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Safety and Success of Ultrasound Guided Interscalene and Cervical Plexus Block as a Sole Anesthesia Method for Acromioclavicular Joint Fixation: A Retrospective Observational Study

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Abstract

Purpose: The purpose of this study is to analyse the safety and success of combined interscalene-cervical plexus block as a sole anesthesia method for Acromioclavicular joint fixation retrospectively. *Methodology:* We retrospectively analysed and present a case series of acromioclavicular joint fixation surgery that were operated under combined interscalene-cervical plexus blockbetween *Jan 2017* and *Dec 2018* in our institute. Block success, any complications as inadvertent arterial puncture, hematoma formation, respiratory distress, Horner's syndrome, pneumothorax, and signs of local anesthetic toxicity from the records were evaluated. Any conversion to general anesthesia, intra-operative anesthetic supplementation and time to receive first dose of analgesics also analysed from the records. *Results:* After exclusion 32 patients were analysed and found 100% block success rate. None of them required conversion to general anesthesia. In our study, four patients developed hoarseness of voice (12.50%), and three patients complained of breathing difficulty (9.38%). No other major complications. *Conclusion:* The ultrasound guided combined interscalene and cervical plexus block able to provide a successful, safe and effective sole anesthesia technique for acromioclavicular reconstruction surgeries without major complications. Prospective comparative study would prove that it can be an alternate method over general anesthesia.

Keywords: Interscalene and cervical plexus block; Ultrasonographic guidance; Acromioclavicular joint fixation.

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Introduction

Acromioclavicular (AC) joint injuries are grouped according to the Rockwood classification system. Grades I and II injuries represent strain and partial tearing of supporting ligaments and are treated conservatively with excellent results. Surgical management is typically indicated for patients with Grades IV to VI Acromioclavicular joint injuries.[1] A large variety of stabilization methods have been introduced for the Acromioclavicular joint, including K-wire trans fixation, hook plates, arthroscopic tight rope, and suture anchors. One of the treatment modalities is Acromioclavicular joint reconstruction by open reduction and

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fixation using endo button tight rope. Surgical reconstruction of the dislocated Acromioclavicular joint requires exposure and instrumentation of the coracoid. A transverse incision is made over the Acromioclavicular joint for this surgery. Usually this surgery is done under general anesthesia, but after establishment of ultrasound guided interscalene and cervical plexus block, we can provide complete regional block with less failure rate.[2]

Aims

The purpose of this study is to analyse the safety and success of combined interscalene-cervical plexus block as a sole anesthesia method for Acromioclavicular joint fixation retrospectively. The primary objectives are to find the number cases converted to general anesthesia and number of cases required anesthetic supplementation during intra-operative period. The secondary objective is to analyse the occurrence of complications.

Materials and Methods

Following approval by our Institutional Research and ethical committee, the medical records of patients who underwent Acromioclavicular joint fixation surgery over two years (between *Jan 2017* and *Dec 2018*) were reviewed. Acromioclavicular joint fixation that were operated under combined interscalene and cervical plexus block using endobutton tight rope were included for study. Surgeries done under general anesthesia and Acromioclavicular joint stabilization done by other methods like hook plate, K-wire trans fixation and also by arthroscopic method were excluded resulting in a total of 32 patients.

Patients anesthetic records and drug charts were retrospectively reviewed starting from *Jan 2017* to *Dec 2018*. Also, available stored scanned images of the cases reviewed from the USG machine local storage system (Esaotemylab™Gamma, Italy). Demographic data of the patients age, sex, height, weight, ASA physical status, time of drug administration, type and volume of the local anesthetic used was noted. A standard institutional protocol followed in all patients planned for surgery under regional block. If patients planned for surgery under regional block, they were informed about technique of regional block. Routine informed consent was obtained and documented properly. Standard contraindications to interscalene nerve block included coagulopathy, local site infection, phrenic nerve paralysis, polytrauma with multiple fractures and hypersensitivity to local anesthetics (bupivacaine).

The technique used was ultrasound-guided 'in-plane' lateral to medial approach double-injection (first cervical plexus block followed by interscalene block) method. The patient was placed in a supine position with the head turned away from the side to be blocked. The skin was prepared using an antiseptic solution, and the transducer was dressed with a sterile cover. A *3–11 megahertz* linear transducer was used for performing the blocks. The related side of the patient was scanned by ultrasound in a transverse orientation across the neck with the probe marker facing medially. The blocks were performed using a 23 gauge (*38 mm* Dispovan) hypodermic needle. First superficial cervical plexus block was performed by placing the needle tip deep to the Sternocleidomastoid muscle along its tapering posterolateral border but superficial to the prevertebral fascia and *10 ml* of 0.375% bupivacaine injected. Followed by probe moved caudally to find out the cervical nerve roots at interscalene groove in short-axis view and *20 ml* of 0.375% bupivacaine was given. Distribution of the local anesthetic drug was visualized during the procedure. Standard monitors were applied and patients were sedated with inj. Midazolam (*0.03 mg/kg*), inj. Ondansetron (*4 mg*) and inj. Fentanyl (*1 mg/kg*). To know the desired effect, motor blockade was determined by loss of shoulder abduction and sensory blockade was assessed using the spirit cotton for cold sensation and pinprick test for pain at the surgery site compared with normal side before proceed to surgery. Blocks were performed by same anesthesia team experienced with ultrasound guided regional techniques and also procedure was done by the same surgery team.

A successful block was defined as one which did not necessitate the conversion to general anesthesia. Duration of surgery reviewed from anesthesia record and time to receive first dose of analgesic calculated by the difference in the time of administration of block and the time of first dose of analgesic received by the patient from patient post-operative nurse chart. Anesthetic records were analysed for rates of successful blocks, failed blocks necessitating conversion to GA and local or intravenous anesthetic supplementation. And also, complications such as seizures, hypotension, breathing difficulty, Horner's syndrome, pneumothorax and drug toxicity accompanying diseases of the patients were reviewed. Data were presented as mean ± standard deviation or percentages.

Results

We analysed medical records of 32 patients who underwent Acromioclavicular joint fixation surgery under ultrasound-guided interscalene and cervical plexus block over two years. Demographic data, clinical parameters and other parameters like ASA physical status and duration of surgery are shown in (**Tables 1 & 2)**. All patients were male, and most of them underwent surgery for right Acromioclavicular joint. In our study, we found 100% success rate and none of them required conversion to general anesthesia. In this study, no additional analgesics were used and no intravenous rescue analgesics was required intra-operatively except for one patient who received local anesthetic (*8 ml* of 1% lignocaine with adrenaline) infiltration due to extension of surgical incision involved T2 dermatomal area.

In our study, four patients developed hoarseness of voice (12.50%), and three patients complained of breathing difficulty (9.38%). They were monitored closely and their vital parameters and oxygen saturation were normal. Seven patients developed Horner's syndrome (21.88%), which is clinically insignificant. No treatment was required for those complications and subsides with recovery from block effect. In our study, intra-operative vitals were stable in all patients and there were no other major acute or chronic complications noted. The mean time to receive the first dose of analgesic observed in our study was *6.15 ± 0.52 hours*.

Table 1: Demograhic and intraoperative vitals data

Number of patients	**32**
ASA (I/II/III)	(21/8/3)
Parameter	Mean ± SD
Age (year)	38.78 ± 11.09
Weight (kg)	71.65 ± 6.72
Height (cm)	159.75 ± 7.22
Pulse Rate (Intra-operative)	81.22 ± 8.023
Systolic BP (Intra-operative)	128.12 ± 14.86
Diastolic BP (Intra-operative)	79.06 ± 8.39

†Mean ± standard deviation.

Table 2: Surgical and anesthesia outcomes

Duration of surgery (*minutes*)	61.03 ± 9.09†
Time duration to receive first dose of analgesia (*hour*)	6.15 ± 0.52†
Block success rate	100%
Additional anesthetic supplementation required	nil
Complications	
Horner's syndrome	21.88% (7/32)
Hoarseness of voice	12.50% (4/32)
Breathing difficulty	9.38% (3/32)

Discussion

In our study, we aim to report our clinical experiences of the ultrasound-guided combined interscalene cervical plexus block technique as a sole anesthesia method for open reduction and fixation of Acromioclavicular joint dislocation. Surgeries on clavicle and shoulder under ultrasound guided interscalene and cervical plexus block have been increasing now-a-days. Regional anesthesia is always better than general anesthesia but it has issues on safety and success rate.[3]

With the advent of ultrasound-guidance, interscalene brachial plexus block with superficial cervical plexus block has become ease and high success rate with less complications in view of phrenic nerve paralysis and intravascular injection leads to local anesthetic toxicity or other complications.[2–4] The possibility of phrenic nerve paralysis can be avoided by the local anesthetic drug spread limited to superficial cervical plexus area possible with direct imaging of needle location using ultrasound guidance.[5]

Although the incision for Acromioclavicular surgery is different from surgical incision for fracture clavicle, the incision is confined to the block area of interscalene and superficial cervical pexus, displays in (**Fig. 1**).

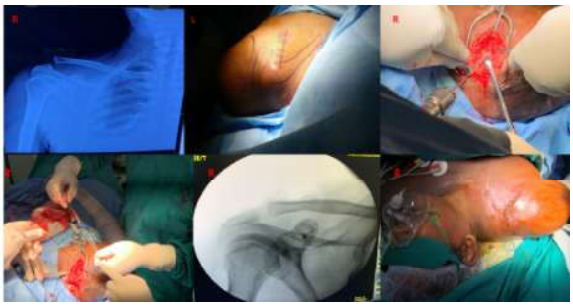

Fig. 1: Showing surgical incision area and procedures

In our study, we found 100% block success and no patients required conversion to general anesthesia. One patient received local anesthetic infiltration during intra-operative period. From the anesthesia record we found that, the patient was obese and required further surgical incision for better exposure below the lateral end of the clavicle anteriorly involves T2 dermatome. Around *8 ml* of 1% lignocaine with adrenaline was infiltrated from subcutaneous to surgical depth before extending incision below.

In our study, complications were minimal and did not receive any specific treatment. Four patients developed hoarseness of voice probably due to blockade of recurrent laryngeal nerve. And three

patients were presented with breathing difficulty which was mild subjective dyspnoea due to phrenic nerve dysfunction. Reassurance was given to these patients and they were explained that shortness of breath is mild subjective feeling and hoarseness of voice will resolve with recovery from block effect. All these complications were mild and managed with reassurance.

The combined interscalene-cervical plexus block for clavicular surgeries was used as a primary method of anesthesia by Balaban *et al.*[6], shown high success rate. They found this method effective for achieving surgical anesthesia and can be used as an alternate method to general anesthesia. Recent study by Banerjee *et al.*[7], compared general anesthesia with ultrasound-guided dual block (superficial cervical plexus block and interscalene brachial plexus block) for clavicular surgeries regarding various parameters such as intra-operative anesthesia, post-operative analgesia, and discharge time from post-operative care unit. The time interval for the first complaint of pain in interscalene brachial plexus block group is comparable with the time to receive the first dose of analgesic (*6.15 ± 0.52 hours*) in our study. When compare to Contractor *et al.*[8], our study shows, less incidences of side effects {Horner's syndrome (21.8%) and hoarseness of voice (12.5%)}. No other significant side effects were noted.

Limitations

Limitations of this study starts from its retrospective nature, and also several measurements like block performance, onset time, post-operative VAS score and analgesic requirement were not evaluated. Acromioclavicular joint reconstruction is a rarely performed intervention, a smaller number of cases was also a limitation. This should be a prospective study to analyse surgeon and patient satisfaction, post-operative pain score, analgesic duration, analgesic requirement and hospital stay in near future.

Conclusion

This retrospective analysis shows that ultrasound guided interscalene and cervical plexus block was safe with minimal complications and able to provide adequate surgical anesthesia. In conclusion, ultrasound guided combined interscalene and superficial cervical plexus block can be a sole anesthesia method of choice for Acromioclavicular reconstruction surgeries. Further prospective and comparative study would prove that it can be a safe and good alternative to general anesthesia.

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