The Ochsner Journal 14:259–263, 2014

Analgesic Efficacy and Technique of Ultrasound-Guided Suprascapular Nerve Catheters after Shoulder Arthroscopy

Hesham A. Elsharkawy, MD,[1,2] Alaa A. Abd-Elsayed, MD, MPH,[3] Kenneth C. Cummings, III, MD,[1,2] Loran Mounir Soliman, MD[1]

[1]*Department of General Anesthesiology, Cleveland Clinic, Cleveland, OH*
[2]*Department of Outcomes Research, Cleveland Clinic, Cleveland, OH*
[3]*Department of Anesthesiology, University of Wisconsin, School of Public Medicine and Public Health, Madison, WI*

ABSTRACT

Background: Conventional approaches to brachial plexus blocks may not cover the suprascapular nerve. Accordingly, after shoulder arthroscopy, sensation from the posterior part of the shoulder is commonly spared. Most previous research involving suprascapular nerve blocks described single-injection techniques. However, with the widespread availability and fairly reasonable cost of disposable infusion pumps, continuous catheter techniques provide a more appealing method of prolonging postoperative analgesia.

Case Report: We describe 2 patients who were successfully treated with ultrasound-guided continuous suprascapular nerve catheters. With the patient seated, a high-frequency linear ultrasound probe was used. Both patients experienced excellent pain relief without complications.

Conclusion: Continuous suprascapular catheter techniques provide good pain relief and improve postoperative analgesia after shoulder arthroscopy.

INTRODUCTION

Suprascapular nerve block (SSNB), originally described by Wertheim and Rovenstine in 1941 as a method to treat chronic shoulder pain,[1] has subsequently proved useful in the perioperative setting. However, despite its benefits, SSNB has not been widely adopted.

The suprascapular nerve (SSN) arises from the C5 and C6 nerve roots, emerges from the lateral aspect of the upper trunk of the brachial plexus, and then enters the supraspinatus fossa via the suprascapular notch underneath the superior transverse scapular ligament. In the supraspinous fossa, the nerve is in direct contact with bone and exits the suprascapular fossa to the infrascapular fossa lateral to the spinoglenoid notch.[2]

Although the SSN typically has no clinically important cutaneous branches, it plays a major role in pain after shoulder procedures. Along with small branches of the axillary and lateral pectoral nerves, the SSN innervates up to 70% of the posterior shoulder joint, as well as the acromioclavicular joint, subacromial bursa, and coracoclavicular ligament (Figure 1).[3]

Conventional approaches to brachial plexus blocks may not cover the SSN because of its early exit from the plexus. Accordingly, sensation is commonly spared from the posterior part of the shoulder with these blocks, especially after arthroscopic surgeries that approach the joint from its posterior aspect.

SSNB decreases pain scores at rest and with movement in the early postoperative period and alleviates pain up to 24 hours on shoulder abduction. Furthermore, significant reductions in analgesic dose and demand, discharge time, and the incidence of nausea have been reported.[4] An ultrasound-guided SSNB is a recently developed technique that offers visualization of the SSN and the muscle layers. Although SSN catheters have been used, published reports of their use are few.

In the present medical environment, cost-effective anesthetic choices are an increasing priority. Suc-

Address correspondence to
Hesham A. Elsharkawy, MD
Departments of General Anesthesiology and Outcomes Research
Cleveland Clinic
9500 Euclid Avenue
Cleveland, OH 44195
Tel: (216) 445-3783
Email: elsharh@ccf.org

Keywords: Analgesia–patient-controlled, brachial plexus, catheters–indwelling, infusion pump, nerve block, ultrasonography–interventional

The authors have no financial or proprietary interest in the subject matter of this article.

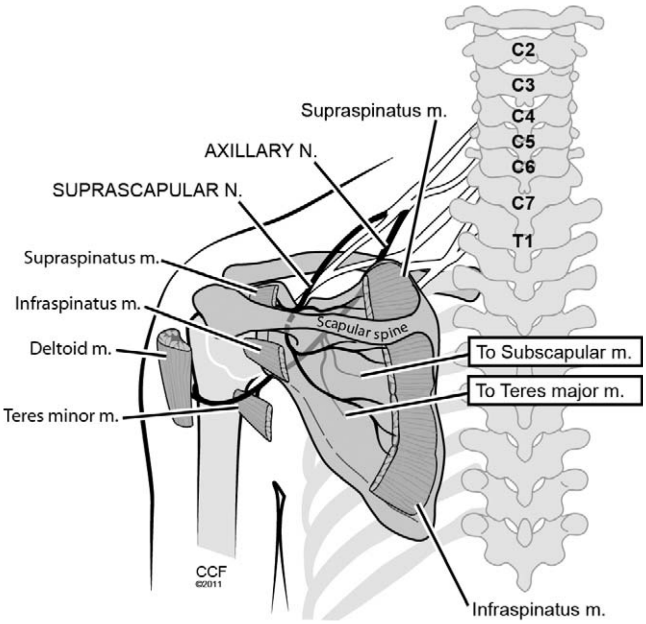

Figure 1. The anatomy of the suprascapular nerve (SSN). The SSN arises from the C5 and C6 nerve roots, emerges from the superior trunk of the brachial plexus, and then enters the supraspinatus fossa via the suprascapular notch underneath the superior transverse scapular ligament. M, muscle; N, nerve.

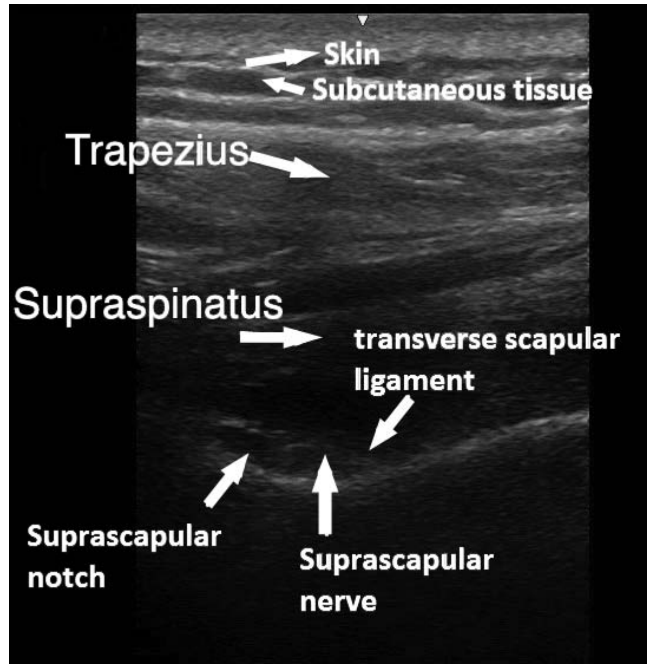

Figure 2. Ultrasound of the suprascapular region identifying the following structures: the trapezius muscle, supraspinatus muscle, suprascapular notch, transverse scapular ligament, and the suprascapular nerve.

cessful ambulatory surgery is dependent on analgesia that is effective and has minimal adverse effects. In this report, we describe 2 patients with pain refractory to our standard regional anesthetic techniques who were successfully treated with continuous SSN catheters.

METHODS

With the patient seated, a high-frequency linear ultrasound probe was positioned in the suprascapular region. Scanning began with identification of the acromioclavicular joint. The probe was then moved medially, revealing the following structures: the acromion, trapezius muscle, supraspinatus muscle, suprascapular notch, and the suprascapular artery (Figure 2).

Through movement of the patient's arm, dynamic scanning facilitated identification of some anatomical structures. Abduction and adduction, as well as anterior and posterior adjustment, moved the supraspinatus tendon and muscle. Tilting the probe anteriorly is usually needed to appreciate the notch of the scapula. The SSN can be visualized medial to the pulsation of the suprascapular artery as an oval or round slightly hyperechoic structure (Figure 3).

Block Technique

Full aseptic technique was maintained. The skin was infiltrated with lidocaine 1%. A 17-gauge Tuohy needle was used to place a 19-gauge catheter. The needle was advanced using an in-plane approach medial to lateral to visualize the whole length of the needle (Figure 4). After negative aspiration, 10 mL of ropivacaine 0.5% was injected, and the spread of the local anesthetic was confirmed as a separation between the supraspinatus muscle and the spine of the scapula.

The catheter was then advanced 3-5 cm beyond the tip of the needle. Another 5 mL of local anesthetic was injected through the catheter to confirm the final position of the tip of the catheter. The catheter was then tunneled and secured in place. In both cases, we paid attention to running the appropriate dose of the local anesthetic infusion to avoid the cumulative toxicity.

CASE 1

An 18-year-old male presented with recurrent shoulder dislocation secondary to glenoid hypoplasia. He was scheduled for left shoulder glenoid osteotomy and posterior capsulorraphy. Preoperatively, a supraclavicular catheter was inserted with ultrasound guidance. The catheter was bolused using

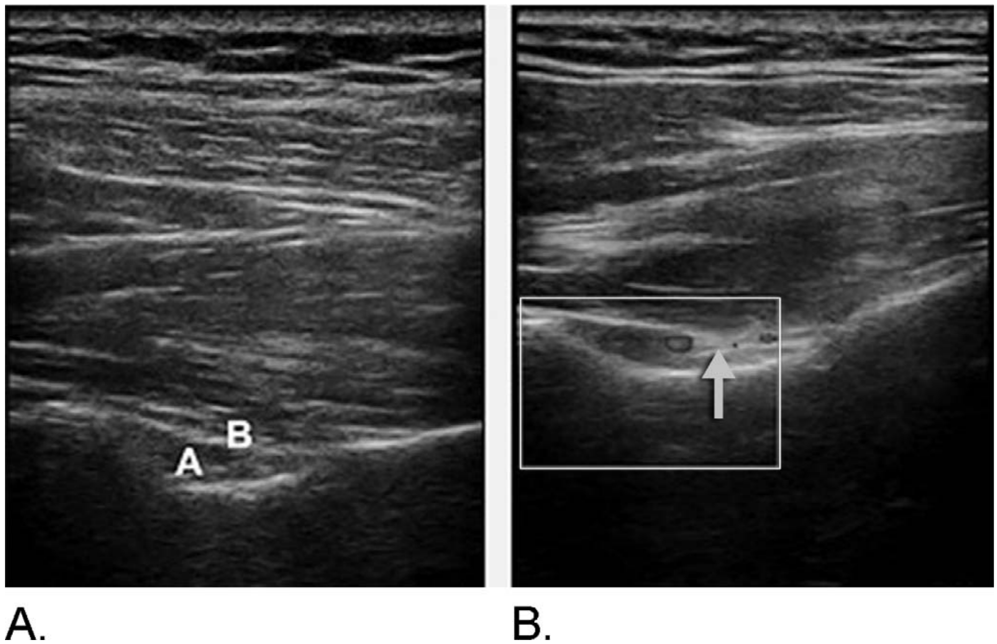

Figure 3. A: The letter A indicates the area for the suprascapular vessels; the letter B indicates the transverse scapular ligament. B: With application of color Doppler. The suprascapular nerve (indicated by the arrow) can be visualized medial to the pulsation of the suprascapular artery as an oval or round slightly hyperechoic structure.

25 mL of ropivacaine 0.75%. Surgery was performed under general anesthesia.

Postoperatively, an infusion through the supraclavicular catheter was started using ropivacaine 0.1% with a basal rate of 8 mL/h, a bolus dose of 12 mL, and a lockout interval of 60 minutes. The patient's pain was well controlled in the anterior aspect of the shoulder, but the patient had significant pain at the posterior portion of the surgical incision on the posterior aspect of the shoulder in spite of bolusing the supraclavicular catheter with 15 mL of mepivacaine 2%.

On postoperative day 2, the decision was made to place a suprascapular catheter in addition to his indwelling supraclavicular catheter. The catheter was placed using the previously described technique. An infusion was begun using ropivacaine 0.1% with a basal rate of 6 mL/h, a bolus dose of 6 mL, and a 60-minute lockout.

Subsequently, the patient reported significant relief of pain. The procedure was well tolerated without apparent complications. On postoperative day 3, both infusions were stopped for 4 hours. The patient tolerated the surgical-site pain well, and the catheters were removed before he was discharged from the hospital.

CASE 2

A 32-year-old male presented for right shoulder arthroscopy, manipulation under anesthesia, lysis of adhesions, and subacromial decompression. Preoperatively, a supraclavicular catheter was inserted under ultrasound guidance and bolused with 25 mL of ropivacaine 0.75%. Surgery was performed under general anesthesia.

In the postanesthesia care unit 1 hour after surgery, the patient reported severe pain in the back of his shoulder. The supraclavicular catheter was bolused with 10 mL mepivacaine 2%, which relieved some pain in his anterior shoulder but did not relieve the pain in his posterior shoulder. A right suprascapular catheter was inserted, and 10 mL of ropivacaine 0.75% was injected, resulting in marked relief of his pain. Infusions of ropivacaine 0.1% were started in both catheters with identical settings of a 6 mL/h basal rate, a 6 mL bolus dose, and a 60-minute lockout.

The patient was discharged home the same day and was instructed to bolus the supraclavicular catheter for anterior shoulder pain and to bolus the suprascapular catheter for posterior pain. The Acute Pain Service called the patient every day for 3 days; on the third day he was instructed to remove both catheters. He experienced excellent analgesia and did not require any additional analgesic medications while the catheters were in place.

DISCUSSION

We described 2 cases of successful continuous SSNB used to supplement preexisting supraclavicular blocks for shoulder procedures. Both patients expe-

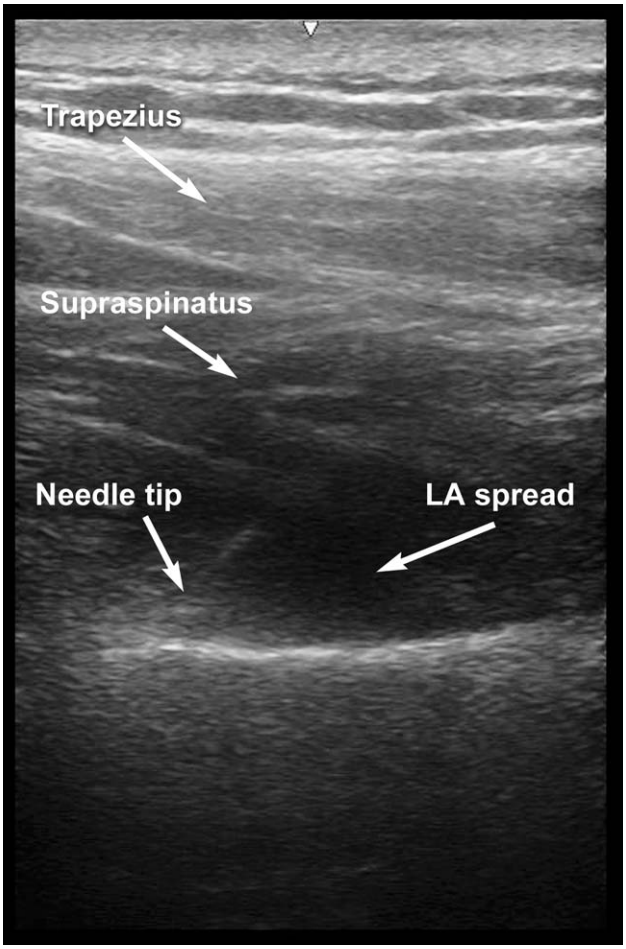

Figure 4. Ultrasound showing local anesthetic (LA) injection. The needle is advanced using an in-plane approach. After negative aspiration, 10 mL of ropivacaine 0.5% is injected, and the spread of the local anesthetic is confirmed as a separation between the supraspinatus muscle and the spine of the scapula.

Technical Tips for a Successful Block

Movement of the patient's arm facilitates identification of the supraspinatus tendon and muscle, but it is not mandatory in thin patients, especially if movement is painful. Based on our experience, we recommend the following steps for better success with performing this block:

- Adjust the focal point to be at the suprascapular notch.
- Place the probe as close as possible to the spine of the scapula.
- If possible, ask the patient to adduct the arm and move it forward, thus bringing the nerve more superficially.
- If visualizing the nerve is still difficult, using color Doppler to detect the suprascapular artery pulsation can be helpful, as the nerve usually lies medial to the pulsation.

Limitations of Suprascapular Block Following a Supraclavicular Block

- Visualization of the needle is difficult, as the angle is usually steep. Using echogenic needles may improve visualization. Designating an insertion point as far as possible from the ultrasound probe can reduce the needle angle. Rocking the ultrasound probe toward the opposite side of the needle—ie, toeing in—can also decrease the angle between the needle and ultrasound beam.
- The block is painful because the needle will pass through muscles.
- Using nerve stimulation is difficult because the nerve is sensory only and suprascapular block is usually done after supraclavicular block with possible blockade already achieved.
- Patient position must change from supine to seated or lateral because it is difficult to perform the procedure supine.

rienced excellent pain relief without complications. Most previous research involving SSNBs describe single-injection techniques. However, with the widespread availability and reasonable cost of disposable infusion pumps, continuous catheter techniques are more appealing for prolonging postoperative analgesia. In our practice, placement of a continuous SSNB with or after the interscalene/supraclavicular block appears to improve analgesia in selected patients. However, the total dosage must be carefully calculated to avoid local anesthetic toxicity from running 2 infusions simultaneously.

Despite the usefulness of SSNB, little has been reported about it in the literature. Ritchie et al[4] studied the preoperative effect of a single-injection SSNB on 25 patients undergoing shoulder arthroscopy under general anesthesia. Compared to controls, patients receiving blocks had lower perioperative opioid requirements, improved pain scores, and shorter times to discharge.[4] Chan and Peng provided a comprehensive discussion of single-injection SSNBs.[5] In open shoulder procedures, Neal et al found that SSNBs extended analgesia by an average of 3.6 hours in patients who also received single-injection interscalene blocks and general anesthesia.[6]

For continuous SSNBs using catheters, the literature reports only cases that differ significantly from our reported use. One report described an SSN nerve catheter used for intractable shoulder pain in a patient with metastatic lung cancer.[7] Another report described the use of intermittent boluses through an epidural catheter placed in the suprascapular fossa to provide analgesia for a scapular fracture.[8] Finally, Coetzee et al described a method of catheter placement under arthroscopic guidance.[9]

CONCLUSION

This report reviews the relevant anatomy and describes a new technique for continuous suprascapular block after shoulder arthroscopy. The 2 cases highlight some of the limitations of current therapeutic options and suggest that suprascapular catheters may provide excellent analgesia in selected patients. Although described here as a rescue technique for inadequate analgesia from supraclavicular catheters, suprascapular catheters may play a primary role in certain cases. However, future randomized controlled trials will be required to determine which patients would benefit most from this technique, whether the technique could replace other upper extremity blocks, and what comparative role could be played by continuous-infusion vs single-injection blocks.

ACKNOWLEDGMENTS

We credit the Cleveland Clinic Center for Medical Art & Photography for the illustration by David Schumick, BS, CMI. Reprinted with permission of the Cleveland Clinic Center for Medical Art & Photography ©2011.

REFERENCES

1. Wertheim HM, Rovenstine EA. Suprascapular nerve block. *Anesthesiology*. 1941;2:541-545.
2. Bigliani LU, Dalsey RM, McCann PD, April EW. An anatomical study of the suprascapular nerve. *Arthroscopy*. 1990;6(4):301-305.
3. Singelyn FJ, Lhotel L, Fabre B. Pain relief after arthroscopic shoulder surgery: a comparison of intraarticular analgesia, suprascapular nerve block, and interscalene brachial plexus block. *Anesth Analg*. 2004 Aug;99(2):589-592.
4. Ritchie ED, Tong D, Chung F, Norris AM, Miniaci A, Vairavanathan SD. Suprascapular nerve block for postoperative pain relief in arthroscopic shoulder surgery: a new modality? *Anesth Analg*. 1997 Jun;84(6):1306-1312.
5. Chan CW, Peng PW. Suprascapular nerve block: a narrative review. *Reg Anesth Pain Med*. 2011 Jul-Aug;36(4):358-373.
6. Neal JM, McDonald SB, Larkin KL, Polissar NL. Suprascapular nerve block prolongs analgesia after nonarthroscopic shoulder surgery but does not improve outcome. *Anesth Analg*. 2003 Apr;96(4):982-986, table of contents.
7. Mercadante S, Sapio M, Villari P. Suprascapular nerve block by catheter for breakthrough shoulder cancer pain. *Reg Anesth*. 1995 Jul-Aug;20(4):343-346.
8. Breen TW, Haigh JD. Continuous suprascapular nerve block for analgesia of scapular fracture. *Can J Anaesth*. 1990 Oct;37(7):786-788.
9. Coetzee GJ, de Beer JF, Pritchard MG, van Rooyen K. Suprascapular nerve block: an alternative method of placing a catheter for continuous nerve block. *Reg Anesth Pain Med*. 2004 Jan-Feb;29(1):75-76.

This article meets the Accreditation Council for Graduate Medical Education and the American Board of Medical Specialties Maintenance of Certification competencies for Patient Care and Medical Knowledge.