

COMPARING THE EFFICACY OF FOREARM AND UPPER ARM TOURNIQUET WITH INTRAVENOUS REGIONAL ANESTHESIA, FOR INTRAOPERATIVE ANALGESIA AND POST OPERATIVE PAIN - A PROSPECTIVE STUDY

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Abstract

Background: To compare the efficacy of forearm and upper arm tourniquet with intravenous regional anesthesia, for intraoperative analgesia and post operative pain. **Materials and Methods:** This prospective, randomized comparative study, was done in 30 patients each in the control group (upperarm intravenous regional anesthesia) using 40ml of 0.5% lignocaine and the study group (forearm intravenous regional anesthesia) using 20ml of 0.5% lignocaine. **Result:** The mean difference of onset time for sensory block in forearm group and in upperarm group was not statistically significant. The mean difference of onset time for motor block in forearm group and in upperarm group was statistically significant. The mean VAS score during the surgery was not statistically significant but was statistically significant after cuff deflation. **Conclusion:** Intra Venous Regional Anesthesia using forearm tourniquet if better preferred over upper arm tourniquet.

INTRODUCTION

Intravenous regional anesthesia is considered as a secure and efficient method for administering anesthesia. An additional advantage of the method is bloodless field especially during forearm surgery. Conventionally, a tourniquet in the upperarm is used for such procedures. The upperarm intravenous regional anesthesia poses some disadvantages as well, that includes- a potential threat for local anesthetic toxicity, residual pain of tourniquet and lacks postoperative analgesia. The anesthetic agent may also leak past tourniquet, due to high venous pressures. The drug may also cause toxicity after tourniquet release, particularly when a higher drug dose is used.^[1,2]

A change in site of the tourniquet may have an added benefit. Using tourniquet at forearm is advantageous over upperarm site. Intravenous regional anesthesia with forearm tourniquet provides same quality of analgesia with almost half the dose of local anaesthetic agent.^[3,4] Also, forearm tourniquet is better tolerated and less painful. Additionally, the tourniquet at forearm preserves motor function of wrist and hand, and is helpful during orthopaedic procedures.

Therefore, aim of our study was to compare the efficacy of forearm and upper arm tourniquet with intravenous regional anesthesia, for intraoperative analgesia and post operative pain.^[6,7,8]

MATERIALS AND METHODS

Study Setting

This was a prospective, longitudinal, comparative, unicentric, study. The study was conducted in the department of general surgery, at Bhagwan Mahaveer Institute of Medical Sciences, Pawapuri. The study was conducted over a period of 05 months from January 2022 to May 2022. All study participants were counseled. An informed and written consent was obtained from the participating subjects before the commencement of the study.

Study Sample

The study sample consisted of randomly selected 120 subject who reported to our department for forehand surgery and matching the inclusion and exclusion criteria.

Inclusion Criteria

- Age range of 15 - 50 years

- ASA Grade I and II
- Required surgery of less than 1 hour duration.

Exclusion Criteria

- Allergy to local anesthetics,
- Systemic disease
- Less than 6 hrs NPO.

Procedure

After admission, preanesthetic evaluation was done by a trained anaesthetist. Premedication was not given to any patients. Pulse rate, Oxygen saturation and Blood Pressure were measured. A 22G cannula was positioned intravenously in the operating arm.

In the upperarm group, a double tourniquet was applied. Tourniquet pressure was raised 100mmHg above systolic. The hand was again inspected and examined for absence of the radial pulse in order to ensure circulatory isolation before the administration of local anesthetic. 0.5% Lignocaine was used in a standard volume of 40ml. To avoid systemic toxicity, the cuff was deflated at least after 20 minutes of last local anesthetic injection. The patients were monitored closely for 30 minutes after tourniquet release for the signs of systemic toxicity.

In the forearm group, a double tourniquet was placed 1cm inferior to the medial epicondyle. 0.5% Lignocaine was used in a standard volume of 20ml was administered slowly.

To avoid systemic toxicity, the cuff was deflated at least after 20 minutes of last local anesthetic

injection. The patients were monitored closely for 30 minutes after tourniquet release for the signs of systemic toxicity.

Postoperative pain was evaluated using verbal analog pain scale between '0' and '10' where '0' represents no pain and 10 represents severe pain.

Statistical Analysis

The data was tabulated in a Microsoft excel spread sheet. And the data was subjected to statistical analysis using SPSS Software.

RESULTS

The onset time for sensory block in forearm group was 2.493 ± 0.612 and in upperarm group it was 2.43 ± 0.675 . This difference in the two groups were not statistically significant. The onset time for motor block in forearm group was 5.337 ± 1.242 and in upperarm group it was 6.453 ± 1.377 . This difference in the two groups was statistically significant. [Table 1]

The mean Tourniquet time in the study group was 29.223 ± 2.097 minutes and in control group was 29.133 ± 1.944 minutes. This difference in the meantime was not statistically significant. [Table 2]. The mean VAS score during the surgery is shown in table 3. This mean difference was not statistically significant. The mean VAS difference after cuff deflation was statistically significant. [Table 3]

Table 1: Onset time

	Forearm	Upperarm	
Onset time	Mean \pm S.D.	Mean \pm S.D.	p-value
Sensory Block	2.493 ± 0.612	2.43 ± 0.675	0.6348
Motor Block	5.337 ± 1.242	6.453 ± 1.377	0.0025

Table 2: Tourniquet Time

Tourniquet Time	Forearm	Upperarm
Mean \pm S.D.	29.223 ± 2.097	29.133 ± 1.944
p-value	0.9326	

Table 3: Visual Analog Score

VAS	Forearm IVRA	Upperarm IVRA	
	Mean \pm S.D.	Mean \pm S.D.	p-value
At 10 min	0.0603 ± 0.2286	00	0.1538
At 20 min	0.2403 ± 0.5247	0.0297 ± 0.1647	0.0639
At 30 min	0.5103 ± 0.7722	0.2097 ± 0.4536	0.112

DISCUSSION

In Intravenous regional anesthesia technique the arm is occluded proximally and local anesthetic agent is administered to that particular limb, to achieve conduction blockade.^[9] This technique was first advocated by August Bier in 1908.^[10] It is safe, pleasant, and non life threatening, in done by trained personnel. This provides satisfactory access to the surgical site and without much disturbance to the innate homeostatic cascade.^[11] The intravenous regional anesthesia technique is limited to the limb

surgery of less than 1 hour duration.^[12] Threat of local anesthetic toxicity and lack of postoperative analgesia, nerve decompression are amongst the other limitations of the technique.^[13] The advantages of this technique includes- simple, speedy onset and smooth recovery, adequate muscle relaxation.^[14] The intravenous regional anesthesia technique not only increases the safety margin but also allows fifty percent lower dose of Lignocaine in compared to the traditional technique.^[15] This advancement reduces systemic toxicity and also lowers the threat in case of tourniquet failure.^[16]

The current study, attempted to do away with these disadvantages by means of forearm tourniquet.^[3] In the present study, the onset time for sensory block in forearm group was 2.493 ± 0.612 and in upperarm group it was 2.43 ± 0.675 . This difference in the two groups were not statistically significant. The onset time for motor block in forearm group was 5.337 ± 1.242 and in upperarm group it was 6.453 ± 1.377 . There was a rapid pain sensation recovery after tourniquet deflation in the upperarm group, and therefore hemostasis and wound closure becomes difficult. Therefore, a metacarpal block supplement was necessary. The forearm tourniquet offered extended sensory blockade, and therefore the supplement block was not required.^[17]

Only 02 subjects in forearm group and 01 in upper arm group reported tourniquet pain. This may be due to the prolonged duration of surgery. Analgesia in these subjects was supplemented using metacarpal block.

The present study also observed satisfactory intraoperative analgesia in both the groups. The VAS score at the end of 10, 20 and 30 minutes was comparable between the two groups. But was significant at the end of 1 hour. This was because of the prolonged post operative analgesia observed in forearm tourniquet.

CONCLUSION

Intra Venous Regional Anesthesia using forearm tourniquet offers multiple advantages like –reduced drug dose, lower systemic toxicity, higher safety margin, and prolonged analgesia.

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