# A Comparative Study between General Anaesthesia and Interscalene Brachial Plexus Block in Postoperative Analgesia in Arthroscopic Shoulder Surgery

Thesis

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# List of Abbreviations

| Abb. | Full term |
|---|---|
| GA | General Anesthesia |
| ISB | Interscalene brachial plexus block |
| OR | operating room |
| PACU | Post anesthesia care unit |
| PCA | Patient-controlled analgesia |
| PONV | Postoperative nausea and vomiting |
| SD | Standard deviation |
| U/S | Ultrasound |
| VAS | Visual analog scale |
| USA | United States of America |

# INTRODUCTION

Shoulder pain is a common complaint, third only to headache and backache as the most frequent cause for a visit to a physician. In one study, gross pathologic changes in the shoulder, such as thinning or tear of the rotator cuff, were observed in 60% of cadavers examined. Shoulder pain may result in significant job-related disability, particularly for individuals who lift heavy items or perform activities at shoulder level. Surgery is often advised for patients who do not improve after 6 months of conservative treatment.

Both general anesthesia (GA) and nerve block anesthesia have been used for shoulder surgery. An interscalene brachial plexus block (ISB) can provide complete regional anesthesia for shoulder surgery and has been used as the sole anesthetic by some. ISB for shoulder surgery is commonly administered in conjunction with GA, with the block performed primarily for postoperative analgesia. However, there are compelling reasons to avoid GA in outpatients and older patients because of short-term cognitive impairment, postoperative nausea and vomiting (PONV), and delayed recovery. Furthermore, postoperative pain can interfere with initial rehabilitation.

Opioid analgesics are commonly used for analgesia when nerve blocks are not used. Opioids are effective in relieving postoperative pain at rest but may increase PONV, somnolence,

constipation, urinary retention, respiratory depression, and sleep disturbances.

There have previously been no prospective, randomized studies comparing the use of ISB *versus* GA for outpatient shoulder surgery. Our hypothesis was that use of nerve block anesthesia would result in improved same-day recovery over GA.

# Aim of the Work

In this study we will discuss postoperative analgesic difference between general anaesthesia and interscalene brachial plexus block in shoulder surgeries and which of them can provide a proper satisfaction to the patient.

Regional anaesthesia provides a satisfactory postoperative analgesia, decreases the opoid requirements and helps in early rehabilitation.

# INTERSCALENE BRACHIAL PLEXUS BLOCK

The first brachial plexus blocks were performed by William Stewart Halsted, in 1885, at the Roosevelt Hospital in New York City. In 1902, George Washington Crile described an "open approach" to expose the (axillary) plexus facilitating direct application of cocaine. The need for surgical exposure of the brachial plexus led to limited clinical utility of this technique ***(Etienne, 1925).***

This changed in the early 1900s when percutaneous access to the brachial plexus was first described. In 1925, July Etienne1 reported the successful blockade of the brachial plexus by inserting a needle halfway between the lateral border of the sternocleidomastoid muscle and the anterior border of the trapezius muscle at the level of the cricothyroid membrane, making a single injection in the area around the scalene muscles ***(McNaught et al., 2011).***

This approach was most likely the first clinically useful interscalene block technique. In 1970, Alon Winnie2 described the first consistently effective and technically suitable percutaneous approach to the brachial plexus block. The technique involved palpating the interscalene groove at the level of the cricoid cartilage and injecting local anesthetic between the anterior and middle scalene muscles. Winnie's approach was modified over the years to include slight variations to the technique such as perineural catheter

placement ***(Borgeat, 2002).***

However, the success of this approach and the widespread adoption of the interscalene brachial plexus block as the "unilateral spinal anesthesia for the upper extremity," should be credited solely to Alon Winnie ***(Kapral, 2008).***

More recently, the introduction of ultrasound-guided techniques has allowed for additional refinements and improved block consistency with reduced local anesthetic volumes ***(Kapral, 2008; Gautier et al., 2011).***

## Indications:

The interscalene block is indicated for procedures on the shoulder and proximal humerus as well as the lateral two thirds of the clavicle.

The interscalene block can also be utilized for surgery of the arm or forearm. However, the higher incidence of incomplete blockade of the inferior trunk with this technique may provide inadequate analgesia in the ulnar distribution.

## Clinical Pearls:

- Up to 70% of patients report severe pain on movement after open major shoulder surgery, which is more than after hysterectomy (60%), gastrectomy, or thoracotomy (60%) ***(Bonica, 1990).***
- Major shoulder surgery entails massive nociceptive input from the richly innervated joint and periarticular tissues, which produce continuous deep somatic pain and bouts

of reflex spasm of muscles ***(Gautier et al., 2011).***

- Periarticular structures exhibit not only C afferents, but also A alpha and A delta afferents, the latter being poorly blocked by opioids, which explains the relative inefficacy of opioids to control this type of postoperative pain ***(Hollinshead, 1982).***

## Contraindications:

**Absolute contraindications include:**

- Patient's refusal.
- Local infection.
- Active bleeding in an anticoagulated patient.
- Proven allergy to local anesthetic.

**Relative contraindications include:**

- Chronic obstructive airway disease
- Contralateral paresis of the phrenic or recurrent laryngeal nerves
- Previous neurologic deficit of the involved arm.
- The risks and benefits of the chosen anesthetic technique should be discussed with the patient and the surgeon.

**Clinical Pearl:**

- Skin infiltration of the posterior arthroscopic port site

with local anesthetic is often necessary for arthroscopic shoulder surgery in addition to interscalene block.

**Anatomy:**

The plexus is formed by the ventral rami of the fifth to eighth cervical nerves and the greater part of the ventral ramus of the first thoracic nerve (**Figure 1**). In addition, small contributions may be made by the fourth cervical and the second thoracic nerves ***(Bonica, 1990).***

There are multiple complex interconnections between the neural elements of brachial plexus as they course from the interscalene groove to their endpoints in terminal nerves. However, most of what happens to these roots on their way to becoming peripheral nerves is not clinically essential information for the practitioner. However, spatial arrangement of the trunks (superior, middle, and inferior) and interpretation of the motor response with nerve stimulation can be of importance (**Table 80B–2**) ***(Hollinshead, 1982).***

The brachial plexus supplies all the motor and most of the sensory functions of the shoulder except the cephalad cutaneous parts of the shoulder. These are innervated by the supraclavicular nerves originating from the lower part of the superficial cervical plexus (C3–4) (**Figure 2**) which supply sensation to the shoulder above the clavicle, the first two intercostal spaces anteriorly, the posterior cervical triangle and the upper thorax in this area as well as to the tip of the shoulder ***(DePalma, 1983).***

Only three nerves of the brachial plexus innervate the shoulder. The most proximal of these is the upper lateral brachial cutaneous nerve, a branch of the axillary nerve that innervates the lateral side of the shoulder and the skin overlying the deltoid muscle. The upper medial side of the arm is innervated by both the medial brachial cutaneous and the intercostobrachial cutaneous nerves. In the anterior portion of the arm over the biceps muscle, the skin is innervated by the medial antebrachial cutaneous nerve ***(Hollinshead, 1982).***

Apart from the cutaneous nerve supply to the shoulder, the innervation of the joint deserves special consideration. In general, a nerve crossing a joint gives branches that innervate that joint. Therefore, the nerves supplying the ligaments, capsule, and synovial membrane of the shoulder derive from the axillary, suprascapular, subscapular, and musculocutaneous nerves ***(DePalma, 1983; Gardner, 1948).***

The relative contributions of these nerves are not constant, and the supply from the musculocutaneus nerve may be very small or completely absent. Anteriorly, the axillary nerve and suprascapular nerve provide most of the nerve supply to the capsule and glenohumeral joint (**Figure 3**).

In some instances, the musculocutaneous nerve may innervate the anterosuperior portion of the joint. In addition, the anterior capsule may be supplied by either the subscapular nerves or the posterior cord of the brachial plexus after piercing the subscapular is muscle.