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PERINEURAL DEXAMETHASONE VS INTRAVENOUS DEXAMETHASONE: SUPRACLAVICULAR BRACHIAL PLEXUS BLOCKS (BPB) IN UPPER LIMB SURGERIES

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ABSTRACT

Background: The supraclavicular brachial plexus block (BPB) is a reliable method for upper limb surgeries below the shoulder, especially in patients with cardiorespiratory issues. Ultrasound guidance enhances safety and accuracy, and local anaesthetics provide effective but temporary analgesia. Pain relief is extended by adjuvants like dexamethasone, but intravenous (IV) dexamethasone is being researched as a potentially safer, off-label alternative with potential systemic anti-inflammatory benefits.

Objective: To compare perineural dexamethasone with intravenous dexamethasone in treating postoperative pain in those patients who were having elective surgery of the upper limbs with supraclavicular brachial plexus block

Study design: A comparative study

Duration and place of study: This study was conducted from November 2023 to November 2024 at Rahim Yar Khan Medical College / Hospital Rahim Yar Khan Pakistan.

Methodology: This research involved 60 patients between the age of 18 and 60 years who were all ASA physical status I or II and had elective upper limb cancer surgery with supraclavicular brachial plexus block (BPB). The subjects were divided into two groups: Group A had perineural

dexamethasone with bupivacaine, while Group B had intravenous dexamethasone with perineural saline and bupivacaine.

Results: There were a total of 60 patients elected for this study according to the inclusion criteria. All the participants were divided into 2 groups, each having 30 individuals. The mean age in the perineural group was 52.5 yrs while it was 51.3 in the systemic group. Table number 1 shows the demographics and their distribution in both the groups. The time to onset of both sensory and motor block was much higher in the systemic compared with the perineural group. In the perineural group, six patients needed one dose of morphine, while four needed a second dose. In the systemic group, 18 patients needed one dose of morphine, of whom 10 needed a second dose.

Conclusion: In ultrasound-guided supraclavicular BPB, perineural dexamethasone offers longer motor block, sensory block, and postoperative analgesia than intravenous dexamethasone.

INTRODUCTION

The brachial plexus block (BPB) is one of the most common techniques employed for the administration of analgesia and perioperative anaesthesia in surgery of the upper limb [1]. For procedures conducted below the shoulder joint, supraclavicular technique is found to be the most dependable and simple [2]. This regional blockade of nerves is especially advantageous for patients with various cardiorespiratory conditions since it reduces preoperative anxiety and the requirement for systemic anaesthesia [3]. Ultrasound guidance for administration of peripheral nerve blocks is a low-risk and effective technique and gains increasing relevance in today's medicine because it does not involve ionising radiation, is inexpensive, and has very good temporal resolution [4]. While local anaesthetics themselves can achieve ideal conditions for supraclavicular BPBs, pain relief is typically temporary [5]. To increase the onset time, intensity, and duration of the block, local anaesthetics are usually mixed with adjuvants such as clonidine, opioids, neostigmine, and midazolam [6].

Perineural dexamethasone has been reported to prolong analgesia in studies, but neurotoxicity has been raised as a concern, although at present there is not conclusive evidence [7,8,9]. To reduce safety concerns but maintain prolonged pain relief, researchers investigated intravenous (IV) dexamethasone as an alternative that would be safer than the perineural method, albeit still considered off-label [10]. Furthermore, low doses of intravenous dexamethasone are under investigation for potential systemic anti-inflammatory effects [11]. This research was aimed at finding out whether perineural or intravenous dexamethasone has more effect in managing pain after surgery in individuals who are treated with elective upper limb surgery with supraclavicular brachial plexus block.

METHODOLOGY

This is comparative research which was conducted among 60 patients who were aged between 18 years and 60 years. Men and women participated in this research. All the patients were given an American Society of Anaesthesiologists (ASA) physical status I or II. They were listed for elective upper limb cancer operations, including melanoma, liposarcoma, synovial sarcoma, osteosarcoma, and squamous cell carcinoma. The operations were carried out with a supraclavicular brachial plexus block (BPB). Tourniquet time for surgery was limited within 120 minutes. Every individual was informed about the study and their written consent was obtained.

Exclusion criteria: All the people who had mental illness, steroid treatment, neuropathies, uncontrolled diabetes, and a history of having allergy from local anaesthetics were not a part of this study. Moreover, the ones with infections at the location of the planned block puncture were also excluded from this research.

All elective upper limb cancer patients undergoing supraclavicular brachial plexus block (BPB) were assigned into two groups (30 individuals in each group). Perineural bupivacaine and dexamethasone

were administered in Group A, while intravenous dexamethasone and perineural saline with bupivacaine were administered in Group B. All the patients underwent standard preoperative workup, monitoring, and ultrasound-guided block placement. Pin prick and modified Brom age scores were used to measure sensory and motor block effectiveness, respectively. Important outcomes were narcotic total use, postoperative pain scores (measured by VAS), and the duration and onset of sensory and motor block. Side effects were assessed in patients and excluded in those who had failed blocks. The statistical analysis was conducted using SPSS version 26. All the quantitative variables of both the groups were expressed in terms of standard deviation (SD) and mean. An unpaired student's t-test was used to compare the quantitative variables. All the qualitative variables of both the groups were expressed in terms of percentages and frequencies. Chi-square test or Fisher's exact test was used to analyse qualitative variables.

RESULTS

There were a total of 60 patients elected for this study according to the inclusion criteria. All the participants were divided into 2 groups, each having 30 individuals. The mean age in the perineural group was 52.5 yrs., while it was 51.3 in the systemic group. Table number 1 shows the demographics and their distribution in both the groups. All the values are expressed in terms of mean except gender.

Table No. 1:

Parameters	Perineural Group	Systemic Group	t/X2	p-value
Mean Age (yrs)	52.5	51.3	1.068	0.292
Gender				
● **Female**	16	15	0.091	0.763
● **Male**	14	15		
Surgery duration in minutes	83.3	76.5	1.854	0.071
Weight (kg)	78.4	76.1	0.994	0.326

Table number 2 shows block and duration of analgesia of the block between both the groups.

Table No. 2:

Variables	Perineural Group	Systemic Group
Sensory block		
● **Onset time (min)**	16.8	24.4
● **Duration (min)**	715.4	647.1
Motor block		
● **Onset time (min)**	24.8	26.7
● **Duration (min)**	605.0	587.3
Duration of analgesia of the block (hr)	16.3	13.4

In the perineural group, six patients required a single dose of morphine, whereas four required a second dose. In the systemic group, 18 individuals required a single dose of morphine, with 10 receiving a second dose.
Table number 3 compares the number of doses of morphine after the operation in both the groups.

Table No. 3:

Variables	N	Group A	N	Group B
Morphine 1st dose (mg)	6	2.08	18	2.14
Morphine 2nd dose (mg)	4	2.00	10	2.13

DISCUSSION

Ineffective postoperative pain control will lead to negative outcomes, including a greater likelihood of chronic pain, chronic discomfort, and longer hospitalization stays [12]. Successful pain control after surgery, however, improves patient satisfaction, decreases tension, and contributes to improved global recovery and surgical results [13].

Our findings indicate that the perineural group had significantly shorter onset times for sensory and motor blocks compared to the IV group. Furthermore, the perineural group also had a significantly longer sensory duration. But no significant difference was noted between the two groups in motor block duration. Likewise, Pahari et al. indicated that the perineural group had a shorter sensory block duration compared to the IV group [14]. Weheba et al. discovered that sensory and motor blocks possessed quicker onset times and an extended sensory block duration in the perineural group, and this coincides with our results [15]. Conversely, they found the duration of the motor block to be longer in the perineural group. These results are consistent with those of Nadeem and Butt, who observed significantly shorter onset times for sensory and motor blocks in the perineural group compared to the IV group [16].

In the present trial, the analgesia time was significantly longer in the perineural group compared to the IV group. Dexamethasone, when used in conjunction with nerve blocks, can decrease pain by inhibiting nociceptive C fibres, decreasing ectopic neuronal discharges, fighting both systemic and local inflammation, and altering the immunological reaction to injury through neuropeptides. These results are in accordance with those of Pahari et al., where they reported highly prolonged analgesia in the perineural group following axillary BPB [14]. In a similar vein, Aliste et al. validated our findings by demonstrating that the perineural group experienced postoperative pain relief significantly longer than the IV group after axillary BPB [17]. There was no significant difference in the time of analgesia between the two groups as observed by Nadeem and Butt [16].

No statistically significant difference between the two groups was found in the number of patients who needed one postoperative dose of morphine. But there were fewer people in the perineural group who needed a second dose compared to the IV group. Morphine consumption overall was significantly lower in the perineural group. In the same way, Weheba et al. discovered that the perineural group used significantly fewer opioids than the IV group [15]. Sakae et al. also demonstrated a strong decrease in opioid usage in the perineural group, which concurs with these findings [18]. By contrast, Lee et al. found there was no significant difference in the total of opioid requests for the two groups [19].

Three subjects experienced nausea and vomiting in our study, with no cases of pneumothorax reported. No notable differences between the two groups were found in the incidence of adverse effects. Likewise, Sakae et al. found that four patients in the IV group experienced nausea and

vomiting, whereas a single patient in the perineural group[18] did so. Likewise, Chun et al. reported six cases of nausea in the IV group and three in the perineural group [20].

CONCLUSION

In ultrasound-guided supraclavicular BPB, perineural dexamethasone provides prolonged sensory, motor block, and postoperative analgesia compared to intravenous dexamethasone.

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This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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