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ORIGINAL ARTICLE

A Randomized Comparative Evaluation of Effects of Dexmedetomidine as an Adjuvant with Bupivacainein Supraclavicular Block in CRF patients Undergoing Basilic Vein Transposition Surgery

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ABSTRACT

Aim: To compare analysis of bupivacaine in supraclavicular block with dexmedetomidine bupivacaine in supraclavicular block in chronic renal failure patients undergoing basilica vein transposition surgery.
Methodology: Double-blind randomised control trial. Department of Anaesthesia, Sindh Institute of Urology and Transplantation, Karachi, from September 1st, 2021, to February 28th, 2022
Seventy chronic renal failure patients undergoing elective basilic vein transposition surgery were enrolled. Patients were divided into two groups, in which 35 patients in group A received bupivacaine (0.25%) in 28mL plus dexmedetomidine (1ug/kg) diluted to 2 mL, and 35 patients in group B were injected with bupivacaine (0.25%) in 28 mL plus 2mL of normal saline.
Results: The mean time of onset of sensory blockade was comparatively higher in group B as compared to group A. Similarly, the onset of motor block time was also higher in group B as compared to group A, and the duration of motor block did not show any significant results between groups, and the duration of motor block was not statistically significant between groups [p = 0.404].
Conclusion: The combination of bupivacaine and dexmedetomidine appeared to be useful for onset time and prolongs the duration of analgesia in supraclavicular brachial plexus block.
Keywords: Chronic kidney disease, Dexmedetomidine, Supraclavicular brachial plexus block

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health issue associated with decreased quality of life, increased health care expenditures with a considerable increase in morbidity and mortality. Untreatedis has a therapeutic effect on end-stage renal disease, but these patients encounter many physical, psychological, and social stresses on the body[3].

Different approaches can be adopted for the creation of arterio-venous fistula such as local anaesthetic infiltration, regional and local anaesthesia. Regional hetic nerve block can be created by localised anaesthesia, which results in increased vessel flow and increased intra-operative venous diameter even after surgery[6]. It also helps in the maintenance of blood flow through the fistula, which helps in the prevention of fistula failure and thrombosis[7-9].

Various blockades have been evaluated, including both opioids and nonopioids agents[10-12]. Among others, dexmedetomidine showed better affinity for the α²-adrenoreceptor as compared to clonidine[13]. By virtue of its effect on spinal α² receptors, dexmedetomidine mediates its analgesic effects. [14] Dexmedetomidine has been found to prolong analgesia when used as an adjuvant to local anesthetics[15].

Gandhi et al (2016) evaluated a comparative study in supraclavicular brachial plexus block patients who received dexmedetomidine with bupivacaine on time of onset sensory blockade (21.4:2.5 vs. 18.4:2.5), duration of sensory blockade (732 4±48.9 vs. 146.5±36.4), motor blockade (11.242.1 vs. 8.5+1.4), duration of motor blockade (660.2:160.4 vs. 100.7:48.3), and duration of analgesia (732.4±195.1 vs 194.8±60.4).

Conventional basilic vein transposition (BVT) requires long-term anaesthesia and good analgesia. The purpose of the study was to compare the effects of dexmedetomidine as an adjuvant to bupivacaine for supraclavicular block in CRF patients undergoing BVT surgery that will enhance the effects of bupivacaine in terms of sensory, motor, and duration of analgesia, and the patient will get early-onset and prolonged analgesia. Also, in order to establish the local perspective, there is a paucity of local data. This provides me with a strong rationale to conduct this study.

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Dexmedetomidine, when combined with bupivacaine, significantly reduced sensory and motor block onset in CRF patients with supraclavicular block. However, no difference was found in analgesia requirement or duration.

MATERIALS AND METHODS

This double-blind randomised control trial was conducted at the Department of Anaesthesia, SIUT Karachi, from September 1st, 2021, to February 28th, 2022 after permission from IRB and 70 patients, with 35 in each group, were enrolled. Patients were randomly allocated using a sealed opaque envelope bearing A (injection of bupivacaine (0.25%) in 28 mL plus dexmedetomidine (1ug/kg diluted to 2ml) and B (0.25% injection of bupivacaine adjuvant in 28 mL and 2ml of normal saline). Chronic renal failure patients who underwent elective basilic vein transposition surgery, either gender, ASA III-IV, or age 18–65 years, were included. All patients with mental challenges, pregnancy, hypersensitivity to bupivacaine or dexmedetomidine, seizures, neck swelling (hematoma, lipoma, tumour, thyroid), neuromuscular dystrophy, and bleeding disorders were excluded. All the patients were instructed not to consume solid food after midnight prior to surgery. A brief history of demographic data was taken from each patient. Each participant's height in metres was measured using a wall-mounted scale, weight in kg was measured using a weighing machine, and BMI in kg/m2 was noted prior to operation. The findings of quantitative variables (age, height, weight, sensory blockade, motor blockade) and qualitative variables (hypertension, age, gender, dyslipidemia, and diabetes mellitus) were noted.

Only the anesthesiologist had awareness regarding treatment allocation. Routine assessment and vitals, including blood pressure and peripheral oxygen saturation, were monitored and recorded. A supraclavicular brachial plexus block in the supine position was performed by an anesthesiologist. After establishing the IV line, a probe of 12MHz frequency was placed on the supraclavicular fossa. The placement of the probe was in a transverse direction above the clavicle at its midpoint. A cross-sectional view of the sub-clavian artery was obtained by tilting the probe caudally. A 25-gause was used for the administration of 1-2ml of lidocaine to prevent needle discomfort. A short 80- or 50-mm needle that helps with nerve stimulation was used. A close approximation to the divisions of the brachial plexus was confirmed

by getting nerve stimulation at 0.3 mA current. The needle was advanced in the direction of the ultrasound beam, and the tip and shaft of the targeted nerves were clearly visible in real-time. The drugs in both groups were administered through visualisation through ultrasound beams and by confirming with nerve stimulation. Sensory blockade and motor blockade were assessed every 3 minutes. Postoperative pain was assessed with VAS. A line was marked by the patients according to the intensity of pain on the Visual Analogue Score hourly for 4 hours post-operatively, and those having arm pain via VAS >4 hours post-surgery were given rescue analgesics inj. Paracetamol (15mg/kg 1/V), and the duration of analgesia was noted. The data was analysed in SPSS-20.

RESULTS

The descriptive statistics of patients according to group are presented in Table 1. The gender distribution with respect to group is shown in Figure 1. The average hemodynamics of the patients and VAS pain score were not statistically significant between groups (Table 2). Almost 93% of patients were hypertensive, 45% had dyslipidemia, 43% had diabetic mellitus, and only 34% were smokers (Table 3).

The mean time of onset of sensory blockade was higher in group B as compared to group A [3.05±3.05 vs. 3.94±1.3 p=00005], but the duration of sensory blockade was not statistically significant between groups [275±46.83 vs. 262.83±21.92; p=0.168]. Similarly, the average motor block onset time was significantly higher in group B as compared to group A [5.74±1.79 vs. 9.71±3.37; p = 0.0005]. However, the duration of motor block was not statistically significant between groups [258.54±41.26 vs. 29.85±29.85; p = 0.404]. The duration of analgesia was almost similar in both groups [298.06±51.82 vs. 288.83±29.06; p = 0.361] (Table 4). The requirement for rescue analgesia was also not statistically significant between groups [42.86% vs. 57.14%; p = 0.063] (Table 5).

Table 1: Descriptive statistics of the patients (n=70)

Study variable	Group A	Group B
Age (Years)	44.83±12.17	39.03±14.83
Height (m^2)	1.84±0.87	1.62±0.08
Weight (kg)	59.06±6.53	58.46±9.72
BMI (kgm^2)	21.97±1.62	22.08±3.16

Table 2: Hemodynamic comparison within study groups

Variable	Group A	Group B	P-value
SBP (mmHg)	146.86±21.96	145.80±18.36	0.828
DBP (mmHg)	80.46±10.25	82.97±12.92	0.370
MAP (mmHg)	101.54±10.12	102.57±13.52	0.720
Pulse (beat/min)	78.06±15.20	74.11±13.05	0.248
Spo2 (%)	92.23±21.41	99.29±0.66	0.055
VAP Score	2.80±3.24	2.11±2.86	0.352

Table 3: Frequency of comorbid status of the patients according to groups

Variables	Group A	Group B
Diabetic Mellitus	17(48.6%)	13(37.1%)
Hypertension	34(97.1%)	31(88.6%)
Dyslipidemia	17(48.6%)	15(42.9%)
Smoking	10(28.6%)	13(39.4%)

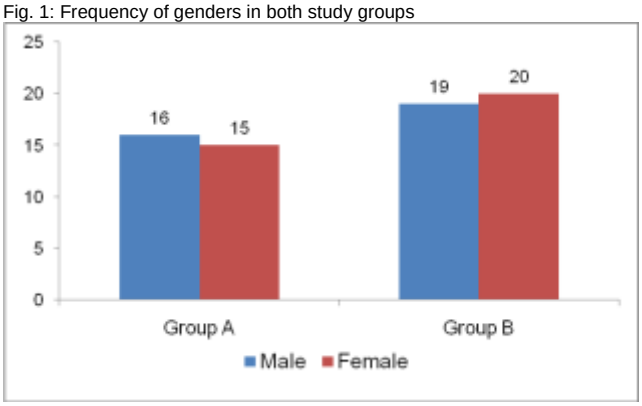
Table 4: Comparison of outcome between groups

Outcome	Group A	Group B	P-value
Sensory block onset time (min)	3.94±1.30	7.14±3.05	0.0005
Duration of sensory blockade (min)	275±46.83	262.83±21.92	0.168
Time of onset of motor block (min)	5.74±1.79	9.71±3.37	0.0005
Duration of motor blockade (min)	258.54±41.26	251.31±29.85	0.404
Duration of analgesia (min)	298.06±51.82	288.83±29.06	0.361

Table 5: Comparison of requirement of rescue analgesia between groups (n=70)

Requirement of rescue analgesia	Group A	Group B	P value
Yes	15 (42.86%)	13 (37.14%)	0.63
No	20 (67.14%)	22 (62.86%)	

Fig. 1: Frequency of genders in both study groups



DISCUSSION

Various studies on animals have shown a therapeutic window for dexmedetomidine within the range of 2.5–100µg without causing any neurological effects[17–21]. Clinical studies on humans have also proven vital results without causing neural damage[22-24]. Combinations of dexmedetomidine with other adjuvants also prove better efficacy. However, the mechanism of the analgesic effect of dexmedetomidine in combination with other drugs is still a matter of debate. The studies conducted by Murphy et al.25 and Brummett et al.26 proved that dexmedetomidine shows better results in combination with powerful adjuvants. Proposed mechanisms suggested by different authors[27–29] showed that dexmedetomidine induces anaesthetic effects through vasoconstriction of α2-adrenoceptors, release of epinephrine, and increasing the concentration of potassium ions in A delta neurons.

The mean onset time for motor and sensory blockade was significantly higher in group B as compared to group A. The study by Gandhi et al[30], however, proves faster in the dexmedetomidine group as compared to the other group. Another study conducted by Hamed et al showed a significant difference in their study group. Considerable variance was observed in motor and sensory duration. Furthermore, the study of Rashmi and Komala[32] proved a better outcome through the combination of dexmedetomidine with adjuvant.

Analgesic requirement duration was not statistically different in both study groups. On the other hand, Gandhi et al[30] showed opposite results in which considerable variances were observed. A study by Farooq et al[33] highlighted that dexmedetomidine and fentanyl with ropivacaine showed extended duration of analgesic effect. This might happen due to the effect of ropivacaine, which makes the duration longer than usual as compared to bupivacaine.

CONCLUSION

The mean time of onset of sensory blockade and the average time of onset of motor block were significantly lower in dexmedetomidine as an adjuvant to bupivacaine for supraclavicular block in CRF patients. However, no difference was observed between groups in accordance with the analgesia requirement and mean duration. Combination of bupivacaine and dexmedetomidine proved to be a better choice of drug for the prolongation of analgesia duration in supra-clavicular brachial plexus block.

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1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

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