ORIGINAL RESEARCH

To evaluate the use of dexamethasone as an adjuvant in supraclavicular blocks for surgical procedures involving the upper limbs

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ABSTRACT
Aim: To evaluate the use of dexamethasone as an adjuvant in supraclavicular blocks for surgical procedures involving the upper limbs. **Materials and methods:** Brachial plexus blocks were used throughout all of the procedures. After providing patients with written explanations of the full research procedure, permission on an ethical level was acquired from the institution's ethics committee, and patients gave their written agreement in order to participate in the study. The current investigation comprised a total of 120 patients, all of whom were assigned at random to one of two different research groups. Patients in group A were given bupivacaine in combination with dexamethasone, whereas patients in group B were given just bupivacaine. **Results:** The patients in group A had a mean age of 30.58±3.69 years, whereas the patients in group B had a mean age of 23.77±2.98 years. The patients in group A had a mean weight of 59.85± 6.67 kg, whereas the patients in group B had a mean weight of 61.98 ±5.55 kg. The patients in group A had a mean height of 169.98 cm with a standard deviation of 3.69 cm, whereas the patients in group B had a mean height of 167.99 cm with a standard deviation of 5.56 cm. The length of the operation was 165.98±6.69 minutes for group A patients and 154.99±4.58 minutes for group B patients on average. Patients in group A had a sensory block that lasted for an average of 4.99± 0.96 minutes, whereas patients in group B experienced a sensory block that lasted for 6.88 ±1.01 minutes. The mean duration of analgesia for patients in group A was 839.89 ±9.97 minutes, whereas the mean duration for patients in group B was 279 ±8.89 minutes. **Conclusion:** we concluded that the addition of dexamethasone to local anaesthetic drugs in brachial plexus block significantly prolonged the duration of analgesia and motor block in patients who were undergoing surgery on their upper limbs. This was the case in patients who had undergone brachial plexus block.
Key words: Anaesthesia, Dexamethasone, Supraclavicular

INTRODUCTION

The use of just local anaesthetics for supraclavicular brachial plexus block results in satisfactory operating circumstances, despite the fact that this results in shorter-lasting post-surgical analgesia. In order to achieve a rapid, dense, and persistent block in brachial plexus block, several adjuvants such as opioids, clonidine, neostigmine, and midazolam, among others, were added to local anaesthetics; nevertheless, the results are either equivocal or linked with adverse effects. [1, 2] Steroids, in addition to their analgesic and anti-inflammatory effects, also have significant anti-inflammatory effects. They do this by inhibiting phospholipase A2, which results in a reduction of inflammation. It has been discovered that local administration of methylprednisolone may impede transmission in nociceptive C-fibers, but it does not have this effect on myelinated A-beta fibres. [3] The fact that the impact might be reversed points to a direct action of steroids on membranes. [3] Corticosteroids also decrease ectopic neuronal firing. [4] Dexamethasone is both an effective and highly

selective glucocorticoid. It is one of the glucocorticoids. There have been a number of studies that have been conducted employing 8 milligrammes of dexamethasone as an adjuvant to a combination of local anaesthetics. These research have focused on the rapid onset but extended duration of analgesia and motor block. [5-7] As a result, we investigated the use of dexamethasone as an adjuvant in supraclavicular block for surgical procedures involving the upper limbs.

MATERIALS AND METHODS

The current research was carried out at the orthopaedics department, and all of the patients who were scheduled to have below-the-shoulder upper limb surgeries (both elective and emergency) were included in the study. Brachial plexus blocks were used throughout all of the procedures. After providing patients with written explanations of the full research procedure, permission on an ethical level was acquired from the institution's ethics committee, and patients gave their written agreement in order to participate in the study. The current investigation comprised a total of 120 patients, all of whom were assigned at random to one of two different research groups. Patients in group A were given bupivacaine in combination with dexamethasone, whereas patients in group B were given just bupivacaine. Group A patients had better outcomes than group B patients. Each of the two groups had a total of sixty patients. In order to meet the inclusion criteria, patients needed to be between the ages of 20 and 62, have a physical status of I or II according to the American Society of Anesthesiologists, and have the intention of undergoing below-the-shoulder upper limb surgeries (either elective or emergency) while receiving a brachial plexus block. Patients who refused to give their consent, pregnant women, patients with a history of allergy to local anaesthetics, patients with peptic ulcer disease, patients with diabetes mellitus, patients with peripheral neuropathy, and patients with contraindications for brachial plexus block such as bleeding disorder, patients on anticoagulants, severe respiratory disease, and neurological deficit involving brachial plexus local infection at the injection site were all excluded from the study. Intravenous access was established using an 18-G cannula on the contralateral hand in the pre-operative room. Baseline measures such as heart rate, mean arterial pressure, and oxygen saturation were examined and recorded. After providing an adequate description of the procedure, the block was carried out in the supine position with the patient's head turned to the other side. The upper limb that was going to be anaesthetized was abducted and stretched down the side as far as feasible towards the ipsilateral knee. The interscalene groove was located, and its status as a landmark was verified by probing of the subclavian artery, at which time a mark was placed roughly 1.5 to 2.0 cm posterior to the mid-clavicle point. When an output current of less than 0.5 milliamperes was still able to elicit a minor distal motor response in the forearm and hand, the location of the needle was deemed to be satisfactory. After the blood aspiration was negative, a total volume of 40 millilitres of the solution was slowly injected. The solution included 38 millilitres of bupivacaine with 0.25% and 2 millilitres of dexamethasone or normal saline. In order to prevent discomfort caused by the tourniquet, 5 millilitres (mL) of lignocaine solution containing 2% and 1:200,000 of adrenaline was injected into the intercostobrachial nerve (T2). The sensory and motor blockade of the radial, median, musculocutaneous, medial cutaneous nerve of arm and forearm, and ulnar nerves (C5-T1 dermatomes) were evaluated every two minutes after the completion of the injection for the first thirty minutes, then every thirty minutes after the end of surgery for the first twelve hours, and then hourly until the block had completely worn off. Pinprick testing was used to evaluate the sensory blocking of each nerve, and the results were ranked on a scale with three levels: 2 indicated normal sensibility, 1 indicated loss of sensation to pinprick, and 0 indicated loss of sensation to light touch. Motor block was evaluated by observing the patient's ability to perform the following movements: thumb abduction and wrist extension (radial nerve), thumb adduction and ulnar deviation of the hand (ulnar nerve), flexion of the elbow in supination (musculocutaneous), thumb opposition and wrist flexion (median nerve). The results were recorded on a three-point scale, where 2 represented normal movement, 1 represented paresis, and 0 represented no movement at all. The amount of time that passes between the conclusion of a local anaesthetic injection and the lack of feeling in response to a pinprick throughout all nerve distributions is referred to as the "onset time" of a sensory block. Onset time of motor blockade was defined as the time interval between the end of the local anaesthetic injection and paresis (motor score = 1) in all of the nerve distributions. This was done in order to determine the moment at which the motor blockade began to take effect. The amount of time that passed between the beginning of the sensory block and the beginning of the first postoperative discomfort was used as the benchmark for determining how long the sensory block would last. The amount of time that passed between the beginning of the motor block and the full restoration of motor functions was what was considered to be the motor block's duration. Following thirty minutes, if it was determined that the block was effective, surgical procedures started. SPSS was used to do an analysis on each and every one of the outcomes. In order to determine the degree of significance, a Chi-square test was carried out.

RESULTS

The patients' demographic information is summarised in Table 1, which may be seen below. The patients in

group A had a mean age of 30.58±3.69 years, whereas the patients in group B had a mean age of 23.77±2.98 years. The patients in group A had a mean weight of 59.85± 6.67 kg, whereas the patients in group B had a mean weight of 61.98 ±5.55 kg. The patients in group A had a mean height of 169.98 cm with a standard deviation of 3.69 cm, whereas the patients in group B had a mean height of 167.99 cm with a standard deviation of 5.56 cm. The length of the operation was 165.98±6.69 minutes for group A patients and 154.99±4.58 minutes for group B patients on average. By comparing the two study groups, the researchers got findings that weren't statistically significant.

Table 1: Demographic parameter

Parameter	Group A	Group B	P value
Age(Years)	30.58±3.69	23.77±2.98	0.25
Weight(kg)	59.85±6.67	61.98±5.55	0.36
Height (cm)	169.98±3.69	167.99±5.56	0.41
Duration of surgery	165.98±6.69	154.99±4.58	0.44

The anaesthetic parameters for the individuals who participated in the two separate studies are shown in Table 2. Patients in group A had a sensory block that lasted for an average of 4.99± 0.96 minutes, whereas patients in group B experienced a sensory block that lasted for 6.88 ±1.01 minutes. The mean duration of analgesia for patients in group A was 839.89 ±9.97 minutes, whereas the mean duration for patients in group B was 279 ±8.89 minutes. When the p-value for the mean analgesia time and the motor block duration time of the patients in the two study groups were compared, the researchers found that there was a statistically significant difference between the groups.

Table 2: Anaesthetic parameters

	Group A	Group B	P value
Onset of the sensory block	4.99±0.96	6.88±1.01	0.36
Duration of analgesia	839.89±9.97	279±8.89	0.001
Motor block duration	378.85±5.98	187.77±11.85	0.001
Motor block onset	22.25±3.69	11.36±1.39	0.45

DISCUSSION

The brachial plexus block is consistently rated as one of the most effective procedures for surgical procedures involving the upper limbs. It has its own benefits, such as reducing or eliminating the need for upper airway instrumentation and adverse effects caused by general anaesthetic medicines. The supraclavicular approach has been reported as being the simplest and most reliable strategy for anaesthetic and perioperative pain control in surgical procedures that take place below the shoulder joint. Other methods of doing brachial plexus blocks have also been documented. The brachial plexus is blocked in a supraclavicular approach where it is most compactly arranged at the level of nerve trunks. This allows for rapid onset to be achieved, as well as a high success rate for elbow, forearm, and hand surgery. This is possible because all of the branches of the brachial plexus can be reliably blocked. [8]

It is not entirely apparent how the steroid dexamethasone works to maintain peripheral neuronal blockage after it has been administered. It's possible that the impact of blocking is due to a local action rather than a systemic one. [9-11] In a nutshell, the prolongation of duration of sensory and motor blockade after perineural administration of dexamethasone may be secondary to its local action on nociceptive C fibres mediated via membrane associated glucocorticoid receptors and the up-regulation of the function of potassium channels in excitable cells. This could be the case because dexamethasone has a local effect on nociceptive C fibres. [12] As a result, we investigated the use of dexamethasone as an adjuvant in supraclavicular block for surgical procedures involving the upper limbs.

In the current research, we found that the mean amount of time patients in Group A received analgesia was significantly longer than the amount of time patients in Group B received it. In comparison to Group B, the beginning of the sensory and motor blockage was seen in Group A much sooner on average. This might be the result of the additive effect that dexamethasone and local anaesthetics have on one another. Prior research shown that there was no significant decrease in the beginning of sensory and motor blockage in the dexamethasone group compared to the group that served as the control. This disparity can be attributable to the fact that the amount of local anaesthetic used and the method of block are different. 11 Patil et al investigated how well adding buprenorphine to a local anaesthetic solution improved the quality of postoperative analgesia and how long it lasted. A prospective, randomised, and double-blind control study was carried out on fifty healthy patients in the ASA Grade I/II range who were between the ages of twenty and seventy and were scheduled to undergo orthopaedic and reconstructive surgery of the upper limb while under supraclavicular brachial plexus block. They found that the average duration of postoperative analgesia was substantially longer in Group B compared to Group C.

This was one of their findings. There was no discernible difference in the mean onset of sensory block between the two groups. In Group B, the length of the motor block was substantially longer on average than it was in Group C. Based on the findings, they came to the conclusion that the addition of 3 micrograms per kilogramme of buprenorphine to 0.5 percent bupivacaine for supraclavicular brachial plexus block prolonged the duration of postoperative analgesia and sensory blockade without increasing the number of adverse effects. [13] In order to determine the lowest effective dose of dexamethasone for use as an adjuvant in supraclavicular brachial plexus nerve block, Liu et al. conducted an experiment in which they compared the analgesic effects of three different doses of dexamethasone to those of low concentrations of local anaesthetics. They examined 89 adult patients who were about to have shoulder arthroscopy done on them. They found that the median analgesia duration of a supraclavicular brachial plexus nerve block with 0.25% bupivacaine was 12.1 hours; and that the administration of 1 mg, 2 mg, or 4 mg of dexamethasone significantly prolonged the analgesia duration to 22.3, 23.3, or 21.2 hours, respectively. In a manner similar to that described above, dexamethasone was also shown to greatly lengthen the duration of the motor nerve block. They came to the conclusion that when added to 0.25% bupivacaine for supraclavicular brachial plexus nerve block, low-dose dexamethasone (1-2 mg) prolongs analgesic duration and motor blockade to the same amount that 4-mg dexamethasone does. This was based on the findings of their study. [14]

CONCLUSION

The authors came to the conclusion that the addition of dexamethasone to local anaesthetic drugs in brachial plexus block significantly prolonged the duration of analgesia and motor block in patients who were undergoing surgery on their upper limbs. This was the case in patients who had undergone brachial plexus block. Yet, more research is strongly recommended before continuing the investigation into this topic.

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