

Research Article

Study of Effect of Adding Two Different Doses of Dexmedetomidine as an Adjuvant to Low Dose Bupivacaine in Saddle Block for Transurethral Resection of Prostate in Elderly Patients

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Abstract

Background: Transurethral Prostatectomy is most commonly carried out under spinal anesthesia in elderly males, it is of outmost importance to limit dose of LA and distribution of block in these patients to ensure stable hemodynamics.

Objective: To compare the effects of adding two different doses of dexmedetomidine as an adjuvant with low dose bupivacaine in saddle block for TURP in elderly male population of Pakistan.

Methods: The prospective, randomized, double-blind study was conducted on 75 patients of ASA Class I and II. They were randomly allocated into three groups. ml), Group II (n = 25) intrathecal bupivacaine 5 mg (1 ml) + dexmedetomidine 10 µg (1 ml), Group III (n = 25): intrathecal bupivacaine 5 mg (1 ml) + placebo (1 ml) administered intarthecally. The highest level and time to reach that level of sensory block, time of two-segment sensory regression, time of rescue analgesia and incidence of side effects were recorded at various intervals.

Results: With comparable baseline and demographic features, median peak sensory block levels is T10 in group I and III whereas in group II it is T8. Time to reach maximal sensory level is 11.52±1.04 minutes in group I, 8.28±0.79 minutes in group II and 13.92±.99 minutes in group III .Time required for two-segment regression being longest (189.80±26.47 vs. 128±15.1 and 64.04±8.08 (p=0.00) in group I and III respectively). Significant increase in time to first analgesic requirement is noted in group II (494.80±59.24 minutes) whereas in group I it is 356.60±55.47 minutes and in group III it is 179.92±25.44 minutes. Saddle block does not cause any significant hemodynamic changes as level of block is only restricted to perineal area, and similarly in my study no significant hemodynamic changes were recorded during anesthesia. Because of this, hemodynamic readings are not added in result.

Conclusion: When dexmedetomidine is used in a dose of 10 µg as compared to 5 µg with low dose bupivacaine in saddle block, it hastens the onset and prolongs the effect of sub-arachanoid block, effectively reduces post-operative analgesic requirement and prolongs postoperative analgesic period. These effects could be achieved without any remarkable side effects.

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Introduction

Patients planned to undergo Transurethral Resection of the Prostate Gland (TURP) are mostly old males with multiple co-morbidities involving cardiovascular, endocrine, renal, cerebral or respiratory systems, which significantly increase their risk for surgery and anaesthesia.¹ sub-arachnoid block is the technique of choice in TURP. Limitation of spinal anesthesia is risk of hypotensive crisis in geriatric population. Sympathetic impediment due to intrathecal block Cause vasodilatation which leads to reduced venous return, making it the major causative factor for hypotension.² Selective spinal anesthesia (SSA), often called as saddle block, can be defined as "administration of least possible quantities of local anesthetics so that nerve supply to a specific area needed to be anesthetized is afflicted only, Thus, SSA is more deserved in geriatric population.³

Saddle anesthesia selectively block nerve supply to sacrum and only paralyse pelvic muscles. By reducing the level of block, sympathetic manifestations of spinal anesthesia are minimized and avid fluid administration is rarely required. However this may compromise quality of anesthesia and make it less convenient for surgeons and patients⁴. Period of effective post-operative analgesia may also get compromised.⁵ Dexmedetomidine is highly selective alpha 2-adrenergic receptor drug agonist. It's Neuroleptic and antianxiety effects occur because of its action on the locus ceruleus of the brainstem. Activation of α_2 -adrenergic receptors at this site decreases central sympathetic discharge, causing increase in output of inhibitory neurons. The analgesic effect of Dexmedetomidine is due to its binding at α_2 -adrenergic receptors which are present in the dorsal horn of the spinal cord which alter secretion of substance P and fabricate required analgesic effects.⁶ Intrathecal Dex (ITD) had been added secondarily to many local anesthetic agents in different quantities in range of 2.5 to 15 micrograms (μg) and had shown promising results with improved quality of intrathecal block.⁷

The logic behind conducting this study is to study the beneficial effects of adding various quantities of

dexmedetomidine with extremely reduced amount of bupivacaine (5mg) in saddle block for TURP operation in geriatric population of Pakistan.

Methods

Mean time (in minutes) after which peak sensory level regress to 2 segment is taken for calculation of sample size, 116 ± 20.1 vs. 130 ± 15 .⁴ Taking level of significance alpha 5%, Confidence level 90% and power of study 80%, estimated sample size is 25 for each group.

This study is a randomized double blind control trial conducted at services hospital Lahore, Pakistan. Study is registered with clinicaltrials.gov and registration number of the study is NCT04037774. After getting approval from institutional review board and ethical Committee of the Institute Seventy five males scheduled for elective TURP operation in the age range of 55 and 75 years and American Society of Anesthesiologists (ASA) Grade I-II were involved in this trial. All patients were assessed a day before surgery in the pre-anaesthesia clinic. Informed written consent was taken from all the participants. Patients having any Contraindications of spinal anesthesia, uncontrolled systemic disease, ASA III and IV and those having any known allergy to study were not included in the study.

With the help of lottery method and random number allocation technique patients were grouped as,

Group I: received 1ml of 0.5% hyperbaric bupivacaine hydrochloride (5mg) mixed with $5\mu\text{g}$ of dexmedetomidine (1ml), $100\mu\text{g}$ dexmedetomidine diluted in 20ml NS.

Group II: received 1ml of 0.5% hyperbaric bupivacaine hydrochloride (5mg) mixed with $10\mu\text{g}$ of dexmedetomidine hydrochloride (1ml), $100\mu\text{g}$ dexmedetomidine diluted in 10ml NS.

Group III: received 1ml of 0.5% hyperbaric bupivacaine (5mg) with 1ml of NS as placebo.

Volume of the study drug was kept same in all the patients (2ml). Anaesthesiologist carrying out the

block and patients included in the study, were both kept uninformed of the study drug.

Each patient was assigned a random number according to specific group, sealed inside opaque envelopes and were labelled with study proposal, researcher's name and patient allocated number.

Routine monitors including electrocardiogram (ECG), pulse oximetry (SpO₂) and noninvasive blood pressure (NIBP) were applied as patients arrived in operating room. Blood pressure, heart rate and spo₂ were taken and noted. Under aseptic conditions IV line was secured using 18G cannula. 25 gauge Quinke spinal needle was used for lumbar puncture. Block was instituted in sitting position, via median approach in L3L4 intervertebral space. Aspiration of cerebrospinal fluid was done to confirm successful placement of spinal needle in subarachnoid space, then study drug was injected over 10 second and patients were kept in sitting position for at least 10 minutes. After 10 minutes patients were positioned supine.

The level of sensory block was ascertained by application of cold gel bag and highest level of sensory block was marked and noted. Highest level was assessed by consecutive testing for sensory block every 2 minutes after completing spinal injection until the highest attained level remained same for 10 minutes. Testing for highest level sustainability was done every 20 minutes until it was noticed to regress to two segment below highest ascertained level. Systolic blood pressure (SBP), diastolic blood pressure and heart rate (HR) were recorded at baseline before institution of block and were recorded regularly every 5 min for the first 40 min following saddle block. If Hypotension (SBP <90 mmHg or 20% less than the baseline) and bradycardia (Heart rate <50 beats/min) occurred, it were managed with Intravenous phenylephrine and atropine, respectively. Phenylephrine was given in dose of 50µg and atropine was given in dose of 0.6 mg when needed. Incidence of undesirable effects such as nausea, vomiting, shivering, pruritus, hypotension and bradycardia were recorded. The patients were thoroughly explained VISUAL ANALOGUE

SCORE during pre-operative examination, and they were asked to complain and ask for analgesics once their VAS reach level 4 or higher. The time of first rescue analgesic was noted and total dose of analgesics used in all three groups in 24 hours were also kept in record. Toradol IV 30 mg and paracetamol IV 1g were given as the post-operative rescue analgesics.

SPSS 25 was used for analyzing statistics. Demographic data is demonstrated as mean±SD. Mean time to attain highest level of sensory block and its two segment regression alongwith duration of effective post-operative analgesia between groups are analyzed by one way ANOVA. Level of sensory block is compared among group by Mann Whitney U test . A p value <0.05 is taken as significant.

Results

Pre-operatively the patients in all three study groups had comparable baseline hemodynamics and demographics, (Table 1)

According to our study results the time to reach highest level of sensory block as well as the time required for 2 segment regression is significantly different among all the three groups. Results showed that the time to reach highest level of sensory block decreases as the dose of dexmedetomidine increases whereas the time for 2 segment regression significantly increases as the dose of dexmedetomidine increases.

The mean time to reach highest level of sensory block was is found to be 13.92±.99 minutes in control group while in group I and group II that received 5 and 10 micrograms of dexmedetomidine along with 5mg bupivacaine it is found to be 11.52±1.04 and 8.28±0.79 minutes respectively, (p=0.00) (Table 2).

Mean peak level of sensory block achieved is T10 in group I and III, while it's T8 in group II. (Figure 1) Time to 2 segment regression was longest in group II, 189.80±26.47 minutes while in group I and III it is found to be 128±15.1 and 64.04±8.08 (p=0.00) (Table 2).

All groups have statistically significant difference in duration of analgesia in post-operative period, with a p value of less than 0.05. Patients remained pain free for 494.80 ± 59.24 minutes in group II whereas duration of postoperative analgesia is 356.60 ± 55.47 and 179.92 ± 25.44 minutes in group I and III respectively (Table 2).

None of the patients in group I and III experienced any of the side effects whereas 2 patients out of 25

underwent bradycardia and 1 patients become hypotensive when dexmedetomidine was used in dose of $10 \mu\text{gms}$ in group II, the incidence of bradycardia and hypotension is not statistically significant with a p value of 0.132 and 0.373 respectively.

Baseline mean arterial pressures and heart rate were comparable among groups, p value ≥ 0.05 .

Table 1: Demographic Data and Baseline Hemodynamics Among Groups:

Characteristic	Group I	Group II	Group III	P Value
Age (years)	72.44 ± 10	71.12 ± 8.09	76.64 ± 7.29	0.65
Height (feet.inches)	5.69 ± 0.25	5.66 ± 0.26	5.67 ± 0.24	0.88
Weight (kg)	75.96 ± 9.74	78.20 ± 8.93	75.12 ± 6.48	0.42
Baseline Heart rate	82.96 ± 3.40	84.40 ± 5.04	85.72 ± 4.53	0.09
Baseline blood pressure	91.84 ± 2.09	91.80 ± 2.36	93.40 ± 3.47	0.06

Table 2: Comparison of Groups Characteristics

Characteristic	Group I	Group II	Group III	P Value
Time to reach highest level of sensory block(min)	11.52 ± 1.04	8.28 ± 0.79	13.92 ± 0.99	0.00
Time to 2-segment regression(min)	128 ± 15.10	189.80 ± 26.47	64.04 ± 8.04	0.00
Time to first post-operative analgesic requirement(min)	356.60 ± 55.47	494.87 ± 59.24	179.92 ± 25.44	0.00

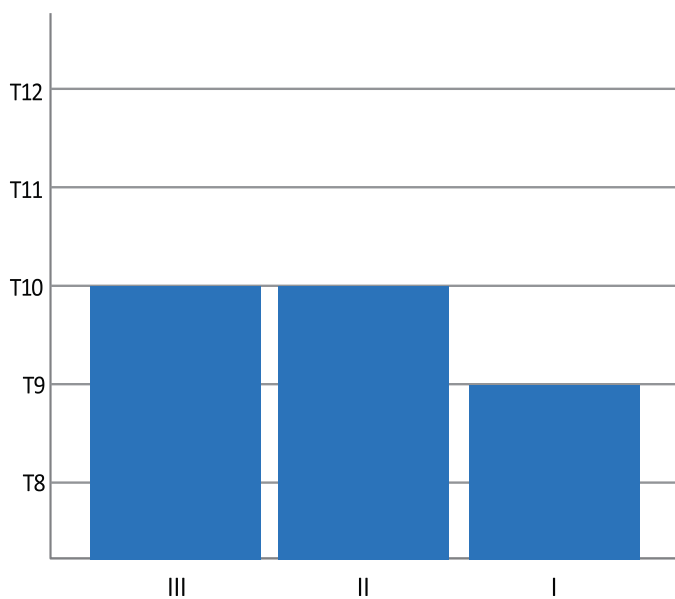


Figure 1: Peak Sensory Level Achieved in three Groups. Peak Sensory Level Shown in Figure 1.

Discussion:

Benign prostatic hyperplasia is a frequent finding in geriatric population. Patients who fail to respond to pharmacological therapy are commonly treated surgically by transurethral resection of prostate.⁸ To date sub-arachanoid block is the most common technique used for TURP surgeries however It is imperative to restrict the level of block in elderly population to minimize detrimental hemodynamic and pulmonary outcomes.⁹

A study conducted in 2017 in India by Arati Ray Et al studied the correlation bradycardia and found out that there were no side-effects of dexmedetomidine in doses of $3 \mu\text{g}$ and $5 \mu\text{g}$; although $5 \mu\text{g}$ dose of dexmedetomidine caused significant prolongation of post-operative analgesia compared to $3 \mu\text{g}$ doses¹⁰. These results are in coherence with our results which

also showed that dexmedetomidine in dose of 5 µg did not cause hemodynamic instability in any of the study subject.

Anjan das et al. investigated effects of adding two different doses of dexmedetomidine with bupivacaine for hysterectomies and observed that The use of 10µg dexmedetomidine compared to 5µg dexmedetomidine to adjuvant hyperbaric bupivacaine 0.5-% more efficiently hastens the onset and prolongs the duration of sensory and motor blockade and reduces the requirement of rescue analgesic in the postoperative period in patients undergoing elective abdominal hysterectomy.¹¹

A study conducted in mysore in 2016 compared the frequency of side effects i.e hypotension and bradycardia between 2 study groups. One group was given 10 micrograms of dexmedetomidine along-with 5mg bupivacaine and other was control group. These results are comparable to our results and showed that 1 patient underwent hypotension and 1 patient experienced bradycardia in dexmedetomidine group. This study also showed significant prolongation of post-operative analgesia and early onset of block with dexmedetomidine group¹². Thus it can be concluded from these results that dexmedetomidine is a dose of 10 µgm can be used safely without significant adverse hemodynamic effects and also leads to profound prolongation in period of post-operative analgesia and density of block in selective spinal anesthesia.

A study conducted by Halvadia S, et. all in 2019 also compared dexmedetomidine in doses of 5 and 10 µgm with control group. She used bupivacaine in dose of 12.5 mg. her results showed very less time required to reach maximum sensory level with dex 10 and 5 µg groups that is 5.23±0.06 and 5.32 ± 0.13minutes. This discrepancy in results is most likely due to higher dose of bupivacaine used in Halvadia's study¹³ while in our study we used only 5mg of bupivacaine with dexmedetomidine as an adjuvant.

Another study conducted in EGYPT in 2017 by Elshalakany A N, et. all compared dexmedetomidine in dose of 5 µgm with control group and used 15mg of bupivacaine. They also compared time for 2

segment regression and duration of post-operative analgesia among two groups and also reported prolongation of these 2 parameters among dexmedetomidine group. Duration of post-operative analgesia and 2-segment regression in their study was 370±20.3 and 128.7 ± 11.4mins in dex 5µgm group while in our study these parameters are 356.60±55.47 and 128±15.1 mins respectively. Results are quite comparable.¹⁴

Similarly another study conducted in Nepal in the year 2018 Added dexmedetomidine to smaller dose of bupivacaine (5mg) for perianal surgeries and showed significant prolongation of post-operative analgesia.¹⁵

Farokhmehr laleh et al. 16 and Gupta Met all 17 also studied different doses of dexmedetomidine in subarachnoid block and concluded that

the addition of 10 µg compared with 2.5 µg or 5µg ITD to 0.5% hyperbaric bupivacaine is associated with significantly earlier onset of sensory and motor block as well as prolonged duration of sensory block, motor block, analgesia, and DA with a comparable adverse effect profile.

Limitations:

In our study we included only elderly patients of ASA I and II status. Effect of intrathecal dexmedetomidine in geriatric population of ASA III and IV and those having comorbidities with complex systemic disease is yet to be studied.

Conclusion:

The use of 10µg dexmedetomidine compared to 5µg dexmedetomidine to adjuvant hyperbaric bupivacaine 0.5% more efficiently hastens the onset and prolongs the duration of sensory block and reduces the requirement of rescue analgesic in the post-operative period in patients undergoing elective transurethral resection of prostate in geriatric population.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest

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