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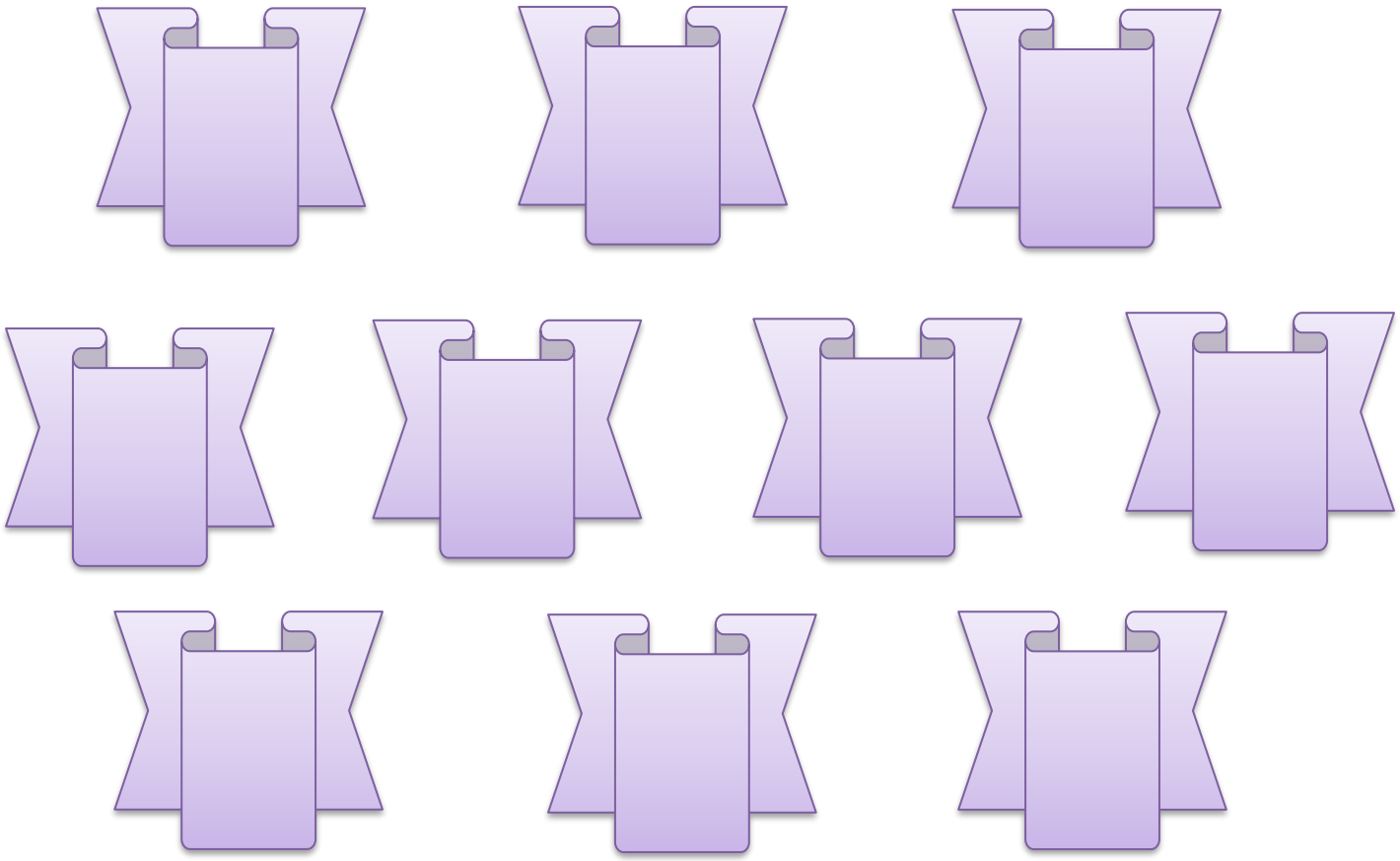

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Original Article

Dexmedetomidine versus Midazolam as Local Anesthetic Adjuvants to Bupivacaine in Ultrasound-Guided Supraclavicular Brachial Plexus Block for Upper-Limb Vascular Surgeries: A Comparative Study

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ABSTRACT

Background: The supraclavicular nerve block is a useful alternative to general anesthesia for upper limb surgery. Previous research investigated the effect of adjuvant, but its role in the context of a reduced volume of a local anaesthetic drug under ultrasound-guided blocks remains unknown.

Aim of the Study: To determine the enhancing effect of dexmedetomidine or midazolam as a local anaesthetic adjuvant to bupivacaine.

Patients and Methods: A prospective double-blind randomized clinical trial, included 90 patients arranged for upper limb vascular surgery. Two groups are comprised; BD group [45 patients]: patients who received ultrasound-guided supraclavicular regional block with injection of 20 ml Bupivacaine 0.25% + 10 ml Lidocaine Hydrochloride 2% + 1µ/kg Dexmedetomidine, and BM group [45 patients]: Patients received ultrasound-guided supraclavicular regional block with an injection of 20 ml Bupivacaine 0.25% + 10 ml Lidocaine Hydrochloride 2% + 50µ/kg Midazolam. The primary outcome was duration of post-operative analgesia.

Results: The BD group had a statistically significant longer duration of analgesia compared to the BM group. Patients in the BD group had significantly higher scores on the Ramsay Sedation Scale and VAS starting from 30 and 45 minutes intraoperatively, respectively, and these scores continued to be higher until 6 hours postoperatively. However, there were no significant differences between the two groups regarding blood pressure measurement along the follow-up period.

Conclusion: Adding dexmedetomidine to bupivacaine for supraclavicular brachial plexus block was found to be more effective than adding midazolam in extending the duration of both sensory and motor block.

Keywords: Dexmedetomidine; Midazolam; Anesthesia Adjuvants; Brachial Plexus Block; Conduction Anesthesia.

INTRODUCTION

Upper-extremity vascular surgery is less prevalent than lower-extremity vascular surgery [1]. Smoking, diabetes, dyslipidaemia, and chronic renal illness were among the comorbidities discovered in patients undergoing upper limb vascular surgery. The majority of upper limb vascular procedures involve the treatment of chronic ischemia, acute ischemia, thoracic outlet syndrome, and the establishment of vascular access for haemodialysis patients [2].

Regional anesthesia techniques have gained significant popularity due to their numerous benefits over general anesthesia and systemic analgesia. These techniques offer excellent pain management, lower risk of complications, and shorter post-anesthesia care unit stays [3]. The supraclavicular nerve block is a beneficial substitute for general anesthesia in upper limb surgery, as it eliminates the adverse impacts of general anesthetic drugs and upper airway instrumentation. This technique provides complete muscle relaxation, stability of blood pressure during surgery, and pain relief after the operation [4].

The sections of the brachial plexus are visible above and behind the subclavian artery in the supraclavicular area. Ultrasound technology can be used at the patient's bedside to display a cross-sectional view of the brachial plexus divisions, which appear as small, dark nodules of varying sizes located to the side and above the subclavian artery. The subclavian artery is visible as a bright, rib-like structure. The ultrasound image of the plexus in this area has been compared to a "bunch of grapes" [5, 6].

Previous research investigated the effect of adjuvant, but its role in the context of a reduced volume of a local anaesthetic drug under ultrasound-guided blocks remains unknown. Using additional anesthetics with brachial plexus block can enhance the effectiveness and length of pain relief [7]. However, any additional anesthetic used should not cause negative effects throughout the body or cause prolonged loss of motor function. Additionally, it should reduce the overall amount of local anesthetic required [8]. Various medications like opioids, naloxone, clonidine, midazolam, dexmedetomidine, epinephrine and dexamethasone have been utilized in combination with local anesthetics to achieve this goal, but the level of success has been inconsistent [9]. Despite their potential benefits, the use of these medications can lead to adverse effects such as excessive sedation, breathing difficulties, low oxygen levels, and low blood pressure. As a result, researchers have been experimenting with different dosages of new adjuvant medications in recent years to identify those that are safer and more effective for patients [10].

Bupivacaine is a frequently used amide local anaesthetic that blocks the voltage-gated ion channels and affects the activity of many other channels including N-methyl-D-aspartate [NMDA] receptors. Blocking NMDA receptors inhibits N-methyl-D-aspartate-mediated synaptic transmission in the dorsal horn of the spinal cord, an area critically involved in central sensitization which plays a vital role in chronic pain states [11].

Dexmedetomidine is a medetomidine imidazole stereoisomer. It is a highly selective agonist of the 2-adrenoreceptor. It inhibits the hyper-polarization-activated cation current, resulting in nerve hyperpolarization and analgesic effect. It reduces firing in the locus ceruleus, resulting in drowsiness and supraspinal analgesia. It also has neuroprotective properties because it reduces the inflammatory response at the injection site. As a result, it is a fantastic drug to investigate its influence as a local anaesthetic adjuvant on the quality of supraclavicular brachial plexus block [12].

Midazolam is a water-soluble, short-acting benzodiazepine. It causes antinociception and enhances the impact of local anaesthetics by acting on ionotropic gamma-aminobutyric acid-A receptors, boosting the influx of chloride ions and inhibiting nerve impulse conduction due to membrane hyperpolarisation [13].

AIM OF THE WORK

The purpose of our study is to determine the enhancing effect of dexmedetomidine or midazolam as a local anesthetic adjuvant to bupivacaine 0.25% on the sensory and motor aspects of the supraclavicular brachial plexus block in patients having upper limb vascular surgery.

The Primary outcome: Assessment of the duration of post-operative analgesia.

The secondary outcomes: Assessment of the hemodynamics [HR, SBP, DBP, MBP], SpO2, and sedation by Ramsay Sedation Scale [RSS] and complications or side effects.

PATIENTS AND METHODS

Research design

A prospective double-blind randomized clinical trial, that involved 90 patients indicated for upper limb vascular surgery at the Cardiothoracic and Vascular Surgery Centre, Mansoura University Hospitals, Mansoura, Egypt over the period of one year, from October 2021 till October 2022.

Ethical consideration

The study gained approval from the local ethical committee and Institutional Review Board [IRB] [code no.: MS. 21.09.1688] of the faculty of medicine, Mansoura University. An informed written consent was signed by all participants after complete explanation of the technique of our study.

Inclusion criteria

Patients undergoing scheduled upper extremity vascular surgery, with American Society of Anesthesiologists physical status [ASA] grade I, II and III, and age range between 21 and 60 years.

Exclusion criteria

Any contraindications to regional block [i.e., infection at the needle insertion site, contralateral pneumothorax, or diaphragmatic paralysis], known hyper-sensitivity to the study drugs, pre-existing neuropathy involving the surgical limb or history of major psychiatric disorder.

Sample size calculation

The sample size was calculated using Power Analysis and Sample Size software program [PASS] version 15.0.5 for windows [2017] with the post-operative duration of analgesia assessed by VAS score as the primary outcome. Patients were randomized into two groups: the Dexmedetomidine group and the Midazolam group. The null hypothesis was considered as the absence of difference between all groups regarding the postoperative duration of analgesia. A sample size of 41 patients in each group is needed to achieve 80% power [1-β or the probability of rejecting the null hypothesis when it is false] and α error detects an effect size of 0.63 [moderate effect size] in the proposed study using a t-test. Allowing 10%. drop-out patients expected, so 45 patients were enrolled into each group.

Grouping: Patients were randomly allocated into two groups:

1. BD group [45 patients]: Patients who received ultrasound-guided supraclavicular regional block with injection of 20 ml Bupivacaine 0.25% + 10 ml Lidocaine Hydrochloride 2% + 1µ/kg Dexmedetomidine [14].

2. BM group [45 patients]: Patients will receive ultrasound-guided supraclavicular regional block with an injection of 20 ml Bupivacaine 0.25% + 10 ml Lidocaine Hydrochloride 2% + 50µ/kg Midazolam [15].

Randomization: The randomization was done via computer-generated randomization table. Block performers, investigators, and data collectors were blind to the drug injected [Group Assignment] while a nurse in the recovery room opened the envelope and prepare the injectate.

Preoperative evaluation

History: Personal data [age, gender, occupation, special habits, and residence], medical history [current systemic comorbidities with its duration and drugs of treatment] and surgical history.

Investigations: complete blood count, liver function tests [serum albumin, bilirubin, liver transaminases, INR], serum creatinine, random blood glucose, serum electrolytes [Na and K], ECG and echocardiography when needed.

Preprocedural preparation: The standard monitoring was applied to the patient including ECG, non-invasive blood pressure [NIBP], peripheral oxygen saturation [SpO2]. The last two parameters were recorded at time intervals of 0, 5, 10, 15, 30, and 45 mins during the operation. On arrival in the recovery room, an intravenous [IV] cannula of suitable size was inserted in the contralateral upper limb.

The supraclavicular block technique [16]

Under strict aseptic precautions and after infiltration of 2 ml of 2% lidocaine locally. A 22-gauge spinal needle was used for local

anesthetic infiltration. The supraclavicular brachial plexus was visualized under ultrasound guidance [GE Healthcare Vivid T8].

To perform the procedure, a superficial ultrasound probe was positioned in the supraclavicular fossa in a transverse orientation that was parallel to the clavicle and directed downward toward the thorax on the same side of the body. This allowed for visualization of the brachial plexus and subclavian artery, with the first rib appearing as a bright line and the pleura of the lung visible beneath it. Using an in-plane approach, a needle was inserted from the outer side toward the inner side, targeting the main neural cluster of the brachial plexus. Once it was confirmed that no blood was drawn into the syringe, a local anesthetic [approximately 10 ml of 2% lidocaine hydrochloride] was injected. Subsequently, the local anesthetic mixture was deposited near the surrounding satellite neural clusters according to group allocation. Injection was stopped if the patient experiences paresthesia or pain.

Outcomes

Sensory block in the territories of the median, ulnar, radial, and musculocutaneous nerves were assessed by pinprick test within time intervals 0, 10, and 20 mins using a 2-point scale: 1: loss of sensation [analgesia], and 2: loss of touch sensation [anesthesia] [17]. Duration of the sensory block was recorded as the time taken from the local anesthetic administration to complete recovery of anesthesia on all nerves. Duration of analgesia was recorded as the time from local anesthetic administration to a visual analog score [VAS] of more than 40.

Motor block was evaluated by thumb abduction [radial nerve], thumb adduction [ulnar nerve], thumb opposition [median nerve], and flexion at the elbow joint [musculo-cutaneous nerve] at time intervals 10, and 20 mins on a 2-point scale for motor function: 1: reduced motor strength but able to move fingers, 2: complete motor block [17]. Duration of the motor block was recorded as the time from local anesthetic administration till recovery of complete motor function of the hand and the forearm. The motor block was designated incomplete when there is a grade 1 motor block in the presence of a grade 2 sensory block. When both sensory and motor blocks were incomplete, this was termed as a failure of the block and the patient was excluded from the study.

Sensory and motor block, heart rate, non-invasive blood pressure, and sedation score [Ramsay Sedation Scale 1-6] were assessed at 1, 2, 4, 6 hours following the operation.

Pain was assessed using the visual analog scale [VAS], which ranges from 0 to 100, with 0 for no pain, and 100 for the worst pain ever [18].

Statistical analysis

IBM's SPSS Statistics [Statistical Package for the Social Sciences] for Windows [version 25] was used for statistical analysis of the collected data. The Shapiro-Wilk test was used to check the normality of the data distribution. Normally distributed continuous variables were expressed as mean ± SD while categorical variables were expressed as number and percentage. Student t-test was used for continuous data. A Chi-square or Fisher's Exact tests were used for categorical data using the crosstabs' function. All tests were conducted with a 95% confidence interval. P [probability] value < 0.05 was considered statistically significant.

RESULTS

There was no statistically significant difference between the two groups regarding age, sex, height, weight and BMI. The duration of analgesia was statistically significantly longer in the BD group with a mean value of 11.43 ± 1.85 hours compared to the midazolam group [9.33 ± 1.69 hours] as shown in table [1].

After 10 minutes from the onset of intervention, 30 [66.7%] patients in the BD group achieved complete sensory block and complete motor block. On the other hand, in the BM group, 13 [28.9%] patients had complete sensory block [P<0.001] and 19 patients with complete motor block [P 0.02] as shown in table [2].

Regarding heart rate, there were no significant differences between both groups regarding intraoperative HR up to 15 minutes. However, at 30 minutes intraoperatively, the heart rate started to significantly fall in the BD group, which continued until 6 hours postoperatively [Table 3].

There were no significant differences between studied groups regarding intraoperative or postoperative blood pressure [table 4].

Regarding SPO_2, there were significant differences between both groups at 10 minutes intraoperatively which persisted until 6 hours postoperatively, being higher in the BM group [Table 5].

According to the Ramsay Sedation Scale, the BD group showed significantly higher scores starting from 30 minutes intraoperatively and continuing until 6 hours postoperatively [Table 6].

Regarding the VAS, the BD group showed significantly lower scores starting from 45 minutes intraoperatively and continuing until 6 hours postoperatively [Table 7]. None of the patients reported a breakthrough pain [VAS > 40].

Table [1]: Patients' characteristics

Characteristics		BD-Group [n = 45]	BM-Group [n = 45]	Test	P-Value
Age [years], mean ± SD		50.9 ± 13.3	46.9 ± 11.9	t= 1.5	0.14
Gender	Females Males	15 [33.3] 30 [66.7]	10 [22.2] 35 [77.8]	χ^2 =1.4	0.2
Body weight [Kg], mean ± SD		83 ± 14.16	84.88 ± 22.24	t=1.04	0.3
Height [M], mean ± SD		1.7 ± 0.1	1.74 ± 0.08	t=1.57	0.12
BMI [Kg/m^2], mean ± SD		28.7 ± 4.56	28 ± 8.79	t=0.47	0.63
Duration of analgesia [h]		11.43 ± 1.85	9.33 ± 1.69	t=5.6	

Table [2]: Comparison of the motor and sensory block between the two study groups at different time points

	BD-Group [n = 45]	BM-Group [n = 45]	Test	PValue
Sensory block, n [%]				
At 10 min				
Loss of sensation [analgesia]	15 [33.3]	32 [71.1]	χ^2 = 12.9	**< 0.001***
Loss of touch sensation [anesthesia]	30 [66.7]	13 [28.9]		
At 20 min				
Loss of sensation [analgesia]	0 [0]	3 [6.7]	FET	0.2
Loss of touch sensation [anesthesia]	45 [100]	42 [93.3]		
Motor block, n [%]				
At 10 min				
Reduced motor strength	15 [33.3]	26 [57.8]	χ^2 = 5.4	**0.02***
Complete motor block	30 [66.7]	19 [42.2]		
At 20 min				
Reduced motor strength	0 [0]	1 [2]	FET	1
Complete motor block	45 [100]	44 [97.8]		

Table [3]: Comparison of the intra- and post-operative average HR [Beat/min] between the two study groups at different time points

Parameter	D-Group n= 45	M-Group n= 45	Statistical test	P-Value
	Mean ± SD	Mean ± SD		
Intraoperative HR				
At 0 min	79.3 ± 11.8	80.3 ± 10.3	t= 0.52	p= 0.6
At 10 min	77.6 ± 12.6	79.9 ± 9.5	t= 1.02	p= 0.3
At 15 min	76.1 ± 12.3	78.9 ± 10.5	t= 1.23	p= 0.2
At 30 min	72.5 ± 12.1	77.5 ± 11.2	t= 2.11	p= 0.04
At 45 min	69.1 ± 10.3	76.3 ± 11.1	t= 3.37	p= 0.001*
Postoperative HR				
After 1 hour	65.9 ± 12.5	74.2 ± 10.2	t= 3.5	p = 0.001*
After 2 hours	66.6 ± 11.2	75.2 ± 10.7	t = 3.7	p= 0.001*
After 4 hours	68.9 ± 10.5	76.9 ± 10.7	t = 3.6	p= 0.001*
After 6 hours	72.3 ± 11.0	79.1 ± 10.4	t = 3.0	p= 0.003*

Table [4]: Comparison of the Intra- and Post-operative average mean BP [mmHg] between and within the two study groups at different time points

		D-Group [n=45]	M-Group [n=45]	Test	P- Value
Intraoperative blood pressure [Mean ± SD]	**At 0 min**	113.8±20.8	114.2±15.9	t= 0.10	0.9
	At 10 min	111.4±17.6	109.9±15.9	t= 0.42	0.7
	At 15 min	109.2±18.5	109.7±16.7	t= 0.17	0.9
	At 30 min	105.8±18.6	107.8±15.9	t= 0.59	0.6
	At 45 min	103.2±17.5	106.9±16.5	t= 1.09	0.3
Postoperative blood pressure [Mean ± SD]	**After 1 hour**	102.6±19.7	105.5±15.2	t= 0.83	0.4
	After 2 hours	104.8±19.0	106.9±14.3	t= 0.62	0.5
	After 4 hours	108.8±22.5	109.9±18.3	t= 0.27	0.8
	After 6 hours	109.3±18.5	110.7±14.6	t= 0.40	0.7

Table [5]: Comparison of the Intra- and Post-operative SPO2 [%] between and within the two study groups at different time points

		D-Group [n=45]	M-Group [n=45]	Test	P-Value
		Mean ± SD	**Mean ± SD**		
Intraoperative SPO2	**At 0 min**	98.4 ± 2.03	98.4 ± 1.7	t= 0.06	0.9
	At 10 min	97.1 ± 1.8	98.1 ± 1.9	t= 1.09	0.05
	At 15 min	96.4 ± 2.2	97.5 ± 2.2	t= 2.2	0.03*
	At 30 min	95.2 ± 2.5	97.3 ± 1.8	t= 4.7	< 0.001*
	At 45 min	94.7 ± 2.8	97.7 ± 1.7	t= 6.7	< 0.001*
Postoperative SPO2	**After 1 hour**	94.8 ± 2.4	97.7± 1.963	t= 5.7	< 0.001*
	After 2 hours	95.1 ± 2.2	97.4 ± 1.748	t= 5.2	< 0.001*
	After 4 hours	96.1± 1.9	97.7± 1.8	t= 3.5	0.001*
	After 6 hours	97.1± 1.5	98.2± 1.6	t=2.9	0.005*

Table [6]: Comparison of the Intra- and Post-operative Ramsay Sedation Scale between and within the two study groups at different time points

		D-Group [n=45]	M-Group [n=45]	Statistical test	P-Value
		Mean ± SD	**Mean ± SD**		
Intraoperative RSS	**At 0 min**	1.42± 0.5	1.67± 0.7	t= 1.7	0.07
	At 10 min	2.51± 0.9	2.47± 0.6	t= 0.3	0.8
	At 15 min	3.00± 0.8	2.78± 0.6	t= 1.6	0.1
	At 30 min	3.78± 0.9	2.98± 0.5	t= 6.1	< 0.001*
	At 45 min	4.16± 0.9	2.96± 0.7	t= 6.7	< 0.001*
Postoperative RSS	**After 1 hour**	4.33 ± 1.1	3.18 ± 0.8	t= 5.9	< 0.001*
	After 2 hours	3.98 ± 1.0	3.00 ± 0.9	t= 4.8	< 0.001*
	After 4 hours	3.24 ± 0.8	2.44 ± 0.7	t= 4.9	< 0.001*
	After 6 hours	2.51 ± 0.7	2.09 ± 0.4	t= 3.4	0.001*

Table [7]: Comparison of the Intra- and Post-operative Visual Analogue Scale between and within the two study groups at different time points

	D-Group [n=45]	M-Group [n=45]	Statistical test	P-Value
	Mean ± SD	**Mean ± SD**		
Intraoperative VAS				
At 0 min	34.0 ± 8	30. 9 ± 13	t= 1.4	0.2
At 10 min	1.69 ± 1.3	18.2 ± 10	t= 0.6	0.5
At 15 min	10.9 ± 15	13.3 ± 9	t= 1.3	0.2
At 30 min	5.6 ± 13	7.6 ± 8	t= 1.4	0.2
At 45 min	0.9 ± 8	4 ± 9	t= 2.3	0.02*
Postoperative VAS				
After 1 hour	2.2 ± 14	2.8 ± 5	t= 1.8	0.08
After 2 hours	2.4 ± 12	2.8 ± 7	t= 1.9	0.059
After 4 hours	8 ± 12	11.6 ± 7	t= 2.6	0.01*
After 6 hours	16 ± 11	19.4 ± 9	t= 2.6	0.01*

DISCUSSION

Peripheral blocks, such as the supra-clavicular brachial plexus block, are frequently used for upper limb surgeries as they provide efficient anesthesia. Researchers are still exploring suitable adjuvants to enhance the effects of regional nerve blocks, with a focus on medications that can prolong analgesia while minimizing adverse effects [19].

Dexmedetomidine is a potent α2 adrenoceptor agonist that is highly selective towards this receptor, being approximately eight times more selective than clonidine. It has sedative and analgesic properties, as well as sympatholytic and cardiovascular stabilizing effects during the peri-operative period [20]. These effects lead to a reduction in the need for opioids and inhalational anesthetics [21]. Studies have shown that when dexmedetomidine is combined with local anesthetics in peripheral and neuraxial nerve blocks, it can extend the duration of both sensory and motor blockade [22].

Midazolam is a commonly used substance that has anxiolytic, sedative, and amnesic properties. It is known for having a low risk of side effects and a high level of safety. When administered through the neuraxial route, midazolam may have pain-relieving effects, but this is not the case when it is administered systemically [23].

To the best of our knowledge, only one study has previously compared the effects of dex-medetomidine versus midazolam as adjuvants to upper limb vascular surgeries under supra-clavicular block.

In the current study, there was no statistically significant difference between the two groups regarding the age, sex, weight, height and BMI. This indicates the process of good randomization that excludes the risk of selection bias. This came in the same line with **Kumar *et al.*** [24] who included sixty adult patients undergoing upper limb surgery under supraclavicular brachial plexus block who were randomly divided into two groups. The first group was administered midazolam and the second group was administered dexmedetomidine which was followed by maintenance infusion of bupivacaine [0.5%] was injected for supraclavicular brachial plexus block. The demographic profile of the patients in the two groups was comparable.

In the current study, there was a statistically significant difference between the two groups regarding the sensory block at 10 minutes. At 10 minutes, there was higher incidence of loss of touch sensation in the dexmedetomidine group and higher incidence of loss of sensation in the midazolam group. Also, at 10 minutes, there was higher incidence of complete motor block in the dexmedetomidine group compared to the midazolam group.

This was in accordance with **Kumar *et al.*** [24] who reported that the group who received dexmedetomidine experienced a faster onset of sensory and motor block compared to the group that received midazolam. The average time for sensory block onset was 16.6±1.9 minutes in the dexmedetomidine group and 19.8±1.7 minutes in the midazolam group [$p<0.001$]. The average time for motor block onset was 19.5±2.7 minutes in the dexmedetomidine group and 23.6±1.4 minutes in the midazolam group [$p<0.001$]

In the current study, the duration of analgesia was statistically significantly longer in the dexmedetomidine group with mean value of 11.43 ± 1.85 hours compared to the midazolam group [9.33 ± 1.69 hours].

This came within the same line with **Kumar *et al.*** [24] who showed that the group who received dexmedetomidine had a longer duration of sensory and motor block compared to the group that received midazolam.

In the current study, there was no statistically significant difference in the postoperative VAS score except at 12 hours postoperative where it showed a statistically significant increase in the midazolam group. During the postoperative follow-up, the VAS was higher in the midazolam group, but it didn't reach a statistically significant difference except at 12 hours.

Numerous research studies have utilized dexmedetomidine as a supplement to local anesthesia in various regional and peripheral nerve blocks, and these studies have demonstrated that it is a highly effective option for enhancing the effectiveness of the local anesthetic.

Kathuria *et al.* [25] conducted a study that was randomized and controlled, in which they examined the use of dexmedetomidine as a supplement to ropivacaine in the supraclavicular brachial plexus block. The addition of dexmedetomidine either through perineural administration or intravenous co-administration resulted in a reduction in the time it took for the block to take effect and an extension in the duration of both motor and sensory blockade.

The researchers noted that these effects were more noticeable in patients who had received dex-medetomidine through perineural administration. In their study, **Agarwal *et al.*** [26] investigated the impact of adding perineural dexmedetomidine to 0.325% bupivacaine in comparison to a bupivacaine solution with normal saline. The use of perineural dexmedetomidine as a supplement resulted in a significant reduction in the time it took for the block to take effect, as well as an extension in the duration of both sensory and motor blockade.

The addition of intravenous dexmedetomidine to ropivacaine interscalene brachial plexus block can increase the duration of pain relief and decrease the need for opioids, without causing a prolonged motor blockade [27].

Rutkowska *et al.* [28] conducted a study to examine the impact of dexmedetomidine sedation on brachial plexus block in patients with end-stage renal disease. In comparison, our study only included patients with ASA I and II. They used 0.375% bupivacaine, while we used 0.5% bupivacaine. Additionally, they administered midazolam sedation to the control group, but both study drugs were given after the block was established. In contrast, our study began infusions before block placement.

the mechanism of the analgesic effect of dexmedetomidine upon administration as an adjuvant to local anesthetics is still not clear and may be multifactorial [29, 30].

There was no statistically significant difference between the two groups regarding the intraoperative and the postoperative blood pressure along the duration of follow up. This copes with **Kumar *et al.*** [24] who reported that the dexmedetomidine group had lower mean heart rates from 20 minutes into the infusion until the end of the infusion. The researchers also noted that the initial mean arterial pressure values were similar in both groups and remained so throughout the infusion.

The infusion of dexmedetomidine led to consistent hemodynamic parameters and did not cause any notable adverse effects. These results align with previous studies that have demonstrated the usefulness of dexmedetomidine in providing sedation for patients undergoing upper limb surgeries with brachial plexus block [30, 31].

The current study also has limitations, being a single center study and the relatively small sample size included. These limitations could be overcome in subsequent studies for obtaining more powerful results.

Conclusion: When dexmedetomidine was added to bupivacaine for supraclavicular brachial plexus block, it was found to be more effective in extending the duration of both sensory and motor block, and also in providing sufficient pain relief during and after the surgery when compared to midazolam without any significant adverse effects. Further studies should be performed including larger number of patients from one than more centers.

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