Suprascapular nerve block: important procedure in clinical practice. Part II

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ABSTRACT

The suprascapular nerve block is a reproducible, reliable, and extremely effective treatment method in shoulder pain control. This method has been widely used by professionals in clinical practice such as rheumatologists, orthopedists, neurologists, and pain specialists in the treatment of chronic diseases such as irreparable rotator cuff injury, rheumatoid arthritis, stroke sequelae, and adhesive capsulitis, which justifies the present review (Part II). The objective of this study was to describe the techniques and complications of the procedure described in the literature, as the first part reported the clinical indications, drugs, and volumes used in single or multiple procedures. We present in details the accesses used in the procedure: direct and indirect, anterior and posterior, lateral and medial, upper and lower. There are several options to perform suprascapular nerve block. Although rare, complications can occur. When properly indicated, this method should be considered.

Keywords: techniques, nerve block, local anesthesia, shoulder pain.

INTRODUCTION

Shoulder pain has a prevalence of 15%–30% in the adult population. It is a common complaint especially among the elderly and may lead to functional disability and decrease in quality of life.[1] A suprascapular nerve block (SSNB) is an effective method for the treatment of certain shoulder disorders such as adhesive capsulitis, rheumatoid arthritis, calcifying tendinitis, and post-cerebrovascular accident.[2–4]

The procedure has been increasingly used in severe pain control and postoperative analgesia after shoulder surgery,[4–7] as other therapeutic options such as anti-inflammatory drugs and intra-articular steroid injections have their limitations, mainly in the elderly population, which has many comorbidities.[4,8]

The SSNB is a safe, simple, inexpensive procedure, applicable to the majority of physicians working with pain management,[9] in addition to being well tolerated even by patients with several pathologies that affect the shoulder region.[4] It is also an efficient alternative for patients who cannot undergo surgery.[8]

A relative indication would be for patients with advanced-stage shoulder tumors, with a level of pain difficult to treat and who would benefit from interventional techniques, among which are SSNB, as it seems very effective and with low rates of adverse effects. In this case, the method works as palliative care, as it treats the symptoms without necessarily having an effect on the cause.[10] Another SSNB use would be in anesthesiology, regarding locoregional blocks.[5,6,11]

Although efficient regarding its effects, several authors have shown technical modifications to the original SSNB since it was first published, such as the needle insertion site, drug volume, and type and access used, as well as the use of additional equipment to perform the procedure.

The objective of the second part of this review on "Suprascapular Nerve Block" was to report the techniques described for the procedure as well as the complications of local anesthetic administration. The first part reported the historical aspects and clinical indications of the method, as well as drugs and the volume used in the single or multiple procedures.[12]

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SSNB-APPLIED ANATOMY

The suprascapular nerve is a mixed nerve, i.e., a nerve that contains both sensory and motor fibers, accounting for 70% of shoulder joint sensitivity, mainly the posterior and superior capsule. It originates from the C5 and C6 brachial plexus roots, which course posteriorly and laterally to the scapular notch, below the upper transverse ligament. It enters the supraspinatus fossa, which provides sensory branches to the glenohumeral, acromioclavicular joint, subacromial bursa, and coracoclavicular ligament, and motor ones for the supraspinatus muscle and, more distally, to the infraspinatus muscle.[13,13–16] It is important to know those anatomical details to obtain the interruption of sensory impulses in the involved structures, so that SSNB can be adequately performed.

TECHNIQUES DESCRIBED FOR SSNB PROCEDURE

Since its description, SSNB has undergone several modifications such as needle insertion site, access mode and the use of additional equipment for its procedure.

The access is said to be anterior or posterior, lateral or medial, and superior or inferior, taking into account the point of needle insertion in relation to the shoulder anatomical structures. Many techniques have been proposed for different accesses. They can be direct or indirect: a direct technique is when the needle enters the suprascapular notch to administer the anesthetic, where the nerve is located; an indirect technique is when it is not necessary to locate the suprascapular notch and the local anesthetic is administered to the floor of the supraspinatus fossa, after the passage of the nerve through it at the contour of the base of the coracoid process, when the sensitive branches are directed to the shoulder capsule, the subacromial space, and the acromioclavicular joint.

We highlight the SSNB techniques described in the literature, as reported by the authors who described them.

Wertheim and Rovenstine[17]

This was the first description of SSNB. The authors used it in patients with chronic shoulder pain, even in those who did not have a diagnosis. They reported that the procedure was necessary, as a resource prior to the manipulation of the affected region.

The margins are determined and drawn with the aid of a marker. The line is drawn from the superior border of the spine of scapula base to the medial side of the bone. Another line is drawn from the lower angle of the scapula in the cephalad direction, going across the first line. A bisector of the angle is taken from the upper external triangle formed by the lines and 1.5 cm, thus determining the point of needle insertion. The needle is introduced in the medial and inferior directions until contact with the supraspinatus fossa is attained, lateral to the scapular notch. The needle is retracted 1 cm and reintroduced medially until it enters the notch. At this point the patient can experience paresthesia, which confirms contact with the suprascapular nerve. This technique was described with a 5 mL injection of 2% procaine associated with 5 mL of an oily analgesic solution directly into the suprascapular notch. This is a direct access.

Parris[18]

The blockade is carried out above (one finger) the midpoint of the spine of the scapula. The needle is introduced 1 cm up to a certain point in the skin. The upper extremity on the same side of the blockade is flexed at the elbow and rotated medially with a hand placed on the opposite shoulder. This maneuver elevates the scapula and keeps it away from the posterior chest wall, in order to prevent a possible pneumothorax. This blocade recommends 10 mL of 0.25% bupivacaine. This is a posterior access.

Wassef[14]

The needle insertion point is between the junction of the medial border of the trapezius muscle and the posterior border of the lateral third of the clavicle. The site is located above the clavicle, where the needle is directed caudally and posteriorly, with slight medial inclination. A peripheral nerve stimulator is used and 3 mL of 0.25% bupivacaine plus 1:200,000 of adrenaline are injected. This is an anterior access (Figure 1).

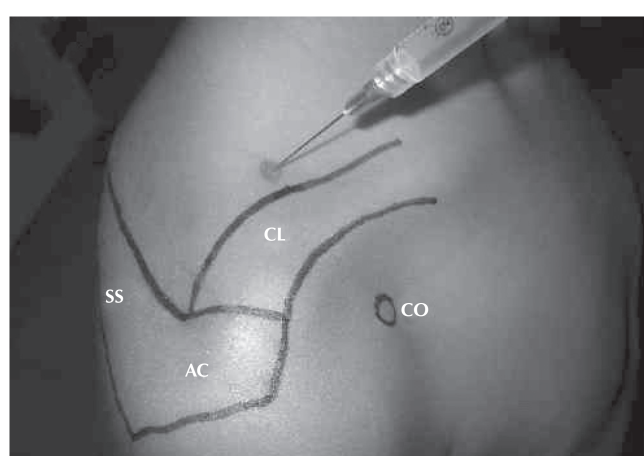

Figure 1
Wassef technique. Lateral shoulder view; the needle is inserted above the clavicle in a caudal and posterior direction, with a slight medial inclination.
AC: acromion; CL: clavicle; SS: spine of scapula; CO: coracoid process.

Risdall and Sharwood-Smith[19]

The first line is drawn to divide the length of the spine of the scapula in three parts, and the second line is perpendicular to the first junction of the medial and the two lateral thirds. The needle is directed to the scapular notch, located 1–2 cm cranially from the intersection point. The suprascapular nerve is located, using a peripheral nerve stimulator. It is injected 10 mL of 0.5% bupivacaine plus 1:200,000 of adrenaline. This is a medial and posterior access.

Dangoisse *et al.*[20]

The needle is inserted 1 cm above the middle of the scapular spine, parallel to the lamina until the floor of the supraspinatus fossa is reached. Paresthesia is not observed, and the risk of pneumothorax and nerve injury decreases. It is injected 8 mL of 0.5% bupivacaine plus 80 mg of methylprednisolone. This is an indirect access (Figure 2).

Roark[21]

The lateral border of the spine of the scapula is palpated as reference, and the needle should be directed to its lateral border, within the spinoglenoid notch. It is injected 10 mL of local anesthetic (not specified which one). This is an inferior and lateral access.

Matsumoto et al.[16]

A line is drawn between the anterolateral acromial angle and the medial border of the spine of the scapula. The insertion point is in the middle of this line. The needle is tilted 30º dorsally and inserted until it reaches the base of the coracoid process. The anesthetic solution consists of 1% lidocaine and 0.75% ropivacaine in a 1:1 mixture, and 10 mL are injected. This is a superior and posterior access.

Checcucci[11]

A 2-cm point medial to the medial border of the acromion along the upper border of the spine of the scapula is identified. Then, a line is marked, which is parallel to the spine and 2 cm are considered in the cranial direction. The needle is inserted perpendicularly to the skin in the craniocaudal direction. A peripheral nerve stimulator is used with an initial 1 mA. A 15-mL mixture is injected, consisting of 5 mL of 2% lidocaine and 10 mL of 0.5% levobupivacaine (Figure 3).

Barber[13]

The location is 1 cm medial to the convergence between the spine of the scapula and the posterior border of the clavicle (Neviaser portal).[22] The needle is inserted in the direction of the coracoid process at a depth of 3–4 cm. The needle is used anteriorly until the scapula is no longer palpable. Then, the needle is moved posteriorly until the same bone can be felt once again. This locates the needle at the base of the coracoid process in the supraspinatus fossa, where the suprascapular nerve passes. At this point, 20–25 mL of 0.5% bupivacaine is injected. This is a lateral access (Figure 4).

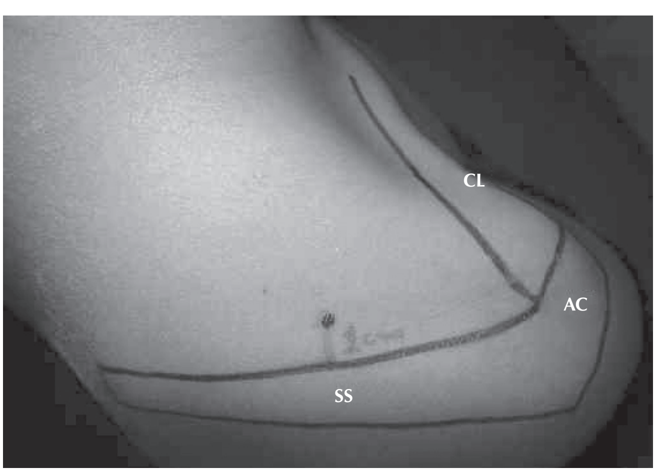

Figure 2
Dangoisse technique. Posterior shoulder view; the needle is inserted 1 cm above the middle of the spine of scapula to the floor of the supraspinatus fossa.
AC: acromion; CL: clavicle; SS: spine of scapula.

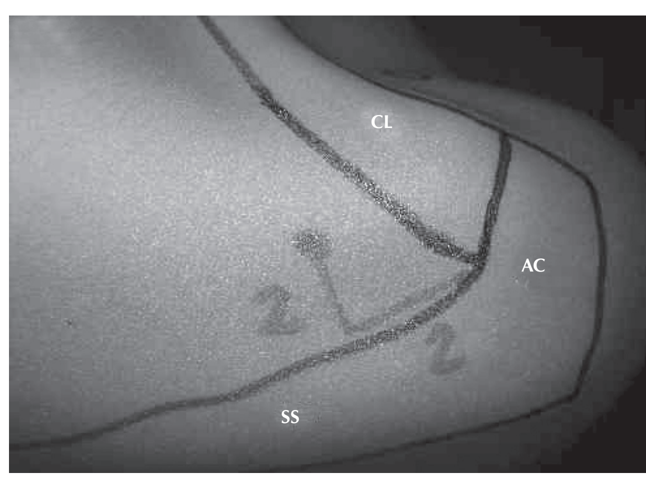

Figure 3
Checcucci technique. Posterior shoulder view; the needle is inserted at a point 2 cm medial to the medial acromial border and 2 cm from the upper margin of the spine of scapula, perpendicular to the skin in the craniocaudal direction.
AC: acromion; CL: clavicle; SS: spine of scapula.

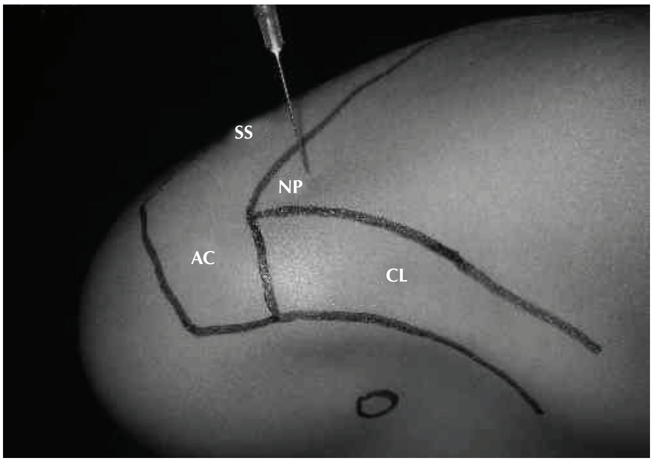

Figure 4
Barber technique. Anterior shoulder view; the needle is inserted 1 cm (Neviaser portal) in the direction of the coracoid process.
AC: acromion; CL: clavicle; SS: spine of scapula; NP: Neviaser portal.

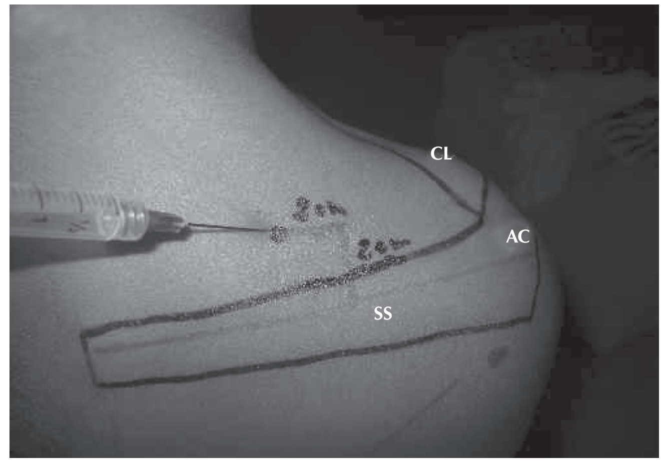

Figure 5
Meier technique. Posterior shoulder view. The line connects the lateral part of the acromion and the medial extremity of the spine of scapula. The point of insertion is located 2 cm in the cranial direction and 2 cm medial to the half of this line.
AC: acromion; CL: clavicle; SS: spine of scapula.

Alam[23]

The point of insertion of the epidural catheter by an angiocath is anterior and proximal to half of the spine of the scapula. The catheter is tunneled through an anterior-posterior direction cannula. The local anesthetic and the volume used are not mentioned.

Dahan[4]

This is a modification of the Dangoisse technique. The needle is inserted 2 cm above the middle of the spine of the scapula, perpendicular to the skin and lateral to the scapular notch. A 10-mL of 0.5% bupivacaine is injected, without corticosteroids. This is an indirect access.

Meier et al.[24]

A line that connects the lateral side of the acromion and the medial extremity of the spine of the scapula is identified. The insertion point is located 2 cm cranial and 2 cm medial to the half of the line. The angle is 45º in the coronal plane with 30º of ventral inclination. A peripheral nerve stimulator is used and 15 mL of 1% mepivacaine are injected (Figure 5).

Feigl[25]

The point of insertion is the Neviaser portal,[22] behind the acromioclavicular joint and coracoid process, medial to the acromion and anterior to the anterior edge of the spine of the scapula. The needle is advanced in a posterior and medial direction in relation to the spine of the scapula until the supraspinatus fossa. The needle-skin angle is approximately 70º in the horizontal plane. This is a lateral access.

Thus, the direct accesses are the Wertheim[17] and Barber[13] techniques; the indirect accesses are the Dangoisse[20] and Dahan[4] techniques; the anterior is the Wassef technique;[14] the posterior accesses are the Meier,[24] Parris,[18] Risdall,[19] Alam,[23] and Matsumoto[16] techniques; the lateral accesses are the Checcucci,[11] Barber,[13] and Feigl techniques;[25] and the inferior access is seen in the Roark technique.[21]

It should be noted that the direct access of the Wertheim[17] and Barber[13] techniques exhibit the greatest risk of nerve injury, as well as of pneumothorax. Moreover, the Dangoisse,[20] Checcucci,[11] and Feigl[25] techniques are less likely to result in such complications, as they do not access the scapular notch where the suprascapular nerve enters after passing below the upper transverse ligament, in addition to the fact that the needle insertion position is far from the lung.

COMPLICATIONS SECONDARY TO LOCAL ANESTHETIC ADMINISTRATION

Little has been discussed about SSNB complications, regarding the administration of local anesthetics for the procedure. However, two complications, in particular, deserve special mention due to their effects: systemic toxicity and nerve injury.

Systemic toxicity

The SSNB is part of the peripheral nerve block[12] and it becomes important to analyze the complications inherent to the use of local anesthetics. Complications are rare, but one should consider the occurrence of adverse events that can be devastating for both the patient and the physician.[26]

These adverse events range from mild systemic symptoms such as agitation and metallic taste in the mouth to hearing deficits that may follow the systemic absorption of local anesthetic, from an adequate and correctly infused dose for cardiovascular events (tachycardia, ventricular arrhythmia, cardiac arrest) and central nervous system disorders (seizures, respiratory arrest, coma), very often by an unintentional intravascular injection that may result in death.[26,27]

The main factors that influence the severity of local anesthetic systemic toxicity (LAST) are the patient's individual risks, specific local anesthetic agent and dose used, and use of concomitant medications.[27]

LAST remains the main source of mortality and morbidity in the practice of regional blockade. Prevention is still the best criterion to increase patient safety during administration. The combination of several procedures, such as constant surveillance, careful aspiration and minimum effective dose (subtoxic), decreases the frequency of LAST.[28] The use of ultrasound to guide the needle insertion and the anesthetic infusion can be a useful procedure, but it have also been reported as not completely reliable.[29–32]

The LAST incidence in suprascapular nerve block is unknown. In a study of severe complications in locoregional anesthesia, the researchers identified a number of severe events related to upper limb blocks (3,459 interescalene blocks; 1,899 supraclavicular blocks; 11,024 axillary plexus blocks; and 7,402 mid-humeral blocks), but did not include SSNB and found seizures and peripheral neuropathy as complications.[33]

The clinical description of LAST includes progressive worsening of neurological signs and symptoms after infusion of local anesthetics and progressive increase in blood concentrations of this anesthetic, resulting in seizures and coma. In extreme cases, signs of hemodynamic instability can develop into cardiovascular events.[34]

Support treatment must be offered: supplemental oxygen, drugs for seizure disorders, and treatment of cardiovascular events. However, when toxicity occurs, it is mandatory to prepare the necessary action plan to save the patient's life. Respiratory care, oxygenation, ventilation, and basic life support are important factors for successful resuscitation.[26,35]

The lipid infusion should be considered early, and the treatment team must be familiar with the method.[27] The use of lipid emulsion in humans for the treatment of LAST was first described in 2006,[36] and researches have sought to clarify the most adequate dose for patient safety and the combination with other resuscitation agents.[26]

Peripheral nerve injury

In order to identify a nerve injury, it is essential to know the anatomy of the peripheral nerve. The individual nerve fibers are surrounded by the endoneurium and organized into fascicles, which, in turn, are surrounded by the perineurium. The epineurium is the outer membrane of the nervous structure, with the stroma inside and a set of fascicles.[26]

It should be remembered that the number of fascicles increases from proximal to distal, while their diameter decreases. In the brachial plexus region in the interscalene position, nerves are more solid and oligofascicular, considering that the more distal the fascicles are, the more dispersed and more numerous they are, and more stroma they have. This explains why a simple penetration of the suprascapular nerve epineurium does not necessarily lead to nerve damage.[37,38]

Local anesthetic infusion in the perineurium is associated with high injection pressure, subsequent fascicular lesion and neurologic injury, but the infusion within the epineurium occurs at low pressure, with motor function returning to normal.[39] Therefore, intraneural infusion outside the perineurium does not invariably lead to neurological damage.[40]

Peripheral nerve injury after locoregional anesthesia is a rare complication, which leads to neurological deficit and a sensation of pain that can last for several months.[41] Fortunately, most injuries are transient and often subclinical, or are presented as mild mononeuropathy.[26] An important detail is that the longer the needle bevel, the greater the likelihood of fascicular injury.[42]

It is very difficult to have consistent data on its incidence, which ranges from 0.02%–0.4%,[33,43] considering all peripheral nerve blocks; the rate is higher for the so-called transient lesions, reaching up to 10% on the days after the blockade.[26,44,45]

And what of its incidence in SSNB alone? This question requires a clinical trial to answer it, as the literature has yet to provide an answer. What can be stated is that direct access is more likely to result in nerve injury, as, for the procedure to be carried out, the needle necessarily enters the scapular notch and has contact with the suprascapular nerve.[13,17,18,20]

The use of regional anesthesia under ultrasound visualization, despite its popularity, does not mean a decrease in the incidence and severity of postoperative neurologic symptoms.[44,45] In a meta-analysis of randomized clinical trials comparing ultrasound with neurostimulation when performing the peripheral nerve blockade, it is suggested that further studies are required concerning complications such as LAST and persistent neurological injury.[46]

FINAL CONSIDERATIONS

The SSNB is an effective and safe pain treatment in chronic diseases that affect the shoulder, and has been widely used by professionals in clinical practice such as rheumatologists, orthopedists, neurologists, and pain specialists. The pain in this joint is a frequent complaint and leads to significant functional disability and reduced quality of life of the affected patients. When properly indicated, SSNB should be considered.

This therapy has also been increasingly used by anesthesiologists for postoperative analgesia in shoulder surgeries, as the pain, which is often severe, interferes with the rehabilitation process.

It is noteworthy that this procedure, in spite of being of low cost and easily reproducible, has restrictions due to the lack of trained professionals in the area. The present study reviewed the different approaches described in the literature to perform the blockade, with the needle insertion being anterior or posterior, lateral or medial and superior or inferior. Therefore, there are several options to perform the SSNB. It is up to the health care professional to decide which one best suits the patient, as complications, though rare, can occur.

The infusion of local anesthetic into the supraspinatus fossa (SSNB) interferes with the sodium channel function, preventing the spread of action potentials in axons. When there is prolonged motor blockade of the supra- and infraspinal muscles, innervated by the suprascapular nerve and important for shoulder abduction and external rotation, the deltoid activity increases significantly, and the scapular kinematics changes.[47–50]

The present study does not intend to be exhaustive, but to offer a scientific contribution to the medical professional involved in the care of patients with shoulder pain, a pathology that requires specific therapy.

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