

# Point-of-care ultrasound-guided regional anaesthesia: the superficial cervical plexus block for a patient with a clavicle fracture

## CASE PRESENTATION

A right-hand dominant woman aged 46 years with a history of opiate use disorder presents to the ED following a right clavicle injury. While riding to work, the patient fell off her bicycle, landing on her right shoulder. She denies any other injury. On physical examination, she is tearful, cradling her right arm. Her vital signs are normal. Her right clavicle has an obvious deformity and associated bruising without overlying injury or tenting of the skin. She has severely reduced range of motion of the right shoulder due to pain but is neurovascularly intact distally. Plain radiography of her right clavicle (figure 1) revealed a comminuted right clavicular fracture with a coracoclavicular distance of 7 mm. Given her personal history with opioids, the patient declined narcotics but was in severe acute pain. Thus, the ultrasound machine was brought to the bedside in anticipation of ultrasound-guided regional anaesthesia of the superficial cervical plexus.

## WHAT IS A SUPERFICIAL CERVICAL PLEXUS BLOCK?

The superficial cervical plexus block (SCPB) targets branches of the cervical plexus, specifically cervical nerve roots C2–C4. These branches emerge from the posterior aspect of the sternocleidomastoid muscle (SCM), about halfway between its origin on the manubrium and medial clavicle and its insertion on the mastoid process posterior to the ipsilateral ear as shown in figure 2.

The superficial cervical plexus provides anaesthesia to the skin from the inferior earlobe superiorly, the midline neck anteriorly, the lateral aspect of the trapezius laterally and along the clavicle inferiorly as shown in figure 3. There is no motor innervation by the superficial cervical plexus; therefore, there is no associated paralysis.

## WHAT ARE THE INDICATIONS FOR PERFORMING A SUPERFICIAL CERVICAL PLEXUS BLOCK?

In emergency medicine, common indications to perform an SCPB include relieving pain or allowing a procedure of the anterolateral neck, including central line placement in the internal jugular (IJ) vein and neck abscesses requiring incision and drainage,



**Figure 1** Right clavicular radiography demonstrating a right comminuted clavicular fracture.



**Figure 2** Cadaveric image of the superficial cervical plexus as it emerges from the posterior aspect of the sternocleidomastoid muscle (SCM) showing specifically the lesser occipital nerve (1), great auricular nerve (2), transverse cervical nerve (3) and supraclavicular nerves (4).

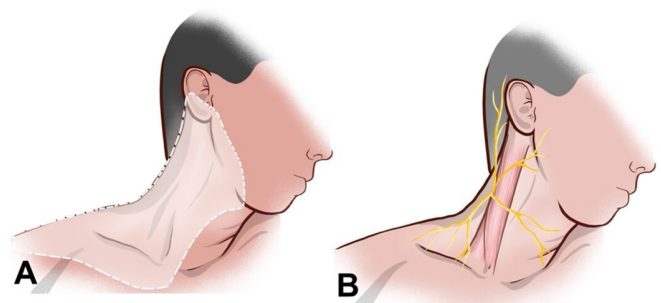
and clavicular fractures. The procedure has also been applied for primary anaesthesia or postoperative anaesthesia for carotid endarterectomy, superficial neck surgery or thyroidectomy for other specialties.<sup>1,2</sup>

## WHICH ULTRASOUND TRANSDUCER IS BEST SUITED FOR PERFORMING A SUPERFICIAL CERVICAL PLEXUS BLOCK?

The high-frequency linear transducer is ideal for this procedure. The high-frequency transducer has the highest image resolution, ideal for anatomy recognition and the linear transducer is best for visualising superficial structures.

## HOW DO YOU SET UP TO PERFORM A SUPERFICIAL CERVICAL PLEXUS BLOCK?

In preparation for this procedure, you should consider the following:



**Figure 3** (A) The anticipated area of anaesthesia of the skin from the inferior earlobe superiorly, the midline neck anteriorly, the lateral aspect of the trapezius laterally and along the clavicle inferiorly compared with (B) a simplified portrayal of the nerves of the superficial cervical plexus.

- ▶ **Patient consent:** it is vital to explain the procedure, associated risks to the patient and obtain patient consent as with all procedures. The patient needs to understand that they will not be able to feel the side of their neck after the SCPB. The procedure's risks are inability to anaesthetise, bleeding, infection and damage to surrounding structures. Although intimidating because it is performed in the neck, there are very few specific associated risks. One of the more apparent potential side effects is Horner's syndrome (ipsilateral ptosis, miosis and anhidrosis). Although its incidence is unknown, the frequency of Horner's syndrome is rare in the authors' experience.<sup>3</sup> Additionally, if Horner's syndrome does occur, it is important to know that it is self-limited and does not require additional evaluation or workup. Phrenic nerve palsy is a complication to be aware of for deep cervical plexus blocks performed in the neck, but there should be no risk of phrenic nerve paralysis with a superficial block like the SCPB.<sup>2</sup>
- ▶ **Sensory examination:** to diagnose underlying injuries and to prevent subsequently diagnosed nerve damage from being assigned to the performance of the procedure, it is critical to perform and document a thorough neurovascular examination before the injection of any anaesthesia.
- ▶ **Patient positioning:** place the patient in a position of comfort, supporting and stabilising their back, neck and head. We have found two optimal positions of comfort, including (1) the patient may be seated upright with their back supported against the gurney and (2) the patient in the lateral decubitus position with their affected side up.
- ▶ **Ultrasound machine and positioning:** the ultrasound machine should be fully charged or plugged in to prevent a sudden loss of power during the procedure. Note that some ultrasound machines have a 'procedure mode' that prevents the screen from going into sleep mode or switching off in the middle of the procedure. The machine should be positioned so that the operator can visualise the patient's neck, their own hands and the ultrasound machine screen in the same 'line of sight'. Being in the same 'line of sight' means that the operator can move their eyes between their hands and the ultrasound screen without head movement. One example of how one might set up is shown in figure 4.
- ▶ **Equipment:** to perform this procedure, the operator will need the ultrasound machine, a sterile cover for the



**Figure 4** Picture of how one might set up to perform the superficial cervical plexus block in the patient's right neck.

ultrasound transducer, sterile gloves, cleaning materials to clean the skin, anaesthetic, syringe and needle. For this procedure, the needle does not need to travel a long distance below the skin so the needle does not need to be longer than a commonly used needle, generally about one and a half inches in length. Of note, smaller diameter needles can be more challenging to visualise on ultrasonography. Using an echogenic tip and at least a 20-gauge diameter needle will improve visualisation.

- ▶ **Transducer orientation:** transducer orientation can be confusing. In diagnostic point-of-care ultrasonography, the indicator on the transducer aims towards the patient's right side when in the axial or transverse plane and towards the patient's head in the longitudinal or sagittal plane or the coronal plane. In procedural point-of-care ultrasonography, the indicator on the transducer must be pointing in the same direction as the indicator on the ultrasound machine screen to ensure that an operator's movements match what they are observing on the ultrasound machine screen.
- ▶ **Anaesthesia:** the local anaesthetic choice will depend on the desired duration of action. Unlike other ultrasound-guided regional anaesthesia, the SCPB is purely sensory and should not cause motor paralysis. The goal of the SCPB is to provide pain control. We have found that long-acting anaesthetics such as mepivacaine or ropivacaine are ideal for this procedure. Only 5–10 mL is needed for the SCPB.
- ▶ **In-plane technique:** the in-plane technique should be used for ultrasound-guided regional anaesthesia, where the entire length of the needle tip and shaft is visualised throughout the procedure to prevent inadvertent injection into other structures or damage to the nerve itself.
- ▶ **Monitoring:** a patient should have their vital signs monitored during any ultrasound-guided regional anaesthesia procedure being performed proximal to the elbow or the knees. However, this procedure only uses about 5–10 cc of local anaesthetic, similar to that required for a simple laceration repair, making the risk of an adverse event from systemic toxicity exceedingly low and cardiac monitoring is not mandatory.
- ▶ **Support:** depending on your experience with ultrasound-guided regional anaesthesia, you may consider asking a colleague or nurse to be in the room to assist you.
- ▶ **Contraindications:** absolute contraindications to perform an SCPB include allergic reaction to local anaesthesia, inability to consent or decline to consent. Special considerations should be given to patients with bleeding diatheses or who are anticoagulated and who have an overlying skin infection.

#### WHAT VIEWS SHOULD BE OBTAINED WHEN PREPARING TO PERFORM A SUPERFICIAL CERVICAL PLEXUS BLOCK?

As with all ultrasound-guided regional anaesthesia, the operator should first identify the relevant anatomy before beginning the procedure.

To target the superficial cervical plexus, which emerges about halfway up the posterior border of the SCM, the operator should place the transducer in a transverse orientation across the SCM. Then, the provider should move the transducer posteriorly until a tapering of the SCM is visualised. For this specific procedure, often the nerves are too small, and the nervous plexus will not be well visualised. Instead, the provider will see the tapering SCM and visualise the underlying anterior scalene muscle and middle scalene muscle (figure 5).





**Figure 5** The linear transducer in a transverse orientation in the right neck showing the sternocleidomastoid muscle (SCM) superficially with the anterior scalene muscle (ASM) anteriorly and middle scalene muscle (MSM) more posteriorly. The superficial cervical plexus can be found at the posterior aspect of the tapered SCM (white arrows).

Keeping the taper SCM in the centre of the screen, the operator can move the transducer cephalad and caudal and may find themselves visualising the small nerves. As long as the operator is at the tapering lateral edge of the SCM about halfway up the SCM from origin to insertion, it is not critical that the operator visualise the nerves, just the landmark.

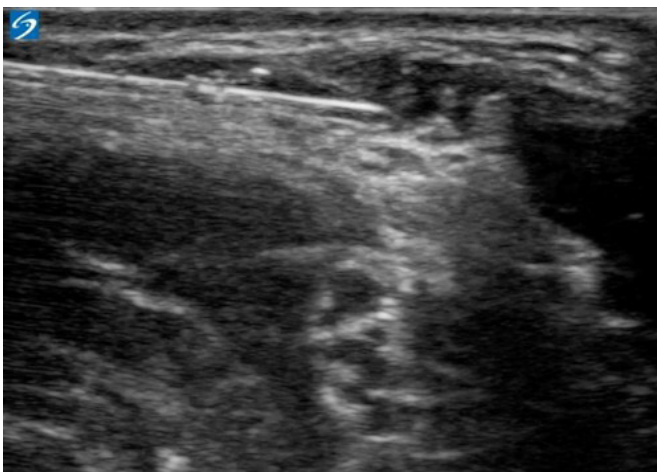
#### WHERE ARE YOU TRYING TO PLACE THE TIP OF YOUR NEEDLE?

Because, in this procedure, the operator is not visualising the nerves, the goal is to place the distal needle tip just inferior to the lateral edge of the SCM, as shown in [figure 6](#).

#### WHAT IS THE EVIDENCE FOR PERFORMING AN ULTRASOUND-GUIDED SUPERFICIAL CERVICAL PLEXUS IN CLINICAL PRACTICE?

The SCPB has been well documented to provide anaesthesia to the clavicular region.<sup>1-7</sup>

There are various case reports that document the use of the SCPB.<sup>3 4 8-11</sup> There are no randomised trials; however, in an ED convenience sample study of 27 patients, with heterogeneous shoulder diagnoses (eg, paracervical muscle spasm, clavicular



**Figure 6** Location of needle tip deep to the SCM.

fractures, acromioclavicular joint injuries, radicular pain and rotator cuff disorders), there was a 62% reduction in the verbal numeric pain score with the performance of the SCPB.<sup>7</sup>

#### WHAT ARE EXPERT TIPS WHEN PERFORMING A SUPERFICIAL CERVICAL PLEXUS BLOCK?

- ▶ *Needle approach:* in all ultrasound-guided regional anaesthesia in the neck, the needle approaches from the posterior lateral position. The ‘danger structures’, or structures to avoid, include the medial vascular structures such as the common carotid artery or IJ vein.
- ▶ *When identifying the anatomy, determine the vasculature first:* this approach enables the operator to identify the ‘danger structures’ and orient themselves. Once the common carotid artery and lateral IJ vein have been identified, the operator can move the transducer more laterally, over the bulk of the SCM to identify the tapering edge of the SCM muscle.
- ▶ *Stabilise your hand:* identifying the relevant anatomy is the most critical part of any ultrasound-guided regional anaesthesia. Once the ideal anatomy has been identified, the operator should stabilise their hand, dropping the small finger on the patient to prevent unintentional sliding or movement of the transducer.
- ▶ *Prevent and prepare for local anaesthetic systemic toxicity (LAST):* as ultrasound-guided regional anaesthesia becomes increasingly pervasive in emergency medicine, it will become increasingly important to have systems in place to deal with the most severe possible complication of these procedures, LAST. Operators should always use the lowest dose necessary to achieve the desired anaesthesia; maximum doses should be calculated using ideal body weight, not actual body weight and operators should calculate the appropriate dose of lipid emulsion prior to the procedure to reduce the cognitive load in the case of this complication. Many institutions store the treatment for LAST, lipid emulsion, in the same location as the local anaesthetics for this reason.
- ▶ *Anticipating postdischarge care:* ultrasound-guided regional anaesthesia is an incredible tool to address acute pain. However, it is important to acknowledge that anaesthesia from the SCPB will wear off and it is important to have a plan for pain control after this time.

#### WHAT ARE SOME PITFALLS OF PERFORMING SUPERFICIAL CERVICAL PLEXUS BLOCK?

- ▶ *Disorientation:* as with any ultrasound-guided regional anaesthesia, the most critical step is confidently identifying the anatomy. Often, operators will be too far anterior or get lost too far posteriorly. If the operator is systematic in their approach and identifies the common carotid artery and IJ vein anteriorly and then moves posteriorly to the tapering edge of the SCM muscle, it is easier to remain oriented. From there, the operator wants to keep the tapering border of the SCM in the middle of their screen from left to right. Then, the operator can slide the transducer cephalad and caudal until they have a view with which they are comfortable.
- ▶ *Never inject under pressure:* this is a critical teaching point. Despite using point-of-care ultrasonography to visualise the needle tip, sometimes the needle tip will inadvertently end up inside the nerve bundle. The operator should never inject the anaesthetic under pressure which may indicate that the needle tip is inside the nerve bundle, and should take care with the amount of force applied to the syringe

plunger to avoid injury. The force should be comparable to flushing a peripheral intravenous. The operator should advance or withdraw the needle slightly and repeat a gentle test push.

- ▶ **Operator competency:** as with all ultrasound-guided procedures, it is critical that the operator feel confident with the SCPB prior to its performance. Comfort spans from anatomical knowledge and pharmacological familiarity to the motor skills of ultrasound-guided procedures and will differ for each individual depending on their training and experience with both diagnostics and procedural point-of-care ultrasonography. Although there is no established number in the literature to achieve competency to perform ultrasound-guided regional anaesthesia, some references cite that trainees should complete five quality reviewed ultrasound-guided procedures or learning modules.<sup>12</sup> The time it takes to perform this procedure—from set up to completion—will depend on the operator competency.

### CASE CONCLUSION

With the patient sitting upright, supported against an upright gurney, she watched the entire procedure on the ultrasound screen in front of her without additional pain. The patient had complete relief of pain and was discharged home with a sling, oral analgesia as needed for when the anaesthetic wears off and outpatient follow-up with orthopaedics.

Sally Graglia<sup>1,2,3</sup>, Aaron Kornblith<sup>3</sup>

<sup>1</sup>Emergency Medicine, San Francisco General Hospital and Trauma Center, San Francisco, California, USA

<sup>2</sup>Emergency Medicine, UCSF, San Francisco, California, USA

<sup>3</sup>Emergency Medicine, University of California, San Francisco, San Francisco, California, USA

**Correspondence to** Dr Sally Graglia, Emergency Medicine, San Francisco General Hospital and Trauma Center, San Francisco, CA 94110, USA; [sally.graglia@gmail.com](mailto:sally.graglia@gmail.com)

**Acknowledgements** The EMJ SONO Case Series would like to acknowledge Dr Barbie Klein, Molly Rubin and the UCSF Willd Body Programme for taking the cadaveric image and granting its use for dissemination.

**Contributors** SG recruited and consented the patient, performed and recorded sonographic imaging and wrote the initial manuscript draft. AK provided multiple revisions and mentorship. SG and AK take responsibility for the manuscript as a whole.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Consent obtained directly from patient(s).

**Ethics approval** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** No data are available.

© Author(s) (or their employer(s)) 2023. No commercial re-use. See rights and permissions. Published by BMJ.

**Handling editor** Caroline Leech

*Emerg Med J* 2023;0:1–4. doi:10.1136/emered-2023-213071

### ORCID iD

Sally Graglia <http://orcid.org/0000-0001-5840-5287>

### REFERENCES

- Bendtsen F, Abbas S, Chan V. New York school of regional anesthesia. Ultrasound-guided cervical plexus nerve block. Available: <https://www.nysora.com/techniques/head-and-neck-blocks/cervical/ultrasound-guided-cervical-plexus-block> [Accessed 18 Mar 2022].
- Kim J-S, Ko JS, Bang S, *et al.* Cervical plexus block. *Korean J Anesthesiol* 2018;71:274–88.
- Flores S, Riguzzi C, Herring AA, *et al.* Horner's syndrome after superficial cervical plexus block. *West J Emerg Med* 2015;16:428–31.
- Shanthanna H. Ultrasound guided selective cervical nerve root block and superficial cervical plexus block for surgeries on the clavicle. *Indian J Anaesth* 2014;58:327–9.
- Abdelghany MS, Ahmed SA, Afandy ME. Superficial cervical plexus block alone or combined with interscalene brachial plexus block in surgery for clavicle fractures: a randomized clinical trial. *Minerva Anesthesiol* 2021;87:523–32.
- Sheikh M, Carvalho B, Boublík J, *et al.* Superficial cervical plexus block for awake large-bore central line placement in parturients: a case series. *AA Pract* 2021;15:e01429.
- Ho B, De Paoli M. Use of ultrasound-guided superficial cervical plexus block for pain management in the emergency department. *J Emerg Med* 2018;55:87–95.
- Herring AA, Stone MB, Frenkel O, *et al.* The ultrasound-guided superficial cervical plexus block for anesthesia and analgesia in emergency care settings. *Am J Emerg Med* 2012;30:1263–7.
- Beals T, Haines L. Ultrasound-guided superficial cervical plexus blockade for acute spasmodic torticollis in the ED. *Am J Emerg Med* 2017;35:376.
- Di Pietro S, Caracciolo E, Barcella B, *et al.* Superficial cervical plexus block in emergency departments: rationale for its use in incision and drainage of neck skin abscesses. *Intern Emerg Med* 2022;17:1533–6.
- Flores S, Herring AA. Ultrasound-guided greater auricular nerve block for emergency department ear laceration and ear abscess drainage. *J Emerg Med* 2016;50:651–5.
- American College of Emergency Physicians. *Policy statement ultrasound guidelines: emergency point-of-care, and clinical ultrasound guidelines in medicine.* 2016: 2–46.