Ultrasound Guided Low Approach To Interscalene Brachial Plexus Block "Spinal Anaesthesia of The Upper Extremity"

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Abstract: Background: Interscalene Brachial plexus block is not widely used these days due to its complications and it is not appropriate in upper limb surgeries because it does not affect the lower trunk (C8–T1, ulnar nerve) of the brachial plexus. Methods: A low approach, ultrasound-guided interscalene brachial plexus block (LISB) was performed on one hundred and twelve patients undergoing surgery of the upper extremities. The patients were assessed after the block for the degree of block in each nerve and muscle as well as for any complications. Results: The patients were assessed after the block for the degree of block in each nerve and muscle as well as for any complications. We observed complete sensory and motor block in all the nerves in all the 112 patients. None of the patients received additional analgesics, and none experienced complications. Conclusions: The present study confirmed the achievement of an appropriate sensory and motor block in the upper extremities, including the ulnar nerve with no complications. [Darshana S NJIRM 2017; 8(6):16-19]

Key Words: Interscalene brachial plexus block; Ultrasoundguided; Upper limb surgery

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Introduction: We all know that Blocks are safer than general anaesthesia but these days most practitioners avoid classic interscalene block due to its complications and Ulnar nerve sparring. That is why we practice low approach to interscalene block technique, which consists of inserting the needle more caudally than in the commonly described procedure performed at the level of the cricoid cartilage. Here the lower trunk of the brachial plexus (C8-T1; ulnar nerve) is not spared[1]. Still as a blind procedure there are few chances of complication, that is why the ultrasound guided blocks as become the cornerstone in modern practice. It is no more a blind procedure, the direction of the needle and spread of the drug can be visualized. So the USG guided Low approach interscalene block makes puncture of the carotid artery less likely and performance of the block easier to master by trainees. Low approach to interscalene block is used in shoulder, arm and forearm surgery.

Anatomy: The brachial plexus is a somatic nerve plexus formed by intercommunications among the ventral rami (roots) of the lower 4 cervical nerves (C5-C8) and the first thoracic nerve (T1). The brachial plexus supplies all of the cutaneous innervation of the upper limb. Starting from their origin and descending distally, the components of the plexus are named roots, trunks, divisions, cords, and, finally, terminal branches. The anterior scalene muscle arises from the anterior tubercles of the cervical vertebra and insert into the scalene tubercle of the first rib. The middle scalene muscle arises from the posterior tubercles of the cervical vertebra and inserts on the first rib posterior to the subclavian artery. C5 and C6 unite to form the superior trunk, while C7 makes up the middle trunk. Lastly, C8 and T1 unite to form the inferior trunk. All of this occurs while the nerves are coursing between the anterior and middle scalene muscles.

Block Technique: Interscalene nerve block refers to the technique of anesthetizing the roots or trunks of the brachial plexus in the neck between the anterior and middle scalene muscles. The roots of the brachial plexus are found in the interscalene groove between the anterior and middle scalene muscles at the level of the cricoid cartilage (C6) in the neck. For LOW APPROACH INTERSCALENE BLOCK (LISB), the distance between C6 and the Clavicle are divided into three sections. Then we performed a low approach, ultrasound-guided interscalene brachial plexus block (LISB) on the interscalene groove that is located at a site about two-thirds of the distance caudally from C6 [2].

Disadvantages of Classic ISB: The classic interscalene block (ISB) using nerve stimulation to guide injection has been in practice for decades and provides excellent anaesthesia for upper extremity surgery but slowly it is becoming a dying art. In classic Interscalene block (ISB) the lower trunk of the brachial plexus (C8-T1; ulnar nerve) is spared in up to 80% of the blocks. It is associated with some major risk and complication like Phrenic nerve blockade , Ipsilateral Horner syndrome, hoarseness of voice due to Recurrent

laryngeal nerve block, Vertebral artery puncture and epidural or intrathecal injection. Some of these complications are due to the usage of large volume on local anaesthetics.

Advantages of USG guided LISB: In low approach interscalene block technique, which consists of inserting the needle more caudally than in the classic interscalene block where it is performed at the level of the cricoid cartilage. In Low approach to interscalene block the distribution of anaesthesia is also adequate for elbow and forearm surgery and with Ultrasound guidance the success rates are increased and the complications rates have been brought down. Most of the studies show use of US guidance system for performing Brachial plexus block, results in near 100% success without complications. Ultrasound guidance provides real time view of the block needle, the brachial plexus, and its spatial relationship to the surrounding structures[3].

Aims of Study:

- To evaluate the efficacy of sensory and motor blocks.
- Success rate of the block and incidence of any signs of complications.

Methods: The present study was conducted on one hundred and twelve patients (112), who were classified as physical status 1 or 2 by the American Society of Anaesthesiologists (ASA) and who were scheduled to receive an upper limb surgery at our hospital between May 2016 and April 2017. We excluded patients with coagulation disorders, those who were under the age of 18 or over the age of 75, those who weighed less than 50 kg or more than 100 kg, patients with any kind of neurological deficit, or patients with surgical site infections.

After obtaining the approval of the study protocol by the hospital ethical committee and written informed consent, all the patients underwent thorough pre-anaesthetic evaluation on the day prior to the surgery. Thorough general and systemic examination was done including airway and the surface anatomy where the block was to be given. All the patients were explained about the procedure.

The following investigations were done:

- Blood investigations: Hb%, TLC, DLC, BT, CT, serum urea, serum creatinine, serum bilirubin, blood sugar and blood group.
- Urine routine,. ECG and Chest x-ray PA view.

The patients were pre-medicated only with Inj. Ondensetron 4mg IV prior to receiving anaesthesia. After they arrived in the operating room, patients were connected to a non-invasive blood pressure manometer, pulse oximeter, and electrocardiogram to monitor their vital signs. The patients were in the supine position with their heads facing away from the side of the block. The region was prepped with betadine and the linear probe of the ultrasound (SonoSite M-Turbo, SonoSite, Inc., Bothell, WA, USA) was placed on the interscalene groove, which is located at about two-thirds of the distance caudally from C6 when the distance between C6 and the clavicle is divided into three sections, as suggested by Kim et al[4] .Sterilized plastic wrap and gels, and 23G, 1.5 inch needles were used. With the help of a nerve stimulator at 0.9 mA, the contraction of each muscle (pectoralis, deltoid, arm, forearm or hand) was confirmed.

For the local anaesthesia, 10 ml of Injection Lignocaine Hydrochloride 1.5% with 1:2,00,000 adrenaline and Injection Bupivacaine 0.5% 10 ml . After injection of local anaesthetic the sensory blockade was evaluated by pinprick over the 7 regions based on dermatomal distribution: axillary nerve; forearm medial, lateral, and posterior cutaneous nerves; palmar branch of median nerve; superficial branch of ulnar nerve; and superficial branch of radial nerve. For motor blockade, we evaluated 5 movements corresponding to axillary, musculocutaneous, radial, median, and ulnar nerves. We confirmed cases for any hemi-diaphragmatic paralysis after the surgery by performing a chest X-ray and consulting a radiologist regarding the results.

Results: Among 112 subjects of this study, 40 were males and 72 were females. The patients' demographic and clinical data including age, body weight, height, gender, surgery length, are illustrated in Table 1.

Table 1: Patient Demographic Data

	N=112
Age(yr)	42.8±12.6
Height(cm)	154± 7.2
Weight(kg)	59 ± 8.3
Sex (M/F)	40/72
Operation time (MIN)	60 ± 34.3
Values are mean ± standard deviation or number of patients	

The success rate of the block was 100%. The mean duration of the onset of sensory block was 6.2 ± 2.4 min. the mean duration of onset of motor block was 9.4 ± 3.8 min. The motor and sensory effect returned by 180 ± 20 Min.

Table 2: Types of surgery

Types of Surgery	N=112
Elbow curettage & drilling	6 (5.5%)
Distal radius ORIF	18 (16%)
Ulnar metal removal	9 (8%)
Hemiarthroplasty	7 (6.5%)
Shoulder arthroscopy	15 (13.5%)
Subacromial decompression	3 (2.5%)
Rotator cuff repair.	8 (7.1%)
Proximal humerus platting	20 (17.8%)
Midshaft humerus plate/nail	23 (20.5%)
Ganglion excision	3 (2.6%)

Values are number of patients. ORIF: open reduction & internal fixation.

Table 3: Analgesic Requirement and Complications after a Low Approach Interscalene Brachial Plexus Block

	N=112
Patients requiring analgesics during operation	0
Patients with complication	
Nausea	0
Horner's syndrome	0
dyspnea	0

Values are number of patients

None of the patients received additional analgesics after the surgery, and there were no abnormalities during the surgeries. In addition, there were no signs of complications, such as dyspnoea or Horner syndrome, during the surgery, in the recovery room, or in the wards.

Discussion: This study confirmed that an appropriate sensory and motor block was achieved in the upper extremities, including the ulnar nerve, and that there were no complications associated with the block. LISB resulted in a greater frequency of sensory-motor block of the hand and wrist. With the needle insertion more caudad with the LISB, it is possible that there is greater spread of local anaesthetic to the lower trunk [5].

Owing to the advances in procedural techniques and the application of ultrasound technology the use of local anaesthetics can be reduced when performing LISB. Hence, in the present study, we used 20 ml of local anaesthetics. We achieved appropriate sensory and motor blocks required for upper limb surgeries[6].

ISB is known to induce a temporary paralysis in the ipsilateral hemi-diaphragm due to phrenic nerve palsy. The phrenic nerve is located within 2 mm of the brachial plexus of the cricoid cartilage and divides 3 mm per 1 cm as it descends caudally. Thus, it can be predicted that the incidence of phrenic nerve palsy-induced hemi-diaphragmatic paralysis can be reduced in LISB. In the present study, there were no signs of dyspnoea or hemi-diaphragmatic paralysis[7].

As mentioned above, there were no complications in the current study. We presume that we were able to reduce the risk of complications, such as vascular injection or nerve injury, by using an ultrasound and nerve stimulator in addition to the inherent merits of the LISB method.

In the present study, the sensory block was achieved within 5-10 min .While motor block took 10-15 minutes similar to Plante at el study[8], and there were no additional analgesics injected and no additional block was performed.

Conclusion:

1. The nerves in the upper extremities, including the ulnar nerve, were appropriately blocked within fifteen minutes after the performance of LISB.
2. Higher success rate with more distal spread of sensory-motor coverage.
3. Low Volume of Local anaesthetics was sufficient to provide appropriate Block.
4. There were no complications induced by the block.

The Ultrasound guided Low approach to Interscelene block is safe, easy to perform and requires short performance time. Thus, it is truly the spinal anaesthesia of the upper limb.

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