

The Shoulder Block

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KEY POINTS

- Pain following shoulder surgery remains challenging in the perioperative period.
- The shoulder block consists of a combined suprascapular and axillary nerve block.
- The shoulder block offers an alternative analgesic option for shoulder surgery, particularly in patients who refuse or in whom interscalene blocks are contraindicated.
- There is a lower risk of complications compared with the interscalene block, with several advantages and high patient satisfaction.

INTRODUCTION

Pain following shoulder surgery is still very common and remains challenging in the perioperative period.¹ Interscalene blocks (ISBs) are the most commonly performed blocks for shoulder surgery¹ and whilst providing effective analgesia, the ISB is associated with significant side effects and complications (including phrenic nerve palsy and hoarseness, along with inadvertent injection into the vertebral artery, cerebrospinal space, and cervical epidural space).²

The shoulder block (combined suprascapular and axillary nerve block [CSANB]) has been developed as an alternative to ISB for shoulder surgery.³ The nerves are blocked peripherally around the joint to provide analgesia rather than anaesthesia. It can be used in arthroscopic procedures and may be useful in open procedures, particularly for those for whom ISBs are contraindicated or may be challenging (contralateral phrenic nerve palsy, significant respiratory impairment, or obesity). This article aims to provide an introduction to the shoulder block as an alternative to the ISB.

ANATOMY

The skin over the shoulder receives innervation from branches of the cervical and brachial plexuses. The shoulder joint is innervated by several peripheral branches of the brachial plexus (Table 1).

INDICATIONS

Arthroscopic Procedures

There is increasing evidence supporting the use of the CSANB for arthroscopic surgical procedures.³

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Nerve	Origin	Course	Innervation
Suprascapular nerve	Superior trunk	Passes through suprascapular notch, lies beneath supraspinatus with suprascapular artery on lateral part of supraspinous fossa; curves around spinoglenoid notch with suprascapular artery	Posterior scapula, acromion, supraspinatus, infraspinatus, teres minor, posterior and superior capsules
Axillary nerve	Posterior cord	Passes laterally across posterior surface of humerus and through the quadrangular space to lie beneath deltoid (with circumflex artery)	Skin over deltoid, humeral head and neck, deltoid, teres minor, inferior capsule
Subscapular nerve	Posterior cord		Anterior scapula, subscapularis, anterior capsule
Lateral pectoral nerve	Lateral cord		Anterior capsule, lateral portion of pectoralis major
Musculocutaneous nerve	Lateral cord		Anterior capsule, long head of biceps

Table 1. The Innervation of the Shoulder Joint. The Suprascapular and Axillary Nerves are Responsible for the Majority of the Supply to the Shoulder Joint Whilst the Other Nerves Have Relatively Minor Contributions

Open Procedures

There is sparse evidence at present comparing ISBs and CSANBs in open shoulder procedures. However, there are patients that refuse an ISB or may be unsuitable for an ISB (patients with respiratory compromise, eg chronic obstructive pulmonary disease) who may benefit from the opioid-sparing effect of regional anaesthesia.^{1,4} The analgesia options should be made available and the decision should be made tailored to individual needs.

Chronic Shoulder Pain

Suprascapular nerve blocks are commonly used in chronic pain⁵ and the CSANB may be used to improve chronic shoulder pain management.

BLOCK TECHNIQUE

Prior to performing any block, it is vital to ensure the following practices are followed:

- Obtain informed consent from the patient.
- Establish intravenous access and attach appropriate monitoring (electrocardiogram, noninvasive blood pressure monitoring, and pulse oximeter).
- Confirm the correct side of block (stop before you block).⁶
- Ensure appropriate aseptic precautions (eg 0.5% chlorhexidine gluconate and 70% denatured ethanol, sterile gloves, and sterile probe cover).

Consent involves describing the block (including sedation if required), positioning, the intended benefits, risks (see below) and alternatives. Specific to this block, patients are also informed that there may be some pain in the recovery room initially (due to swelling of the anterior capsule) which will subside with time (absorption of fluid into the joint) and requires systemic multimodal analgesia.

Suprascapular Nerve Block

Equipment

- Ultrasound machine with a high-frequency linear or curvilinear probe (and probe cover)
- 15-20 mL of local anaesthetic (LA) of choice (bupivacaine, ropivacaine) for the injection ensuring a safe, nontoxic dose (< 2 mg/kg)
- 50- to 100-mm needle
- Sterile tray with gloves and skin prep
- Lidocaine for skin infiltration

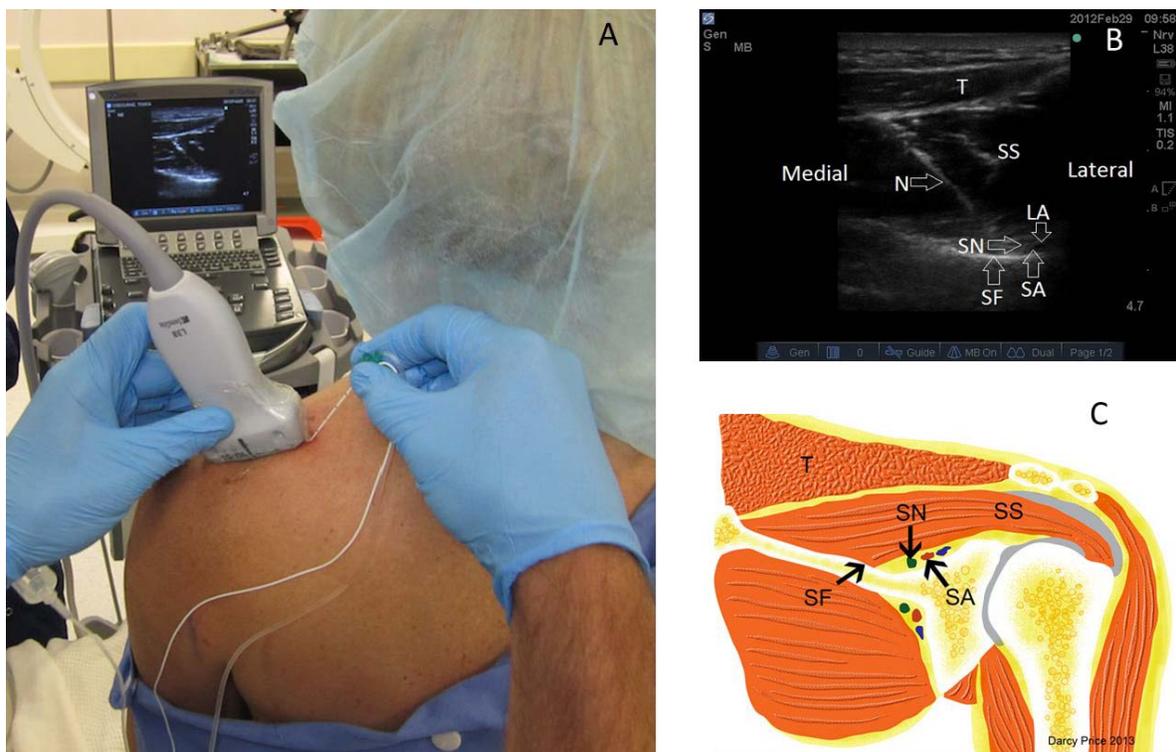


Figure 1. Performing the suprascapular nerve block.^{3,7} (A) Positioning of the patient and probe for visualising the suprascapular fossa. (B) Sonography of suprascapular fossa, showing the needle passing through trapezius and supraspinatus and injecting local anaesthetic into the floor, adjacent to the suprascapular artery and suprascapular nerve. (C) Relevant anatomy. SF indicates suprascapular fossa; SS, supraspinatus; T, trapezius; SN, suprascapular nerve; SA, suprascapular artery; N, needle; LA, local anaesthetic. Image supplied by D.P.

Position

- Ideally, the operator is positioned behind the patient with the ultrasound positioned in front of the patient (Figure 1).
- The suprascapular nerve block can be easier to perform with the patient sitting.

Performing the Block

With the patient sitting, the ultrasound probe is applied in the long axis parallel to the spine of the scapula, the suprascapular fossa can be visualised with its characteristic 'hockey stick' appearance, containing the supraspinatus overlying the neurovascular bundle of the suprascapular artery and suprascapular nerve (Figure 1).

Injection of LA fills the potential space and appears to lift supraspinatus up. In some cases, if the neurovascular bundle is not visible the needle can still be directed towards the floor of the fossa and withdrawn slightly once bony contact is made. Once negative aspiration for blood is confirmed, injection of LA will fill the space and cause supraspinatus to lift up.

Other approaches have also been described where the suprascapular nerve can be blocked in the supraclavicular region as the nerve passes below the omohyoid muscle.⁸

Axillary Nerve Block

Equipment

- Ultrasound machine with a high frequency linear/curvilinear probe (and probe cover)
- 5–7 mL^{7,9} of LA of choice (bupivacaine, ropivacaine) for the injection ensuring a safe, nontoxic dose (< 2 mg/kg)
- 50- to 100-mm needle
- Sterile tray with gloves and skin prep
- Lidocaine for skin infiltration

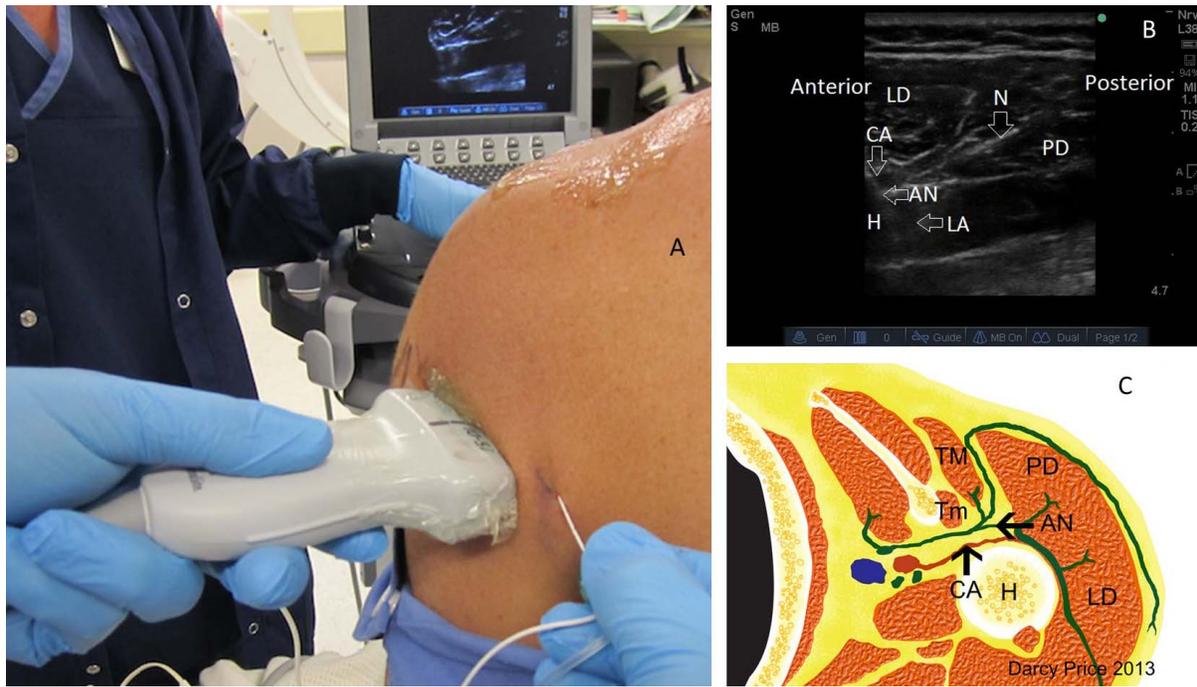


Figure 2. Performing the axillary nerve block.^{3,7} (A) Positioning of the patient and probe for visualising the posterior surface of the humerus. (B) Short-axis sonography view of axillary nerve block, showing the needle passing between lateral deltoid and posterior deltoid towards the humerus and deposition of local anaesthetic around the axillary nerve and circumflex artery. (C) Relevant cross-sectional anatomy including teres major and teres minor. AN indicates axillary nerve; N, needle; LD, lateral deltoid; PD, posterior deltoid; H, humerus; LA, local anaesthetic; CA, circumflex artery; TM, teres major; Tm, teres minor. Image supplied by D.P.

Position

- Ideally the operator is positioned behind the patient with the ultrasound positioned in front of the patient (Figure 2).
- The axillary nerve (AN) block can be easier to perform with the patient sitting or lateral. (D.P. recommends lateral positioning as a personal preference.)

The probe is placed on the posterior surface of the humerus, proximal to the axillary crease (where the latissimus dorsi and deltoid meet) to visualise the neurovascular bundle (consisting of the AN and circumflex artery). The bundle may be visualised in the short- and long-axis planes (Figures 2 and 3).

When scanning the posterior humerus in the short axis, the lateral and posterior deltoid muscles create a 'donut sign' where the circumflex artery is easily identified beneath the posterior deltoid (Figure 2). The needle is passed in-plane through the posterior deltoid, directed anteriorly, and aiming for the posterior surface (rather than lateral) to allow a better spread of LA medially towards the posterior cord to cover more branches.

Performing the Block

Five to seven milliliters of LA is normally injected and should fill the potential space beneath the posterior deltoid (large volumes associated with more proximal spread resulting in radial nerve block (Figure 4)).^{7,9}

Whilst an ISB may be used with sedation for surgical procedures, the CSANB provides *analgesia* and not anaesthesia and is therefore recommended to be used only in conjunction with general anaesthesia.

Catheter techniques may benefit some groups of patients and can be placed for the suprascapular nerve but may lie within the surgical field for the AN.

COMPLICATIONS

- The usual risks of any block apply including LA toxicity or allergy, nerve injury, bleeding, infection, and intravascular injection.
- Cases of radial nerve palsy were reported during the first few AN injections when 15 mL of LA was injected, leading to more proximal spread and involvement of the radial nerve.³
- Specific to the block, there are very few complications reported so far.⁷
- Ultrasound-guided blocks are likely to be more accurate than landmark techniques.¹⁰

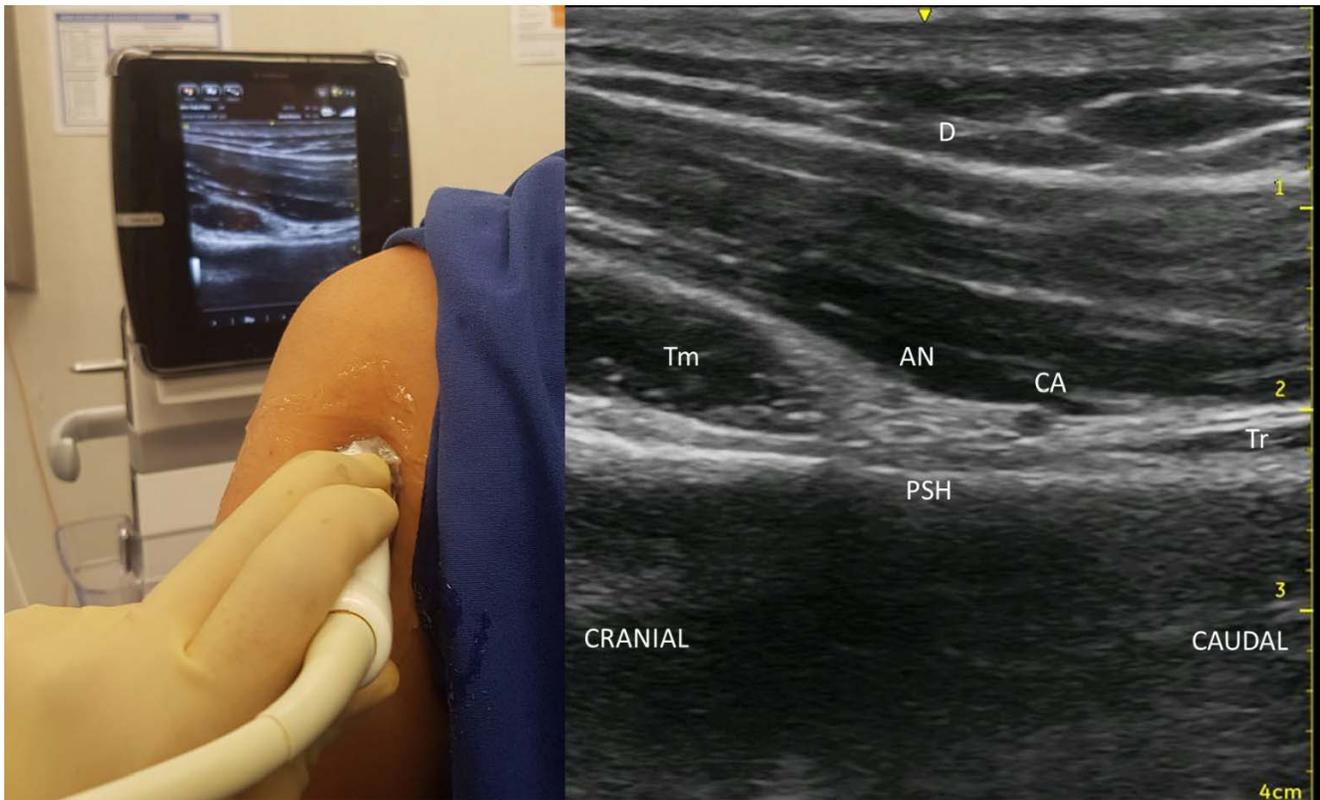


Figure 3. The axillary nerve. Long-axis view showing the position of the probe and the image generated. The axillary nerve and circumflex artery lie between the deltoid, triceps, and teres minor along the posterior surface of the humerus. AN indicates axillary nerve; CA, circumflex artery; D, deltoid; Tr, triceps; Tm, teres minor; PSH, posterior surface of the humerus. Image supplied by B.S.

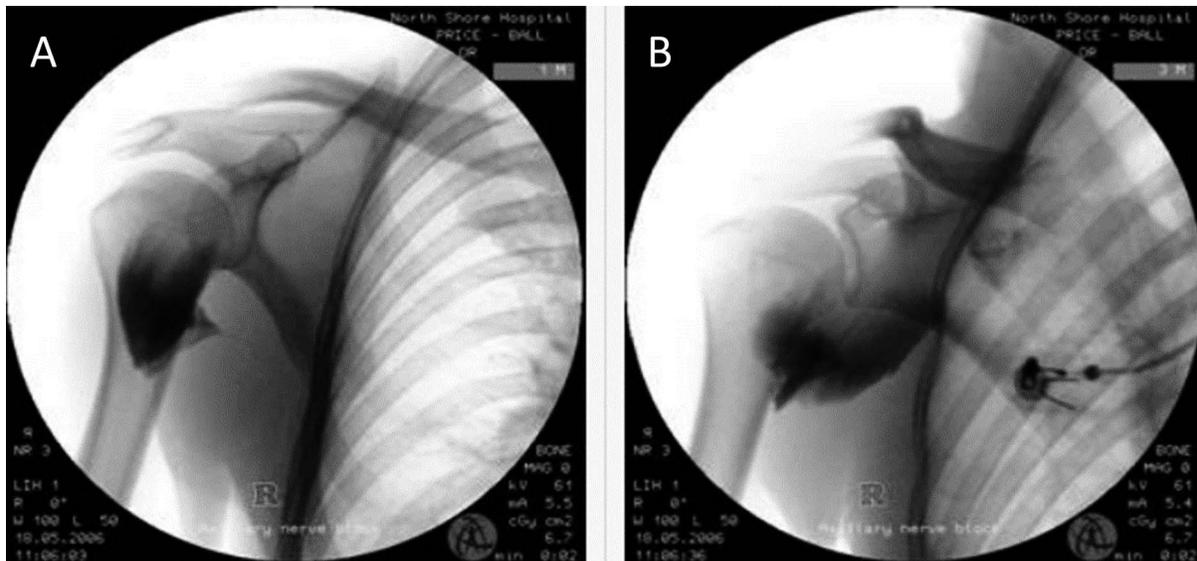


Figure 4. Fluoroscopy showing spread of 15 mL local anaesthetic after axillary nerve injection. (A) Immediate injection fills the potential space beneath posterior deltoid. (B) Spread of injectate seconds later showing proximal spread through quadrangular space. Image supplied by D.P.

COMPARISON TO ISB

Compared to ISB, the CSANB offers the following:

- Peripheral nerve blockade (rather than central) reducing the risk of damage to nerves¹¹) and deeper structures
- Sparing of phrenic nerve blockade (phrenic nerve almost certainly blocked with ISB with almost 50% describing the hemidiaphragmatic paralysis as uncomfortable⁷; less arm paraesthesia and is generally well tolerated (almost 50% of patients report dissatisfaction with ISB due to the sensation of a numb arm and motor discomfort)^{12,13}
- Noninferior analgesia at rest and on movement with reduced opioid consumption from 6-24 hours⁷
- Reduced rebound pain¹³
- Reduced postoperative nausea and vomiting¹⁴
- Satisfaction score similar to ISB¹⁴
- Lower pain scores with CSANB with fewer fluctuations than ISB at 6-8 hours¹⁶

There are some limitations to the CSANB (compared to ISB):

- Increased pain in the immediate postoperative phase up to 6 hours (which can possibly increase opioid consumption as the lateral pectoral, subscapular, and musculocutaneous nerves are not blocked)¹⁵
- There is no evidence to support use of CSANB over ISB in open and major arthroscopic procedures (however, a CSANB can act as an alternative in patients where an ISB is contraindicated or refused). Furthermore, anterior shoulder pain is not effectively blocked by the CSANB and further research is required to develop this aspect for this block.

At present, there is increasing evidence supporting the use of CSANBs in arthroscopic surgery with overall equivalent analgesia and without some of the undesired effects of the ISB. The CSANB is an analgesic block used in conjunction with general anaesthesia (and systemic analgesia in early stages of recovery); however, the analgesic benefits become obvious after 6 hours and have fewer undesirable effects (compared to ISB). There are some further areas of development, including the following:

- CSANB should be compared with ISB for open shoulder surgery.
- Rotator cuff surgery involving the subscapularis may require subscapularis nerve blockade.

SUMMARY

- The CSANB is a simple, low-risk block combination that can be performed in the awake patient.
- The CSANB can be used for arthroscopic procedures, rescue techniques, chronic shoulder pain management, and open techniques when an ISB is contraindicated or refused.
- Good intraoperative pain management is required and the benefits of the CSANB are seen in the postoperative period.

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This article is dedicated to Dr Darcy Price (1966-2018), a highly respected and much-admired anaesthetist, dedicated teacher, and regional anaesthesia enthusiast. He was instrumental in developing, researching, and educating our specialty as to the benefits of the combined suprascapular and axillary nerve block as an alternative to the interscalene block for shoulder anaesthesia. A pioneer, but also humble, he simply named this technique the 'Shoulder Block'; in Auckland, New Zealand, it is known more appropriately as the 'Darcy Block'.

He was an inspiration to many and each of us has a special memory of him. He was an esteemed colleague and loyal friend; a kind, humble, and considerate gentleman with an engaging sense of humour who will be greatly missed.

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