

# Outcome of Brachial Plexus Blocks with Nerve Stimulator and Paraesthesia Technique.

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## ABSTRACT

**Background:** Brachial plexus block is the technique where in local anesthetic is being injected along the plexus for upper limb surgery. It is widely used and has replaced general anesthesia in day care surgery. **Methods:** A retrospective study with 124 patients who were administered brachial plexus block were reviewed in order to see its outcomes and suitability. In this study, the area of surgery, type of pathology, duration of surgery, approach of brachial plexus block, nerve block localization technique, effects of blocks and its complications if any were studied. **Results:** The youngest age group was 16 years whereas oldest was 70 years. The most common area of surgery was on forearm with 73 patients whereas least common site was on shoulder with 9 patients. The supraclavicular block was the most used approach with 76 patients, Interscalene approach in 34 patients whereas axillary approach with 14 patients. Nerve stimulation was used in 82 patients whereas paraesthesia technique was used in 42 patients. Successful block was seen in 98 patients whereas failed block in 8 patients. Only one patient had pneumothorax, beside this there was no other complications noted within this study period. **Conclusion:** Brachial plexus block if administered with an expert hand found to be always effective with less or no complications and is one of the popular peripheral nerve blocks being practised by an anesthesiologist for upper limb surgery.

**Keywords:** Brachial plexus block, general anesthesia, pneumothorax, supraclavicular block.

## INTRODUCTION

Brachial plexus block is one of the most popular blocks used for upper limb surgeries. The brachial plexus block is popular due to its rapid onset of anesthesia and a high success rate. There are various approaches which has been described for brachial plexus blocks viz. Supraclavicular, Interscalene, Infraclavicular, Axillary.<sup>[1]</sup> A thorough knowledge of brachial plexus anatomy is required to perform these blocks effectively and appropriately. Beside this the understandings regarding different approaches for brachial plexus block with its complications will definitely decreases the risk factors associated with it.

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Different methods can be used to identify the branches of the brachial plexus: loss of resistance, transarterial injection, presence of paraesthesia, neurostimulation and ultrasound.<sup>2,3</sup> The Brachial plexus is formed by the ventral rami of the fifth to eighth cervical nerves and the greater part of the

ramus of the first thoracic nerve. Also, the small contributions may be made by the fourth cervical and the second thoracic nerves. The followings are the complications of brachial plexus blocks viz. Vascular injury leading to hematoma formation, pneumothorax, phrenic nerve blockage, horner's syndrome, recurrent laryngeal nerve blockade, rare complications includes carotid artery puncture and intervertebral artery injection, subdural injection and nerve injuries.<sup>4</sup> The use of ultrasound guided in brachial plexus block is increasing but due to lack of ultrasound in operation theatre, the paraesthesia technique with or without nerve stimulator is the prefer technique in our hospital.

## MATERIALS AND METHODS

This study was conducted from August 2015 to August 2016 with duration of one year in Nobel Medical College Teaching Hospital, Biratnagar, Nepal. This was a retrospective study and was done after the approval from the Institution's Research Ethical Committee. All the data was reviewed and obtained from the hospital records, anesthesia register and anesthetic charts which include pre-anesthesia checkup charts, intra-operative charts and post operative advices charts. The approach for

brachial plexus block was chosen by the anesthesiologist posted in that operation theatre on that particular day. A well explained written consent was obtained from all patients and were kept nil orally for at least 6 hours prior to surgery. A intravenous cannula of 18G were introduced in all patients and intravenous infusion with dextrose saline were started except for diabetic patients in whom normal saline was administered.

All the patients who were planned for brachial plexus block were kept in supine position and put on standard monitors to record heart rate (HR), non invasive blood pressure (NIBP), SPO2 & ECG. Under all aseptic precautions, brachial plexus block were performed with standardized techniques either with paraesthesia or using nerve stimulator. A 23 G hypodermic needle was used for eliciting paraesthesia whereas 19G x 60 mm stimulation cannula was used as nerve locator and neuro-stimulator was done using Stimuplex Dig, B Braun, Germany. Muscle twitching and contraction of desired upper limb was obtained at an electric intensity of 0.4-0.6 mA. The local anesthetics mixture was administered, which consists of 1.5% of 15ml of lignocaine with adrenaline and 0.325% of 15ml of plain bupivacaine slowly after negative

aspiration by an assistant. A gentle massage on the area was performed for uniformity distributions of injected drugs.

After assessment of sensory and motor blockage, patients were handed for surgical procedures. In response to our study, the patient's details including age, sex, weight, ASA status along with type of surgery and area of surgery were revived. Beside this the approach for brachial plexus block, duration of surgery, paraesthesia or use of nerve stimulator, effectiveness of block (partial or complete or failed), conversion to general anesthesia using either endotracheal tubes or LMA or TIVA were obtained. Complications related to block, if any, were also obtained. All the obtained data was expressed as numbers, percentage and ranges using SPSS version 16.

## RESULTS

During our study period, 252 numbers patients were proposed for upper limb surgery. Out of these 124 patients were posted for brachial plexus block. The mean weight of the patient was 63 kg.

**Table 1: Age in years, Sex, ASA status.**

Variables		Number of Patients	Percentage (%)
Age (Years)	< 20 years	12	9.6
	20-40 years	26	20.96
	41-50 years	52	41.93
	51-70 years	34	27.41
Sex	Male	78	62.90
	Female	46	37.09
ASA Status	I	33	26.61
	II	69	55.64
	III	22	17.74

The maximum age group of the patients in our study was in between 41-50 years groups and the minimum age group was seen in less than 20 years groups. Among them the youngest age being 16 years and eldest being 70 years of age.

Regarding the area of site for surgery, 7.2% of patients had surgery on shoulder, 22.58% of patients had surgery on arm, 58.87 % of patients had surgery

on forearm and 11.29% of patients had surgery on hand. The pathology involved among these numbers of patients, 68.54% of patients had osteoarticular involvement whereas 39 % of patients had soft tissues involvement only.

In our study the mean duration of surgery was 142.04±41.02 minutes.

**Table 2: Approach of BPB, Nerve Block Localization Techniques, Outcome of Block**

Variables		Number of patients	Percentage (%)
Approach for Brachial Plexus block	Interscalene	34	27.41
	Supraclavicular	76	61.29
	Infraclavicular	00	00
	Axillary	14	11.29
Nerve block localization technique	Paresthesia	42	33.87
	Nerve stimulator	82	66.12
Outcomes of Block	Partial block	18	14.51
	Complete block	98	79.03
	Failed block	08	6.45

The patient with partial blocks or failed blocks were converted to general anesthesia with either endotracheal intubation, Laryngeal mask airway (LMA)

or total intravenous anesthesia (TIVA). Among them 30.76 % of patients were intubated with endotracheal tube, 26.92 % of patients laryngeal

mask airway (LMA) were used whereas in 42.30 % of patients total intravenous anesthesia (TIVA) was used.

Among all these patients with brachial plexus blocks, 1 patient had pneumothorax which was managed with chest tube effectively. No other complications were recorded in our study.

## DISCUSSION

Brachial plexus block have revolutionized in the field of peripheral nerve blocks and have decreased the complications of general anesthesia and in turn leads to the early ambulatory of patients.<sup>[5]</sup>

In our study the total number of patients opted for brachial plexus block accounts 49.20% which was similar to the study done by OE Etta et al<sup>[6]</sup>, Rukewe et al<sup>[7]</sup>, had brachial plexus blocks in their hospital. However, the number of patients included in their study was less as it was performed by a single anesthesiologist. In comparison, availability of more numbers of experienced anesthesiologists, the numbers of patients included in our study were more.

In our study, approach for brachial plexus block, the most commonly used block found to be a supraclavicular approach followed by interscalene and axillary block respectively. OE Etta et al<sup>[6]</sup> reported in their study where interscalene and axillary block the most commonly used in their center. Similarly Satyam N et al<sup>[5]</sup> studied on supraclavicular approach being the most commonly used in their center which was similar to our study.

Mortazavi et al<sup>[8]</sup> & Etta OE et al<sup>[6]</sup> reported in their study as paresthesia technique being high success rate whereas Rukewe et al<sup>[7]</sup> observed that the use of nerve stimulator being high success rate. In our study also, the high success rate for brachial plexus block was seen with use of nerve stimulator. The more failure rate in paresthesia group may be due to uncooperative patients or not being able to identify the paresthesia effectively.

In our study, partial block was seen in 14.51% of patients where as failed blocks in 6.48% of patients. All these patients were given general anesthesia in order to complete the surgery either by endotracheal intubation, LMA insertion or by TIVA. The less number of conversion to general anesthesia may be due to the higher use of nerve stimulator (82%) as well as experience anesthesiologists using it.

Supraclavicular block provides dense anesthesia of upper limb and was also coined as the “spinal of the arm”.<sup>[8]</sup> But paraesthesia technique with supraclavicular approach has high failure rate and high rate of complications like pneumothorax.<sup>[9]</sup> In our study we have observed higher success rate with supraclavicular approach may be due to the fact that we have used nerve-stimulation technique more than paraesthesia technique. Therefore the complications like pneumothorax found in only one patients which

was similar with the study done by Kapral et al<sup>[10]</sup> & Raghove et al.<sup>[11]</sup>

## CONCLUSION

Our retrospective study on brachial plexus block concludes that the supraclavicular approach with nerve stimulator seems to be better option in terms of lesser complications and the conversion rate. Nerve stimulator is being the helpful device in assisting the block more effectively and efficiently. The newer approach in peripheral nerve block with the use of ultrasound guided technique may be more effective but due to lack of ultrasound in our setup it could not be justified in our study.

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