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ORIGINAL ARTICLE

Comparison of effectiveness of combination of xylocaine and dexmedetomidine with xylocaine alone in biers block of upper limb.

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ABSTRACT… Objective: To evaluate two groups (combination versus xylocaine alone) in terms of onset of motor block, duration of block, and postoperative analgesia following the release of the tourniquet. **Study Design:** Quasi Experimental study. **Setting:** Chaudhary Muhammad Akram Teaching & Research Hospital. **Period:** 01 June 2023 to 30 Nov 2023. **Material & Methods:** Quasi experimental study design with a sample of total 80 patients divided into two groups of 40 each (xylocaine alone & combination of xylocaine and dexmedetomidine) were selected by using non probability convenient sampling technique. **Results:** Combining dexmedetomidine with xylocaine in Bier's block for upper limb surgery demonstrated significant advantages. Group B exhibited faster onset (3.8 min), prolong motor block, and prolonged postoperative analgesia (12.4 hrs) compared to group A (xylocaine alone: 5.2 min onset & shorter postoperative analgesia 6.8 hrs). Dexmedetomidine enhanced post-operative pain control, showcasing its effectiveness in improving outcomes for Bier's block procedures. **Conclusion:** Dexmedetomidine enhances Bier's block with xylocaine, providing faster onset, extended motor block, and superior post-operative analgesia for upper limb surgery.

Key words: Anesthesia, Bier's Block, Dexmedetomidine, Effectiveness, Upper Limb, Xylocaine.

INTRODUCTION

Upper extremity surgeries pose challenges for anesthesiologists and pain specialists due to persistent pain issues. Utilizing regional anesthesia techniques targeting the brachial plexus is crucial for effective pain control in modern surgical practice, minimizing systemic side effects linked to general anesthesia.[1] The Bier's block, which is also known as intravenous regional anesthesia, is a method that is often used in order to achieve anesthesia in the upper limb.[2] Regional anesthesia's roots extend to ancient times, employing herbal remedies for surgical pain. Modern principles emerged in the late 19th century, with Bier's block, pioneered by August Bier, a key advancement utilizing distal vein injection for localized anesthesia in upper limb surgeries.[3]

Regional anesthesia has advantages over general anesthesia, offering rapid recovery, enhanced postoperative pain control, and lower airway complication risks. It's often safer for patients with comorbidities by avoiding systemic anesthetic agents. Despite its benefits, challenges exist, requiring expertise in anatomy, dosing, and managing complications like tourniquet pain and local anesthetic toxicity. Careful selection of local anesthetic agents is crucial, influencing the quality and duration of anesthesia in procedures such as Bier's block.[4] Dexmedetomidine, a highly selective alpha-2 adrenoceptor agonist, is frequently combined with local anesthetics to enhance peripheral nerve block quality. Studies demonstrate its analgesic effects in rodents, volunteers, and patients, reducing the need for anesthesia by up to 90%. Its efficacy extends to various procedures such as brachial plexus blocks, spinal, and epidural anesthesia and it potentiating the action of local anesthetics for improved

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intraoperative and postoperative outcomes in IVRA.[5,6] The purpose of the current study was to investigate the efficacy, onset, duration and postoperative analgesia in postoperative time with intravenous dexmedetomidine anesthesia (IVRA) using 0.5mcg/kg of dexmedetomidine combined with 3mg/kg of 0.5% lignocaine.[7]

A literature review demonstrates that combination treatment is more effective than xylocaine alone, and a clinical experiment indicated that adding dexmedetomidine to lidocaine enhanced the sedation rate following the relaxation of the tourniquet.[8] According to the findings of another trial, the dosage of 0.25 micrograms per kilogram of dexmedetomidine for Bier block was successful.[7] According to the findings of a research that used sequential allocation, dexmedetomidine was more effective than clonidine.[9] Dexmedetomidine demonstrated superior efficacy to lidocaine alone in IVRA (Bier's block) for both anesthesia and analgesia in a clinical study.[10] Another study shows dexmedetomidine combined with lidocaine in IVRA (Bier's block) demonstrated superior anesthetic and analgesic efficacy compared to lidocaine alone, according to a clinical investigation.[11] The results of a research that dexmedetomidine, when added to lidocaine for intravenous regional anesthesia or administered parenterally as premedication, demonstrated enhanced analgesia quality and prolonged recovery of sensory and motor block in research findings. Overall, it proved beneficial in improving anesthetic outcomes.[12] Conducting a study on dexmedetomidine as an adjuvant to xylocaine in Bier's block in Lahore, Pakistan, addresses local challenges in pain management for upper extremity surgeries. This research aims to enhance regional anesthesia outcomes, contribute to global knowledge, and provide valuable insights for local healthcare improvement. Additionally, it offers an opportunity to assess economic feasibility and resource implications in the Lahore healthcare system.

Objective

The purpose of this study is to evaluate two groups (combination versus xylocaine alone) in terms of onset of motor block, duration of block, and postoperative analgesia following the release of the tourniquet.

MATERIAL & METHODS

In this quasi-experimental study conducted at Chaudhary Muhammad Akram Teaching & Research Hospital, a total of 80 patients were selected using non-probability convenient sampling and divided into two groups, with 40 patients in each group. The study, which took place from June 1, 2023, to November 30, 2023, aimed to compare the effectiveness of Bier's block using xylocaine alone (Group A) versus a combination of xylocaine and dexmedetomidine (Group B). The intervention involved administering xylocaine alone (2%, 3mg/kg) to Group A, while Group B received a combination of xylocaine (2%, 3mg/kg) and dexmedetomidine (0.25 µg/kg). Inclusion criteria comprised adult patients requiring Bier's block for upper limb surgeries, while exclusion criteria included patients with contraindications to the study drugs, allergy to study medications, pre-existing neurological disorders, or other medical conditions contraindicating Bier's block. Data were collected using a pre-tested questionnaire, and statistical analysis was performed using SPSS 23, employing the student t test for evaluating quantitative data. The results were presented as mean and standard deviation, with a significance level set at $p < 0.05$. The study aimed to provide insights into the comparative efficacy of these interventions in Bier's block anesthesia. Ethical approval was taken from institution ethical review committee dated May 02, 2023.

RESULTS

Gender Distribution Among Two Groups

Table-I summarizes gender distribution in a study comparing xylocaine and dexmedetomidine with xylocaine alone in Bier's block. In the xylocaine group (n=40), there were 23 males and 17 females. In the xylocaine and dexmedetomidine group (n=40), there were 19 males and 21 females.

Groups	Variable	Male	Female	Total
A	Xylocaine	23 (57.5%)	17 (42.5%)	40
B	Xylocaine And Dexmedetomidine	19 (47.5%)	21 (52.5)	40

Table-I. Gender distribution

Onset of Motor Block Among Two Groups

Table-II shows that combining dexmedetomidine with xylocaine in Bier's block for upper limb procedures significantly accelerates onset time (3.8 min vs. 5.2 min, $p < 0.05$)

Variables	Group A (Xylocaine Alone)	Group B (Xylocaine And Dexmedetomidine)	
	Mean	Mean	P-Value
Onset Time (min)	5.2 ± 1.0	3.8 ± 0.8	< 0.05

Table-II. Statistical comparison of onset of motor block among two groups

Duration of Motor Block Among Two Groups

Table-III shows that the addition of dexmedetomidine to xylocaine significantly prolonged motor block duration in Bier's block for the upper limb (group B: 80 min vs. group A: 50 min). The mean difference was 30 minutes, supported by a p-value 0.00.

Variables	Group A (Xylocaine Alone)		Group B (Xylocaine And Dexmedetomidine)		
	Mean	95% CI	Mean	95% CI	P-Value
Duration of Motor Block (minutes)	50±20	(45, 55)	80±15	(75, 85)	0.00

Table-III. Statistical comparison of duration of motor block among two groups

Post Operative Analgesia after Release of Tourniquet

Table-IV shows that combination of xylocaine and dexmedetomidine in Bier's block significantly prolonged analgesia duration (6.8 hours vs. 2.2 hours with xylocaine alone), resulting in lower pain scores and improved post-operative pain management. Dexmedetomidine enhanced immediate pain control, reflected in consistently lower scores at various intervals ($p < 0.001$).

DISCUSSION

Compared to xylocaine alone in Bier's block, the xylocaine group (n=40) had 23 males and 17 females, whereas the xylocaine plus dexmedetomidine group had 19 men and 21 females. Other research comparing dexmedetomidine and xylocaine found similar gender distributions. In research comparing intravenous dexmedetomidine and lidocaine for abdominal gynecological operations, gender distribution did not vary.[13,14]

Combining dexmedetomidine with xylocaine in Bier's block for upper limb procedures demonstrated significantly faster onset (3.8 min vs. 5.2 min) and prolong motor block level ($p < 0.05$). Additional studies, including one with lidocaine-dexmedetomidine, consistently support enhanced sensory block duration.[15] These results are similar to another clinical trial that evaluated the effects of dexmedetomidine in combination with lidocaine and compared the onset of motor and sensory blocks.[16] Adding dexmedetomidine to xylocaine prolonged motor block in Bier's block for upper limb surgery by 30 minutes ($p < 0.05$), supported by similar findings in other studies.

In intravenous regional anesthesia, dexmedetomidine with lignocaine accelerated onset and prolonged both sensory and motor blockade in upper limb orthopedic surgery.[17] Combining xylocaine and dexmedetomidine in Bier's block for upper limb surgery significantly prolongs analgesia (6.8 hours in group B vs.

Variables	Group A (Xylocaine Alone)			Group B (Xylocaine And Dexmedetomidine)			P-Value
	Mean	Pain Score		Mean			
		Time	Score		Time	Score	
Mean Duration of Analgesia (hours)	2.2 ± 1.2	2h 4h 8h 12h 24h	5.3 ± 1.0 4.8 ± 0.9 3.5 ± 0.8 2.7 ± 0.6 1.5 ± 0.5	6.8 ± 1.5	2h 4h 8h 12h 24h	2.0 ± 0.5 1.8 ± 0.4 1.2 ± 0.3 1.0 ± 0.2 0.5 ± 0.1	p < 0.001

Table-IV. Post operative analgesia after release of tourniquet

2.2 hours in group A, $p < 0.001$), with lower pain scores and enhanced immediate post-operative pain control, supported by studies showing improved block quality and prolonged analgesia in IVRA for upper limb surgeries.[18] One limitation of the study is the lack of information on potential confounding factors, such as patients' baseline health conditions, which could affect the generalizability of the findings. Additionally, the study does not address potential long-term effects or complications associated with the combined use of dexmedetomidine and xylocaine in Bier's block for upper limb procedures.

CONCLUSION

Dexmedetomidine with xylocaine in Bier's block demonstrates significant benefits, including a quicker onset time, prolonged motor block duration, and extended analgesia, highlighting its potential to enhance the efficacy of regional nerve blocks for upper limb procedures as compared to xylocaine alone

RECOMMENDATION

Dexmedetomidine with xylocaine in Bier's block for upper limb procedures may improve onset time, motor block duration, and post-operative pain control. The data imply that Bier's block with dexmedetomidine and xylocaine performs better than xylocaine alone, justifying its use in upper limb procedures.

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2	Asif Rashid Alamgir	Statistical work, Quality assessment.	
3	Sahir Shafiq	Statistical work, Stydy plan.	
4	Umair Ahmed	Statistical work, Study makes up.	
5	Riaz Hussain	Statistical work, Study plan	
6	Umer Farooq	Study plan	