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RESEARCH ARTICLE

A COMPARATIVE STUDY OF DEXMEDITOMEDINE AND DEXAMETHASONE AS ADJUVANTS TO LOCAL ANESTHETICS IN BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES

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Abstract

Objective: To compare and evaluate the onset time and duration of sensory, motor block, and quality of intraoperative and postoperative analgesia of dexmedetomidine and dexamethasone as adjuvants to local anesthetics in brachial plexus block.

Methods: This was a prospective comparative study conducted among 60 adult patients aged 18-60yrs belonging to ASA I & II posted for upper limb surgeries.

1. Group-a: 20ml of 2% lignocaine with adrenaline + 20ml of 0.5% bupivacaine + 20mcgs of dexmedetomidine.
2. Group-b: 20ml of 2% lignocaine with adrenaline + 20ml of 0.5% bupivacaine + 4mg dexamethasone.

Results: The groups were similar in age, hemodynamic parameters like intra and post-operative heart rate, mean arterial pressure. In this study, the onset and duration of sensory and motor blockade were statistically shorter in the dexamethasone group when compared to the dexmedetomidine group.

Conclusion: The present study concludes both dexmedetomidine and dexamethasone act as functional additives with dexmedetomidine having the advantage of conscious sedation and hemodynamic stability prolongs the duration of block whereas the onset of the block was shorter when dexamethasone was added.

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Introduction:-

Regional nerve block offers an alternative choice of anesthesia using minimal anesthetic drugs and a high safety profile. Brachial plexus block is a popular and widely employed regional nerve block technique for upper limb surgeries. The supraclavicular approach of brachial plexus block is the easiest and most consistent method for surgeries below the shoulder joint.

The supraclavicular approach of brachial plexus block is an excellent alternative to general anesthesia for upper limb surgery. This achieves complete muscle relaxation, intraoperative hemodynamic stability, and postoperative analgesia.

Bupivacaine is used frequently for supraclavicular nerve block as it has a long duration of action of 6-9 hours. Adjuvants for brachial plexus block may improve the quality and duration of analgesia.

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Various adjuvants have been used to prolong regional blockade, shorten the onset of block, and prolong the duration of postoperative analgesia. Various adjuvants, including Opioids, Midazolam, Magnesium sulfate, Dexamethasone, and Neostigmine, have been added to local anesthetic to increase the duration of a block and postoperative analgesia with the risk of various adverse effects. The efficacy of alpha 2- adrenoceptor agonists has been established in a variety of regional anesthesia techniques.

Dexmedetomidine is a selective alpha2 adrenoceptor agonist and is approximately eight times more potent than Clonidine. Dexmedetomidine has been reported safe and effective when administered with long-acting local anesthetic in peripheral nerve blocks.

Various clinical studies have found that administration of dexmedetomidine as an adjuvant to local anesthetics prolonged duration of sensory and motor blockade.

Steroids have potent anti-inflammatory as well as analgesic properties. They suppress inflammation through inhibition of phospholipase A2. Local application of methylprednisolone has been found to block transmission in nociceptive C- fibers but not myelinated A-beta fibers. The effect was reversible, suggesting a direct membrane action of steroids. Corticosteroids also suppress ectopic neuronal discharge. Perineural injection of Glucocorticoid, along with local anesthetics, is reported to influence the onset and duration of sensory and motor blockade.

Dexamethasone is a very potent and highly selective glucocorticoid. Many studies were done using Dexamethasone 4mg as an adjuvant to the local anesthetic mixture in brachial plexus block resulted in variable effects on the onset but the prolonged duration of analgesia and motor block.

The present study is being undertaken to evaluate the onset time, duration of sensory and motor block, duration of postoperative analgesia, with dexmedetomidine and dexamethasone as adjuvants to local anesthetic in brachial plexus block by supraclavicular approach.

Materials And Methods:-

The study was conducted on 60 Adult patients in age group of 18-60 years belong to ASA 1 & 2 scheduled for upper limb surgeries. Patients were divided into two groups containing 30 each. GROUP-A received 20ml 2% lignocaine with adrenaline + 20ml 0.5% bupivacaine + 20mcgs dexmedetomidine. GROUP-B received 20ml 2% lignocaine with adrenaline + 20ml 0.5% bupivacaine + 4mg dexamethasone.

Inclusion criteria: asa 1 & 2, age group 18-60 yrs, consenting patients.

Exclusion criteria:

unwilling patients, infection at the site of injection, coagulopathy disorders, hyperthyroid patients, pregnancy, peripheral neuropathy, patients with known hypersensitivity to local anesthetics.

Procedure:

iv access obtained in the opposite limb with large bore iv cannula. Standard monitors- ecg, pulse oximeter, non-invasive blood pressure were connected and monitored in all patients and recorded at 5 minutes interval in the first 30mins and after that every 30mins. The patients were placed in a supine position with the head turned opposite side. Arm to be anesthetized adducted and extended towards the ipsilateral knee. The supraclavicular area is draped and subclavian artery pulsations palpated, and a 23g needle is inserted lateral to artery and directed backward-inwards-downward till paresthesia in forearm elicited. After negative aspiration for blood, 40ml of a respective drug was injected.

The onset of sensory block was assessed by spirit swab

Assessment of motor block was done using a modified Bromage scale

- 0 - Normal power
- 1 - Paresis but able to move an arm
- 2 - Not able to move the arm but ready to move fingers
- 3 - Complete motor blockade

Postoperative pain assessed using a visual analog scale [VAS] score of 0-10

Blood loss assessment was done, and fluid was administered as per need. The duration of surgery was noted. Side effects like nausea and vomiting, dryness of mouth complications like pneumothorax, hematoma, post block neuropathy, local anesthetic toxicity were monitored.

Results:-

Regarding the Age and sex distribution, there was no significant difference among both groups.

Table no 1:- Age distribution among both groups.

Age(yrs)	Group A	Group B
18-30yrs	8	7
31- 45 yrs	15	17
46- 60yrs	7	6

Table no.2:- Sex distribution in both groups.

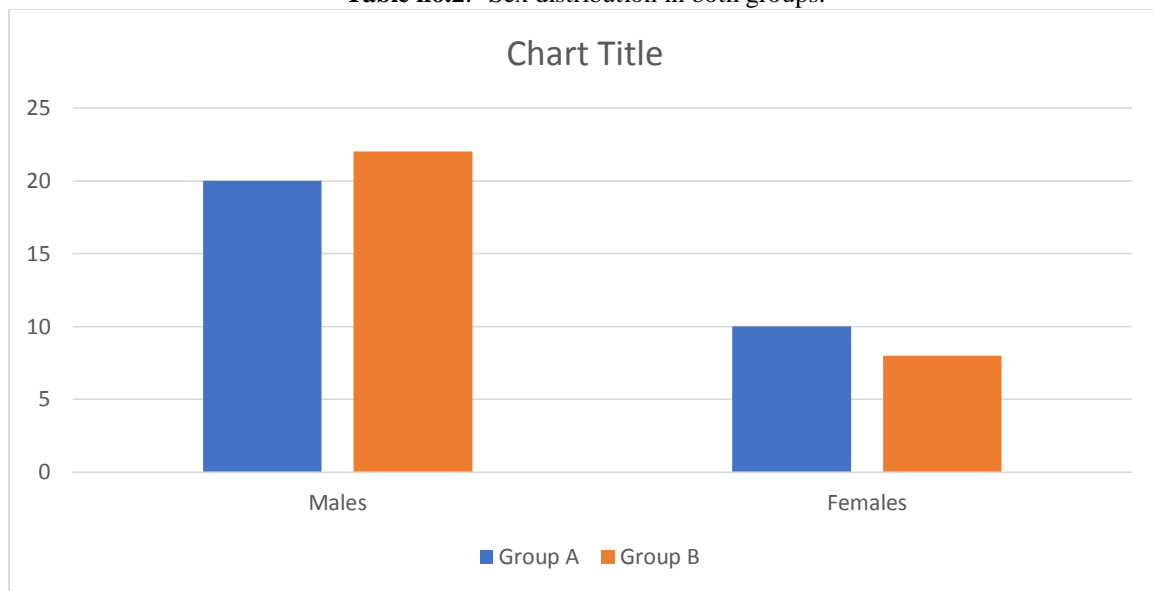


Table no.2 shows Majority of cases in both groups were males.

Table no.3:- Characteristics of sensory and motor block in both groups.

	Group A	Group B	p-Value
Onset of sensory block(min)	7.4±1.3	6.5±1.4	0.019
Onset of motor block(min)	23.4±2	20.1±3.2	0.0001
Duration of sensory block(min)	899±60.8	738±24.4	0.0001
Duration of motor block(min)	863.1±54.1	692±30.05	0.0001
Duration of analgesia(min)	908.5±14.3	786±69.7	0.0001

P-value >0.05: Non significant; p-value<0.05: significant; p-value<0.01: highly significant.

Table no.3 shows the onset time of sensory, motor block were longer in group A compared to group B (p-value <0.05). Duration of sensory and motor block were longer in dexmedetomidine group compared to dexamethasone group (p-value < 0.05). Postoperative analgesia was significantly longer in dexmedetomidine group than dexamethasone group (table no.3: p-value <0.001). However, intraoperative analgesia was good and statistically similar in both the groups.

Table no.4:- Comparison of pulse rate in both groups.

Duration	Group A	Group B
Baseline	78	76

15mins	86	84
30min	78	80
60min	74	79
120min	75	78
180min	66	72

Table 4 shows that the pulse rates in both groups were found to have no statistical significance.

Table no.5 Comparison of mean arterial blood pressures in both groups

Mean arterial pressure	Group A	Group B
Baseline	90	89
15mins	88	86
30mins	85	81
60mins	81	78
120mins	79	76
180mins	79	74

Table no.5 shows the comparison of MAP in both groups is not statistical significant.

Discussion:-

Regional anesthesia with a brachial plexus block has been widely used alternative to general anesthesia in patients who are at high risk for general anesthesia. Single-shot Brachial plexus block usage is limited by early onset of postoperative pain, high opioid dose requirement, high incidence of PONV, which can be managed by adding an adjuvant to local anesthetics. We choose supraclavicular approach for brachial plexus block as the narrowest part of plexus is located there and anesthesia will be rapid, dense and predictable for entire upper limb. The advantages of adding an adjuvant to local anesthetics include prolongation of sensory and motor block, delayed onset of pain in the postoperative period. Low opioid analgesic dose requirement in the postoperative period. Addition of steroid to LA effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action. Dexamethasone, synthetic glucocorticoid derivative is preferred because of it is highly potent anti inflammatory property, about 25-30times more potent than hydrocortisone and without any mineralocorticoid activity. Dexmedetomidine is a selective α -2 agonist, has been shown to improve the duration of analgesia when added as adjuvant to LA in nerve block. The analgesic effect is by blockade of hyper-polarisation activated cation current as seen in animal study.

In our study, the surgeries varied from distal humerus fractures to radius ulna and hand surgeries. No significant complications were encountered in our research.

Conclusion:-

Dexmedetomidine and Dexamethasone, both are good adjuvants in nerve blocks. But the study conducted revealed that the onset of block was shorter when dexamethasone was added. whereas dexmedetomidine is better alternative having an added advantage of conscious sedation and hemodynamic stability with enhanced quality and duration of block.

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