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Brief Research Communication

Small-Dose of Bupivacaine with Fentanyl Spinal Anaesthesia in Trans Urethral Resection of the Prostate among Elderly Men: A Randomized Controlled Study

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Abstract

Background: The elderly are vulnerable to the toxic effects of drugs and have an increased sensitivity to many agents due to the age-related physiological changes and the increased associated co-morbidity. Hence many alterations to anaesthetic techniques are made and in use to address the potential complications following surgeries in the elderly patients. Evidences on the efficacy of low doses of the anaesthetic bupivacaine when added with an opiod fentanyl in spinal anaesthesia (SA) in Indian elderly patients who undergo transurethral resection of the prostate (TURP) is sparse. **Aim:** The objectives are to compare the degree of the sensory and motor block in elderly patients undergoing TURP under SA with lower doses of bupivacaine. **Materials and Methods:** A randomized controlled study was done on forty elderly men who were aged 60 years or older and scheduled to undergo TURP. Two comparable groups of patients were administered intrathecally either with bupivacaine 7.5 mg and fentanyl 25 µg (group I) or bupivacaine 5.0 mg and fentanyl 25 µg (group II). Sensory blockage was assessed by pinprick testing at predetermined intervals in the mid-clavicular line until the block regressed to L2 dermatome level. Modified Bromage scale was used to assess the motor block until the score was recorded zero. **Results:** The median peak level of sensory block recorded was at T7 and T8 among patients in group I and II respectively (p = NS). The mean time to L2 level regression was recorded at 159 vs 171 min (p = NS). Motor block was significantly intense in patients in group I in terms of mean duration of complete recovery of the block ($P < 0.001$). Grade III block was 100% vs 45% in group I and II respectively. **Conclusions:** We found that 5.0 mg of bupivacaine with 25 µg of fentanyl provides satisfactory anaesthesia for performing TURP in the elderly.

Keywords: Spinal anaesthesia, TURP, elderly, bupivacaine, fentanyl, sensory blockade, motor blockade

Introduction

There are potential challenges in anaesthetising elderly patients. The age-related physiological changes and the increased co-morbidity associated with old age puts the elderly patients at a greater risk of an adverse outcome following surgeries.[1] The pharmacokinetics of the anaesthetic agents which are dependent on its distribution and elimination show a variable change with advancing age.[2] Hence the elderly are vulnerable to the toxic effects of drugs and have an increased sensitivity to many agents. As a result a number of alterations to anaesthetic technique are employed such as lowering the dosages, avoiding premedicants in the very old, usage of faster acting opioids during induction and maintenance of anaesthesia, infusion of drugs at a slower rate and reduced dose of non steroidal anti-inflammatory drugs for postoperative pain relief among others.[3]

Spinal anaesthesia (SA) is preferred for performing trans urethral resection of the prostate (TURP) which is commonly undertaken in the elderly men. SA helps in early recognition of symptoms caused by over-hydration, TURP syndrome and bladder perforation that are possible during TURP.

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[1] Reliable SA using minidoses of local anaesthetics is made possible when combined with opioids. Shorter acting SA is preferably used to prevent complications associated with prolonged immobilization of the elderly.[2,4-9] This study looks into the effects of small doses of short acting local anaestheic bupivacaine 5.0 mg and 7.5 mg combined with 25 μg of opioid fentanyl, in Indian elderly patients undergoing TURP.[10] An earlier publication based on this study has reported on the adverse events and patient satisfaction.[11] This report presents the degree of sensory anaesthesia and motor block achieved by the technique.

Material and Methods

This is a randomized and double-blinded study conducted in a government medical college hospital at Bangalore. Patients aged 60 years and above who were electively scheduled for TURP under SA were randomized into two groups of 20 each. Patients under group I received bupivacaine 7.5 mg with 25 μg of fentanyl and those in group II received bupivacaine 5.0 mg with fentanyl 25 μg. The solutions to be administered intrathecally were prepared using hyperbaric bupivacaine 0.5% solution in dextrose and fentanyl 50 μg/ml to be made finally to 2 ml. Patients who had either an ASA grade I or II were only included for the study. As per the protocol patients were screened clinically for any deformities of the vertebral column, infections at the site of lumbar puncture, neurologic diseases and psychiatric disturbances to be excluded from the study. Blinding was done for the combinations of the intrathecal drugs used for the consented patient, the investigating anaesthetist and the operating surgeon.

The sample size of the patients in the two groups was estimated by power analysis. The standard deviation of data from a previously published report is used for the sample size estimation.[7] Here the assumption is of a 90% power so as to detect a 30 minute difference in the mean time required for complete sensory recovery. As per the protocol the selected patients fasted overnight and were premedicated with 5.0 mg of oral diazepam at one and a half hour before surgery.[9] An intra venous (IV) infusion of 500 ml of Ringer's lactate solution was slowly administered in the operation theatre. The monitoring undertaken and recorded was pulse oximetry, continuous electrocardiogram and automated blood pressure measurement. SA was administered at L2-3 spinous inter space in the midline through a 25 -guage disposable, Quinke-Babcock spinal needle with the patient in lateral decubitus position and the needle aperture directed cephalad. Injections were made over 10 to 15 seconds and the patient returned to supine position immediately.

To assess the sensory blockage following SA, pinprick testing was carried out with a sterile 18-guage hypodermic needle in the mid -clavicular line. To record the peak sensory blockade assessment was made every 3 minutes for the first 30 minutes. Then the sensation was assessed every 30 minutes until the blockade regressed to L2 level. Note was made of the time of reaching the highest level of sensory blockade and of regression to L2 dermatome level from the time of administering SA. The modified Bromage scale was used to assess the motor block. The following was noted where, 0= no motor loss, 1= inability to flex the hip, 2= inability to flex the knee and 3= inability to flex the ankle.[1] The motor block was assessed once in 3 minutes for the first 30 minutes after administering SA. This was followed by assessment of the motor block once in 10 minutes until the operation ended and then every 30 minutes until the score was zero.

Statistical analysis

The observed results of sensory and motor block between the two groups is analysed by student t-test and mann-whitney U-test. A p value of <0.05 is considered as statistically significant. The statistical analysis is done using SPSS 15 version.

Results

The two groups of elderly patients undergoing TURP under SA were comparable with respect to age, weight, height, body mass index and duration of surgery. The median level of the upper limit of sensory block was at T7

Table 1. Patient characteristics and duration of surgery

Patient characteristics	Group I (7.5 mg + 25 µg)	Group II (5.0 mg + 25 µg)
No.	20	20
Age (yr)	67.7 ± 5.1	67.3 ± 5.3
Weight (kg)	55.5 ± 8.2	54.0 ± 6.1
Height (cm)	158.1 ± 6.1	160.4 ± 4.6
BMI	22.2 ± 3.6	20.9 ± 1.7
Surgery time (min)	45.9 ± 16.4	43.2 ± 10.8
Bupivacaine (mg)	7.5	5.0
Fentanyl (µg)	25	25

Values are mean ± SD, BMI=body mass index, differences are not significant (p>0.05)

Table 2. Characteristic of sensory block

Sensory block	Group I (7.5 mg+25 µg)	Group II (5.0 mg+25 µg)
Highest level of block median (range)	T7 (T4-9)	T8 (T4-9)
Mean time to highest level of sensory block (min)	17.5 ± 8.1	16.6 ± 6.6
Mean time to L2 regression (min)	171.0 ± 36.5	159.0 ± 36.5

values are mean ± SD; differences are not significant (p>0.05)

Table 3. Characteristic of motor block

Motor block	Group I (7.5 mg + 25 µg)	Group II (5.0 mg + 25 µg)
Onset of grade III motor block (min)	9.8 ± 2.8	12.3 ± 2.5*
Complete recovery of motor block (min)	238.5 ± 117.8	113.2 ± 49.3**
No. of patients having Grade III block	20 (100%)	9 (45%)

values are mean ± SD; *$p < 0.02$, **$p < 0.001$

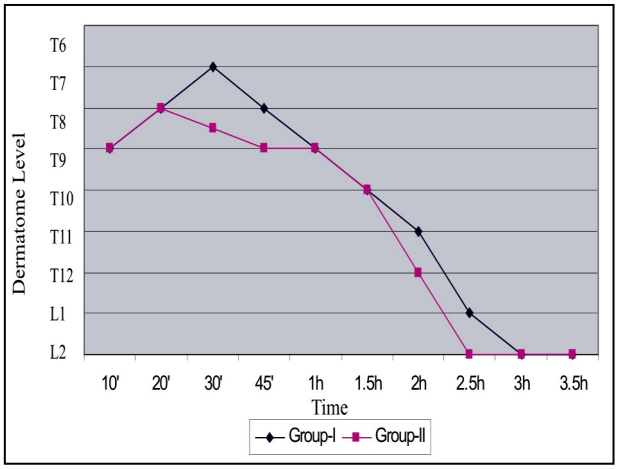

Fig 1. Median upper limit of sensory block over time

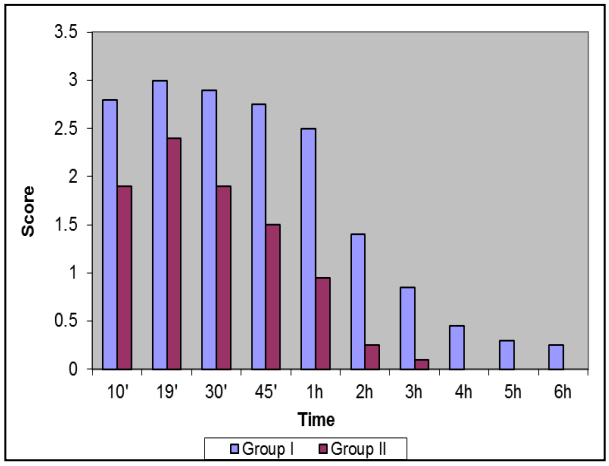

Fig 2. Mean motor block score over time

in Group I and at T8 in Group II. The differences in the median levels of sensory blockage levels in these two groups is not statistically significant (U=202). The mean time observed to the highest level of sensory blockage was 17.5 min and 16.6 min in Group I and II respectively (t=0.4267, p> 0.05). The mean time to L2 regression is shorter in group II patients at 159 min compared to 171 min in group I patients and the differences are not statistically significant (t=1.0390, p> 0.05) (tab 2 & fig 1). There was a significant difference between the two groups in terms of motor blockade as determined by modified Bromage scale (p< 0.001). The mean time for onset of complete motor block is earlier in Group I patients at 9.8 min compared to 12.3 min in Group II and the differences are highly significant (t=- 2.495, p< 0.02). The mean duration for complete recovery of motor block is found to be 238.5 ± 117.8 min in group I patients and 113.2 ± 49.3 min in group II (t= 4.495, p <0.001). All the patients had grade III motor block in group I and only 9 (45%) in group II (tab 1 & fig 2).

Discussion

This study conducted on elderly men undergoing TURP found SA with bupivacaine 5.0 mg and fentanyl 25 μg is as effective as bupivacaine 7.5 mg with fentanyl 25 μg in establishing an adequate sensory blockage for the surgery. Bupivacaine 5.0 mg resulted in a shorter acting motor block of lower intensity. Bupivacaine 5.0 mg produced similar levels of sensory analgesia as the 7.5 mg dose, both administered with 25 μg of fentanyl intrathecally. Several investigators have evaluated intrathecal administration of small doses of bupivacaine with fentanyl. Kuusnieni and others, found similar sensory level of analgesia with bupivacaine 5.0 mg and 7.5 mg both with fentanyl in elderly patients undergoing urological surgery at 30 min and at the end of surgery.[7] In our study the time taken for sensory block regression to L2 was quicker in group II (159 min) compared to group I (171 min) but was not statistically significant. But there was no need for any additional analgesic administration during the surgery in these patients. Some studies done earlier have found that the duration of sensory blockage has a relation to the dose of bupivacaine. Plain low dose bupivacaine (5.0 mg) alone is not known to produce adequate surgical anaesthesia in some cases, whereas a dose of 8 mg or more reliably produced surgical anaesthesia. Ben-David and others, and Kuusneini and others, have demonstrated findings of achieving better surgical anaesthesia with lower doses of bupivacaine with fentanyl combinations rather than with bupivacaine alone in different surgical procedures.[5-7] Geriatric patients show an increased responsiveness to analgesics. The reduction in the anaesthetic requirements of fentanyl in the elderly is due to decreased elimination clearance and by the slow rate of redistribution to other sites within the body. The similar sensory analgesic effects in the two groups who were administered low-dose bupivacaine in our study could be attributed to the added fentanyl.

In this study motor block was more intense in patients belonging to group I. A statistical difference was found between the patients in the two groups in terms of onset of grade III motor block (9.8 vs 12.3 min) and time to complete recovery of motor block (238.5 vs 113.2 min). Axelsson KH and others and Gentili and others demonstrated the advantages of small-dose bupivacaine-fentanyl SA over conventional dose bupivacaine in terms of faster motor recovery.[12,13] The recovery and mobilization of patients will be faster if the motor block is less intensive. Ability to ambulate patients promptly after surgery is a fundamental determinant of uncomplicated surgical recovery. In the study of low dose bupivacaine and fentanyl anaesthesia for urological surgeries in elderly men by Kuusneini and others, none of the patients receiving 5.0 mg of bupivacaine with 25 μg of fentanyl had motor block at the end of the operation and 30% of them had no motor block after the injection.[7] Yet none of the patients needed supplementation of analgesia during the operation in their study. The differences in motor block in the study by Kuusneini and group and in our study could be due to the variation in the mean weight and height which was 81 kg vs 54 kg and 173 cm vs 160.4 cm respectively. This could mean a low spinal volume and space in the patients in our study which would have

intensified the effects of bupivacaine and fentanyl leading to motor block.

Conclusions

We conclude that a small 5 mg dose of an anaesthetic bupivacaine when added to 25 μg of opioid fentanyl to produce spinal blockade is adequate in producing satisfactory anaesthesia in Indian elderly patients for the surgeons to perform TURP. The less intense motor block observed in this study with a 5 mg dose of bupivacaine will be helpful to facilitate an early mobilization of the patients so as to prevent the potential postoperative complications known to occur in the elderly.

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