidance reduces the risk and increases the accuracy of SGB. Utilizing ultrasound guidance has the added benefit of soft tissue visualization, especially vascular structures, which has the potential to prevent adverse outcomes when compared to the fluoroscopic technique.

Stellate ganglion blocks (SGBs) are used to treat a variety of sympathetically-mediated conditions. In the past, the SGB was performed “blind,” that is, without imaging guidance. Accumulated evidence of serious complications such as inadvertent subarachnoid or epidural injection, recurrent laryngeal nerve palsy, seizures, blindness, and death led to the emergence of image-guided techniques: fluoroscopy and ultrasound [1]. Avoiding vulnerable anterior cervical structures with the use of imaging has resulted in fewer complications. [2,3-5].

A systematic review of 260 complications associated with SGB reported that the blind paratracheal approach accounted for 48.5% of the cases, while fluoroscopic and ultrasound guidance accounted for 26.9% and 24.6%, respectively [6]. It should be noted that these data could be misleading given that the number of blind procedures performed may significantly outnumber those done with image guidance. There was one reported death due to hematoma, which occurred in association with the blind approach. All complications of subdural block, intrathecal block, transient locked-in syndrome, and hematoma occurred when the blind technique was used. It was concluded that SGBs are a relatively safe procedure; however, significant complications may occur and can be attributed to vascular disruption, injection of medication into an unintended space, or alterations in autonomic tone [6].

Currently, the use of image-guided techniques is the standard of care [6]. Fluoroscopic guidance decreases the incidence of adverse outcomes [4,6] and increases effectiveness compared to the blind technique [7,8].

Under fluoroscopy, most often a direct antero-posterior (AP) approach is used. The final needle position is the junction of the vertebral body and the uncinate process at C6 or C7. At C7, there is an increased risk of vertebral artery injury, esophageal puncture, and pneumothorax [2]. Anatomic variations such as esophageal deviations or esophageal diverticulum increase the risk of esophageal puncture with a straight AP fluoroscopic approach [3]. An oblique approach to C7 has been described, which avoids the pleura and vascular structures while increasing accuracy [7], but increases the risk of recurrent laryngeal and vagus nerve blockade [4]. Life threatening complications using fluoroscopic guidance are a rare occurrence (1.7 in 1,000) [9]. Confirmation of contrast spread to the target location of the stellate ganglion is easily visualized with conventional fluoroscopy and is more difficult and a potential shortcoming of the ultrasound-guided technique. A small test dose of 1 ml of 1% lidocaine should be administered to detect unintended intravascular needle placement.

Conversely, the use of ultrasound offers several potential advantages. In addition to increasing safety, ultrasound has the potential to improve accuracy and, subsequently, effectiveness [10]. Vascular and other soft tissue structures cannot be directly visualized under fluoroscopy, but can be visualized by ultrasound [4].

With the transducer in the transverse short axis position at the level of the cricoid notch, the anterior aspect of the Chassaignac’s tubercle on the C6 transverse process, the carotid artery, internal jugular vein, thyroid gland, trachea, Longus colli, Longus capitis, prevertebral fascia, the root of C6 spinal nerve, and transverse process of C6 can all be identified [11]. Ultrasound has been shown to decrease the incidence of esophageal puncture.
compared to a traditional fluoroscopic approach [12]. One retrospective review of 156 ultrasound-guided blocks found transient adverse side effects in 13.5% of patients, the most common being hoarseness. No severe or life-threatening complications occurred [13].

Because of better soft tissue visualization, another potential benefit of ultrasound is decreased injectate volume needed for an effective SGB compared to other approaches [12,14]. A study that compared blind SGB with 8ml to ultrasound-guided SGB with 5ml of injectate [14] measured vasodilation of the upper extremity and face along with the extent of Horner’s syndrome to assess effectiveness. Complete SGB was found in all 12 of the ultrasound cases and in 11 of the 12 using the blind approach. Non-serious hematoma formation occurred in three of the blind injections while the ultrasound-guided injections yielded none. Another study comparing blind and ultrasound-guided SGBs for post-stroke complex regional pain syndrome (CRPS) found the ultrasound-guided SGB group had greater improvement in VAS scores and fewer adverse events [10].

CT or MRI guidance for SGBs are also potential image guidance options. Both may be more expensive and time-consuming. Improved accuracy of final needle position upon the C6 tubercle, and identification of a safe trajectory accomplished with CT or MRI may be accompanied by lower complication rates [15].

Conclusions/Recommendations

- Risks of potentially life-threatening and other adverse events are substantially decreased when performing SGB under image guidance.
- Effective injections can be accomplished using less volume when proper imaging techniques are utilized leading to less chance of adverse outcomes, such as anesthetic toxicity, seizure, etc.
- Image guidance offers the ability to show real-time needle advancement and provides direct monitoring of injectate spread.
- If a fluoroscopic technique is utilized, and location is confirmed with live contrast administration, a small test dose of local anesthetic should be administered to further reduce the risk of intravascular injection.
- Utilizing ultrasound guidance has the added benefit of soft tissue visualization, especially vascular structures, which has the potential to prevent adverse outcomes when compared to the fluoroscopic technique.

References