A COMPARISON OF EFFICACY AMONG VARIOUS DOSES OF INTRATHECAL HYPERBARIC BUPIVACAINE 0.75% FOR ADULT ANORECTAL SURGERY

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ABSTRACT

Objective: To compare the efficacy of various doses of intrathecal hyperbaric bupivacaine 0.75% for adult anorectal surgery.

Study Design: Randomized control trial.

Place and Duration of Study: The study was conducted at the department of Anaesthesia, Intensive Care and Pain medicine, Combined Military Hospital (CMH) Quetta from November 2008 to October 2009.

Material and Methods: 120 adult patients undergoing anorectal surgery were randomly assigned to three groups. Groups A (n=40) was given the lowest dose of 4.5mg intrathecal hyperbaric bupivacaine 0.75%, while group B (n=40) and group C (n=40) were given 6.0mg and 7.5 mg,respectively. Dural puncture at L4/L5 level for drug administration was done in the sitting position and patient was made to lie down after five minutes and block level assessed.Variables to be assessed were level of sensory block indicated by number of dermatomes with pinprick method and extent of motor block by Modified Bromage Score.

Results: Level of sensory block in groups A,B and C was 5.88 ± 0.94, 8.15± 0.83, 10.10 ± 0.78 dermatomes, respectively (F (2, 117) = 245.976; p<0.0001 ANOVA; *p*<0.0001 group A vs B, group A vs. C and group B vs. C). Extent of motor block was 4.83 according to the Modified Bromage Scale in group A, compared to 2.25 in group B and 1.48 in group C (H (2) = 92.007; *p*<0.0001; *p*<0.0001 group A vs. B, group A vs. C and group B vs. C).

Conclusion: Efficacy of three doses of intrathecal hyperbaric bupivacaine 0.75% was found to be statistically different although all three doses produced adequate anaesthesia for anorectal surgery. The 4.5 mg dose of spinal hyperbaric bupivacaine is recommended since the doses of 6 mg and 7.5 mg result in extensive motor block.

Keywords: Anorectal surgery, Hyperbaric bupivacaine, Spinal anaesthesia.

INTRODUCTION

Anorectal diseases like hemorrhoids, anal fistula and anal fissure are fairly common in our adult population and treated surgically. Day care surgery is being popularized worldwide due to reduced health costs and remarkable safety profile[1]. Anorectal surgery requires deep anesthesia because the manipulated zone gets multiple nerve supply and is reflexogenic[2].

Spinal (intrathecal) anesthesia provides reliable and intense surgical anesthesia and the goals of early ambulation and discharge from hospital can be achieved with spinal anaesthesia provided unnecessary extensive sensory and motor block is avoided by adopting minimal effective dose of a safe and short acting local anesthetic[2,3].

This study aims to determine the optimal dose of hyperbaric bupivacaine 0.75% that would be adequately effective to provide regional anesthesia with added benefit of reduced motor block, so that early post-operative ambulation and discharge from hospital may be possible.

MATERIALS AND METHODS

These randomized control trials were conducted at Department of Anaesthesia, Intensive Care and Pain medicine, Combined Military Hospital (CMH) Quetta, over a period of one year from November 2008 to October 2009 after approval from the hospital ethical

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committee. A total of 120 patients of both the genders were included in the study after getting informed written consent. Patients between ages of 20 to 70 years, of American Society of Anesthesiologists (ASA) class I and II were selected while those having spine deformity, body mass index (BMI) more then 40, neuropathies, local sepsis, coagulopathy, severehypovolemia, severe aortic stenosis, severe mitral stenosis, hypersensitivity to amide type local anaesthetics and mental retardation were excluded from study. The selected patients were randomly divided in three groups i.e. group A (patients receiving 4.5 mg of hyperbaric bupivacaine0.75%), group B (patients receiving 6.0mg of hyperbaric bupivacaine 0.75%) and group C (patients receiving 7.5mg of hyperbaric bupivacaine0.75%). The hyperbaric bupivacaine 0.75% used was Abocaine Spinal Abbot Laboratories Pakistan®. Dural puncture was performed by 25-G Quincke needle (B.D® Quincke spinal needle) at the level of L4-L5 inter space with patients in sitting position. The dose was injected intrathecally over one minutes with the bevel directed caudally. Patient was kept in sitting position for five minutes after administration of intrathecal hyperbaric bupivacaine 0.75% before putting the patient to lithotomy position for surgery.

Bias of data recording was curtailed by using double blind method, neither patient nor the anaesthetist or the trained assistant who were evaluating the sensory and motor level after spinal anaesthesia were knowing the dose administered intrathecally ,and the anaesthetist who performed spinal anaesthesia was not included in recording the effect of block. The level of block was measured after five minutes of supine positioning i.e. 10 minutes after administration of spinal anaesthesia.

The sensory block was measured by pin-prick method.Sensory block measurements was scaled according to number of dermatomes anesthetized where 1=S5 ,5=S1,8=L3,10=L1 and so on. The motor block was evaluated by Modified Bromage Score which is a 6-point scale where 1 indicates a complete block while 6 indicates full motor power of lower limbs ,as given in Table-1.Any need of rescue analgesia/anaesthesia using intravenous ketamine (0.25mg/kg) was also recorded.

Computer software Statistical Package for Social Sciences (SPSS) version 16.0 was used to manage and analyze the data. Descriptive statistics were used to describe the results i.e. mean and standard deviation(SD) for quantitative variables while frequency and percentages for qualitative variables. Chi square test was applied for the comparison of qualitative variables. Quantitative variables were compared through one way analysis of variance(ANOVA) followed by Post-hoc Bonferroni test /Kruskal-Wallis H test followed by Mann-Whitney U test where appropriate. A p-value<0.05 was considered as significant.

RESULTS

Total 120 patients were included in the study. Male to female ratios in Group A ,B and C were 35:5,33:7,34:6,respectively (p>0.05). Group comparison revealed that the average age of group A, B and C was 44.05 ± 11.00, 36.00 ± 3.95, 41.6 ± 6.17, respectively p<0.0001, group A vs B (p<0.0001), group A vs C (p>0.05) and group B vs C (p<0.01). Group comparison demonstrated that the average weight of group A, B and C was 66.32 ± 8.31, 61.43 ± 9.48, 62.90 ± 10.12, respectively (p>0.05).

The sensory block as measured by pinprick method is shown in Table-2. The difference was found to be significant (p<0.0001). All three groups were significantly different from each other (group A vs. group B, p<0.0001; group A vs. group C, p <0.0001; group B vs. group C, p<0.0001). Motor block score as measured by Modified Bromage Scale is shown in Table-3. The difference among the three groups was found to be significant (p<0.0001). All three groups were significantly different from each other (group A vs. group B, p<0.0001; group A vs. group C, p<0.0001; group B vs. group C, p< 0.0001).

There were two cases(5%) in low dose group A that required intraoperative rescue analgesia with intravenous ketamine for minor abdominal discomfort while one case each from group-B (2.5%)and group C (2.5%) also required the same (*p*-value>0.05).

DISCUSSION

Spinal anaesthesia for anorectal surgery has been under continuous research with an aim to determine a local anaesthetic dose that is sufficient to provide selective sensory anaesthesia without extensive motor block having added benefit of safety in terms of neurological and cardiovascular side-effects[5,6]. By reducing the dose of local anaesthetic there is concern about spinal anaesthesia failure. This study demonstrated that 4.5 mg dose is sufficient to provide surgical anaesthesia for minor anorectal surgery. The cases that required rescue analgesia with intravenous ketamine for minor abdominal discomfort were equally distributed to three groups.

Level of sensory block achieved in current study with these three doses shows a difference of three dermatomes between low and middle dose group and a difference of two dermatomes between middle and high dose. Sensory block level achieved with low dose group is S1, it was sufficient to cover the nerve supply of the target anorectal area and surgery was performed without any pain suffered by the patient. Higher dose is related to extra blockage of spinal nerves and a higher level of sympathetic and motor block and hence more hemodynamic instability and motor paralysis leading to a poor quality of anesthesia[6,7].

Study conducted by Gudaitytė et al[6] used 7.5, 5.0 and 4.5 mg doses of 0.5% hyperbaric Bupivacaine for anorectal surgery and upper sensory block levels achieved were 10.4 ± 1.7 (10=L1), 7.0 ± 2.2 (7=L4) and 6.7 ± 1.9 (6=L5) respectively. The sensory level achieved was similar to current study. Maroof et al[7] in their study, conducted in Saudi Arabia, used hypobaric bupivacaine 0.1% in a of dose of 5mg on prone jack knife position for anorectal surgery and found this dose to be sufficient for minor anorectal surgery. Selectively targeting local anesthetic at nerve roots supplying the surgical field was shown to be successful, and the use of low dose bupivacaine produced favorable results

Table-1 : Modified bromage score.

Score	Criteria
1	Complete block (unable to move feet or knees)
2	Almost complete block (able to move feet only)
3	Partial block (just able to move knees)
4	Detectable weakness of hip flexion while supine (full flexion of knees)
5	No detectable weakness of hip flexion while supine
6	Able to perform partial knee bend

Table-2: Sensory block across three groups.

	Group_A (4.5mg) n=40	Group_B (6.0mg) n=40	Group_C (7.5mg) n=40	*p*-value
Mean no of dermatomes blocked	5.88	8.15	10.10	< 0.0001
Standard Deviation	0 .94	0 .83	0. 78	

Table-3: Motor block across three groups.

	Group_A (4.5mg) n=40	Group_B (6.0mg) n=40	Group_C (7.5mg) n=40	*p* -value
Mean score (Modified Bromage Scale)	4.83	2.25	1.48	< 0.0001
Standard Deviation	0.38	0.81	0.51	

in unilateral spinal anaesthesia for short procedure of lower limb as in knee arthoscopy[8,9].

In current study the extent of motor block was 4-5 points according to the Modified Bromage Scale in low dose group cases, compared to 2-3 score in 82.5% of middle group, and 1-2 scores in 100% of group C cases. As the dose increases motor block gets extensive. Patient with low dose group A were able to move and position themselves unaided before start of surgery and similarly at the end of surgery patients were able to move on to shifting trolley with minimal aid of nursing staff but most of the patient of middle dose group B and all of the high dose group C patients were unable to do so as they were having extensive motor block. This applies also to early ambulation of low dose group as very weak motor block resolve earlier than the relatively profound block of middle and high dose groups. These findings are similar to that of Gudaitytė et al[6] having a very weak motor block with 4 and 5 mg dose and relatively profound block with 7.5 mg dose and it is also in agreement with findings of Wassef [10] where there was almost no motor block with ultra low dose of bupivacaine i.e.1.5 mg.Though studies with 1.5mg of bupivaciane for perianal block were faced with mix of success[10,11] and failures[12]. There were studies that gave favourable result with ultra low dose of local anesthetic with combination of opioids[13,14].

Further studies should be conducted using serial recording of sensory and motor block before, during and after surgery till regression of block to S4, which will give a good indication for time to home-readiness, that is the goal in ambulatory anaesthesia. Tetanic stimulation using peripheral nerve stimulators or trans-cutaneous electrical nerve stimulation, both of which correlate well with pain of surgical incision, will allow more objective assessment of sensory block.

CONCLUSION

Efficacy of three doses of intrathecal hyperbaric bupivacaine 0.75% for anorectal surgery was found to be statistically different but all of them provided satisfactory analgesia and motor paralysis. Based on the result of this study the dose of spinal hyperbaric bupivacaine 0.75%recommended for anorectal surgery is 4.5 mg. Doses of 6 mg and 7.5 mg are excessive due to high sensory and motor blocks which are not required for anorectal surgery.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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