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Identification of complications and side effects with axillary approach to the brachial plexus block while using lignocaine hydro chloride: A clinical study

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Abstract

The axillary approach to brachial plexus blockade provides satisfactory anaesthesia for elbow, forearm, and hand surgeries also provides reliable cutaneous anaesthesia of the inner aspect of the upper arm including the medial cutaneous nerve of arm and intercostobrachial nerve, areas often missed with other approaches. In addition, the axillary approach remains the safest of all the other approaches as it does not risk blockade of the phrenic nerve, nor does it have the potential to cause pneumothorax, making it an ideal approach for day care surgery. Historically, single-injection techniques have not provided reliable blockade in the musculocutaneous and radial nerve territories, but success rates have greatly improved with multiple-injection techniques whether using nerve stimulation or ultrasound guidance. The present study has been undertaken to evaluate the complications and side effects during axillary approach to brachial plexus. The study was conducted on 50 patients of age between 15 to 65 years of either sex (using 1.5% lignocaine hydrochloride with epinephrine. one patient developed restlessness and two cases of accidental puncture of axillary artery occurred during performance of the procedure. The procedure was repeated after applying firm pressure over the artery for 5 minutes. Quality was excellent in 48% (n=24), Good in 44% (n=22), Fair 4% (n=2) and Poor/Failure in 4% (n=2).

Keywords: Brachial plexus, axillary approach, lignocaine chloride

Introduction

Brachial plexus block is preferentially used technique for anaesthesia of upper limb due to its easy accessibility and simplicity with predictable landmarks. Axillary approach provides reliable block especially when given as multiple injections either under ultra sound guidance or nerve stimulation. Though it is a relatively safer approach compared to other approaches, this study has been undertaken to know the complications and side effects encountered during or after the block.

Materials and Methods

Study design: Observational clinical study

Place of the study

The present clinical study of "Brachial plexus block through axillary approach was carried out at Dr. VRK Women's Medical college hospital attached to Dr. VRK women's Medical College, Aziz Nagar.

Study period: The study was conducted between Feb 2019 - July 2019.

Study population

The study was conducted on 50 patients of age between 15 to 65 years of either sex (Using 1.5% lignocaine hydrochloride with epinephrine).

Inclusion criteria

- Patients of either sex aged between 15 to 65 years scheduled to undergo forearm and hand surgeries.
- Patients of ASA physical status I and II.

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Exclusion criteria

- Un co-operative patients
- Patient's refusal
- Patients who are not able to abduct the arm.
- Patients with infection and cellulitis at the site of block.
- Patients with any upper extremity neurological diseases.
- Patients with history of allergic tendency and hypersensitivity to drugs.
- Positive history or documented evidence of bleeding tendencies or patients on anticoagulants.
- Patients in whom adrenaline is contraindicated.

Investigations

The following investigations were done

- Blood: Haemoglobin %, Total Count, Differential Count, ESR, Bleeding Time, Clotting Time, Blood Urea, Serum creatinine, Blood sugar.
- Urine: Albumin, Sugar and Microscopy
- ECG and Chest X-ray P.A. view.
- HIV and HBsAg

Preliminaries included

1. Written informed consent
2. Intravenous access - with 20G/18G intravenous cannula on the contralateral upper limb under aseptic techniques.
3. Premedication: Injection diazepam 0.2 mg/kg body weight administered intravenously over 3 minutes, 10 minutes before performing the block (Maximum 10mg).

Local anaesthetic used

1.5% lignocaine hydrochloride with epinephrine.

Dose: 7 mg/kg body weight of lignocaine with epinephrine.

Equipment's**a) For the procedure**

A portable tray covered with sterile towels containing autoclaved.

1. Syringes - 20ml (2 no's), 5 ml (2 no's)
2. Hypodermic needles of 2.5 cms length 22 g - 2.
3. Bowls containing iodine and spirit.
4. Sponge holding forceps
5. Towels and towel clips.
6. Drugs: 2% lignocaine hydrochloride with adrenaline (1:200,000) and distilled water.

b) For emergency resuscitation

The anaesthesia machine, emergency oxygen source ('E' type cylinder), pipeline O₂ supply, working laryngoscopes, appropriate size endotracheal tubes and connectors.

- Working suction apparatus with suction catheter
- Airways (Oropharyngeal)
- Intravenous fluids.

Drugs: Thiopentone, diazepam, Succinylcholine, hydrocortisone, atropine, adrenaline, ketamine, aminophylline, mephenteramine, calcium glucometer and sodium bicarbonate.

Monitors: Pulse oximetry, Non-invasive blood pressure monitor on the opposite upper limb, visceral monitoring of respiratory rate.

Table 1: Types of surgery

Diagnosis	Type of surgery	Male		Female		Total
		Elect.	Emerg	Elect.	Emerg	
Fracture Right radius	ORIF+DCP/Sq. nail	7	-	3	-	10
Fracture Left radius	ORIF+DCP/Sq. nail	2	-	1	-	3
Fracture Left ulna	ORIF+DCP	1	-	-	-	1
Fracture Both bones Right forearm	ORIF+DCP/Sq. nail	7	-	3	-	10
Fracture Both bones Left forearm	ORIF+DCP/Sq. nail	9	-	1	-	10
Malunion Colle's Fracture Right	Corrective osteotomy/Darren's procedure	2	-	-	-	2
Smith's Fracture Rightradius	ORIF + butter's plate	1	-	-	-	1
Extensor tendon injury	Tendon repair	-	3	-	-	3
Tenosynovitis	Soft tissue release	-	-	1	-	1
Osteomyelitis Right radius	Curettage & cauterization	1	-	1	-	2
Osteomyelitis Left radius	Curettage & cauterization	1	-	-	-	1
Old Rightradius with implant insitu	Implant removal	1	-	-	-	1
Crush injury Right hand	Wound debridement	-	1	-	-	1
Crush injury Left index finger	Disarticulation	-	-	-	1	1
Crush injury Right middle finger	Disarticulation	-	-	-	1	1
Compartment syndrome	Fasciotomy	-	2	-	-	2
Total						50

ORIF: Open reduction internal fixation, DCP: Dynamic compression plate

Table 2: Side effects / complications

Type	Numbers
Tremor	-
Numbness of tongue	-
Tinnitus	-
Convulsions	-
Haematoma	-
Vessel puncture	2
Infection	-
Nerve injury	-
Ischaemic injury	-

Miscellaneous Unanaesthetised dermatome	1
Restlessness	1
Total	4 (8)

In the present study of 50 cases of brachial plexus block of axillary approach one patient developed restlessness which was overcome by additional smaller dose (1/4th of initial doses IV) of Diazepam.

Two cases of accidental puncture of axillary artery occurred during performance of the procedure. The procedure was

repeated after applying firm pressure over the artery for 5 minutes.

Musculocutaneous nerve escaped blockade in one patient which however did not require any intervention as it did not involve the site of surgery.

Table 3: Assessment of efficacy of block

Quality of block	Number of cases (Percentages in brackets)
Excellent	24 (48)
Good	22 (44)
Fair	02 (04)
Poor/Failure	2 (4)
Total	50 (100)

Individual cases were assessed for quality of block as described under 'Techniques and Efficacy Assessment'. Quality was excellent in 48% (n=24), Good in 44% (n=22), Fair 4% (n=2), Poor/Failure in 4% (n=2).

However, the Excellent/Good/Fair blockade groups are mentioned in the table no 4 were considered as being

'Successful' (48 out of 50 cases) as procedures/Surgeries could be completed with supplementation. While 2 cases were considered to be 'Poor block/Failure' requiring general anaesthesia for completion of the procedure as shown in table 4.

Table 4: Success rate of blockade

1	Total numbers of 'successful' blockade	Number (%)
	Without Supplementation (Excellent/Good Block)	46 (92%)
	With supplementation (Fair block)	2 (4%)
2	Numbers of failures (Poor block/Failures) Administered general anaesthesia.	2 (4%)

Discussion

Brachial plexus block is close to the ideal anaesthetic technique for upper limb surgeries for the patients, anaesthesiologists and surgeons. The axillary approach to the brachial plexus block is popular as it is easy to perform and relatively safe.

Success rate

In the study of 50 cases conducted by axillary brachial plexus block, including both elective and emergency, 24 (48%) cases were categorised as excellent, 22 (44%) cases as good blocks and 2(4%) cases were considered as 'fair' which required supplemental analgesia and 2(4%) cases were categorised as poor blocks/failures. Cases in the first three groups were considered as 'successful' and the last group as 'failures'. Thus, total number of cases considered as successful were 48 (96%) and 2(4%) cases were failures.

	Success rate
Ang ET, <i>et al.</i>	98%
Dunlop DJ, <i>et al.</i>	98.8%
Pearce H., <i>et al.</i> ,	92.5%
Present study	96%

Ang ET, *et al.* reported success rate of 98%, Dunlop DJ, *et al.* 98.8% and Pearce H, *et al.* 92.5% success rate [1-3]. The present study shows a success rate of 96%.

Incidence of side effects / complications

In the present study of 50 cases of axillary brachial plexus block there were no major complications perioperatively

and postoperatively. Vessel puncture occurred in two cases, one patient had an unanaesthetised dermatome and one patient developed restlessness.

Michel J. Cousins (1980) says there are no complications or contraindications specific to axillary approach of brachial plexus block [4].

Plevak DJ, *et al.* (1983) examined the results of 716 axillary blocks, where 40-60 ml of local anaesthetic was used. The complications noted were seizures, persistent paraesthesia (Lasting for 48 hours) and haematoma. The paraesthesia technique showed a clear tendency towards more neurologic sequelae [5].

Zipkin M., *et al.* (1991) reported that complications associated with axillary brachial plexus block are related to local or systemic anaesthetic toxicity, bleeding, infection and nerve damage. A case of false aneurysm of the axillary artery was reported [6].

Sehneider H. and Paul A. (1992) reported a case of transient total motor aphasia in a 50-year-old patient after axillary blockade of the brachial plexus [7].

Stan TC, *et al.* (1995) reported that out of 1000 consecutive axillary brachial plexus block two patients presented with a sensory paraesthesia (0.2%) in the distribution of the ulnar nerve and the musculocutaneous nerve that most likely occurred during supplementation of an incomplete block [8]. Three patients presented with upper arm myalgias (0.3%) related to tourniquet injury. Vascular complications, including transient arterial spasm in 10 cases (1%) unintentional intravascular injection in 2 cases (0.2%) and small (0-2 cm) hematoma formation in 2 cases (0.2%) were recognized but did not require any intervention other than

close observation.

Pearce H, Lindsay D, and Leslie K, (1996) reported that complications were common, but generally mild and transient; mild acute local anaesthetic toxicity, 3.5%; axillary tenderness and bruising, 12% and dysesthesias 12.5% [3].

In our study there was no incidence of neurological sequelae postoperatively. This could be due to the technique not using the elicitation of paraesthesia.

Conclusion

Axillary brachial plexus block is a safe and effective regional anaesthetic technique suitable for a wide variety of procedures, for both inpatient and outpatient care. Ultrasound Guidance has allowed improved efficacy with smaller volumes of local anaesthetic. Direct visualisation of block performance and local anaesthetic injection, though inherently safer, does not completely eliminate the risk of intravascular and intramural injection, and care should be continually exercised using standard safety precautions of slow, careful, fractionated injections to prevent and minimise the risks associated with the technique.

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Conflict of interest

There is no conflict of interest

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