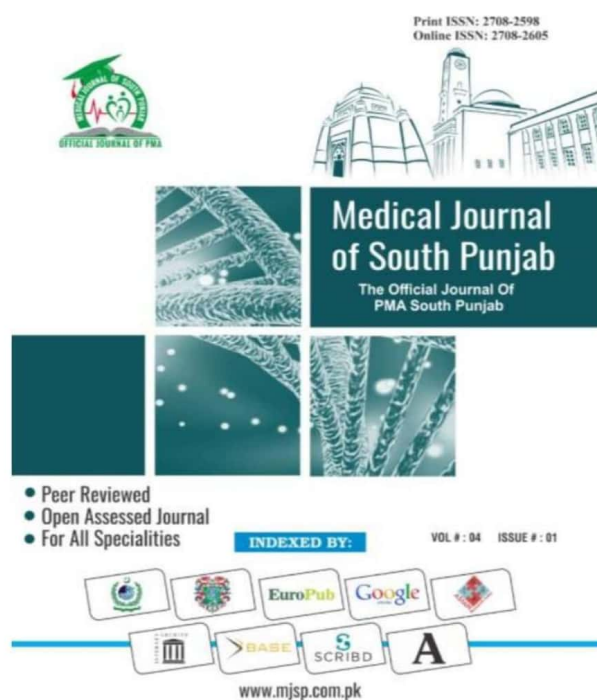


ISSN (E): 2708-2601
ISSN (P): 2708-2598

Medical Journal of South Punjab
Article DOI:10.61581/MJSP.VOL04/02/10
Volume 4, Issue 2, 2023



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Publication History

Received: Dec, 01 2023 Revised: Dec 05 2023
Accepted: Dec 08, 2023 Published: Dec 30, 2023

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Conflict of Interest:

Author(s) declared no conflict of interest.

Acknowledgment:

No Funding received.

Citation: Riaz F, Iqbal A, Haider MS. Comparison of Postoperative Analgesic Duration of Intrathecal Dexmedetomidine Versus Buprenorphine as Adjuvant to 0.5% Heavy Bupivacaine in Spinal Anesthesia for Orthopedic Surgeries. Medical Journal of South Punjab. 2023 Dec 30; 4(2):70-76.

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An official publication of

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Comparison of Postoperative Analgesic Duration of Intrathecal Dexmedetomidine Versus Buprenorphine as Adjuvant to 0.5% Heavy Bupivacaine in Spinal Anesthesia for Orthopedic Surgeries

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ABSTRACT

Objective: To compare the postoperative analgesic duration of intrathecal Dexmedetomidine versus Buprenorphine as Adjuvant to 0.5% heavy Bupivacaine in Spinal Anesthesia for orthopedic surgeries at a tertiary care hospital.

Methods: An RCT was conducted in the Orthopedics Operation Theaters Department of Anesthesiology at Nishtar Hospital Multan from October 15, 2022, to April 14, 2023. Groups A and B were randomly assigned to sixty patients who were set to have Orthopaedic surgery. Intrathecal five micrograms of dexmedetomidine and 15mg of 0.5% strong bupivacaine were administered to participants in Group A (per hospital protocols). The doses of buprenorphine and 0.5 percent strong bupivacaine given to Group B were 60µg and 15mg, respectively. The length of postoperative analgesia was the primary outcome.

Results: The mean age of the study population was 33.45 ± 6.83 . Out of these 60 patients, 41 (63.33%) were males. The mean BMI was 28.47 ± 3.12 kg/m². The frequency of patients in the ASA I group was 34 (56.67%). The mean duration of analgesia in the intrathecal Dexmedetomidine group was 494.90 ± 38.46 minutes compared with 283.03 ± 17.97 minutes in the buprenorphine group (p -value <0.05). Post-stratification analysis regarding age groups, gender, BMI, type of surgery, obesity, and residential status also showed significant results.

Conclusion: Results showed that intrathecal Buprenorphine had a shorter duration of postoperative analgesia than spinal anesthesia with dexmedetomidine adjuvant to bupivacaine.

Keywords: Buprenorphine, Dexmedetomidine, Intrathecal Buprenorphine, Postoperative analgesia, Spinal Anesthesia.

1. INTRODUCTION

When it comes to surgeries involving the lower abdomen, pelvis, vagina, or legs, spinal anesthesia is both safe and effective.^{1,2} Besides being easy, inexpensive, and inspiring, it provides superior anesthetic and postoperative analgesia. Avoiding hypotension caused by sympathetic outflow blocking by neuraxial blocks is possible with pre-loading or the use of vasopressors and inotropic drugs.^{3,4} It is easier to locate a suitable local anesthetic since ester-based medications, like tetracaine, are more commonly associated with actual allergies than amide-based ones, like bupivacaine. How acute postoperative pain is managed impacts recovery, mobility, and rehabilitation. Physical immobility, psychological emotions, financial consequences, and Chronic Pain syndromes might result from subpar therapy.¹ You can prolong spinal anesthesia and analgesia with the use of adjuvants such as tramadol, morphine, fentanyl, buprenorphine, midazolam, neostigmine, and clonidine. Reduces spinal and supraspinal pain and prolongs anesthesia; it is a centrally acting lipid-soluble analog of thebaine. Itching, lethargy, nausea, and vomiting are symptoms of an overdose. Dexmedetomidine is an α -2 adrenergic agonist that is frequently administered as a sedative in the intensive care unit and as a premedicant during awake fiberoptic intubation. Intrathecal administration was its first usage for transurethral resection of the prostate^{5,6}. It activates the nociceptive pathways for visceral and somatic pain and increases the inhibition of both senses and motor control. As of late, its potential as a local anesthetic adjuvant has also been investigated.

Gupta et al.⁷ found that the mean duration of analgesia in the five μ g dexmedetomidine with 3cc (15mg) of 0.5 % heavy bupivacaine group was 493.56 ± 385.9 minutes, whereas the 60 μ g buprenorphine group had 289.66 ± 64.94 minutes. Anitha et al.⁸ found that five μ g of dexmedetomidine with 0.5 % heavy bupivacaine lasted 353 ± 11.06 minutes, while 60 μ g of buprenorphine with 0.5 % heavy bupivacaine lasted 220.43 ± 13.71 minutes.

We suggest conducting this study in Southern Punjab because there is a shortage of local data and research on this topic in Pakistan. The results will produce a valuable local database. By enhancing quality of life and reducing costs for patients and hospitals, they will empower doctors to provide analgesics that last longer. To compare the postoperative analgesic duration of intrathecal Dexmedetomidine versus Buprenorphine as an adjuvant to 0.5 percent strong Bupivacaine in Spinal Anesthesia for orthopedic procedures at a tertiary care hospital was our goal.

2. METHODOLOGY

From October 15, 2022, until April 14, 2023, an RCT was carried out at the orthopedic operating rooms of the Nishtar Hospital Multan, Department of Anesthesiology, with institutional ERB permission (Ref No:087; Dated 19-09-2022). With informed consent, 60 patients (30 per group) were enrolled using a simple random sampling approach with Epi Info software (493.56 ± 385.9 min vs. 289.66 ± 64.94 min 8). When the patient complained of pain as measured by the Visual Analogue Pain Scale, the length of postoperative analgesia (measured in minutes from intrathecal medication delivery to the first rescue analgesic

supplementation) was tracked.

Patients with ASA grades I and II, ranging in age from 20 to 50, had lower limb surgeries while sedated with the spinal anesthetic. Individuals with a history of valvular heart disease, a known allergy to local drugs, co-morbid conditions such as bleeding disorders, injection site infections, poor language understanding, or psychiatric issues were not allowed to participate in the study.

There was permission from the local ethics commission to recruit sixty patients. Baseline information, including age, gender, place of residence, and type of operation, was gathered following a thorough history and examination. Two groups of patients were randomly assigned by a lottery method. Group A patients received 15 mg of 0.5 percent strong bupivacaine and five µg of dexmedetomidine (as per hospital protocols). On the other hand, group B got 15 mg of 0.5 percent strong bupivacaine and 60µg of buprenorphine (as per hospital protocol). A standard procedure was followed for administering spinal anesthetic. The post-anesthesia care unit received the patients (PACU). The interval between the onset of spinal anesthesia and pain (VAS≥4) was noted. An injection of 2 mg/kg of tramadol gave rescue analgesia. A blinded observer recorded observations and data in the ward and PACU at the proforma-specified intervals.

SPSS v.26 was used to analyze all of the data. The means and standard deviations were computed for descriptive data, such as age, length of analgesia, and body mass index. Calculations were made for the frequencies and percentages of categorical research variables, such as age groups, surgical types, residential status, and BMI. The independent sample t-test was used to compare the mean duration of

analgesia in the two groups. Using stratified tables, effect modifiers such as age, gender, surgery type, obesity, and residential status were managed. A p-value of less than 0.05 was deemed significant.

3. RESULTS

The mean age of the study population was 33.45 ± 6.83 years. Out of these 60 patients, 41 (63.33%) were males. The mean BMI was 28.47 ± 3.12 kg/m². The frequency of patients in the ASAI group was 34 (56.67%), while in ASA II was 26 (43.33%). The demographic characteristics of both groups are computed in Table 1. The mean analgesia duration in the intrathecal Dexmedetomidine group was 494.90±38.46 min compared with 283.03±17.97 min in the buprenorphine group (*p-value* <0.05) (Table 2). Stratification of post-operative analgesic duration concerning age, gender, type of surgery, obesity, and residential status showed significant results (Table 3).

Table 1: Demographic Characteristics of Both Groups

Variables	Group A(n=30)	Group B (n=30)	Total (n=60)
Mean Age	33.43±6.8	33.47±6.9	33.45±6.8
20-35 year	18(60%)	17(56.7)	35(58.3%)
36-50 year	12(40%)	13(43.3)	25(41.7%)
Males	22(66.7%)	21(70%)	43(68.3%)
Females	10(33.3%)	09(30%)	19(31.7%)

BMI(kg/m ²)	28.27±3.2	28.67±3.1	28.47±3.1
Rural	15(50%)	14(46.7)	29(48.3%)
Urban	15(50%)	16(53.3)	31(51.7%)

Table 2: Comparison of the Post-operative analgesia Duration between Two Groups

	Group A (Mean±S.D)	Group B (Mean±S.D)	p-value
Post-operative Analgesia Duration (min)	494.90±38.46	293.03±17.97	0.0001

Table 3: Stratification of Post-Operative Analgesic Duration in Both Groups (IN: Interlocking Nail; EF: External Fixator; AM: Austin More Prosthesis)

		Group A (n=30)	Group B (n=30)	p-value
		Post-Operative Analgesic Duration (Mean ± S. D)	Post-Operative Analgesic Duration (Mean ± S. D)	
Age Groups (years)	20-35	505.89±19.1 1	294.76±20.2 1	0.0001
	36-50	478.42±53.3 4	290.77±15.0 4	0.0001
Gender	Male	495.95±40.1 2	289.43±16.8 0	0.0001
	Female	492.80±36.8 8	301.44±18.7 6	0.0001

BMI (kg/m ²)	≤30	494.26±39.8 4	297.06±17.4 2	0.0001
	>30	496.0±37.82	287.0±17.89	0.0001
Residential Area	Rural	490.53±43.3 5	292.89±20.3 6	0.0001
	Urban	499.27±33.8 1	293.29±16.2 5	0.0001
Type of surgery	IN	486.76±47.0 2	290.67±18.3 5	0.0001
	EF	506.90±23.1 6	301.45±16.4 0	0.0001
	AM	501.00±1.73	278.75±9.74	0.0001

4. DISCUSSION

Neuraxial anesthesia is becoming more common for lower limb procedures due to its safety, predictability, and low side effects, minimizing hospital stays.⁹ The fact that postoperative analgesia improves patient outcomes has led to increased emphasis on pain relief and rescue analgesics.¹⁰ Neuraxial adjuvants^{11,12} minimize rescue analgesic demands compared to LA medications alone. Intrathecal LA with dexmedetomidine improves postoperative analgesia.^{13,14} As an adjuvant in the subarachnoid block, intravenous dexmedetomidine prolongs and lowers postoperative rescue analgesia.¹⁵ Authors found that IV (0.5 µg/kg) and IT (3µg) dexmedetomidine adjuvants to IT bupivacaine significantly extended motor and sensory block durations.¹⁶

The intrathecal Dexmedetomidine group had a mean analgesic duration of 494.90 ± 38.46 minutes, while the buprenorphine group had 283.03 ± 17.97 minutes (p -value < 0.05). Gupta et al.⁷ reported that the mean analgesia time for the five μg dexmedetomidine with 3cc (15mg) of 0.5 % heavy bupivacaine group was 493.56 ± 385.9 min. In contrast, the 60 μg buprenorphine group had 289.66 ± 64.94 minutes. In another study by Anitha et al.⁸, 5 μg of dexmedetomidine with 0.5 % heavy bupivacaine lasted 353.00 ± 11.06 minutes, while 60 μg of buprenorphine lasted 220.43 ± 13.71 ($p < 0.05$).

Dexmedetomidine analgesia lasted 495 minutes in our experiment. Shah et al.¹⁷ discovered that five μg dexmedetomidine gave 474 minutes of analgesia. According to Gupta et al.¹⁸, adding five μg dexmedetomidine to analgesia extended its duration to 478 minutes. Dexmedetomidine prolongs analgesia, according to Eid et al.¹⁹. Our buprenorphine group had analgesia for 300 minutes, compared to 475 and 430 for Shaikh and Kiran²¹ and Capogna et al.²¹. Maybe Capogna investigated older people and Safiya just studied lower limbs. In infra-umbilical and more deficient limb surgical patients, adding ten mcg of dexmedetomidine to intrathecal bupivacaine extended the sensory and motor block longer than adding 60 mcg of buprenorphine, which enhanced nausea, vomiting, and respiratory depression. Thus, dexmedetomidine improved the first analgesic requirement time statistically more than buprenorphine.

Dexmedetomidine is increasingly used as a spinal anesthetic adjuvant for supra and infra-umbilical procedures. Lower abdominal surgeries are urological. Dexmedetomidine speeds up

sensory and motor block under spinal anesthetic with bupivacaine for urological procedures, improving intraoperative and postoperative analgesia with good hemodynamic stability and low side effects.²³ A study demonstrated that adding 5 μg dexmedetomidine to bupivacaine during hip hemiarthroplasty spinal anesthesia led to longer sensory and motor blockade and longer first analgesic request than intrathecal buprenorphine (30 μg) or Fentanyl (10 μg). Like ours, the study used similar dosages but found different results. A diverse patient population and more intrusive procedures may explain this.²⁴

5. CONCLUSION

In this study, spinal anesthesia with Dexmedetomidine adjuvant to Bupivacaine had longer postoperative analgesia than intrathecal Buprenorphine. Intrathecal Dexmedetomidine, preferred after analgesia in lower limb procedures, reduces patient morbidity.

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