



A COMPARATIVE STUDY BETWEEN BIER'S BLOCK AND SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB BELOW ELBOW SURGERIES

Surgery

Dr. A. Kamakshi Sanghamitra*

MBBS, (MD) *Corresponding Author

Dr. K.

Madhusudhan

MBBS, MD, Professor

Reddy

Dr. T. Nagaraju

MBBS, MD, Associate Professor

ABSTRACT

Aim: To evaluate the onset of analgesia, degree of sensory and motor blockade, duration of analgesia and complications. **Introduction:** Brachial plexus block provides a useful alternative to general anaesthesia for upper limb surgeries. Intravenous Regional anaesthesia is a simple method of producing analgesia of the arm or leg by intravenous injection of a local anaesthetic, while the circulation is occluded. **Materials And Methods:** A prospective, randomised single-blinded study was undertaken in patients posted for upper limb below elbow surgeries. 80 patients aged 15-50 yrs with ASA class I and II were randomly grouped into two groups. Group 1 – were anaesthetized by supraclavicular brachial plexus block. Group 2 – were anaesthetized by IVRA. **Results:** Group II patients had a faster onset of action, grade I degree of sensory and motor blockade and lesser duration of action. **Discussion:** The addition of dexamethasone 8mg to bupivacaine 0.5% speeds the onset of sensory and motor blockade also prolongs the duration thus provides better analgesia and reduces the requirements of rescue analgesics. **Conclusion:** IVRA appears to be a better alternative with regards to onset, quality of analgesia and degree of motor blockade. But the duration of analgesia is little more with Brachial plexus block.

KEYWORDS

IVRA, Supraclavicular brachial plexus block

INTRODUCTION

Regional nerve block offers an alternative choice of anaesthesia using minimal anaesthetic drugs and a high safety profile.

Brachial plexus block is a popular and widely employed regional nerve block technique for upper limb surgeries. The supraclavicular approach of the brachial plexus block is the easiest and most consistent method for surgeries below the shoulder joint¹. The supraclavicular approach of brachial plexus block is an excellent alternative to general anaesthesia for upper limb surgery. This achieves complete muscle relaxation, intraoperative hemodynamic stability, and postoperative analgesia.²

Intravenous regional anaesthesia is a simple method of producing analgesia of the arm or leg by intravenous injection of a local anaesthetic, while the circulation is occluded³.

AIMS AND OBJECTIVES

To compare Supraclavicular brachial plexus block and Bier's Block with respect to

1. Onset of analgesia
2. Degree of sensory and motor blockade
3. Duration of analgesia
4. Complications

MATERIALS & METHODS

Study design: A prospective randomized single blind study

Method of data collection: The data will be collected in the pre-tested proforma consisting of age, sex, and weight meeting the objectives of the study.

Study population: Adult patients with ASA P I & II patients aged 15-50 years posted for upper limb below elbow surgeries.

Sample size: 80 patients in the department of anaesthesiology at Santhiram Medical College and General Hospital, Nandyal for a duration of 6 months (October 2021 - March 2022)

Sampling Criteria:

Inclusion Criteria

- ✓ Patients with ASA class I and II
- ✓ Patients aged between 15 to 50 years
- ✓ Patients with SBP: 100-139 mm of Hg
- ✓ Patients with DBP: 60-89 mm of Hg.
- ✓ Patients who gave written informed consent.

Exclusion Criteria

- ✓ Patients belonging to ASA III and IV.

- ✓ Patients who havenot given written informed consent.
- ✓ Patients who were highly nervous and uncooperative
- ✓ Known case of hypersensitive reaction to local anesthetic.
- ✓ Patients with abnormal BT, CT or on anticoagulation therapy, severe anaemia, hypovolemia, shock, septicemia and h/o seizures.
- ✓ Local infection at the site of proposed puncture for supraclavicular block.

Statistical Analysis

Data was collected and entered into Microsoft Excel and analysed using SPSS software version 18. Quantitative data was analysed by using the student 't' test. Qualitative data was analysed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

METHODOLOGY

A randomized single-blinded study was taken up among 80 patients aged between 15 to 50 years undergoing upper limb below elbow surgeries in the department of anaesthesiology at Santhiram medical college and general hospital for a duration of 6 months (October 2021 – March 2022). Ethical clearance was obtained before the Institutional Ethical review committee. An informed, bilingual and written consent was obtained from all the patients.

The patients who satisfied the inclusion and exclusion criteria were randomly divided into two groups of 40 patients each

Group 1 – were anaesthetized by supraclavicular brachial plexus block
Group 2 – were anaesthetized by IVRA

- All the patients underwent pre anesthetic check up. The procedure of the technique and the development of paraesthesia were explained to the patient to ensure good co-operation.
- The procedure of the surgery was chosen in such a way that the surgery should be finished within 60 minutes.
- All the elective patients were premedicated with 5-10mg of diazepam orally HS, previous day.

Supraclavicular Brachial Plexus Block:

- IV access obtained in the opposite limb with large bore iv cannula. Standard monitors- ECG, pulse oximeter, Non-invasive blood pressure were connected and monitored in all patients and recorded at 5 minutes interval in the first 30mins and after that every 30mins.
- The patients were placed in a supine position without a pillow, arms at the side and with the head turned to opposite side, arm to be

anesthetized is adducted and extended towards the ipsilateral knee.

- The supraclavicular area is draped and subclavian artery pulsations palpated, and a 22G 5cm needle is inserted lateral to artery and directed backward-inwards-downward till paresthesia in forearm is elicited.
- After negative aspiration for blood, 30ml of 0.5% plain lignocaine was injected.

IVRA / Bier's Block:

- Venipuncture:** is performed in the limb to be operated with a 22G IV cannula.
- Exsanguination:** is ensured by elevating the limb to be operated above the level of the heart for 2 to 4 minutes for gravity drainage and by Esmarch's bandage application.
- Tourniquet:** After exsanguination, the tourniquet was applied to occlude the vessels.

First a pneumatic tourniquet was applied proximally and the cuff pressure was raised 50mm of Hg above the systolic BP then Esmarch's bandage which was used for exsanguination was removed and the time of application of tourniquet was noted.

A second tourniquet was applied distal to the first tourniquet after anaesthesia was elicited in the forearm and the pressure inflated to the same level as the first tourniquet. The first tourniquet was then released and removed.

- Injection of drug: 0.5% plain Lignocaine hydrochloride was injected and the forearm was tested for loss of sensation for pin prick and time of onset of analgesia was noted.
- Tourniquet release: soon after surgery if duration of surgery was >25 mins & 25 mins after its application if duration of surgery was <20mins

RESULTS

A comparative study between brachial plexus block supraclavicular and IVRA was carried out on 80 patients divided into 2 groups of 40 patients each in the age group of 15 and 50 years. The following observations were made.

Table-I: Onset Of Analgesia After Injection Of Drug

Group	Range (mins)	Mean $\pm$ S.D.	P. Level
I	10 – 15	11.8 $\pm$ 1.6	P < 0.001
II	2 – 5	3.3 $\pm$ 0.8	P < 0.001

The result shows that there is early onset of analgesia with IVRA and the result was found to be significant.

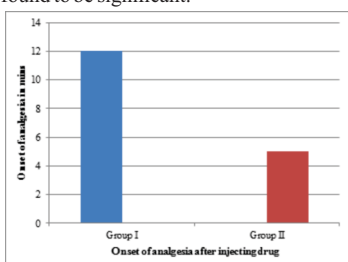


Table-II: Quality Of Analgesia

Quality of analgesia	Group I		Group II	
	No.	%	No.	%
Grade I	22	55	32	80
Grade II	18	45	8	20
Grade III	-	-	-	-
Total	40	100	40	100

Among patients receiving brachial block 55% had grade I analgesia whereas with IVRA the percentage was 80%.

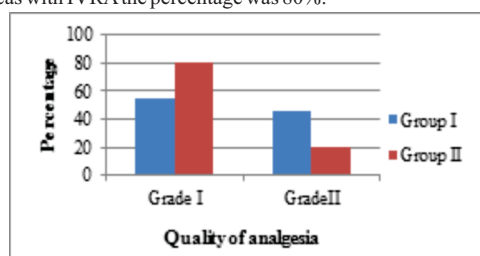


Table – III: Degree Of Motor Blockade

Degree of motor blockade	Group I		Group II	
	No.	%	No.	%
Grade I	13	32.5	24	60
Grade II	27	67.5	16	40
Grade III	-	-	-	-
Total	40	100	40	100

The degree of motor blockade achieved with brachial block 32.5% patients had Grade I blockade with the remaining having Grade II (68%) blockade. With IVRA the degree of motor blockade was Grade I in 60% with 40% achieving Grade II blockade.

Table – IV: Comparison Of Duration Of Analgesia Between The Two Study Groups

Group	Duration of range	Analgesia Mean	(min) S.D.	Significance
I	60 – 76	66.6	4.1	P < 0.001
II	30 – 62	47.4	9.9	

The mean duration of analgesia with brachial block was found to be 66.6 mins when compared to IVRA which was 47.4 mins.

DISCUSSION

Regional Anaesthesia is becoming more popular especially with the advent of safer drugs and techniques; brachial plexus and IVRA are two such techniques which have become more useful in last few decades. Since both the procedures share similar indications and site of action, an attempt has been made to compare the two.

Brachial plexus block has emerged as a popular technique among anaesthetists for upper limb surgeries. This type of anaesthesia avoids the unwanted effects of general anaesthesia like complications related to upper airway instrumentation. The research has also shown that this approach is attractive approach and effective in terms of cost, performance, the margin of safety and also provides good postoperative analgesia⁴. Many approaches of brachial plexus block are also described and the available literature has consistently shown that supraclavicular block is superior and easiest method for anaesthesia and postoperative pain management⁵.

Various drugs such as tetracaine, prilocaine, mepivacaine, lignocaine and bupivacaine have been used for the procedures from time to time. Etidocaine is twice as toxic as lignocaine. Dickler (1965) reported that prilocaine can cause methemoglobinemia⁶. Chlorprocaine can produce CNS effects and thrombophlebitis. Bupivacaine is more cardiotoxic and does not provide adequate muscle relaxation.

Lignocaine is a safe local anaesthetic has moderate potency, relatively early onset of action and reasonable duration of action. In this study, 80 patients were divided into 2 groups of 40 patients each and brachial plexus block was performed on Group I whereas IVRA was given to Group II patients. The patients were in the age group of 15 and 50 years of either sex, coming for surgeries, either emergency or planned, below the elbow joint in the orthopedics or general surgery department.

In this study lignocaine was used as an anaesthetic agent for all the cases in a concentration of 1% for brachial block and 0.5% for IVRA. The recommended maximum dose used was 3-5mg/kg body weight. The concentration was fixed and dose and volume varied according to the body weight of the patient. Palve H et al., stated that maximum recommended dosage of lignocaine are frequently exceeded in clinical practice as some blocks may need more lignocaine to produce adequate anaesthesia. They used up to 900 mg of lignocaine with adrenaline without any toxic symptoms⁷.

The onset of action of analgesia after injection of 1% lignocaine was 11.8 $\pm$ 1.6 minutes whereas with 0.5% lignocaine for IVRA it was found to be 3.3 $\pm$ 0.8 minutes.

In the supraclavicular approach Grade I analgesia was observed in 56% of patients when compared to IVRA in which 80% of the patients were found to achieve grade I analgesia. The remaining patients in both the groups achieved Grade II analgesia.

The degree of motor blockade observed in Group I (i.e. supraclavicular approach) was found to be Grade I in 32% of patients and 60% in Group II patients. Grade II motor blockade was found to be 68% and

40% in Group I and Group II respectively.

The mean duration of analgesia with brachial block (supraclavicular approach) was found to be 66.6 min, whereas the duration of analgesia with IVRA depends on the time of release of tourniquet with an average of 47.4 minutes.

CONCLUSION

IVRA appears to be a better alternative with regards to the onset of analgesia, the quality of analgesia and degree of motor blockade. More recent studies are more in favor of using adjuvants to local anaesthetics in IVRA which improved the quality of blockade and also the post-operative outcome with regards to analgesia even though it is not as comparable as brachial blockade.

Duration of analgesia was more with brachial plexus blockade. With the advent of latest technique of continuous brachial plexus blockade by insertion of catheter, pain relief was still more pronounced.

With regards to complications, no significant difference has been found and both the techniques were found to be equally safe with mild temporary complications.

Hence after the conclusion of the above study IVRA stands out as a better alternative for regional blockade indicated in upper limb surgeries below the elbow joint.

REFERENCES

1. Yadav RK, Sah BP, Kumar P, Singh SN, et al., Effectiveness of addition of neostigmine or dexamethasone to local anaesthetic in providing perioperative analgesia for brachial plexus block: A prospective, randomized, double-blinded, controlled study. Kathmandu University Medical Journal 2008;6(1):302-309
2. Singam A, Buprenorphine as an adjuvant in supraclavicular brachial plexus block, IJBAR, 2012;03:07: 571 – 5.
3. Wildsmith J.A.W. Intravenous regional analgesia. Essential safeguards anesthesia 1992;37:959
4. Singam A, Buprenorphine as an adjuvant in supraclavicular brachial plexus block, IJBAR, 2012;03:07: 571 – 5.
5. Pham – Dang C, Gunst J, Gouin J, Gouin F, Poirier P, Touchais S, et al, A novel Supraclavicular Approach to Brachial Plexus Block, Anesth Analg 1997;85:111–16.
6. Sabzposh SWA et al. Comparison between brachial block and general anesthesia for management of the crush injuries of the hand. Ind J Anaesth. 1997;41:25-26.
7. Rosenberg Per H and James E. Heavner. Multiple and complementary mechanism produce analgesia during IVRA. Anaesthesiology 1985;62:840-842