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ORIGINAL ARTICLE

Intrathecal Dexmedetomidine: A Study of its Post-Operative Analgesic Effects When Used as an Adjuvant in Elective Caesarean Section Surgery under Spinal Anesthesia

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ABSTRACT

Background: Despite the advances in anesthesiology and surgical techniques, postoperative pain continues to be a global health-care issue. To increase the duration of analgesia during caesarian section under spinal anesthesia, adjuvants are frequently added to improve the quality of block.
Aim: To determine the mean post-operative duration of analgesia produced by intrathecal dexmedetomidine with bupivacaine as compared to bupivacaine with placebo in patients undergoing elective caesarean section in spinal anesthesia.
Study Design: Randomized control trial
Place and Duration of Study: Department of Anaesthesiology and Gynaecology/Obstetrics Operation Theatre, Nishtar Medical University, Multan from 1st July 2020 to 31st December 2020.
Methodology: Sixty patients admitted for elective caesarean section were randomized into two groups. Subarachnoid block was performed in all the patients. Group D received intrathecal Inj. Dexmedetomidine 10 mcg along with the standard bupivacaine dose while group C received 1 ml of 0.9% isotonic saline. Time for requirement of first rescue analgesia, which was provided by Inj. Ketoroloac 30 mg IV noted.
Results: The mean post-operative analgesia of Group D and Group C was 270.25±23.81 minutes and 140.46±10.38 minutes, respectively in statistically significant difference(p=0.000). Post stratification was applied to control the effect modifiers like age, BMI, parity and ASA. It was found that in all strata of patients, Dexmedetomidine provided statistically significant difference in analgesia as compared to control group (p=0.000).
Conclusion: Standard spinal anesthesia with Dexmedetomidine has a longer duration of post-operative analgesia as compared to standard spinal anesthesia alone.
Keywords: Analgesia, Caesarean section, Intrathecal dexmedetomidine, Spinal anesthesia.

INTRODUCTION

Despite the advances in anesthesiology and surgical techniques, postoperative pain continues to be a global health-care issue. Inadequate pain control in post surgical patients coincides with a wide range of negative outcomes, including decreased satisfaction, poor quality of life, delayed recovery, and need for increased narcotics use[1,2]. C-section is the most commonly performed surgical procedure in women of child bearing age and intrathecal block is the most widely used technique. It offers a number of advantages i.e. increased safety for mother and fetus, dense motor and sensory block, low incidence of failure rate and cost effectiveness. The main limitation of subarachnoid block is its relatively short duration of action and failure to offer extended postoperative pain relief when it is performed solely with local anesthetics.[3] To increase the duration of analgesia, adjuvants are frequently added to improve the quality of block and prolong the duration of analgesia[4,5]. Dexmedetomidine, a highly selective alpha-2 agonist, prolongs the duration of analgesia when used intrathecal in conjunction with hyperbaric bupivacaine with a much better safety profile[6,7].

Qi et al[8] conducted a study on full-term patients undergoing elective caesarean sections under spinal anesthesia and found that Dexmedetomidine plus bupivacaine provides extended duration of analgesia similar to morphine plus bupivacaine.

Liu et al[9] compared the duration of analgesia provided by bupivacaine + Dexmedetomidine and bupivacaine + placebo among ASA I or II, who underwent caesarean section and found statistically significant increased duration of analgesia with dexmedetomidine. The consumption ofpostoperative rescued sufentanil was also significantly lower in Dexmedetomidine group than in the control group.

The objective of the study was to determine mean postop duration of analgesia produced by intrathecal dexmedetomidine with bupivacaine as compared to bupivacaine with placebo in patients undergoing elective C. section in spinal anesthesia.

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MATERIALS AND METHODS

We conducted a randomized controlled trial through non-probability consecutive sampling in the Department of Anaesthesiology and Gynaecology/Obstetrics Operation Theatre, Nishtar Medical University, Multan after permission from Ethical Review Board. A total number of 60 (30 in each group) patients were selected for this study by using Open Epi software and confidence interval at 95% and Power at 80%. Pregnant females aged 18-40 of ASA I & II undergoing elective caesarean section were recruited for study. Patients have contraindication to spinal block or allergic to any of drug used were excluded. After approval from the ethical committee, informed written consent obtained. The name of patient, hospital MR number, height (cm) and weight (kg) of patient, parity, ASA status and the group assigned to the patient was documented. All the patients were randomized into two groups of thirty patients each by draws method. Prefilled syringes of analgesia, same color and dilution were provided by the anaesthesia assistant who was neither involved in the study nor data analysis.

In group D; Inj. Dexmedetomidine 200mcg/2ml was diluted in 20 ml saline and 1ml (10mcg) out of 20 ml was taken in 2 ml syringe for patients in group D. In group C; 1ml of 0.9% isotonic saline in 2 ml syringe was given. Subarachnoid block was performed as per institution protocol. 1.3 ml (9.75mg) of 0.75% hyperbaric bupivacaine and 1 ml of study drug was injected via two separate syringes. The patient was then turned supine with left uterine displacement and a level of T4-5 block was achieved. In the post-operative care unit, the severity of post-operative pain was assessed every 30 minutes using a numeric pain rating scale (0-no pain, 1-3=mild pain, 4-6= moderate pain and 7-10=severe pain) till the patient demanded first analgesic dose and it was taken as cut-off time for study. The rescue analgesia was provided with an IV injection of 30 mg Ketorolac.

Data analysis was carried out using SPSS-20. Comparison of duration of post-operative analgesia was made using independent sample t-test between the groups. Effect modifiers such as age, BMI, parity and ASA status were controlled by stratification. Post-stratification independent sample t-test was applied to determine the association of effect modifiers with

duration of post –operative analgesia between the groups. P-value ≤0.05 was taken as significant.

RESULTS

Both the group had similar characteristics in term of age, height, weight, BMI and parity and also ASA (Table 1). The mean post-operative analgesia of Group D and Group C was 270.25±23.81 minutes and 140.46±10.38 minutes, respectively. The mean difference was 129.78 found statistically significant with P value of 0.000 (Fig. 1).

Post stratification was applied to control the effect modifiers like age, BMI, parity and ASA and it was found that Dexmedetomidine group provided statistically significant difference in analgesia as compared to control group in all strata of patients (Table 2)

Table 1: Demographic characteristics of both the groups (n=60)

Variable	Group D	Group C	P value
Age (years)	27.73±5.61	28.91±6.34	0.454
Height (cm)	163.24±2.72	162.35±2.58	0.201
Weight (kg)	68.46±3.61	69.21±3.88	0.584
BMI (kg/m^2)	28.13±1.63	28.66±1.91	0.251
Parity	2.13±0.86	1.93±0.73	0.338
ASA			
I	20 (66.7%)	19 (63.3%)	0.787
II	10 (33.3%)	11 (36.7%)	

Table 2: Comparison of postoperative analgesia between two groups, post stratification

Variable	Post- operative Analgesia		P value
	Group D	Group C	
Age (years)			
18-25	273.56±18.02	140.71±9.31	0.000
26-40	265.93±30.01	140.23±11.69	
Body Mass Index			
26-28	275.11±23.15	263.92±24.02	0.000
29-33	138.81±9.09	142.12±10.92	
Parity			
1-2	272.85±22.49	139.42±10.26	0.000
>2	265.78±26.39	143.93±10.82	
ASA			
I	270.64±25.72	140.16±10.83	0.000
II	269.47±20.69	141.05±10.04	

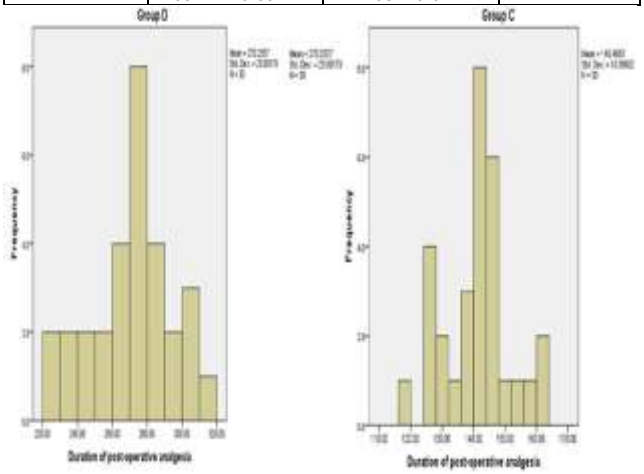

Fig. 1: Frequency of Duration of Post-operative analgesia in Group D & Group C

DISCUSSION

Intrathecal hyperbaric bupivacaine when used as a sole local anaesthetic is usually sufficient for surgical procedures lasting 2-2.5 hours. Therefore, if spinal anaesthesia is needed for a prolonged period of time, additives are often added. Supplementing spinal also has the benefit of providing postsurgical analgesia. A large number of adjuvant drugs are currently in practice. Dexmedetomidine is one of them and is gaining popularity in clinical use.

Dexmedetomidine is an extremely selective alpha-2 agonist. It influences the regulation of wakefulness and nociceptive transmission and produces analgesic effects by acting on the dorsal horn of the spinal cord.[10-12] The mechanisms of Dex, which can potentiate the effectiveness of spinal bupivacaine, remain unidentified. Perhaps it plays its part through the action of α2-AR, which consequently induces vasoconstriction and takes its effect in this context,[13] or directly develops its ability via α2-AR agonists rather than the action of vasoconstriction.[14] In present study, we evaluated the mean post-operative duration of analgesia produced by intrathecal dexmedetomidine with bupivacaine as compared to bupivacaine with placebo in patients undergoing elective caesarean section in spinal anaesthesia.

According to Liu et al[8], intrathecal 5 µg Dexenhances the efficacy of spinal bupivacaine by 24% in patients undergoing caesarean section with spinal anaesthesia. No additional side effect was observed by adding spinal Dex in their study. In the present study 10 mcg Dex enhances the efficiency of spinal bupivacaine by 46% which are consistent with the prior results.

Al-Mustafa et al[15] studied effect of dexmedetomidine 5 mcg and 10 mcg with bupivacaine in urological procedures and found that dexmedetomidine prolongs the duration of spinal anaesthesia in a dose-dependent manner.

Naaz et al[16] used four different doses of 5mcg, 10 mcg, 15mcg and 20 mcg and found out that the time to rescue analgesia was 259.1±15.2, 310.7±48.1, 540.3±51.6 and 702.4±52 respectively with the aforementioned doses. Therefore at the dose of 10 mcg, their study found a little prolonged duration of analgesia as compared to ours (310.7±48.1 versus 270.25±23.80). They also found out that higher doses of 15 mcg and 20 mcg also lead to increased incidence of hypotension and bradycardia. Thus they recommended 10 mcg of dexmedetomidine as the optimum dose which is also used in our study.

Shukla et al[17] compared dexmedetomidine (10 mcg) with magnesium sulfate (50 mg) given intrathecal as adjuvant with hyperbaric bupivacaine in patients undergoing lower abdominal and lower extremity surgeries. They concluded that anaesthesia was of prolonged duration in the dexmedetomidine group, which further validates our results.

Similarly, Shaikh et al[6] investigated the effect of intrathecal administration of dexmedetomidine 5 µg and 10 µg, as an adjuvant to bupivacaine. They figured out that dexmedetomidine has a dose-dependent effect on the time to rescue analgesia with lower VAS scores.

Kamat et al[18] used 10 mcg Dex to hyperbaric bupivacaine in patients undergoing lower extremity and lower abdominal surgeries and concluded that the duration of analgesia was 357.46±30.64, which is considerably higher than the one obtained in our study.

In another study by Singh et al[19], sixty patients were randomly allocated in to three groups. They injected 5 mcg, 7.5 mcg and 10 mcg Dexmedetomidine intrathecal with bupivacaine undergoing lower abdominal surgeries. 10 mcg Dex produced higher post-operative analgesia than 5 mcg Dex, which is consistent with our study findings.

The limitation of our study is that we have measured the analgesic effect of intrathecal dexmedetomidine in relatively healthy patients of ASA I and II. Its effect on patients of ASA III and IV and those having co-morbidities need further exploration. In addition, intrathecal dexmedetomidine in obstetric anaesthesia is not widely used, thus the safety of the use of dexmedetomidine requires further studies to be used safely globally.

CONCLUSION

The standard spinal anesthesia with Dexmedetomidine has longer duration of post-operative analgesia as compared to standard spinal anesthesia alone in women undergoing elective caesarean section.

Conflict of interest: Nil

REFERENCES

1. Gan TJ. Poorly controlled postoperative pain: Prevalence, consequences, and prevention. J Pain Res 2017;10:2287-98.
2. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: Results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg 2003;97(2):534-40.
3. Goma HM, Flores-Carrillo JC, Whizar-Lugo VM. Spinal Additives in Subarachnoid Anaesthesia for Cesarean Section. Top Spinal Anaesth 2014;2014.
4. Staikou C, Paraskeva A. The effects of intrathecal and systemic adjuvants on subarachnoid block. Minerva Anestesiol 2014;80(1):96-112.
5. Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases 2017;5(8):307.
6. Shaikh SI, Dattatri R. Dexmedetomidine as an adjuvant to hyperbaric spinal bupivacaine for infra-umbilical procedures: A dose related study. Anaesthesia, Pain Intensive Care 2014; 18(2):180-5.
7. Naaz S, Ozair E. Dexmedetomidine in current anaesthesia practice- a review. J Clin Diagnostic Res 2014;8(10):GE01-4.
8. Qi X, Chen D, Li G, Huang X, Li Y, Wang X, et al. Comparison of intrathecal dexmedetomidine with morphine as adjuvants in cesarean sections. Biol Pharm Bull 2016;39(9):1455-60.
9. Liu L, Qian J, Shen B, Xiao F, Shen H. Intrathecal dexmedetomidine can decrease the 95% effective dose of bupivacaine in spinal anesthesia for cesarean section: A prospective, double-blinded, randomized study. Medicine (Baltimore). 2019;98(9):e14666.
10. Bielka K, Kuchyn I, Babych V, Martycshenko K, Inozemtsev O. Dexmedetomidine infusion as an analgesic adjuvant during laparoscopic cholecystectomy: A randomized controlled study. BMC Anesthesiol 2018;18(1):4-9.
11. Khan FH. Dexmedetomidine in cardiac anesthesia. Anaesthesia, Pain Intensive Care 2017;21(2):128-30.
12. Sushruth MR, Rao DG. Effect of adding intrathecal dexmedetomidine as an adjuvant to hyperbaric bupivacaine for elective cesarean section. Anaesthesia, Pain Intensive Care 2018;22(3):348-54.
13. El-Hennawy AM, Abd-Elwahab AM, Abd-Elmaksoud AM, El-Ozairy HS, Boulis SR. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children. Br J Anaesth 2009;103(2):268-74.
14. Masuki S, Dinenno FA, Joyner MJ, Eisenach JH. Selective α2-adrenergic properties of dexmedetomidine over clonidine in the human forearm. J Appl Physiol 2005;99(2):587-92.
15. Al-Mustafa MM, Abu-Halaweh SA, Aloweidi AKS, Murshidi MM, Ammari BA, Awwad ZM, et al. Effect of dexmedetomidine added to spinal bupivacaine for urological procedures. Saudi Med J 2009;30(3):365-70.
16. Naaz S, Bandey J, Ozair E, Asghar A. Optimal dose of intrathecal dexmedetomidine in lower abdominal surgeries in average Indian adult. J Clin Diagnostic Res 2016;10(4):UC09-UC13.
17. Shukla D, Verma A, Agarwal A, Pandey HD, Tyagi C. Comparative study of intrathecal dexmedetomidine with intrathecal magnesium sulfate used as adjuvants to bupivacaine. J Anaesthesiol Clin Pharmacol 2011;27(4):495-9.
18. Kamat SD, Puram NN, Dhumal PR, Agrawal PI, Ramanand JB, Rama R. Comparative study of hyperbaric 0.5% bupivacaine and hyperbaric 0.5% bupivacaine with low dose dexmedetomidine in spinal anaesthesia. Int J Basic Clin Pharmacol 2017; 6(2): 410.
19. Singh AP, Chawla S, Bajwa SJS, Khanna M. Efficacy and safety of dexmedetomidine as an intrathecal agent: A dose finding clinical study. Anaesthesia, Pain Intensive Care 2017;21(1): 13-8