ORIGINAL ARTICLE

Ultrasound guided superficial cervical plexus and interscalene brachial plexus block for clavicular surgery

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ABSTRACT

Aims and objectives: To study the effect of ultrasound guided superficial cervical plexus and interscalene brachial plexus block for clavicular surgery.

Methodology: Thirty American Society of Anesthesiologists (ASA) physical status I and II patients undergoing clavicular surgery, ages 20-60 years were selected. All routine non- invasive monitors were applied and IV line was secured. Ultrasound guided superficial cervical plexus block and interscalene brachial plexus block were given. Injection dexmedetomidine 1 μg/kg infusion over 10 min was started. Block efficacy was evaluated. Any complication or side effects were noted. Sedation was assessed using Ramsay sedation score. Perioperative hemodynamics were charted. Duration of motor block was noted as time of shoulder abduction 3cm from time of block. Duration of analgesia was noted as time for first demand of analgesic from time of block.

Results: All the thirty patients allowed clavicular surgeries under combined interscalene brachial plexus and superficial cervical plexus block. No major complications and side effects were noted.

Conclusion: USG guided combined superficial cervical plexus and interscalene brachial plexus block are effective for clavicular surgery without any major complication and may be used in place of general anesthesia or blocks by other techniques.

Key words: Ultrasound; Superficial cervical plexus block; Interscalene brachial plexus block; Dexmedetomidine; Ramsay sedation scale

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INTRODUCTION

The anatomy of neck, particularly nerve anatomy in relation to clavicle is complex. The distal clavicle and anterior superior shoulder area derives its nerve supply from both brachial plexus and cervical plexus. The cervical plexus innervates C2, C3 and C4 sensory dermatomes. The cervical plexus supplies fascia and skin above clavicle and shoulder up to the region of acromion. Depending upon the source, the innervation of the skin overlying the clavicle varies between C3 and C5, while the

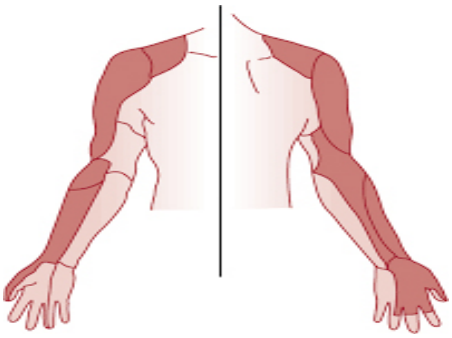

Figure 1: Coverage by brachial plexus block

Figure 2: Coverage by superficial cervical plexus block

sclerotome distribution of clavicle varies from C4 to C6. The brachial plexus innervates the entire upper extremity, both motor and sensory; specifically the skin over deltoid. Thus any single block is usually insufficient for complete coverage of clavicular surgical pain.

Peripheral nerve blocks used to anesthetize patients for clavicular surgeries are superficial cervical plexus block, interscalene brachial plexus block or combined superficial cervical and interscalene brachial plexus block.

Interscalene Brachial plexus Block

It is useful for shoulder surgeries including lateral two thirds of clavicle, proximal humerus and shoulder surgeries.[1] The block can be performed by conventional(winne approach), with the use of PNS and with the use of USG. Interscalene block is an invasive procedure with serious complications like Horner's syndrome, diaphragmatic hemiparesis, epidural, subarachnoid or vertebral artery injection, if not performed carefully and should be performed by or under instructions of trained person using appropriate equipment.

Superficial cervical plexus block

It is useful for surgeries like carotid endarterectomy, superficial neck surgeries and for clavicular surgeries in combination with the interscalene brachial plexus block. With the use of USG technique drug can be deposited in the vicinity of C2, C3 and C4 roots and complications like too deep innervation of needle and puncture of neighbouring structures can be avoided.

But keeping in mind the dual innervation of clavicle, in this study we intended to study the use of combined superficial cervical plexus and interscalene brachial plexus block for conducting clavicular surgery.

METHODOLOGY

After obtaining approval of the institutional ethics committee and written informed consent from all the participants, a prospective study was undertaken.

A total of 30 patients of ASA 1 & 2, 20-60 years of age, undergoing elective orthopedic clavicular surgeries in our hospital were selected.

Patients with infection at the puncture site, coagulopathy, hypersensitivity to drugs used, pregnant females, psychiatric and neurological disease, and patients with severe COPD were excluded.

All patients were kept fasting overnight. In the operating room, all patients were connected to electrocardiography, peripheral oxygen saturation (SpO_2) and non-invasive blood pressure monitor and all the basal parameters were recorded. An IV line was obtained with 18 or 20 gauge cannula. After prior premedication with 4 mg of ondansetron all the patients were preloaded with 10 ml/kg of lactated ringer's solution.

The patient were placed in supine position with 45° head up and after turning the head to opposite side USG guided interscalene brachial plexus block and superficial cervical plexus block were given. 10-15 ml of 1.5% lignocaine with adrenaline plus 5-10 ml of 0.5% bupivacaine were given in interscalene brachial plexus block and 0.25% 10 ml bupivacaine were given in superficial cervical plexus block.

After giving block all patients were given inj. dexmedetomidine 1 μg/kg over 10 minutes. Efficacy of block was assessed for motor and sensory effect. Perioperative hemodynamics were charted.

The level of sedation was evaluated using Ramsay Sedation Scale till the patient was discharged from PACU. Excessive sedation was defined as a score greater than 4/6.

Duration of motor block was noted as time of shoulder abduction by 3 cm from the time of block. Duration of analgesia was noted as time for first demand of analgesic from time of any complications of block e.g. ptosis, meiosis (Horner's syndrome), respiratory distress, hoarseness of voice, were noted.

Hypotension (systolic blood pressure less than

90 mmHg or more than 20% fall from base line value) bradycardia (heart rate < 50/min) and postoperative complications if any were noted and treated appropriately.

RESULTS

The demographic data of the patients are given in Table 1.

Vital signs recorded during the study are given in Table 2. All the parameters remained stable throughout the perioperative period.

Table 1: The demographic data and ASA grade of the present study.

Parameter	Study group
Age (years)	34.37 ± 9.01
Male	17
Female	13
ASA 1/ 2	16 / 14
Weight (kg)	56.73 ± 7.52
Height (cm)	165.30 ± 3.41

Table 2: Vital data of the participants (mean ± SD)

Parameters	Observation
Pulse rate (beats / min)	90 ± 5.4
Systolic BP (mmHg)	134 ± 6.1
Diastolic BP (mmHg)	82 ± 2.6
SpO_2 (%)	98 ± 2.7
Ramsay sedation score	2.09 ± 0.1
Duration of analgesia (hours)	4.61 ± 1.08

The complications noted during the study period were Horner's syndrome in 8/30 (26.7%) patients and hoarseness of voice in 5/30 (16.7%) patients. No other complication was noted.

DISCUSSION

General anesthesia and regional anesthesia have been successfully used for upper extremity and clavicular surgeries[2,3]. Both types of anesthesia have their own sets of advantages and disadvantages. Modern anesthesiology is the science of managing reflexes associated with surgery. Most of these reflexes are initiated by noxious stimuli resulting from surgery or trauma. These reflexes can be managed at the end organ e.g. with beta blockers to counteract hypertension and tachycardia, in respiration to noxious stimulus muscle relaxants to prevent spinal cord mediated reflexive movement. Second site where these reflexes can be interrupted is in the CNS using opioids but these come with many unwanted and unpleasant side effects like tolerance, nausea, constipation and respiratory depression.

Perhaps the optimal place to interrupt this noxious stimulus is the place of its origin itself. This is the prime use of regional anesthesia in modern practice where in it blocks the relay of pain to spinal cord and brain. Regional anesthesia provide excellent analgesia, while minimizing opioids related side effects by reducing the needs of opioids. Nerve block anesthesia being cheaper than GA has many advantages such as anesthesia targeted at the operative site, excellent postoperative pain relief, decreased opioid use and reduced recovery time[4,5]

Regional anesthesia in clavicular surgeries can be successfully managed using combined interscalene and superficial cervical plexus block. The combination of these two blocks successfully covers the complicated sensory innervation of clavicle providing excellent intra operative analgesia and muscle relaxation. Regional analgesia results in opioids sparing, early ambulance, decreased postoperative nausea and vomiting and shorter hospital stay[6]. On the other hand, general anesthesia also has disadvantage of postoperative nausea and vomiting, delayed recovery. Some perceived disadvantage of interscalene block vs general anesthesia are block performance time which is taken care of by use of USG.

Use of ultrasound in anesthesiology has revolutionised the practice of regional anesthesia. In this study we used USG guided interscalene block and superficial cervical clavicular brachial plexus block. Several studies have examined the effect of USG in quality of interscalene block. Kapral et al compared USG guided vs PNS guided interscalene block and found greater motor and sensory effect with USG[7] Similarly, a randomized study by Liu et al, examining ultrasound vs nerve stimulator for ISB in randomized patients revealed increased motor blockade assessed after five minutes as well as decreased needle attempts for the Ultrasound group.[8] Mc Naught et al noted decreased needle attempts for USG group also decreased minimum effective analgesic volume of local anesthesia and decreased pain 30 min postoperatively when compared to PNS group.[9] The USG group also have revealed decreased Incidence of phrenic nerve blockade and respiratory complications and decreased vascular puncture.[10] The ultrasound use decreases incidence of diaphragmatic hemi paresis.[11]When examining ultrasound placement vs. Nerve stimulator placement of ISB catheters in randomized patients, Fredrickson et al

demonstrated greater effectiveness in ultrasound group requiring less local anesthetic volumes and fewer needle attempts.[12]

In our study all the patients were vitally stable throughout the surgery and also postoperatively. Loading dose of dexmedetomidine was given prior to surgical incision in our study. As dexmedetomidine has a role in modulating pain, inhibiting the pain transmission and perception of pain, its role as a pre-emptive analgesic needs to be assessed. It gives best sedation to the patient so that patient can be comfortable intraoperatively being hemodynamic stable.

In our study Horners syndrome was observed in 8/30 (26.7%) patients and hoarseness of voice in 5/30 (16.7%) patients. No other significant side effects were noted. In our study combined interscalene brachial plexus and superficial cervical plexus block also provided postoperative analgesia and made patients early ambulatory and comfortable.

CONCLUSION

We conclude that USG guided combined superficial cervical plexus and brachial plexus block is effective for clavicular surgery and may be used as sole anesthetic technique. It avoids the complications associated with general anesthesia and use of opioids.

Conflict of interest: None declared.

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Authors' contribution: All of the authors took part in the conduct of the study and the manuscript preparation.

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