ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB FRACTURE OR DISLOCATION REDUCTION IN EMERGENCY DEPARTMENT

1Harshad Wankhade, 2Vishwa P Chauhan, 3Reena Parikh, 4A. K. Saxena
1Resident Doctor, Emergency Medicine, 2Resident Radiology Department, 3Assistant Professor, Emergency Medicine Department, 4Professor & Head, Emergency Medicine, SSG Hospital & Medical College, Baroda, Gujarat.

ABSTRACT

Aims & Objective: To establish the role of ultrasound guided supraclavicular brachial plexus block in emergency department for upper limb fracture reduction and or dislocation.

Method: This was the perspective observational study conducted in the emergency department. It includes 40 consecutive patients presented to the ED with upper limb fracture or dislocation. Written inform consent was taken and ultrasound guided supraclavicular brachial plexus block performed. We evaluated the time to perform the block accuracy of drug delivery, volume of drug used, onset, extent and duration of sensory and motor block.

Result: Ultrasound guided supraclavicular brachial plexus block can be easily learned by emergency physician with minimal training and can be performed in emergency room within 12+_3 minutes. Because of it has high level of safety than conventional technique, its complication rate was observed to be 0%. Its simplicity and capacity of rapidly achieving the block helps in decreasing effective length of stay of patient in emergency room and improving the point of care. Mean volume of drug used was 15+_3 ml which is less than conventional technique. Mean duration of onset of sensory blockage was 8.75+_2.47 min, duration of post block analgesia was 371.25+_31.11 min.

Conclusion: Ultrasound guided brachial plexus block have high success rate and low complication rate. It has shown promise in terms of time duration while performing block and hence should be added in the armamentarium of emergency medicine department.

Keywords: Supraclavicular block, Ultrasonography, Bupivacaine.

Corresponding Address: Dr. Harshad Wankhade, Resident Doctor, Emergency Medicine, SSG Hospital & Medical College, Baroda, Gujarat. Mail: harshad113@gmail.com

INTRODUCTION

Ultrasound guided supraclavicular brachial plexus block can be used for fracture / dislocation reduction in upper limb^{(1)}. Ultrasound guided nerve blocks is the new modality in the can be performed by emergency physician in order to relieve...
pain rapidly\(^{(2)}\). Ultrasound provides precise location of nerve henceforth anesthetic drugs easily and correctly administered\(^{(3)}\). In the busy environment of emergency department its utility regarding the effective duration of the patients stay in ED is speculated. This study is carried out to check the time required to perform this block finding its side effect and its implications on the patient management and stay in the ED. So as to add this tool in the armamentarium of emergency physician.

**MATERIALS AND METHOD**

This was perspective observational study conducted in the emergency department of SSG Hospital Baroda. Permission was taken from ethical committee. Its duration was six months from April 2014 to September 2014. Total 40 consecutive patients were enrolled in the study who had upper limb fracture or dislocation. Block use for this patient was ultrasound guided supraclavicular nerve block.

**METHOD OF STUDY**

**INCLUSION CRITERIA-**

1- Reducible upper limb fracture/dislocation
2- Distal radius/ulna fracture (colles, smiths fracture)
3- Elbow dislocation.
4- Undisplaced radius/ulna shaft fracture
5- Scaphoid fracture
6- Undisplaced metacarpal and phalangeal fracture
7- Undisplaced radius/ulna head fracture

**EXCLUSION CRITERIA-**

1- Intraarticular involvement

2- Comminuted displaced fracture
2- Fracture or dislocation with any vascular/neural deficit

**Procedure:** Proper written and informed consent was taken. Premedication were given to the patient before performing block to allay anxiety in the form of Inj. midazolam 0.03 mg/kg. Ultrasound Transducer probe was prepared and covered with sterile sleeve. Proper antiseptic painting and draping was done on the site of performing block then transducer was placed at proper position. Standard noninvasive monitors were applied and all emergency drugs were kept ready during the procedure.

For giving nerve block to the patient we only need the following local anaesthetic drugs mixture as shown in Figure 1.

- 2 % lignocaine 5mg/kg
- 0.5% bupivacaine 1mg/kg
- 8.4% sodabicarb 1ml/10ml of LA

Total volume of 50 ml is made with dilution in sterile water.

**Figure-1 : Drugs**

For performing the block following equipment were required which can be radially available in the Emergency Department.
➢ ultrasound machine with 7-15mHZs liner probe
➢ sterile sleeve and gel
➢ standard nerve block tray including
  • sterile towel and gauze
  • 10 ml syringe with local anaesthetics
  • 2ml syringe and 24 G needle for skin infiltration
  • 100 mm long 18 G spinal needle
  • Sterile gloves
  • Antiseptic solution

While performing the block patient was positioned in supine, semi-sitting or slight oblique position with head turned away 45 degree from the side to be blocked. Then ultrasound transducer was placed transversely rested on middle of clavicle with marker directed laterally. Ultrasound probe placed in coronal oblique plane in supraclavicular fossa to visualized subclavian artery and brachial plexus in transverse section view as shown in Figure 2.

Ultrasound depth was kept around 3 cm, but it should be optimized according to patients because of its dependency on patient size. Brachial nerve plexus was identified on ultrasound images as hyperechoic rings with hypoechoic circle, roughly oval structure lateral to subclavian artery (SA) medial to anterior scalene muscle (ASM) just above the clavicle and below the prevertbral fascia is the brachial plexus (BP) as shown in Figure 3.
After identifying brachial plexus anatomy on the ultrasound needle was inserted in plane lateral to medial till it reaches nearby the plexus. Needle tip position was confirmed visually with the ultrasound images as shown in Figure 4. Once the needle tip was adjacent to the nerve, after hemonegative aspiration 1-2 ml of LA was injected and its spread around nerve was confirmed and then additional LA injected in order to surround plexus. Ideally spread if LA should be around brachial plexus above clavicle and below prevertebral fascia as shown in Figure 5. Typically 15-20 cc of LA solution needed till brachial plexus completely surrounded by drugs. After adequate infiltration, needle withdrawn and sensation checked. Sensory and motar assessments were performed every four minutes until complete sensory, motar loss was achieved. Procedural reduction was performed. Cast / slab was placed in proper position and duly immobilized. Post procedure x-ray taken for checking proper reduction of fracture. Patient observed for 4 hours and sensations checked hourly with VAS score then discharged with analgesics and antihistaminics and advice for follow up.

RESULT:

This study included 40 patients. Average age of patient was 34+_8 years. And weight of the patients was 48+_12 kgs. Most of them belongs to the ASA status 1 (24), followed by status II (12). 4 patients was having grade III as shown in Table 1.

<table>
<thead>
<tr>
<th>Demographic Data (N=40)</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>34+_8</td>
</tr>
<tr>
<td>Weight</td>
<td>48+_12</td>
</tr>
<tr>
<td>ASA Status</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>24</td>
</tr>
<tr>
<td>II</td>
<td>12</td>
</tr>
</tbody>
</table>

| Table-1 : Demographic Data of the Patients. |

Most of the patients studied had undisplaced radius/ulna shaft fracture or distal radius/ulna fracture (50%). Other indications include upper limb fracture/dislocation (20%), elbow dislocation and undisplaced radius/ulna head fracture (10%) respectively. Rest of the indications includes scaphoid fracture and undisplaced metacarpal and phalangeal fracture (5%) respectively, as summarized in the Table 2.

<table>
<thead>
<tr>
<th>Indications</th>
<th>No of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducible upper limb fracture/ dislocation</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Distal radius / ulna fracture (colles , smiths fracture)</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Elbow dislocation.</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Undisplaced radius/ulna shaft fracture</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Scaphoid fracture</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Undisplaced metacarpal and phalangeal fracture</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Undisplaced radius/ulna head fracture</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

| Table-2 : Indications of Nerve Block and Relative Percentage of the Patients |

Mean time required to perform the nerve block was 12+_3.04 minutes. And mean volume of drug used was 15+_3 ml. Mean duration of onset of sensory blockage was 8.75+_ 2.47 minutes and duration of block analgesia last for 371.25+_31.11 minutes, with no significant complication.
rates, of which details are summarized in TABLE 3.

<table>
<thead>
<tr>
<th>Nerve Block Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time taken to perform block</td>
<td>12+3.04 min</td>
</tr>
<tr>
<td>Mean volume of drug used</td>
<td>15+3 ml</td>
</tr>
<tr>
<td>Mean duration of onset of sensory blockage</td>
<td>8.75+2.47 min</td>
</tr>
<tr>
<td>Duration of post block analgesia</td>
<td>371.25+31.11 min</td>
</tr>
<tr>
<td>Complication rate</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table-3: Nerve Block Characteristics Features.

DISCUSSION

Ultrasound guided supraclavicular brachial plexus block can be easily learned by emergency physician\(^4\) with minimal training and can be performed in emergency room within 12+3 minutes, because of its safety (complication rate 0%), simplicity and rapidly achieving the block with decreasing effective length of stay of patient in emergency room\(^5\). Mean volume of drug used was 15+3 ml which is less than conventional technique. Mean duration of onset of sensory blockage was 8.75+2.47 min. Duration of post block analgesia was 371.25+31.11 min. Brachial plexus under ultrasound color Doppler can be identified precisely using ultrasonographic landmarks which allows accurate entry of needle and adequate infiltration of LA around it hence the rate of most dreaded complications of supraclavicular brachial plexus block like pneumothorax, paralysis of phrenic nerve and Horner syndrome significantly decreased\(^6\).

Other complications like inadvertent vascular puncture, injections which leads to hematoma formation, incomplete analgesia from limited spread of drugs and or LA systemic toxicity (especially with bupivacaine) fatal cardiac and neurological complications\(^7\).

Limitations: Supraclavicular brachial plexus block has practical disadvantage like anatomical variation in subclavian artery or aberrant dorsal scapular artery which lies within brachial plexus or surrounding it limits the spread of LA around plexus\(^8\). Other practical disadvantage is medial skin of upper arm cannot be anaesthetized as it is supplied by intercostobrachial nerve (T2) which can be easily block by injecting LA in axilla if required\(^9\).

CONCLUSION

Ultrasound guided brachial plexus block have high success rate and low complication rate. It has shown promise in terms of time duration while performing block and hence should be added in the armamentarium of emergency medicine department.

Conflict of interest- Authors have NO conflict of interest

Source of Funding: Nil.

REFERENCES

2. Prof. Giovanni Manani, Prof. Enrico Facco, Dr. Gastone Zanette A Simple Interscalene Block: The Manani's Technique. Some Elements of


