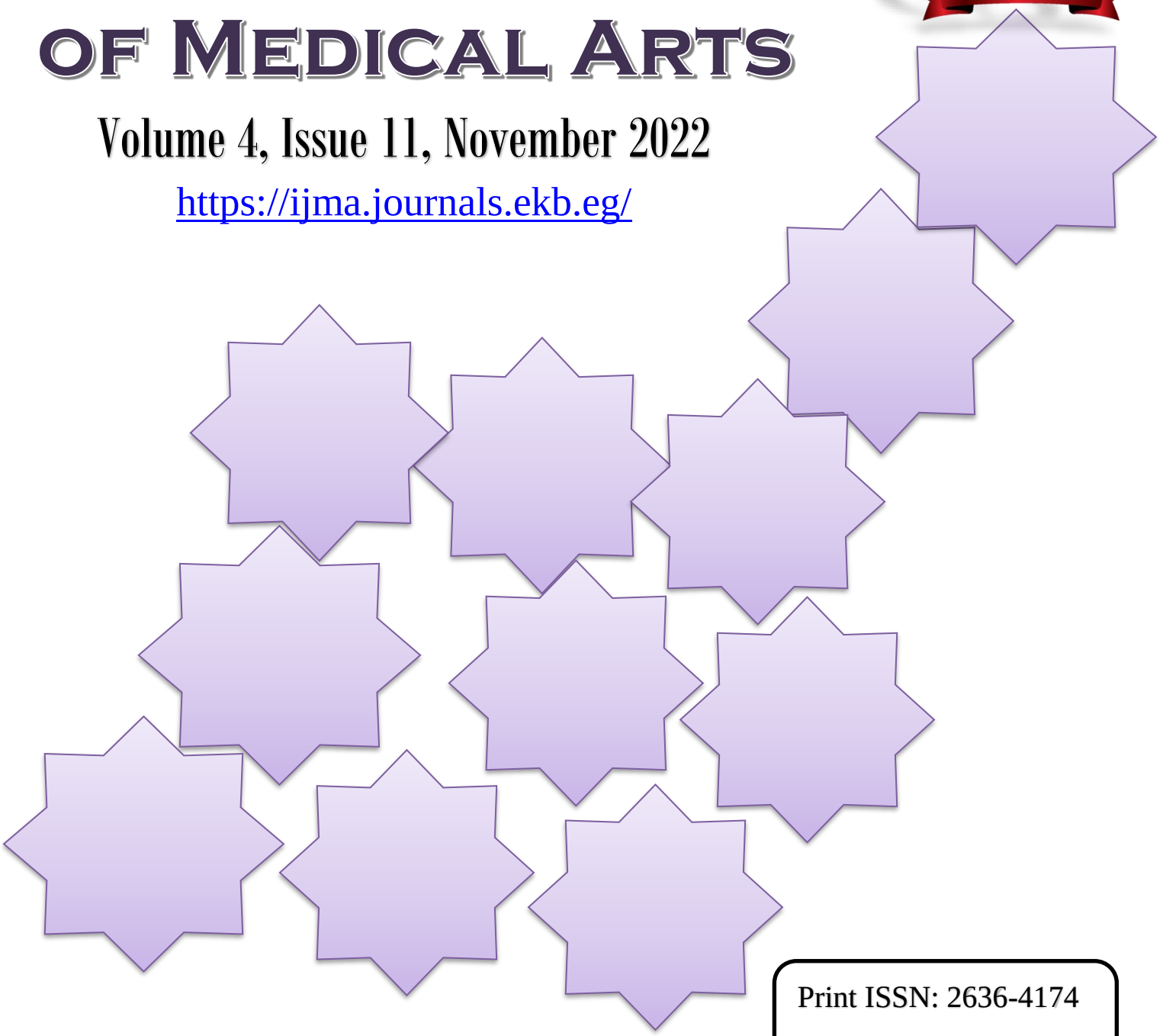
International Journal of Medical Arts

Volume 4, Issue 11, November 2022

https://ijma.journals.ekb.eg/



Print ISSN: 2636-4174

Online ISSN: 2682-3780

Available online at Journal Website
https://ijma.journals.ekb.eg/
Main Subject [Anesthesia]

Original Article

A Comparative Study Between Intrathecal Dexmedetomidine and Dexamethasone as An Adjuvant to Intrathecal Bupivacaine in Lower Abdominal Surgeries: Prospective, Randomized, Double-Blind Clinical Trial

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Article information

Received: 16-11-2022

Accepted: 23-02-2023

DOI: 10.21608/IJMA.2023.175220.1556

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Citation: Abdelazeem EM, Mahdy EW, Elmeligy MS, Abdelwahab ZM. A Comparative Study Between Intrathecal Dexmedetomidine and Dexamethasone as An Adjuvant to Intrathecal Bupivacaine in Lower Abdominal Surgeries: Prospective, Randomized, Double-Blind Clinical Trial. IJMA 2022 November; 4 [11]: 2801-2806. doi: 10.21608/IJMA.2023.175220.1556.

ABSTRACT

Background and Objective: The target of our study compares the effect of dexamethasone versus dexmedetomidine when used as adjuvant to bupivacaine for improving the analgesic effect of spinal anesthesia after lower abdominal surgeries.

Patients and methods: The patients were divided into 3 groups: Control group [I], in which patients were administered 3 ml bupivacaine [0.5%] plus 1 ml of saline, Dexmedetomidine group [II], in which patients were administered 3 ml bupivacaine [0.5%] plus 10 µg dexmedetomidine in1 ml saline, and Dexamethasone group [III], in which patients were administered 3 ml bupivacaine [0.5%] plus 4 mg dexamethasone in 1 ml saline.

Results: As regarding duration of sensory blockade was significantly longer in Dexmedetomidine group [II] and Dexamethasone group [III] when compared to the Control group [I] [p-value=0.02] and also as regards to the duration of motor blockade was significantly longer in Dexmedetomidine group [II] and Dexamethasone group [III] when compared with Control group [I] [p-value=0.02].

Conclusion: Our study perceived that intrathecal dexmedetomidine or dexamethasone as adjuvant to bupivacaine in spinal anesthesia prolong the duration of sensory, motor block and improved postoperative analgesia but dexmedetomidine is superior to dexamethasone.

Keywords: Dexamethasone; Dexmedetomidine; Spinal anesthesia

INTRODUCTION

Spinal anesthesia is therewith the first choice for lower abdominal surgeries, due to the fact that it's rapid onset, and lower failure rates [1]. There is different adjuvant have use to improve block and postoperative analgesia such as opioids, magnesium sulfate, midazolam, and neostigmine [2].

Dexamethasone proves in many studies to improve block and postoperative analgesia [3]. Dexamethasone has anti-inflammatory effect when use as an adjuvant to local anesthetics in neuraxial and peripheral nerve blocks [4]. Intrathecal dexamethasone improves outcome of anesthesia [improve block and postoperative analgesia] [5, 6].

Dexmedetomidine acts on α1, α2 receptors and highly selective α2-adrenoreceptor agonist in comparison to clonidine [7, 8]. Intrathecal dexmedetomidine is safe, improve block and postoperative analgesia [9, 10].

The target of our study evaluates intrathecal dexmedetomidine versus intrathecal dexa-methasone in combination with 0.5% hyperbaric bupivacaine for assessment analgesic effect of these drugs after lower abdominal surgeries.

PATIENTS AND METHODS

Study design: Prospective, randomized, controlled, double-blind clinical trial.

Study participants: Ninety patients of either sex [ASA grade I and II] were scheduled for lower abdominal surgeries under subarachnoid block. Uncooperative patients, ischemic heart disease, diabetes, patients with allergy to the study drugs, impaired renal functions, severe liver disease and patients had contraindication to spinal anesthesia such as patient refusal, coagulopathy, were excluded from this study.

Ethical Consideration: Ethical approval was bestowed by the Research Ethical Committee of Benha Faculty of Medicine and informed written consent was also procured from each patient. Our study started from March 2021 to August 2021 at Benha University Hospital.

Recruitment of the study participants: The patients were prepared for spinal anesthesia using 3 ml bupivacaine [0.5%]. The patients were randomized into 3 equal groups, each group consist of 30 patients: Control group [I], in which patients were, gave 3 ml bupivacaine [0.5%] plus an additional 1 ml of saline, Dexmedetomidine group [II], in which patients were gave 3 ml bupivacaine [0.5%] plus 10 µg dexmedetomidine in 1 ml saline, and Dexamethasone group [III], in which patients were gave 3 ml bupivacaine [0.5%] plus 4 mg dexamethasone. The patients were randomly allocated into 3 groups, 30 in each group by a random sequence done by the computer and after that let in sealed envelopes. The sealed envelopes were opened on the day of surgery before induction of the anesthesia. Spinal block was done by different anesthesiologist [who was not participated in this study].

When, the patient reaches the operating room, start for applying the standard monitoring which include, non-invasive blood pressure, pulse oximetry and electrocardiogram.

Lumbar puncture was achieved by using 27-gauge spinal needles through paramedian approach in L3-L4 intervertebral space while the patients in sitting position with full aseptic precaution.

The patients have monitored for mean arterial pressure, and heart rate every 5 min after injection of local anesthetic for 30 min. Sensory block was estimated by using pinprick every 2 min till proper level was reached. Also, sensory onset time, motor block onset time, sensory block duration and motor block duration were estimated. Visual analogue scale [0 = no pain, 10 = the most severe pain] was assessed postoperatively, at 1 h, 2 h, 4 h, 6 h and at 12 h. When visual analogue scale was more than 3, it was managed by intravenous morphine at a dose of 0.05 mg/kg.

Outcome measures

Primary outcome: Detect time to first analgesic rescue.

Secondary outcome: Assessment of Visual analogue scale, total dose of morphine, the duration of sensory block, duration of motor block and any side effects.

Sample size: The sample size was calculated according to previous results about the first analgesic rescue as the primary outcome [11, 12].

Statistical analysis: Analysis of data was implemented by using SPSS. Quantitative data were analyzed by using Chi-square test. Continuous data were presented as mean and median. Continuous data were analyzed by using one-way analysis for single measures and two-way mixed model for repeated measures. A P-value < 0.05 were considered significant.

RESULTS

A total of 102 patients were showed during the period of study. Twelve patients were excluded due to not matching with inclusion criteria and 5 declined to participate. A total of 90 patients were contained in our study [Fig 1].

Regarding age, weight, height, surgical duration and ASA, there were insignificant statistical differences between the 3 groups [Table 1].

Table [2] showed no any significant differences among the 3 groups as regarding to the onset of the sensory block. But as regards the duration of sensory blockade was significantly lower in control group when compared to Dexmedetomidine group and Dexamethasone group, but it was longer in Dexmedetomidine group when compared with Dexamethasone group. Regarding the duration of motor blockade was significantly lower in control when compared to Dexmedetomidine and Dexamethasone groups, but it was longer in Dexmedetomidine group when compared with Dexamethasone group [Table 2].

Regarding the visual analogue scale, was significantly lower in Dexmedetomidine group and Dexamethasone group, when compared with control group at 2 h and 4 h [Table 3].

Regarding the time of the first analgesic request was significantly lower in control group when compared with Dexmedetomidine group and Dexamethasone group, but it was longer in Dexmedetomidine group when compared with Dexamethasone group. Also, total dose of morphine was scale, was significantly lower in Dexmedetomidine group and Dexamethasone group, when compared with control group significantly lower in Dexmedetomidine group and Dexamethasone group, when compared with control group [Table 4].

Table [5] showed no any significant differences between the 3 groups regarding the side effects of drugs.

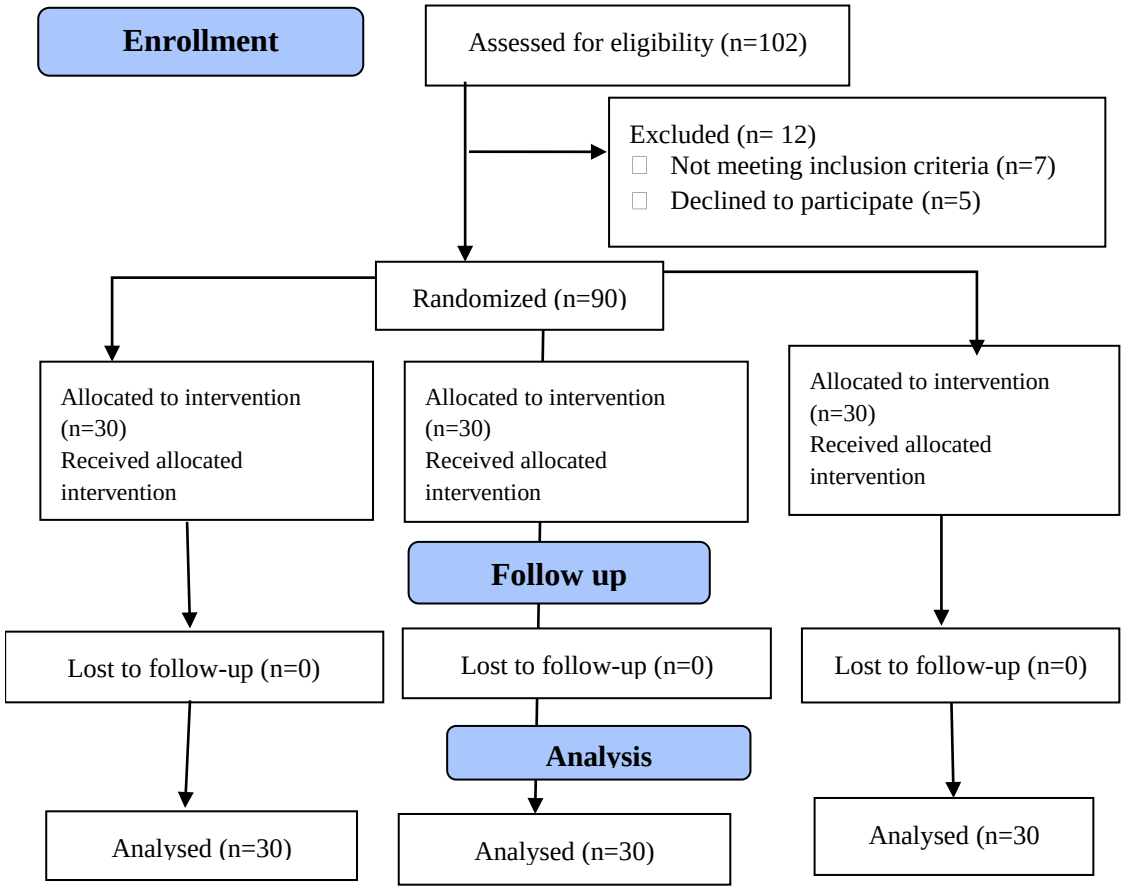

Figure [1]: Consort flow chart

Table [1]: Demographic data of the 3 groups

Variables		Control Group [n=30]	Dexmedetomidine group [n=30]	Dexamethasone group [n=30]	P value
Age [yrs.]		44.38±5.93	46.41±6.54	44.28±5.83	0.237
Weight [kg]		74.23±9.23	76.34±8.38	73.23±9.12	0.401
ASA	I II	18 12	16 14	17 13	0.43
Height [cm]		166.12±6.89	168.45±7.54	166.12±6.89	0.259
Duration of surgery [min]		62.43±11.56	63.74±12.45	65.43±11.66	0.705

Data are expressed as mean ± S.D. or n [%]; P less than 0.05 is considered significant.

Table [2]: Onset, duration of sensory block, and duration of motor block

Variables	Control Group [n=30]	Dexmedetomidine group [n=30]	Dexamethasone group [n=30]	P value
Onset of sensory block [min]	4.85±1.36	5.1±1.64	5.55±1.8	0.32
Duration of sensory block [min]	172.5±29.4	201.2±31.9	199.5±29.4	**0.02***
Duration of motor block [min]	154.9±28.3	177.02±32.2	173±33.2	**0.02***

Data are expressed as mean ± SD or n [%]; P less than 0.05 is considered significant, *Significant

Table [3]: Post-operative Visual analogue scale

Variables	Control Group [n=30]	Dexmedetomidine group [n=30]	Dexamethasone group [n=30]	P value
At One h	2 [1-2]	2 [1-2]	2 [1-2]	0.15
At 2 h	2 [2-3]	2 [1-2]	2 [1-2]	**0.028***
At 4 h	2 [2-5]	2 [1-3]	2 [1-3]	**0.02***
At 6 h	2 [1-3]	2 [1-2]	2 [1-2]	0.17
At 12 h	2 [1-5]	2 [1-4]	2 [1-4]	0.65

Data were presented as median and range. *Significant

Table [4]: Time to first analgesic request and need to analgesia [n [%]]

Variables	Control Group [n=30]	Dexmedetomidine group [n=30]	Dexamethasone group [n=30]	P value
Time to first analgesic rescue [min]	223.85±28.8	253.24±43.8	244.2±33.7	**0.001***
Need to analgesia [n [%]]	3 [10]	2 [6.6]	2 [6.6]	0.565
Total dose of morphine [mg]	9.5±1.2	5.4±1.4	6.1±1.7	**0.02***

Data are expressed as mean ± S.D. or n [%]; P less than 0.05 is considered significant, *Significant.

Table [5]: Adverse events in the three studied groups

Variables	Control Group [n=30]	Dexmedetomidine group [n=30]	Dexamethasone group [n=30]	P value
Hypotension	6 [20]	5 [16.6]	6 [20]	0.452
Bradycardia	3 [10]	2[6.6]	2 [6.6]	0.715
Nausea and vomiting	5 [16.6]	3 [10]	3 [10]	0.528

Data are represented as n [%]; P less than 0.05 is considered significant

DISCUSSION

Regarding to the onset of sensory blockade and onset of motor blockade, the current study found that no significant difference between all groups. But regarding the duration of sensory and motor blockade, it was significantly lower in control group when compared to Dexmedetomidine group and Dexamethasone group, but it was longer in Dexmedetomidine group when compared with Dexamethasone group.

Dexmedetomidine have ability to prolong motor and sensory blockade when added to intrathecal bupivacaine [13]. It has been found to augment the efficacy of local anesthetics while maintaining a safe profile [14].

A double-blinded study conducted on 90 patients divided into three groups, 30 patients for each group were scheduled for lower abdominal operations. They received intrathecal bupivacaine injection plus saline in the first group, and intrathecal bupivacaine plus dexamethasone in the second group, and

intrathecal bupivacaine plus dexmedetomidine in the third group, and they found that the addition of dexamethasone produced a longer duration of sensory blockade when compared to the control group. But dexmedetomidine produced a longer duration of analgesia when it compared with dexamethasone.

Our study results agreed with the study performed by **Shukla *et al*.** [15] comparing magnesium sulfate versus dexmedetomidine, who showed that dexmedetomidine reduced the onset and increased the duration of spinal anesthesia. Another study done by, **Solanki *et al*.** [16] who compared dexmedetomidine versus clonidine, fentanyl, added as adjuvant to intrathecal bupivacaine. It reduced the onset and increased the duration of spinal anesthesia and decreased needing to additional analgesics.

Our study results agreed with the study performed by **Bani-Hashem *et al*.** [17] Who contrasted dexmedetomidine against dexamethasone as adjuvant to intrathecal bupivacaine, who showed an increase in the duration of sensory block.

Also, the current study went with the study performed by **Elzayyat *et al*.** [18] who contrasted dexmedetomidine against dexamethasone as adjuvant to intrathecal bupivacaine in lower abdominal surgery. This study showed that dexmedetomidine reduced the onset and increased the duration of spinal anesthesia and decreased needing to additional analgesics.

Our study results agreed with the study performed by **Hassan *et al*.** [19] Who contrasted dexmedetomidine versus dexamethasone as adjuvant to intrathecal bupivacaine in lower limb Orthopedic surgery. This study showed that dexmedetomidine prolongs in the sensory blockade and decreased needing to additional analgesics.

Also, the current study went with a system review and meta-analysis performed by **Shen *et al*.** [20] Who used intrathecal dexmedetomidine in patients undergoing cesarean section.

But our study contradicts the systematic review and indirect meta-analysis conducted by **Albercht *et al*.** [21], who showed that dexamethasone was superior to dexmedetomidine as a perineural adjunct for supraclavicular brachial plexus block.

Also, the current study was opposite to the study performed by **Song *et al*.** [22], which showed that dexamethasone had equivalent analgesic effects as dexmedetomidine.

Conclusion: Our study perceived that intrathecal dexmedetomidine or dexamethasone as adjuvant to bupivacaine prolong the duration of sensory blockade, duration of motor blockade and improve postoperative analgesia but dexmedetomidine is superior to dexamethasone.

Conflict of Interest and Financial Disclosure: None

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International Journal of Medical Arts

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Print ISSN: 2636-4174
Online ISSN: 2682-3780