

## “A Comparative Study Between Biers’ Block And Supraclavicular Brachial Plexus Block for Upper Limb Below Elbow Surgeries”

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### Abstract:

**Background And Objectives:** Regional anaesthesia is becoming more popular especially with the advent of safer drugs and techniques; This study was conducted in elective surgeries of upper limb below the elbow to compare two regional anaesthesia techniques i.e. the supraclavicular brachial plexus block and Bier’s Block with respect to

1. The onset of Analgesia
2. Quality of Analgesia
3. The degree of motor blockade.
4. Duration of Analgesia
5. Complications if any.

**Patients And Methods:** The present clinical study was carried out in 100 adult patients aged between 15 to 55 years, undergoing elective upper limb surgeries below elbow under Brachial plexus block or IVRA were enrolled they were randomly allocated into two groups as follows Group S 50 Supraclavicular brachial plexus block, Group B 50 Biers block.

**Results:** The mean onset of analgesia with IVRA was 3.38 minutes as compared to the brachial block where the mean was 11.28 minutes. Duration of analgesia is obtained with supraclavicular brachial block with a mean duration of 73.16 minutes compared to 46.58 minutes of Biers block. Complications: No significant complications were observed in both the groups.

**Conclusion:** After the conclusion of the present study and suggestions from previous references, IVRA using 0.5% plain lidocaine appears to be a better alternative with regards to the onset of analgesia, the quality of analgesia and degree of motor blockade than supraclavicular brachial block using 1% plain lidocaine.

**Keywords:** Regional anaesthesia, Brachial plexus block, Biers block, 0.5% plain lidocaine, 1% plain lidocaine

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### I. Introduction

The term 'Regional anaesthesia' was first used by Harry Cushing in 1901 to describe pain relief by nerve block. The term regional analgesia denotes the interruption of pain impulses by physiological blockade at a certain point along their pathway of transmission in the peripheral nerves. Regional anaesthesia is becoming more popular especially with the advent of safer drugs and techniques; Brachial plexus block and Bier's block are two such techniques which have become more useful in the last few decades. Since both the procedures share similar indications and site of action, an attempt has been made to compare the two in this study.

**Objectives of the study:** This study was conducted in 100 individuals who underwent elective surgeries of upper limb below the elbow to compare two regional anaesthesia techniques i.e. the supraclavicular brachial plexus block and Bier’s Block with respect to 1. The onset of analgesia 2. Quality of analgesia 3. Degree of motor blockade. 4. Duration of analgesia and 5. Complications if any

### II. Patients And Methods

The present clinical study was carried out from April 2014 to March 2015 over a period of one year at Government General Hospital, attached to Guntur Medical College, Guntur. Methods of collection of Data: After the approval by the Institutional Ethical Committee of the Guntur Medical College and Hospital, Guntur, 100 adult patients aged between 15 to 55 years, classified as American Society of Anaesthesiologists (ASA) physical status I-II, undergoing elective upper limb surgeries below elbow under Brachial plexus block or IVRA were enrolled in this prospective, randomized, comparative study. After educating the patient about the

procedure involved and obtaining a written informed consent, they were<sup>randomly</sup> allocated into one of the two groups as follows Group S 50 Supraclavicular brachial plexus block, Group B 50 Biers block.

**Inclusion Criteria:**1. Age between 15 to 50 years of both sexes.2. Patients undergoing elective upper limb below elbow surgeries.3.ASA grades 1 and2. 4. Surgeries not lasting more than 60 minutes.  
**Exclusion Criteria:**1.The patients Who were highly nervous and uncooperative. 2. Who were hemodynamically unstable. 3. History of hypersensitivity to a local anaesthetic. 4. Infection and cellulitis of the operating limb. 5. Coagulopathy.6. ASA grade 3 and 4.

Sample size:100; 50 in each group. Sampling Method; Random sampling. Study design: Prospective, randomized, comparative study. Statistical Analysis: Statistical analysis by student t-test (unpaired), chi-square and Fisher Exact test. Study duration: April 2014 to March 2015.  
**PROCEDURE: SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK:** volume of 20 to 30 mL of 1 % lidocaine 3mg/kg solution was given. **IVRA: DRUG:** Preservative free 0.5 % plain lignocaine at a dose of 3 mg/kg body weight was injected over 90 seconds. **THE FOLLOWING PARAMETERS WERE OBSERVED:**  
 1) Time of onset of analgesia in minutes: This was recorded as the interval between the time of injection and the development of loss of sensation to a pinprick. 2) Quality of analgesia: The onset and completion of analgesia were tested by the loss of sensation by using 24 gauge intramuscular needle. The effect of analgesia after injection was graded using Hollman’s scale [1] Grade 0: a Normal sensation of the pinprick, Grade I: Pinprick felt as sharp, pointed but weaker compared with the same area on the other side. Grade II: Pinprick felt as touch with the blunt object. Grade III; No perception of a pinprick. 3) The degree of motor blockade: Motor function was assessed by asking the subject to flex and extend his/her wrist and fingers. Motor blockade produced by the two techniques was assessed as follows using modified Bromage scale [2 ](Three point scale): Grade 0: Normal motor function with full flexion/extension of elbow, wrist and fingers. Grade I: Decreased motor strength with the ability to move fingers and or wrist only. Grade II: Complete motor block with the inability to move fingers. 4) Duration of analgesia: It was measured as the time interval between onset of analgesia and time at which patient complained of pain. 5) Complications: All patients were followed up on the day of surgery and on the following day, for 48 hours to note any complications. All observations and particulars of each patient were recorded in the proforma enclosed.

### III. Results

Various surgical procedures carried out on the selected patients under brachial block and IVRA. Those were CRIF with k wire, ORIF with plating, CRIF with nailing, Implant removal, Tendon repair, External fixation, Debridement of wound, Ganglion cyst excision, Below elbow amputation, Radial head excision, Stump closure.

#### Comparison of onset of analgesia:

It was taken as the period from the time of the injection of the anaesthetic solution to the absence of pinprick sensation as experienced by the patient (in minutes). Assessment of sensory block was done at each minute after completion of drug injection.

**Table No. 1:** Comparison of onset of analgesia

	Group S	Group B
Range ( min)	8 - 14	2 – 5
Mean ± S.D. (min)	11.28 ± 1.262	3.38 ± 0.8

The mean onset of analgesia with IVRA was 3.38 minutes as compared to the brachial block where the mean was 11.28 minutes. The result shows that there is early onset of analgesia with IVRA. A P value <0.0001 and the result was found to be significant.

**Table No. 2:** Comparison of quality of analgesia

Quality of analgesia	Group S		Group B	
	No.	%	No.	%
Grade I	-	-	-	-
Grade II	31	62	8	16
Grade III	19	38	42	84
Total	50	100	50	100

The above table compares the quality of analgesia. Among patients receiving brachial block, 38% had grade III analgesia whereas with IVRA the percentage was 84%.None of the patients had grade I analgesia and hence did not need general anaesthesia to complete the surgical procedure. Fisher exact test was applied for assessment of

the quality of analgesia with the p-value of 0.0001 (  $p < 0.05$  ) which was statistically significant indicating that the quality of analgesia was superior in Group B when compared to Group S.

Table No. 3: Comparison of degree of motor block

Degree of motor block	Group S		Group B	
	No	%	No.	%
Grade 0	0	0	0	0
Grade I	31	62	20	40
Grade II	19	38	30	60
Total	50	100	50	100

The above table compares the degree of motor blockade. Among patients receiving brachial block, 38% had grade II motor block whereas with IVRA the percentage was 60% and 62% of the patients who received Brachial block had grade I motor blockade in comparison to 40% of patients who received IVRA. None of the patients had grade I motor block and hence did not need general anaesthesia to complete the surgical procedure. Fisher exact test was applied for assessment of the quality of motor blockade with the p-value of 0.0029 ( $p < 0.05$ ) which was statistically significant indicating that the quality of motor blockade was superior in Group B when compared to Group S.

**Table No. 4:** Comparison of duration of analgesia

	Group S	Group B	P value
Range (minutes)	63 – 78	35 – 56	< 0.0001
Mean ± S.D. (minutes)		73.16 ± 3.519	46.58 ± 7.251

Above table shows that longer duration of analgesia is obtained with the supraclavicular brachial block with a mean duration of 73.16 minutes compared to 46.58 minutes of Biers block. A P value <0.0001 indicates that the results are statistically significant.

**Table No. 5:** Return of pain sensation after releasing of tourniquet

Return of pain sensation after release of tourniquet in minutes	Range	Mean ± S.D.
	2-10	3.98 ± 1.835

The time of return of pain sensation was noted. It was taken as the time from the release of the tourniquet to the time when the patient complained of pain. The wearing time of anaesthesia ranged from 2 to 10 minutes.

**Complications:**

No significant complications were observed in both the groups.

**IV. Discussion**

Regional anaesthesia is becoming more popular especially with the advent of safer drugs and techniques; Patient satisfaction and growing demand for cost-effective anaesthesia and a favourable post-operative recovery profile have resulted in increased demand for regional anaesthetic techniques. Chilvers et al (1997) [3] conducted a retrospective review and observed that IVRA was 18 times cheaper than general anaesthesia for outpatient hand surgery with fewer side effects (nausea, dizziness) and faster discharge. AGE GROUP: IVRA was conducted in 50 paediatric age group patients by Edson D. Carel et al (1971) [4] and stated that IVRA is a safe, simple, inexpensive and effective anaesthetic for use in the treatment of fractures in children. In 1976 Blasier and Aarons et al [5] in 2004 successfully conducted Biers’ block in paediatric patients. In this study, only adult patients were selected because of good patient cooperation with regard to the procedure. In the present study, 100 patients who received either brachial plexus block or Intravenous regional anaesthesia were in the age group of 15 and 55 years. Weight: Most of the patients in this study weighed between 50 to 70 kg. Franco et al [6] (2006) conducted a retrospective study to determine the influence of body weight on the success rate of the supraclavicular brachial block. They observed that the overall success rate was 97.3% in Non-obese and 94.3% in obese patients. They concluded that obesity is associated with a slight decrease in success rates of a supraclavicular brachial block and an increase in its relative difficulty without apparent effect on acute complications.

**Anaesthetic Agent And Dose:** The site of action of intravenous regional anaesthesia was studied by P. Prithvi Raj et al [7] in 1972. They used various methods like a) Nerve conduction studies, b) Radio-opaque studies and c) Radioisotope studies. They did the studies on 20 healthy volunteers with a mixture of lignocaine 0.5% and Renograffin - 60 and they concluded that lignocaine acts at the main nerve trunks to produce clinical anaesthesia. Eli Brown et al [8] (1989) stated that although various local anaesthetic agents may be used to induce IVRA, no drug has been demonstrated to be superior to lignocaine. In this study, lidocaine in concentrations of 1% and 0.5% was used for supraclavicular brachial block and Biers block respectively.

**The onset of analgesia after Injection:** In this study, the onset of action of analgesia after injection of 1% lignocaine in a supraclavicular brachial block was  $11.28 \pm 1.26$  minutes whereas with 0.5% lignocaine for IVRA it was found to be  $3.38 \pm 0.8$  minutes. The observation for IVRA is comparable and similar to the studies of Bier (1908), Mittal [9] (1972) and many others. Selda et al [10] (2006) noted the mean onset of analgesia of 4 minutes in Biers block using 0.5% lidocaine.

**Quality of Analgesia:** The results in this study correlate with the results of a study by Ruby Mehta et al [11] (2003), where they noted complete analgesia in 35% of patients.

**The degree of motor blockade:** These findings are comparable to the findings of Difazio [12] et al, who found it to be around 40% in case of brachial block. Earlier studies by Cunningham and Kaplan [13] also had similar findings. The complete motor block was noted in 44 % of patients in a study by H R Gautham et al (2014). The findings in case of IVRA are comparable with the findings of Koscielniak N. and Horn A. [14] who found good motor blockade in 58% of their patients.

**Duration of analgesia:** The mean duration of analgesia with brachial block (supraclavicular approach) was found to be 73.16 min, whereas the duration of analgesia with Biers’ block depends on the time of the release of tourniquet with an average of 46.58 minutes. The above findings were similar to the findings of W.P. Gormley et al, Difazio et al [15] who stated the duration to be around 60 minutes with a brachial block when using an alkalinized lignocaine. H R Gautham et al (2014) also noted the mean duration of analgesia of 75 minutes in a supraclavicular block with 1 % plain lignocaine.

**Complications:** No significant complications were observed in both the groups. Hence this correlates with the finding of Dunlop DJ, Graham CM and Watt JM (1995) and Pearce H et al [16] (1996) who stated that complications were mild and transient with the brachial block.

**Safety and efficacy:** In 1976 Martin et al performed intravenous regional anaesthesia for closed treatment of fractures and dislocations of upper extremities in 77 patients. He concluded that the technique is very effective, consistent and safe form of analgesia which requires low dose of lidocaine and can be performed in emergency room using a regular blood pressure cuff

## V. Conclusion

After the conclusion of the present study and suggestions from previous references, IVRA using 0.5% plain lidocaine appears to be a better alternative with regards to the onset of analgesia, the quality of analgesia and degree of motor blockade than supraclavicular brachial block using 1% plain lidocaine.

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