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AXILLARY APPROACH VERSUS INFRACLAVICULAR APPROACH IN USG-GUIDED BRACHIAL PLEXUS BLOCK: COMPARISON OF ANAESTHETIC TIME

Anaesthesiology

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ABSTRACT

Background: Due to increasing case load, it is important to choose the type of anaesthesia which is patient friendly, easy to perform, safe with minimal complications. Regional anaesthesia can overcome all the complications and also have advantage of decreasing morbidity, mortality, cost effective, providing superior post-operative analgesia, and has lower rate of serious complications. This study has been conducted to compare the anaesthetic time in USG guided infraclavicular and axillary block in elective upper limb surgeries being conducted in JLN Hospital and Research centre, Bhilai, Chhattisgarh, India.

Objective: To assess the anaesthetic time in USG guided infraclavicular and axillary block in respect of following parameters

- Hollmen scale
- Modified Bromage scale

Methodology: This is a time bound, hospital based, prospective randomised comparative study conducted over a period of 10 months after getting approval from the institutional ethical committee. Patients scheduled for elective upper limb surgeries were evaluated and data was collected and analysed. Sample size selected was 64. **Results:** Out of 64 cases, admitted in the hospital for elective upper limb surgeries during the period under review, 32 patients (50%) were given axillary (AX) block and 32 patients (50%) were given infraclavicular (IC) block. Block onset time was significantly higher in IC group than AX group, while mean anaesthetic time did not differ significantly among both groups. **Conclusion:** In upper limb the entire sensory and motor blockade can be achieved by blocking the brachial plexus and has stood the best of time for upper limb surgeries. From our study it is inferred that regional block is better way of anaesthesia with high success rate and minimal complications. Careful patient selection should also be taken into account. Current study is an overview in favour of brachial plexus block for upper limb surgeries.

KEYWORDS

Axillary block, infraclavicular block, upper limb surgeries, Block onset time, Performance time, Mean anaesthetic time.

INTRODUCTION

In recent years, the numbers of industrial and road traffic accidents have increased at an alarming rate. Due to increasing case load, it is important to choose the type of anaesthesia which is patient friendly, easy to perform, safe with minimal complications. Surgical procedures involving upper limb can either be with general anaesthesia or regional anaesthesia technique [1].

In general anaesthesia, patients have risk of airway manipulation, hemodynamic instability, cognitive dysfunction and post-operative nausea and vomiting. Regional anaesthesia can overcome all the complications and also have advantage of decreasing morbidity, mortality, cost effective, providing superior post-operative analgesia, and has lower rate of serious complications. Also, peripheral nerve block provides better pain control in the immediate postoperative period [2]. It enables the patient to be discharged on the same day, hence facilitating day care surgery.

Brachial plexus blocks are becoming the mainstay of analgesia as well as anaesthesia for surgeries of the upper limb, such as shoulder arthroscopies, tendon and vascular repair of the arm and forearm and surgeries for orthopaedic trauma of the upper limb.

Techniques of block per se have come a long way.

Initially, nerve blocks were performed with paraesthesia elicitation technique. The classical approach using paraesthesia technique was a blind and land mark based technique and was associated with higher failure rates and injury to the nerves and surrounding structures[3].

With the advent of ultrasound, brachial plexus blocks have undergone a tremendous change. Blocks can now be performed under direct vision with lesser volumes of local anaesthetic agents, improving both safety and success rate.

Ultrasonography was introduced with real time imaging radiological tool. This gained more importance than paraesthesia and peripheral nerve stimulation technique. The application of USG for exact localization of nerve plexus and vessels has revolutionized the regional anaesthesia field[4]. Due to advantage of real time visualization, USG reduces number of needle passes to reach the target nerve groups, which in turn can shorten the block performance time as well as improved safety margin[5]. In the era of ultrasound-guidance the peripheral nerve block is a safe, highly effective, minimally invasive, and cost-effective method of anaesthesia by experienced hand.

METHODS

Type of Study: Time bound, hospital based, prospective randomised comparative study.

Place of Study: J.L.N Hospital and Research Centre, Bhilai, Chhattisgarh.

Study Duration: June 2020 to March 2021.

Study Population: Patients undergoing elective upper limb surgeries at JLN Hospital and Research Centre, Bhilai, Chhattisgarh. (meeting the inclusion criteria of the study)

Inclusion Criteria:

- Patients undergoing elective upper limb surgeries
- ASA I and II
- Patients aged 18-60 years

Exclusion Criteria:

- Patients with paraesthesia or paresis in operating limb.
- Patients who have illness like coagulopathy.
- Any local infection at area of block.
- Any history of hypersensitivity to local anaesthesia.
- Emergency surgeries

Procedure

Patients who fulfilled the above inclusion criteria were randomised into either the infraclavicular (IC) group or axillary (AX) group using closed envelope method into two groups of 32 each. Study was conducted after getting approval from the institutional ethical committee. Informed consent was obtained during preoperative anaesthetic checkup.

* Basic laboratory investigations were conducted.
* Data was collected at the time of patient's recruitment, before surgery commencement and included demographic data such as age, sex and weight of the patient, ASA physical status and

modified Mallampati grading.

* Monitoring was done using pulse-oximeter, non- invasive blood pressure and 5 lead ECG monitor. Monitors were attached and continuous monitoring was done.
* IV cannula was secured and intravenous fluids were started. Both groups received a total of 20ml of 0.5% bupivacaine for the nerve block in infraclavicular and axillary space in Group IC and Group AX respectively.
* Infraclavicular and Axillary brachial plexus block given by use of sonosite USG machine with linear prob and standard USG guided block technique by experience anaesthesiologist.
* The duration of each procedure were measured from the time of Providone-iodine application to the skin to the end of the infiltration of the anaesthetic, including the removal of the block needle.
* The nerve block of the patient was evaluated at 5minutes after removal of block needle followed by 10, 15, 20, 25 and 30 minutes afterwards.
* In our study, onset of motor block was taken as end point of anaesthetic time.
* Sensory block assessed by Hollmen scale. Onset of sensory block: This was defined as minimum of grade 2 of Hollmen scale:
  I- Normal sensation of pin prick.
  II- Pin prick felt as sharp pointed but weaker compared with same area in the other upper limb
  III- Pinprick recognised as touch with blunt object.
  IV- No perception of pin prick.
* Motor block assessed by modified Bromage scale. Onset of motor block: This was defined as minimum of grade 1 of modified Bromage scale:
  0- No block, total arm and forearm flexion.
  1- Partial block, total forearm and partial arm flexion.
  2- Almost complete block, inability to flex the arm and decrease ability to flex the forearm.
  3- Total block, inability to flex arm and forearm.

Data Analysis

Datas were recorded in Excel sheet and The entire data was statistically analysed using Statistical Package for Social Sciences (SPSS version 18.0, IBM Corporation) for MS windows and results were expressed in numbers and percentages.

RESULTS

According to the study, 64 patients underwent upper limb surgeries, out of which 32 patients were given axillary block while rest 32 patients were chosen for infraclavicular block. The distribution of age, gender, mean body weight, ASA grading and mean duration of surgery did not differ significantly between the two groups (P value>0.05).

The mean ± SD of performance time in Group 1 [IC] and Group 2 [AX] was 7.13 ± 0.91mins and 10.47 ± 1.13mins respectively. Mean performance time was significantly lesser in IC group (7.13min) compared to AX group (10.47min) with P value <0.001. (table1, figure 1)

The mean ± SD Sensory block onset time in Group 1 [IC] and Group 2 [AX] was 13.28 ±2.41min and 12.03 ± 2.49 min respectively. Mean block onset time was higher in IC group (13.28min), compared to AX group (12.03 min) with P value <0.045 which is significant. (table2, figure2)

The mean ± SD Motor block onset time in Group 1 [IC] and Group 2 [AX] was 20.00 ± 0.00min and 16.25 ± 2.20 min respectively. Mean block onset time was significantly higher in IC group (20 min), compared to AX group (16.25min) with P value <0.001 which is significant. (table2, figure2)

Mean anaesthetic time did not differ significantly among both groups. Mean anaesthetic time in IC group was 27.13min with SD 0.91, while in AX group was 26.72min with SD 2.22. P-Value is 0.34 (>0.05) which is non-significant. (table3, figure3)

Of 32 cases studied in Group 1 [IC] and Group 2 [AX], none had failure and none had any complications.

DISCUSSION

Ultrasound guided Peripheral nerve blocks have been increasingly recognised as the technique of choice for providing anaesthesia and postoperative analgesia. USG guided nerve blocks are gaining widespread popularity for perioperative pain management because of their reliability and success rate. The use of USG guided nerve blocks has reduced the complication and failure rate, consumption of opioids and the length of hospital stay and enables the patient to be discharged early.

Peripheral nerve blocks are becoming the mainstay of analgesia as well as anaesthesia for surgeries of the upper limb and can be done by blocking the brachial plexus. Different brachial plexus approaches are available. The choice of the approach depends on the patient's condition, the surgical indication, and the anaesthesiologist's experience.

AnatoliStav[6]et al performed a prospective randomized observer-blinded study and concluded that the time needed for performing a BPB by the axillaryapproach (25.35±9.65 min) is slightly longer in comparison with the infraclavicular approach (19.48± 7.88 min).

In AeSong[7]et al concluded that under ultrasound guidance, infraclavicular BPB was faster to perform than the axillary approach, but the block onset was slower with the infraclavicular approach.

Eun-young Choi[8]et al concluded that ultrasound-guided infraclavicular BPB can reduce the performance time compared to ultrasound-guided axillary block and there was no significant difference in the success rate.

López-Morales S[9] et al did a prospective study and said that compared with the infraclavicular approach, ultrasound-guided axillary block group required a longer onset time, 10.2min (SD±1.4) than infraclavicular block group, 6.35min (SD±2).

De QuangHieuTran[10]et al performed prospective, randomised study and found similar success rates and total anaesthesia-related times for the ICB and AXB.

In our study, Mean performance time was significantly lesser in IC group (7.13 ± 0.91min) compared to AX group (10.47 ± 1.13min) with P value <0.001. This concludes that Infraclavicular bock is faster to perform with less patient inconvenience.

In our study, mean sensory block onset time was higher in IC group (13.28min), compared to AX group (12.03 min) with P value <0.045 which is significant. Mean motor block onset time was significantly higher in IC group (20 min), compared to AX group (16.25min) with P value <0.001 which is significant.

Mean anaesthetic time in IC group was 27.13min with SD 0.91, while in AX group was 26.72min with SD 2.22. P-Value is 0.34 (>0.05) which is non-significant.

Both the sexes were included in our study with no significant difference in block onset time and anaesthetic time. In our study, no patients in both the groups were observed for pneumothorax, vascular injury and Horner's syndrome. Hence complication rate was 0%.

CONCLUSION

In upper limb the entire sensory and motor blockade can be achieved by blocking the brachial plexus and has stood the best of time for upper limb surgeries. Hand and forearm surgeries are the usual indications for brachial plexus block.

From various modes of brachial plexus blocks, we have compared infraclavicular and axillary block under ultrasound guidance. Ultrasound guided technique of performing block is more safe and accurate with maximum success rate.

From our study it is inferred that ultrasound guided regional block is better way of anaesthesia with less failure rate, better effect and minimal complications.

The data collected was analysed by using SPSS 18.0. Comparing infraclavicular and axillary block in this study it has been concluded that in our study,

- Age, sex, ASA grading, body weight and duration of surgery were comparable in both the groups with no significant difference.
- Mean performance time was significantly lesser in IC group compared to AX group. Hence infraclavicular block was faster to perform.

- Sensory block onset time was higher in IC groupcompared to AX group.
- Motor block onset time was significantly higher in IC group compared to AX group.
- Overall anaesthetic time did not differ significantly among both groups. Mean anaesthetic time in IC group was 27.13min, while in AX group was 26.72min.
- Both blocks had 100% success rate with zero complications.

Table 1: Inter-group Comparison Of Mean Performance Time

PERFORMANCE TIME (MINUTE)	GROUP 1 [IC] (n=32)		GROUP 2 [AX] (n=32)		P-value
	Mean	SD	Mean	SD	
PERFORMANCE TIME (MIN)	7.13	0.91	10.47	1.13	0.001***
Values are mean and SD, P-value by independent sample t test. P-value<0.05 is considered to be statistically significant. ***P-value<0.001.					

Figure1: Inter-group Comparison Of Mean Performance Time

Table 2: Inter-group Comparison Of Mean Onset Time

	GROUP 1 [IC]	GROUP 2 [AX]	P Value
MEAN ONSET TIME IN MIN (SENSORY BLOCK)	13.28±2.41	12.03±2.49	0.045
MEAN ONSET TIME IN MIN (MOTOR BLOCK)	20±0	16.25±2.2	<0.001

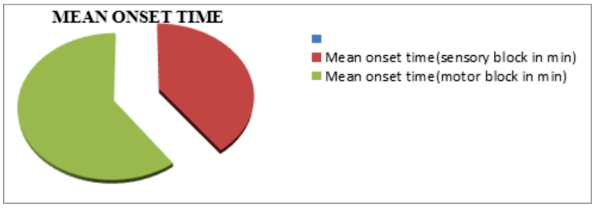

Figure 2: Inter-group Comparison Of Mean Onset Time

Table 3: Inter-group Comparison Of Mean Anaesthetic Time

	GROUP 1 [IC]	GROUP 2 [AX]	P value
MEAN ANAESTHETIC TIME (MIN)	27.13±0.91	26.72±2.22	0.34

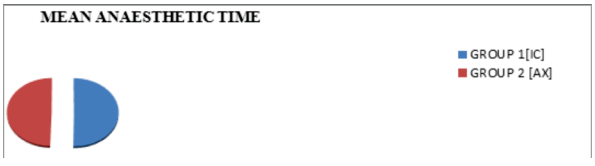

Figure 3: Inter-group Comparison Of Mean Anaesthetic Time

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