ULTRASOUND GUIDED AXILLARY BRACHIAL PLEXUS BLOCK IN PEDIATRIC PATIENTS (8-17 YEARS OLD) IN A SPECIALIZED TERTIARY ORTHOPEDIC HOSPITAL

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ABSTRACT

Brachial Plexus Block is the widely performed upper limb block. Axillary brachial plexus block provides reliable anesthesia and analgesia to the arm distal to the shoulder. The safety and effectiveness of axillary brachial plexus block in pediatric patients aged 8-17 years for the months of June to October 2022 were investigated. The study included a total of 45 patients with an average age of 13.76 years, predominantly male (73.33%) with the majority classified as ASA I (88.89%). The most common surgical procedures performed were ORIF plating of the radial ulna (RU) shaft on the left (15.56%) and right (15.56%) sides, followed by ORIF plating of RU on the left (8.89%). Average onset of the block was 26.44 minutes, with a mean duration of motor block lasting 15.87 hours and sensory block lasting 19.91 hours. Only 17.78% of the participants required rescue medications for post-operative pain management, while the majority (82.22%) did not. Vital signs remained stable. Hence, axillary brachial plexus block is a safe and effective anesthesia technique for pediatric patients undergoing upper extremity surgeries, as it evident with reliable pain control and recorded vital signs throughout the perioperative period.

KEYWORDS

Bupicavaine isobaric; Axillary Brachial Plexus Block; Upper Extremity; Local Anesthetic; Elective

BACKGROUND

Peripheral nerve blocks have seen a big resurgence of interest in the field of anesthesiology since the introduction of ultrasound. Brachial plexus block is the widely performed peripheral nerve block for upper limb surgeries. It is preferred over general anesthesia for upper limb surgery because of better and longer post-operative analgesia, fewer side effects (e.g., nausea and vomiting) and earlier hospital discharge. It also reduces the use of opioids for post-operative analgesia and provides protection from their side effects (1).

There are various methods on how to perform axillary brachial plexus block (ABPB) (paresthesia seeking, nerve stimulating, perivascular, trans-arterial and ultrasound guided). Ultrasound guidance for brachial plexus block has reduced the fail and complications like pneumothorax, intravascular injections, and nerve damage (2). This study focuses on the ultrasound guided ABPB.

Pediatric patients have anatomical and physiological features different from adults. Landmark technique is not reliable in pediatric patients due to the variability in the age and size. There is also a tighter area around nerves and plexuses in the pediatric group compared to adults (3). With the advancement in sonographic technology, the success rate of blocks has increased, and the recommended dosage is less than the other traditional methods for pediatric regional blocks for upper extremities.

This study aims to present the safety and efficacy of ultrasound guided axillary brachial plexus block in pediatric patients by examining the data gathered at a specialized tertiary orthopedic hospital from June – October 2022 period.

METHODOLOGY

This is a retrospective descriptive study which reviews the peripheral nerve block forms and anesthesia record of pediatric patients who underwent ultrasound guided axillary brachial plexus block.

STUDY POPULATION

The target population of the study includes all in-patient pediatric patients aged 8-17 years old who underwent elective upper extremity surgeries under ultrasound guided axillary brachial plexus block from June to October 2022

Oral E-Poster Presentation
41st ESRA Annual Congress, European Society of Regional Anesthesia, Prague, Czech Republic
September 4-7, 2024

Podium Presentation
2023 Inter Departmental Research Contest, Philippine Orthopedic Center, December 12, 2023

Date of Completion: September 13, 2023

INCLUSION CRITERIA

Filipino male and female, aged 8-17 years old, ASA 1-3, in-patient, who underwent elective upper extremity surgeries under ultrasound and nerve stimulator guidance for axillary brachial plexus block using isobaric bupivacaine with or without lidocaine and adjuncts.

EXCLUSION CRITERIA

Exclusion criteria include pediatric patients who are not able follow simple instructions, allergic to local anesthesia, out-patients and those who are under combined general and regional anesthesia. Also, records with incomplete data were excluded in this study. Patients were also excluded from this study if they did not consent for the proposed anesthesia technique.

STUDY TREATMENTS

Regional anesthesia census from June 2022 – October 2022 will be used to gather the population of patients who underwent upper extremity surgery using bupivacaine with or without lidocaine and adjuncts as local anesthetic with nerve stimulator and ultrasound guidance for axillary brachial plexus block

STUDY PROCEDURE

This is a retrospective descriptive study conducted at a specialized tertiary orthopedic hospital from June to October 2022.

The following demographics are obtained from the records of eligible patients: age, gender, ASA classification, surgical indication and procedure, baseline sensory and motor function of upper extremity, postoperative assessment of block and pain as needed medications used and duration of block.

All pediatric patients who are eligible for the study consented for the proposed anesthesia technique before the day of the surgery. The anesthesiologist made sure that anesthesia techniques were explained well to the patient and relatives and understood by the patient.

This peripheral nerve block (PNB) form includes the identity and demographic information of the patient, proposed surgery and anesthesia technique, local anesthetic and dosage, evaluation of block success and failure of the procedure. This also includes medical history of the patient and anesthesia related history and physical examinations relevant to the procedure. Follow up were done within the 24-hour post-operative period to assess the block of duration, post-operative pain score and the need for rescue pain medications.

RESULTS

The patients sampled have an average age of 13.76 years (± 2.56). The majority of the participants were male (33 or 73.33%) while the remaining (12 or 26.67%) were female. The participants have an average weight of 47.29 kg (± 11.66). More so, 40 (88.89%) of them were classified under ASA I, while the remaining 5 (11.11%) were classified under ASA II.

For the elective procedures, ORIF plating RU shaft L (7 or 15.56%) and ORIF plating RU R (7 or 15.56%) were the most commonly provided among the sampled patients. This was followed by ORIF plating RU L, given to 4 or 8.89% of the patients.

The average onset (in minutes) was 26.44 (± 9.21). Meanwhile, the average duration of motor block (in hours) was 15.87 (± 4.84). On the other hand, the average duration of sensory block (in hours) was 19.91 (± 5.17).

Among the total number of participants who underwent elective case for upper extremity surgery under ultrasound guided axillary brachial plexus block, only 8 (17.78%) were given rescue medication, while the remaining majority (37 or 82.22%) did not require it.

Pre-operative recording of vital signs shows that the average blood pressure of the participants was approximately 120/80. Their heart rate was at an average of approximately 89 beats per minute (±14.52). The respiratory rate of the participants was at 19 breaths per minute, and their oxygen level was at 99%. Likewise, intraoperatively, results show that the average blood pressure of the participants was approximately 118/74mmHg. Their heart rate was at an average of approximately 84 beats per minute (±19.07). The respiratory rate of the participants was at 20 breaths per minute, and their oxygen level was at 99%. For post-operative recording of vital signs, results show that the average blood pressure of the participants was approximately 117/74 mmHg. Their heart rate was at an average of approximately 88 beats per minute (±10.52). The respiratory rate of the participants was at 20 breaths per minute, and their oxygen level was at 99%.

In terms of the type, duration and volume of anesthetic agent used, the results show that the longest average block onset was observed with the patient that was given 0.25% Bupivacaine Isobaric + Dexametasone 4mg (15ml), as it had a mean rank of 45.00. On the other hand, the shortest average block onset was observed among those who were given 0.3% Bupivacaine Isobaric + 0.2% Lidocaine + Dexametasone 4mg (25ml) which had a mean rank of 5.00, as well as those administered with 0.3% Bupivacaine Isobaric (25ml) who also had a mean rank of 5.00.

More so, the results show that in terms of the duration of motor block, the longest duration was observed among those who were given 0.5% Bupivacaine Isobaric 100mg + Dexametasone 4mg (20ml) and 0.3% Bupivacaine Isobaric + 0.2% Lidocaine (15ml), as they both had a mean rank of 43.50. Meanwhile, the shortest duration of motor block was seen among those who were administered with 0.25% Bupivacaine Isobaric + Dexametasone 4mg (15ml), as the duration of motor block only had a mean rank of 2.00.

In addition, in terms of the duration of sensory block, the longest duration was recorded among those who were administered with 0.5% Bupivacaine Isobaric 100mg + Dexametasone 4mg (20ml), as it had a mean rank of 45.00, while the shortest duration of sensory block was recorded among those who were given 0.25% Bupivacaine Isobaric + Dexametasone 4mg (15ml) which only had a mean rank of 1.00.

A Kruskal-Wallis H test was used to determine if there is a significant difference among the onset of blocks and duration of motor and sensory blocks across all the patients admitted in this study when compared according to the type, concentration, and volume of local anesthetic used for them. The results show that there is no significant difference in their block's onset, $X^2(19) = 13.53$, $p = .810$. This means that regardless of the type, concentration, and volume of local anesthetic used among the patients, the onsets of their blocks do not statistically significantly vary with each other. The results also show that there is no significant difference in the patients' duration of motor block, $X2(19) = 23.08$, $p = .234$, as well as duration of sensory block, $X2(19) = 24.57$, $p = .175$. These results mean that regardless of the type, concentration, and volume of local anesthetic used among the patients, the duration of motor and sensory blocks does not significantly differ with each other.

DISCUSSION

In ultrasound-guided axillary brachial plexus block, both sensory and motor blocks are integral components of the regional anesthesia technique (14). Both motor and sensory components must be determined to provide the definite onset of the local anesthesia employed in the ABPB. Based on the result of the study, the onset of the block was determined in minutes and the average is 26.44 minutes.

On the other hand, duration of the effect of local anesthesia employed was also determined using the same components (motor and sensory). Sensory blocks, which result in the temporary loss of sensation in the targeted area, typically last several hours to provide pain relief during and after the intervention (5). Similarly, motor blocks, while not the primary objective, often accompany sensory blocks as a result of local anesthetic diffusion to motor nerves. These motor blocks are generally partial and temporary, with the degree of muscle weakness ranging from mild to moderate (17). In terms of the study results, the average duration of motor block used (in hours) was 15.87. And, the average duration of sensory block used (in hours) was 19.91. The gradual return of sensation as the effects of the local anesthetic wears off adds to their safety profile. Importantly, they are also considered safe because they are reversible, allowing patients to regain motor function as the anesthetic effects dissipate (1).

In terms of post-operative pain control, among the participants who underwent elective upper extremity surgery with ultrasound-guided axillary brachial plexus block, a relatively small fraction (8 out of 45) needed rescue medication post-surgery. In contrast, the significant majority of participants did not require rescue medication (37 out of 45), suggesting that this anesthesia technique was effective in providing adequate pain control for the majority of patients, thus obviating the need for additional medications. Similarly, a study by Becker & Reed (2012) demonstrated that this technique was associated with reduced opioid consumption and decreased post-operative pain scores among patients undergoing upper extremity surgeries. Furthermore, a study by Garimella & Cellini (6) emphasized that patients undergoing less invasive or minor upper limb surgeries may experience minimal post-operative discomfort, reducing the necessity for additional medication.

The vital signs before, during, and after the elective upper extremity surgeries were determined. It is evident that there is minimal to no deviation from the baseline (preoperative). Consistent vital signs before, during, and after surgery indicate that the patient's fundamental physiological parameters remain stable. Consistent vital signs are crucial in providing assurance to anesthesiologists that the patient's physiological state is maintained to promote a safe and successful surgical outcome. Any significant deviations from baseline vital signs prompts the attention of the anesthesiologist for possible occurrence of toxicities from local anesthetics.

CONCLUSIONS

The safety and effectiveness of axillary brachial plexus block in pediatric patients aged 8-17 years were investigated in this study.

The study found that axillary brachial plexus block had a relatively rapid onset (mean of 26.44 minutes) and provided adequate duration of motor and sensory block, supporting its effectiveness in achieving anesthesia and post-operative pain control.

It is noteworthy that only a small proportion (17.78%) of the participants required rescue medication for pain management post-surgery. This suggests that axillary brachial plexus block was effective in providing pain relief, reducing the need for additional analgesic medications, which is beneficial in minimizing potential side effects and improving patient comfort.

Throughout the perioperative period, the pediatric patients maintained stable vital signs. This supports the idea that peripheral nerve blocks (e.g. axillary brachial plexus block) are generally safe for patients undergoing upper extremity surgeries.

Overall, axillary brachial plexus block is a safe and effective anesthesia technique for pediatric patients undergoing upper extremity surgeries, as it evident with reliable pain control and recorded vital signs throughout the perioperative period.

AUTHORS' CONTRIBUTION

Kelvin Opiña: Data Curation, Writing -Original draft preparation, Investigation, Formal Analysis. Erwin Rodenas: Writing- Review and Editing, Visualization, Investigation. Maria Vinluan: Conceptualization, Methodology. Supervision. Marco Dimaano: Writing-Review and Editing.

ACKNOWLEDGEMENTS

None

REFERENCES

(1) Becker DE, Reed KL. Local anesthetics: review of pharmacological considerations. Anesth Prog. 2012 Summer;59(2):90-101; quiz 102-3. doi: 10.2344/0003-3006-59.2.90. PMID: 22822998; PMCID: PMC3403589.

(2) Branch NSC and O. NIAMS health information on sports injuries. National Institute of Arthritis and Musculoskeletal and Skin Diseases. Published July 27, 2023. https://www.niams.nih.gov/health-topics/sports-injuries

(3) Doermann A, Gupta DK, Wright DJ, Shafiq B, Hacquebord J, Rafijah G, Lim PK, Gupta R. Distal Radius Fracture Management: Surgeon Factors Markedly Influence Decision Making. J Am Acad Orthop Surg Glob Res Rev. 2023 Mar 2;7(3):e23.00002. doi: 10.5435/JAAOSGlobal-D-23-00002. PMID: 36867522; PMCID: PMC9984156.

(4) Donnell and O'Scanaill: Ultrasound-guided axillary brachial plexus block. Cambridge University Press 2015. Chapter 7 Section 2

(5) Doroshenko M, Turkot O, Horn DB. Sympathetic Nerve Block. [Updated 2022 Nov 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557637/

(6) Garimella V, Cellini C. Postoperative pain control. Clin Colon Rectal Surg. 2013 Sep;26(3):191-6. doi: 10.1055/s-0033-1351138. PMID: 24436674; PMCID: PMC3747287.

(7) Guay J, Suresh S, Kopp S. The use of ultrasound guidance for perioperative neuraxial and peripheral nerve blocks in children. Cochrane Database Syst Rev. 2019 Feb 27;2(2):CD011436. doi: 10.1002/14651858.CD011436.pub3. PMID: 30820938; PMCID: PMC6395955.

(8) Hanschen M, Pesch S, Huber-Wagner S, Biberthaler P. Management of acetabular fractures in the geriatric patient. SICOT J. 2017;3:37. doi: 10.1051/sicotj/2017026. Epub 2017 May 25. PMID: 28534471; PMCID: PMC5441132.

(9) Hussain et.al: Ultrasound-guided brachial plexus blocks in pediatric anesthesia: non-systematic review. 2nd International Scientific Conference of Al-Ayen University, 2020

(10) Kim T, See CW, Li X, Zhu D. Orthopedic implants and devices for bone fractures and defects: Past, present and perspective. Engineered Regeneration. 2020;1:6-18. doi:10.1016/j.engreg.2020.05.003

(11) Lewis SR, Price A, Walker KJ, McGrattan K, Smith AF. Ultrasound guidance for upper and lower limb blocks. Cochrane Database Syst Rev. 2015 Sep 11;2015(9):CD006459. doi: 10.1002/14651858.CD006459.pub3. PMID: 26361135; PMCID: PMC6465072.

(12) Mathews AL, Chung KC. Management of complications of distal radius fractures. Hand Clin. 2015 May;31(2):205-15. doi: 10.1016/j.hcl.2014.12.002. Epub 2015 Feb 28. PMID: 25934197; PMCID: PMC4417479.

(13) Merella and Mossetti: Ultrasound-guided upper and lower extremity nerve blocks in children: Birmingham Children's Hospital, Birmingham UK, BJA Education. 2020

(14) Nowakowski P, Bieryło A. Ultrasound guided axillary brachial plexus plexus block. Part 1--basic sonoanatomy. Anaesthesiol Intensive Ther. 2015;47(4):409-16. doi: 10.5603/AIT.2015.0052. PMID: 26401746.

(15) Obert L, Rey P b., Uhring J, et al. Fixation of distal radius fractures in adults: A review. Orthopaedics & Traumatology: Surgery & Research. 2013;99(2):216-234. doi:10.1016/j.otsr.2012.03.023

(16) Small RF, Taqi M, Yaish AM. Radius and Ulnar Shaft Fractures. [Updated 2022 Dec 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557681/

(17) Valentine BA. Skeletal Muscle. Pathologic Basis of Veterinary Disease. 2017:908–953.e1. doi: 10.1016/B978-0-323-35775-3.00015-1. Epub 2017 Feb 17. PMCID: PMC7158298.

(18) Zadrazil, Opfermann, and Marhofer: Brachial plexus block with ultrasound guidance for upper-limb trauma surgery in children: a retrospective cohort study of 565 cases: British Journal of Anesthesia, Regional Anesthesia, April 24, 2020

FIGURE AND TABLES

Figure 1. Flow Chart

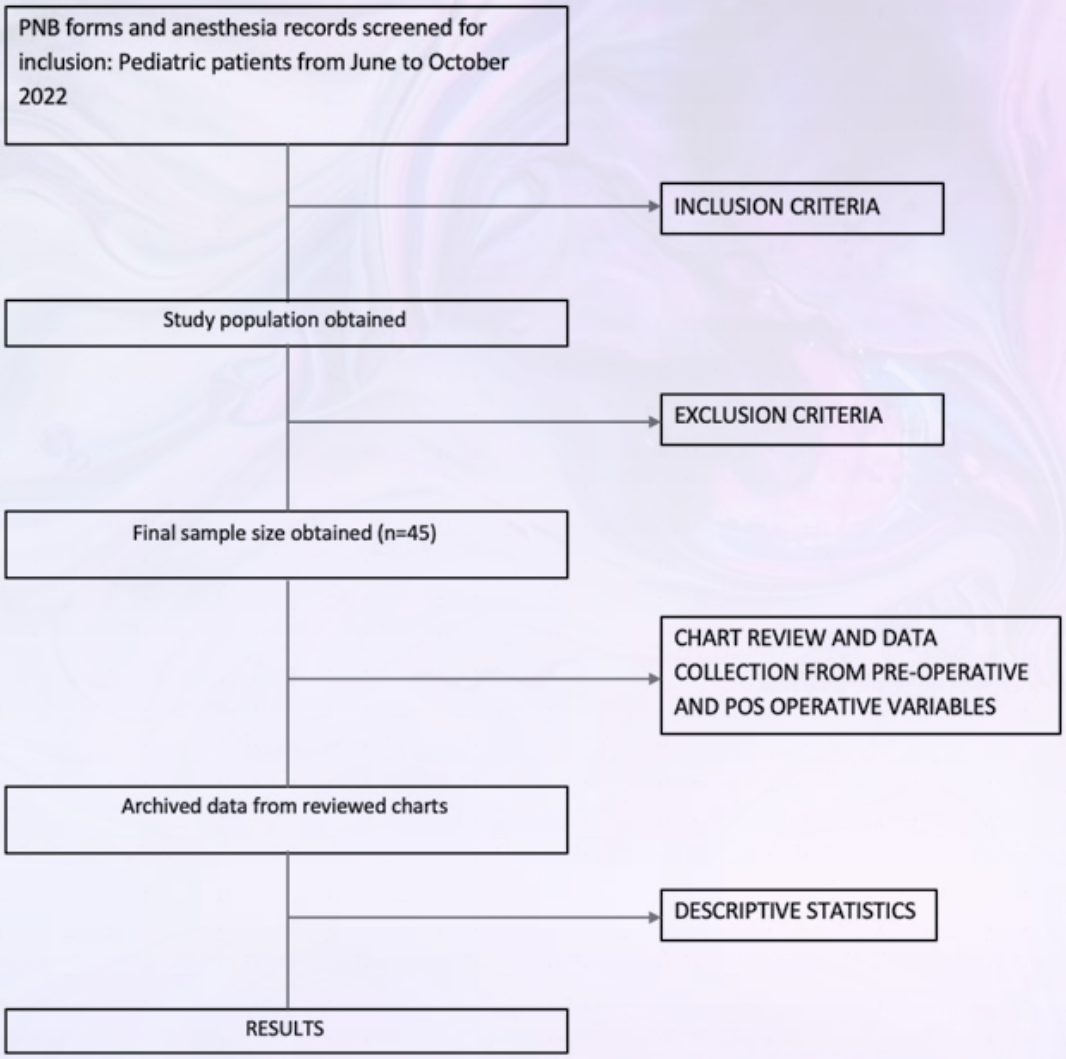

Figure 2.1 Peripheral nerve block (PNB) from (front)

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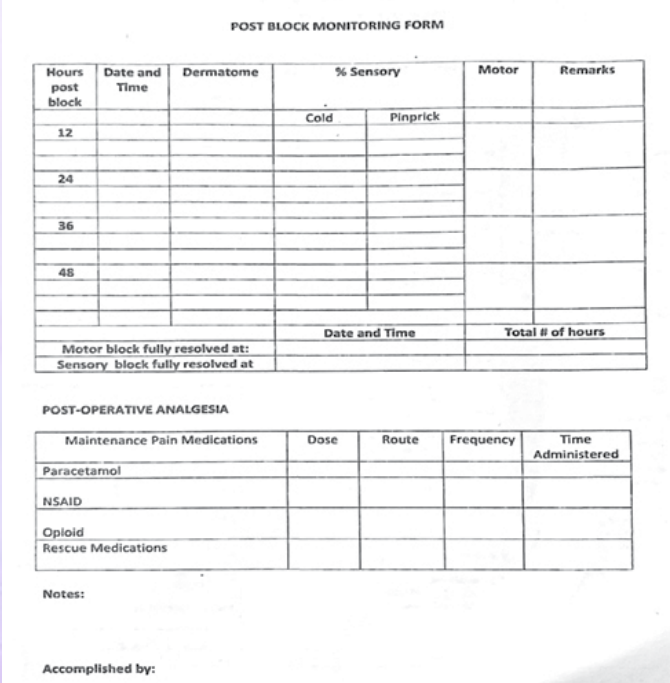
PERIPHERAL NERVE BLOCK FORM

Figure 2.2 Peripheral nerve block (PNB) from (back)



POST BLOCK MONITORING FORM

Hours post block	Date and Time	Dermatome	% Sensory		Motor	Remarks
			Cold	Pinprick		
12						
24						
36						
48						
			Date and Time		Total # of hours	
Motor block fully resolved at:						
Sensory block fully resolved at						

POST-OPERATIVE ANALGESIA

Maintenance Pain Medications	Dose	Route	Frequency	Time Administered
Paracetamol				
NSAID				
Opioid				
Rescue Medications				

Notes:

Accomplished by:

Table 1. Patient demographics

CHARACTERISTICS	VALUES
Age, Mean ± SD	13.76 ± 2.56
Sex	
Male	33 (73.33)
Female	12 (26.67)
Weight, Mean ± SD	47.29 ± 11.66
ASA	
I	40 (88.89)
II	5 (11.11)

Table 2. Specific procedures within upper extremity surgery given to patients

PROCEDURES	PROPORTION
ROI RU shaft R	1 (2.22)
Open osteoclasis, plating radius, pinning ulna R	1 (2.22)
ORIF plating radial head L (wrist)	2 (4.44)
ORIF plating radius R	1 (2.22)
Open Osteoclasis ORIF plating Ulna R	1 (2.22)
Wide resection + RFS +osteotomy + plating distal radius L	1 (2.22)
ORIF plating RU shaft L	7 (15.56)
ORIF plating RU R	7 (15.56)
ORIF plating RU L	1 (2.22)
Osteoclasis + ORIF plating RU L	1 (2.22)
ROI radius L	1 (2.22)
Corrective osteotomy + ORIF plating RU L	1 (2.22)
ORIF plating RU L	4 (8.89)
ORIF plating distal radius R	3 (6.67)
ORIF plating RU shaft R	1 (2.22)
ROI RU L	1 (2.22)
ORIF plating and screw RU R	1 (2.22)
ORIF plating distal humerus L	1 (2.22)
OR pinning RU L	1 (2.22)
OR pinning supracondylar humerus L	1 (2.22)
OR + corrective osteotomy IF and MF head R	1 (2.22)
ROI olecranon L	1 (2.22)
Contracture release IF R	1 (2.22)
ORIF plating distal humerus L	1 (2.22)
OR pinning radial neck (wrist) L	1 (2.22)
ORIF plating radius L	2 (4.44)

ORIF: Open Reduction Internal Fixaation; RU: Radius and Ulna; R: Right; L: Left; RFS: Rapid Frozen Section; ROI: Removal of Implant; OR: Open Reduction

Table 3. Onset and duration of blocks

VARIABLES	VALUES
Onset (minutes), Mean ± SD	26.44 ± 9.21
Duration of block (in hours; motor), Mean ± SD	15.87 ± 4.84
Duration of block (in hours; sensory), Mean ± SD	19.91 ± 5.17

Table 4. Rescue medication given

RESCUE MEDICATION	PROPORTION
Given	8 (17.78)
Not Given	37 (82.22)

Table 5. Preoperative variables

PRE-OPERATIVE VARIABLES	VALUES
Systolic BP, Mean ± SD	119.67 ± 9.07
Diastolic BP, Mean ± SD	76.33 ± 7.86
Heart rate, Mean ± SD	88.64 ± 14.52
Respiratory rate, Mean ± SD	19.22 ± 1.58
Oxygen level (%), Mean ± SD	99.27 ± 0.58

BP: Blood Pressure

Table 6. Intra-operative variables

INTRA-OPERATIVE VARIABLES	VALUES
Systolic BP, Mean ± SD	118.00 ± 9.19
Diastolic BP, Mean ± SD	74.00 ± 7.80
Heart rate, Mean ± SD	84.31 ± 19.07
Respiratory rate, Mean ± SD	20.20 ± 2.03
Oxygen level (%), Mean ± SD	99.27 ± 0.50

BP: Blood Pressure

Table 7. Post-operative variables

POST-OPERATIVE VARIABLES	VALUES
Systolic BP, Mean ± SD	117.11 ± 6.26
Diastolic BP, Mean ± SD	74.00 ± 5.80
Heart rate, Mean ± SD	87.62 ± 10.52
Respiratory rate, Mean ± SD	20.04 ± 1.38
Oxygen level (%), Mean ± SD	98.80 ± 0.40

BP: Blood Pressure

Table 8. Mean ranks of the block onsets and duration of motor and sensory blocks of the patients when grouped according to the local anesthetic administered

Local Anesthetic	N	Mean Rank (Block Onset)	Mean Rank (Duration of Motor Block)	Mean Rank (Duration of Sensory Block)
0.3% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (20ml)	3	19.00	12.33	11.00
0.3% Bupivacaine Isobaric + Dexamethasone 4mg (20ml)	8	20.25	26.88	22.94
0.25% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (20ml)	10	24.25	26.25	28.40
0.25% Bupivacaine Isobaric + Dexamethasone 4mg (20ml)	1	15.00	15.50	41.00
0.25% Bupivacaine Isobaric + Dexamethasone 4mg (25ml)	2	25.75	3.50	3.25
0.25% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (15ml)	3	33.33	18.67	15.00
0.25% Bupivacaine Isobaric + Dexamethasone 4mg (18ml)	2	17.25	23.25	18.75
0.3% Bupivacaine Isobaric + Dexamethasone 4mg (25ml)	3	22.17	19.17	19.50
0.3% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (25ml)	1	5.00	35.50	33.50
0.5% Bupivacaine Isobaric 100mg +Dexamethasone 4mg (30ml)	1	22.00	24.00	18.50
0.3% Bupivacaine Isobaric + Dexamethasone 4mg (30ml)	1	29.50	29.50	33.50
0.25% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (30ml)	1	10.50	11.00	33.50
0.3% Bupivacaine Isobaric (25ml)	1	5.00	32.50	33.50
0.3% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (30ml)	2	29.50	32.00	32.75
0.5% Bupivacaine Isobaric 100mg +Dexamethasone 4mg (20ml	1	22.00	43.50	45.00
0.3% Bupivacaine Isobaric + 0.2% Lidocaine + Dexamethasone 4mg (15ml)	1	15.00	11.00	10.00
0.3% Bupivacaine Isobaric + 0.2% Lidocaine (15ml)	1	29.50	43.50	33.50
0.25% Bupivacaine Isobaric + 0.2% Lidocaine (20ml)	1	29.50	35.50	28.50
0.5% Bupivacaine Isobaric (20ml)	1	34.00	6.00	10.00
0.25% Bupivacaine Isobaric + Dexamethasone 4mg (15ml)	1	45.00	2.00	1.00

Table 9. Comparison of block onset and duration of motor and sensory blocks based on the type, concentration, and volume of local anesthetic used

OUTCOME	GROUP	X^2	*df*	*p* value
Onset of Blocks	Local Anesthetic	13.53	19	.810
Duration of Motor Blocks	Local Anesthetic	23.08	19	.234
Duration of Sensory Blocks	98.80 ± 0.40	24.57	19	.175