DOI: https://doi.org/10.53350/pjmhs2023176180

ORIGINAL ARTICLE

Comparison of Dexmedetomidine and Dexamethasone as an Adjuvant to Bupivacaine in Onset and Interval of Supraclavicular Nerve Block

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ABSTRACT

Aim: To compare duration and onset of motor and sensory block by using dexmedetomidine and dexamethasone as adjuvant to bupivicaine in supraclavicular brachial plexusblock.
Place and duration of study: Department of Anaesthesiology, Surgical Intensive Care & Pain Management, Civil Hospital, Dow University of Health Sciences Karachi from 29th June 2022 to 29th December 2022.
Design: Randomized controlled trial study
Methodology: Sixty patientswere enrolled in the study that had an elective upper-limb surgery performed under supraclavicular anesthesia of hand, wrist, forearmand elbow were allocated through randomization into two groups. Thirty patients in group A treated with bupivacaine 25 ml of 0.5% with dexamethasone 8mg (2 ML) and 30 in group B treated with bupivicaine 25 ml of 0.5% with dexmedetomidine 1µg/kg (2ml). Patients were observed in post-anesthesiacareunitpost-surgery. Duration of onset of pain was noted by patient's first request for analgesia.
Results: Themean age of patients was 34.88±9.39 years. Mean onset time of sensory and motor block was significantly low in group A than group B. Mean duration of sensory block and motor block was significantly high in group B than group A [813.87±113.72 vs. 752.63±27.96; p=0.006] and [734.13± 84.44 vs533.07±88.38;p=0.0005]. The time to request for 1st rescue analgesic was significantly increased in group B as compare to group A(p=0.0005).
Practical Implication: Regional anesthesia in orthopedic procedures is superior to general anesthesia in terms of better postoperative pain relief, less central nervous system depressant effect of drugs and early discharge from hospital.
Conclusion:The duration of block prolonged in cases where dexmedetomidine was added to the bupivacaine was longer but onset was reduced in comparison to the dexamethasone cases.
Keywords: Brachial plexus block, Supraclavicular block, Dexmedetomidine, Dexamethasone

INTRODUCTION

There have been various never blocks applied during intra-operative analgesia as well as analgesic for upper extremity operation. Brachial plexus block is one of such very useful block having a long duration efficacy. Continuous technique applying catheterization has economic constrains and risk of infection, therefore making single-shot supraclavicular brachial plexus highly feasible.

Single shot supraclavicular brachial plexus block is more feasible because continuous technique using catheter is costly difficult, and has increased risk of infection[1,2]. The administration of supraclavicular block is easy and safe currently by using ultrasonography for higher block success rate and very small incidence of pneumothorax in comparison to blind technique.By using of ultrasonography intra neural placement of needle and therefore, injectate can be avoided to retain the nerve morphology. The major benefit of supraclavicular block is that Nerve is tightly packed in that area and it g a very gives a very quick effect of block so giving it Nick name as "spinal of arm"[3,4]. Numerous agents including dexmedetomidine, a potent alpha -2 agonist, and long acting glucocorticoids have been used as adjuvants to bupivacaine to increase onset and duration of supraclavicular block[5,6]. The dexmedetomidine acts by stopping the hyper polarization of activated cationic current[7]. The main action method of dexamethasone is through anti-inflammatory in addition to anti-nociceptive results. This happens through inhibition of inflammatory-mediators, through the process of local mediator-vasoconstriction and decrease of the nociceptive-C fiberaction. Researchers havecompared the aforementioned two drugs and reported contradictory outcomes in context with brachial-plexus blocks when use as adjuvant[8–11].

Shrestha et al[12] detailed a rapid block onset through adjuvant dexamethasone in supraclavicular-block: local analgesic solution. EL-Hamid[13] reported that cases where 0.5% levobupivacaine was used with 8mg of dexamethasone there was a significant decrease in the morphine usage post the surgical procedure.

A significant increased extent of motor block was reported in another comparative research where dexmedetomidine was compared against dexamethasone used as an adjuvant (888.62±57.92min vs. 1303.93±233.71 min) in blocking the supraclavicular. There was also an extension in the sensory block in context of dexmedetomidine (1084.14±207.58 vs. 1619.29±235.49) vs. 1084.14±207.58 min) with the dexamethasone adjuvant to bupivacaine group[14].

MATERIAL AND METHODS

In a randomized control trial performed at department of Anaesthesiology, Surgical Intensive Care & Pain Management, Civil Hospital, Dow University of Health Sciences Karachi from 29th June 2022 to 29th December 2022. There were 60 patients enrolled with half of the number in each group. The age of the patients was between 18-75 years. Those patients who have consent of participation were registered as participants. Cases with under the American Society of Anesthesiologist physical status (ASA) classification I andII, in addition to their elective surgeries of upper limb through supraclavicular anesthesia were included. The upper limb included hand, wrist, forearm as well as elbow, non-consenting, neuropathy of operative limb, systemic corticosteroid for ≥ 2 weeks in a 6month duration ofsurgery. Those cases having hypersensitivity to the drugs under consideration or were suffering from coagulation related disorders, or pregnant were excluded. The patients were divided in two groups. Group A were those who received bupivacaine in 25 ml of 0.5% with the dexamethasone in 8mg (2 ML). While group B were those who received bupivacaine in 25 ml of 0.5% with the dexmedetomidine 1µg/kg(2ml).all cases received a standardized medicines and their medication was started night prior to their surgical procedure. The complete information regarding patient's vitals was kept on record

Received on 09-01-2023
Accepted on 19-05-2023

throughput the procedure. All patients were given I/V midazolam in 0.05mg/kg prior the operation. Ultrasonography was used for identification of the nerves required for block in supraclavicular region. Anervestimulator was applied through 10cm stimulation needleassistance using 1Hz frequency at 1.0 milli ampere which was then reduced to 0.5mA post twitch received. The complete dose was injected post initial 0.5ml dose in the superioras well as inferior region of nerve (brachial plexus) keeping negative aspiration maintained. Patients were followed in the post-anesthesia care unit (PACU) and pain duration tie was recorded.

Statistical analysis and data entry were done using SPSS-19. T-test was applied to compare the onset and duration of sensory and motor block as well as duration of post-operative analgesia between two groups. P≤0.05 was considered as level of significance.

RESULTS

The ratio of males and females was 1:1. Almost67%ofthepatients were from urban area. There were 55% ASAI cases and 45% ASAII cases (Table 1). The means of age,weight,height,and body mass index ofthepatients were shown in Table 2. Mean onset time of sensory and motor block was significantly low in group A than group B [18.87±2.67 vs. 24.77±5.90; p=0.00005] and [32.77±2.38 vs. 38.87±3.98; p=0.0005] respectively. Mean duration of sensory block and motor block was significantly high in group A813.87±113.72 vs 752.63±27.96 (p=0.006) than group B 734.13±84.44vs 533.07±88.38 (p=0.0005). The time to request for first rescue analgesic was significantly (p=0.0005) increased in group B as compare to group A (Table 3).

Table 1: Demographic information of the patients (n=60)

Variable	Group A		Group B	
	No.	%	No.	%
Gender				
Male	13	43.3	17	56.7
Female	17	56.7	13	43.3
Residential status				
Rural	12	40.0	8	26.7
Urban	18	60.0	22	73.3
ASA status				
I	18	60.0	15	50.0
II	12	40.0	15	50.0
Diagnosis				
Hand	9	30.0	5	16.6
Wrist	4	13.3	14	46.7
Forearm	10	33.3	8	26.7
Elbow	7	23.4	3	10.0

Table 2: Descriptive statistics of the patients according to groups (n=60)

Variable	Group A	Group B
Age (years)	35.20±8.56	34.57±10.30
Weight (kg)	64.33±10.03	67.70±11.12
Height (cm)	161.90±9.13	163.77±7.60
Body mass inex (kg/m^2)	24.57±3.54	25.23±3.76

Table 3: Compare the mean commencement and interval of sensory and motor block and analgesia time duration within groups

Outcome	Group A	Group B	P value
One set of sensory block	18.87±2.67	4.77±5.90	0.0005
Duration of sensory block	752.63±27.96	813.87±113.72	0.006
Onset of motor block	32.77±2.38	38.87±3.98	0.0005
Duration of motor block	533.07±88.38	734.13±84.44	0.0005

DISCUSSION

Regional anesthesia in orthopedic procedures is superior to general anesthesia in terms of better postoperative pain relief, less central nervous system depressant effect of drugs and early discharge from hospital[15]. For surgeries on the upper limb, the brachial plexus block is a practical and often employed regional anesthetic method. Although there are many various techniques, we chose the supraclavicular route because it is a straightforward and secure method for administering anesthetic and pain relief during procedures below the shoulder joint[16,17] hence several agents like ketamine, buprenorphine, clonidine and dexamethasone have been applied as anadjuvantstowards the locally available anesthetic drugs for accelerating the onset, prolong the duration and improve the quality of block.[18]. In this study we aimed to compare the effect of dexmedetomidine, and dexamethasone added to bupivacaine on duration and onset of motor as well as sensory block as well as duration of postoperative analgesia. In this study the average age was 35.20±8.56 years in group A and 34.57±10.31 years in group B. This was almost similarly with study by Hamada MH et al[19]. In some studies, average age of the patients was 30 to 40 years[20-22]. In our study there were male to female ratio was equal (Ratio=1:1). In most of the studies male and female ratio was almost equal and some have difference[19-22].

Our study showed that mean duration of sensory [813.87±113.72 min vs. 752.63±27.96 min; p=0.006] and motor block [734.13±84.44 min vs. 533.07±88.38 min; p=0.0005] was significantly high in the dexmedetomidine to bupivacaine (Group B) as compare to dexamethasone to bupivacaine (Group A). However mean onset of sensory and motor block was shorter in dexamethasone group than dexmedetomidine group [18.87±2.67 vs. 24.77± 5.90; p=0.0005] and [32.77±2.38 vs. 38.87±3.98; p=0.0005] respectively. Similar mean time to request of rescue analgesia was also significantly high in dexmedetomidine to bupivacaine (Group B; 1320.73±150.59 min) ascompare to dexamethasone to bupivacaine (Group A; 805.77±84.83 min). This finding is similar with thestudybyHamadaetal[19] revealed that mean duration of sensory and motor as well as of duration of analgesia was significantly prolonged in dexmedetomidine group as compared to dexamethasone. But onset of motor and sensory block was shorter in dexamet has one group than dexmedetomidine group. In another study conducted by Gunaseelan et al[23] after axillary block with dexmedetomidine and dexamethasone as adjuvants to bupivacaine, they compared the duration of sensory and motor blockade and postoperative analgesia. The authors identified higher duration interval in dexmedetomidine group. Khaleeq et al[20] and Gautam et al[21] detailed the adjuvant qualities of dexmedetomidine as block of supraclavicular-brachial-plexus with prolonged analgesia duration also reported similar results.

The properties of adjuvant dexmedetomidine in supraclavicular-brachial plexus-block has also been reported by Kathuria et al[6] as reducing the motor as well as sensory block-onset time while extends the duration. This block was reported not only to delay the primary dead of analgesia post operation but also reduced its overall consumption within 24 hours. Ray et al[24] compared the dexmedetomidine binary doses and reported that the mean duration of sensory anesthesia onset as well as that of motor blockage had a significant comparison. However there was no significant finding related with motor and sensory blockage as well as the time when the patient primarily demanded the pain analgesic.Contrary to this Ali[22] stated both of the doses to be good adjuvants in peripheral blockage of nervein comparison with dexmedetomidine as itself.

Many studies had used dexmedetomidine as an adjuvant to LA in different regional and peripheral nerve blocks and found that it is an excellent choice in potentiating the local anesthetic effect[25,26]. The effects of adding dexmedetomidine to local anaesthetics such as ropivacaine and bupivacaine in the supraclavicular, interscalene, cervical plexus, and ulnar nerve blocks have been explored by Swain et al[25]. Dexmedetomidine has been demonstrated to improve the quality and duration of analgesia.

Liu et al[27] and Vieira et al[28] established the fact that perineural dexamethasone has a prolonged analgesic effect and provides long-term motor block duration with 0.25% bupivacaine in supraclavicular-brachial plexus nerve-block. Biradar et al[26] supported the dexamethasone as adjuvant to bupivacaine as a

relativelyquickonsetofmotoras well assensoryblock.Weietal[29] also reported dexmedetomidine as insignificant in brining hemodynamic variationsregardlessof dosage applied.

There were few studies reporting insignificant onset of sensory and motor blockade in the dexamethasone injected patients than in controls.[28]Localanesthetic variation and block techniques can be the reason for causing insignificant variance.[30]The current study has some limitation only including ASA I and ASA II patients and unintentional miss of delayed complications due to non-follow of cases above 24hourspost-operation.

CONCLUSION

Dexmedetomidine addition to bupivacaine can not only prolongdurationofthe block but also can facilitate in the longer extent of analgesiain comparison to the dexamethasone, however the block onset was reduced than in patients who were given dexamethasone with bupivacaine.

Conflict of interest: Nil

Ethical consideration: Permission was granted by Institutional Review Board.

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