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Original Research Article

Comparative evaluation of subarachnoid block with low dose bupivacaine and fentanyl versus low dose bupivacaine and sufentanil in patients undergoing inguinal surgeries

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ABSTRACT

Background: Fentanyl is a phenylpiperidine derivative synthetic opioid agonist. As an analgesic fentanyl is 75-125 times more potent than morphine. Sufentanil is a semisynthetic thienyl analogue fentanyl with analgesic potency 5 to 10 times more than that of fentanyl. Recently there has been an interest in using analgesics and local anaesthetics in an attempt to decrease the local anaesthetic dose enabling faster recovery.
Methods: A double blinded randomised study was carried out with 50 patients of ASA grade I and II aged between 20 and 60 years undergoing elective inguinal and below inguinal region surgeries under low dose spinal anaesthesia. Patients received 10 mg of 0.5% hyperbaric bupivacaine with 50 µg of fentanyl added to a total volume of 3 ml (group F), and with sufentanil 5 µg [diluted with 5% dextrose] and volume made to 3 ml (group S). Postoperative VAS score for pain, duration of motor block and complications postoperatively is noted.
Results: Prolonged postoperative analgesia was observed in group F (216.7 min) and group S (264.8) which was statistically significant among the groups ($p<0.001$) is higher in group S and also duration of motor block in group F (130.6) and group S (90.5) which was statistically significant among the groups ($p<0.001$) which is higher in group F than group S.
Conclusions: When compared to intrathecal bupivacaine-fentanyl combination; intrathecal bupivacaine-sufentanil combination provided prolonged postoperative analgesia with a lesser duration of motor blockade thus allowing early post operative ambulation.

Keywords: Low dose spinal anaesthesia, Fentanyl, Sufentanil

INTRODUCTION

Spinal anaesthesia is widely used for surgeries involving the lower limb, perineum and inguinal region. The duration of spinal anaesthesia that is timed according to the duration of surgery may help prevent complications associated with prolonged immobilization especially in elderly patients. The rationale for the combination technique is that opioids and local agents eliminate pain by acting at two distinct sites—the local anaesthetic at the nerve axon and the opioid at the receptor site in the spinal cord. If even an extremely low concentration of local anaesthetic is added to the opioid, the quality of analgesia may be far superior. This study thus was designed to test the hypothesis that adding an opioid to the local anaesthetic in the subarachnoid space provides great advantages as has been reported extensively in literature.

Fentanyl is a phenylpiperidine – derivative, synthetic opioid agonist that is structurally related to meperidine.

As an analgesic, fentanyl is 75 to 125 times more potent than morphine fentanyl is extensively metabolized by N – demethylation producing norfentanyl. It is excreted by the kidneys and can be detected in the urine for 72 hours after a single IV dose of fentanyl.[1]

Sufentanil is a semisynthetic thienyl analogue fentanyl with analgesic potency 5 to 10 times more than that of Fentanyl. The volume of distribution and elimination half-time of sufentanil is increased in obese patients reflecting the high degree of liquid solubility of this drug.[2]

The aim of the study is to compare the postoperative analgesia and duration of motor block in patients undergoing inguinal surgeries.

The objective of the study is to study the effect of low dose hyperbaric bupivacaine 10 mg with 5 µg of sufentanil vs. low dose hyperbaric bupivacaine 10 mg with 50 µg of fentanyl.

METHODS

Study design

This study was done in a prospective double blind randomized manner.

Group F: patients in this group received 10 mg of 0.5% hyperbaric bupivacaine with 50 µg of fentanyl added to a total volume of 3 ml.

Group S: patients in this group received 2 ml [10 mg] of 0.5% hyperbaric bupivacaine with sufentanil 5 µg [diluted with 5% dextrose] and volume made to 3 ml.

The final volume of injected solutions was 3 ml in both the groups.

Inclusion criteria

Inclusion criteria were patients undergoing inguinal surgeries; both sexes; age: 20-60 years; patients belonging to ASA I or II.

Exclusion criteria

Exclusion criteria were patient's refusal; ASA physical status III, IV and V; deformity of vertebral column; neurological diseases; local sepsis; bleeding diathesis.

Methodology

This study was conducted on 50 adult patients of ASA physical status I and II in the age group of 20 to 60 years undergoing inguinal surgeries after taking informed consent at KIMS Medical College and RF, Amalapuram between August 2018 to February 2019.

All patients were reviewed the day prior to surgery. The VAS [visual analogue scale] was explained to the patient. The patients were shown a 10 cm long scale marked 0-10 a blank paper and told 0 represents no pain and 10 represents worst possible pain. Patients were advised nil per oral 6 hours prior to surgery.

To enable blinding a resident anaesthetist not involved in the study prepared the solution for spinal anaesthesia. Patients were placed in the right lateral position. Skin over the back was prepared with antiseptic solution and draped with a sterile towel. The L3-L4 interspace was identified and 23 G Quicke-Babcock spinal needle was introduced in this space through a midline approach. Once the needle pierced the dura and was in the sub arachnoid space, the stylet was removed. Free flow of CSF at the hub of the needle was verified. The prepared solution was injected at a rate of 1 ml every 5 seconds without barbotage. The direction of needle aperture was cephalad during drug administration. The total volume of injected was 3 ml. The patients were made to be supine immediately after injection and the following parameters were observed.

Assessment of motor block was started immediately after turning the patient supine. It was tested every 20 seconds till a bromage scale of 1 was reached.

At the end of surgery, the degree of pain was assessed by visual analogue scale [VAS]. In the PACU VAS was done every 15 minutes till VAS score ≥4 was reached. The VAS was also noted whenever the patient complained of pain. Diclofenac sodium 75 mg was given intramuscularly, as the rescue analgesic. Duration of effective analgesia was defined as the time interval between administration of sub arachnoid block and time to reach VAS 4.

Hypotension was managed with intravenous ephedrine in increments of 6 mg. Bradycardia was be managed with atropine 0.01 mg/kgi/v. Patients were monitored for 24 hrs to detect the occurrence of side effects like respiratory depression, nausea, vomiting, pruritus and urinary retention, postoperative headache. Results obtained were statistically analysed.

Statistical analysis

All data were analysed using SPSS version 19.0. Results were expressed as mean and percentage. The groups were compared by using unpaired t test and chi-square test. For all the tests a p value less or equal to 0.05 was considered significant.

RESULTS

Mean age of the patient in group F was 44.28±3.44 yrs and group S was 43.78±4.68 yrs having p value 0.41236. BMI was 23.12±2.1223 kg/m^2 in group F and 24.14±4.121 kg/m^2 having P value 0.12143. Both the

group were comparable to earlier other with respect to sex ratio and ASA scale.

Table 1: Demography of patients.

Variable	Group F	Group S	P value
Age (mean±SD) (yrs)	44.28 ±3.44	43.78 ±4.68	0.41
BMI (mean±SD) (Kg/ m^2)	23.12 ±2.12	24.14 ±4.12	0.12
Sex (M/F)	12 13	11 14	Chi square state 0.0805 p=0.78
ASA (I/II)	11 14	10 15	Chi square state 0.0821 p=0.77

Duration of motor block

The duration was read when bromage scale referred to BO. The mean duration of motor block in group F was 130.6 min while it was 90.5 min in group S which was statistically significant.

The mean duration of motor block was observed to be higher in group F than group S and is statistically significant.

Table 2: Distribution of duration of motor block by groups.

Duration of motor block	Group F	Group S	P value
No of cases	25	25	<0.001
Mean	130.6	90.5	
S.D	17.84	15.12	
Median	130	90	
Mode	130	80	
Range	90-180	60-120	

Table 3: Distribution of duration of post operative anaesthesia of cases.

Duration of post op anaesthesia	Group F	Group S	P value
No of cases	25	25	<0.001
Mean	216.7	264.8	
S.D.	46.16	29.89	
Median	210	275	
Mode	200	280	
Range	120-340	195-300	

Duration of effective analgesia

The mean duration of effective analgesia defined as the time to reach VAS score ≥4 from the time of subarachnoid block was 216.7 min in group F and 264.8 min in group S. This was statistically significant among the groups.

The mean duration of post operative anaesthesia was observed to be higher in group S than group F and is statistically significant.

Complication

The incidence of hypotension was 8% in group F and 16% in group S. The incidence of bradycardia was 12% in group F and 20% in group S.

The incidence of pruritis was 40% in group F and 48% in group S.

The incidence of nausea was 4% in each of the groups.

There seems to be no significant difference in the distribution of cases by bradycardia, hypotension, nausea and pruritis.

Table 4: Distribution of cases by groups and complications.

Co-morbid conditions	Group F		Group S		P value
	N	%	N	%	
Bradycardia					
Yes	3	12.0	5	20	0.70
No	22	88.0	20	80	
Hypotension					
Yes	2	8	4	16	0.67
No	23	92	21	84	
Nausea					
Yes	1	4	1	4	1.00
No	24	96	24	96	
Pruritis					
Yes	10	40	12	48	0.57
No	15	60	13	52	

DISCUSSION

The intrathecal injection of opioids combined with local anaesthetics at lower than conventional doses provides effective central neuroxial block with satisfactory analgesia and adequate relaxation for surgeries of inguinal region. The adding of opioids to local anaesthetics had an added advantage of prolonged post op ambulation with earlier mobilization due to shorter duration of motor blockade.

The study was designed to compare and contrast the combination of a local anaesthetic at lower than conventional doses with two different opioids administered intrathecally with regards to their efficacy and safety. Patients belonging to group F [fentanyl group] received 2 ml of 0.5% bupivacaine with 50 µg fentanyl (1 ml) intrathecally. Other group (group S – sufentanil group) received 2 ml of 0.5% bupivacaine with 5 µg of sufentanil. The duration of motor blockade, post operative analgesia and complications where analysed.

The mean duration of motor block in group F was 130.6 min while it was 90.5 min in group S this shows that sufentanil group provided lesser duration of motor block which allowing early postoperative ambulation. The mean duration of effective analgesia defined as the time to reach VAS score ≥4 from the time of subarachnoid block was 216.7 min in group F and 264.8 min in group S. this shows that sufentanil group provided prolonged post operative analgesia.

Roxane et al in his study found that duration of action of intrathecal fentanyl was 214±120 min and that of sufentanil 240±102 min.[3,4] His findings are comparable to the findings of our study.

Herman et al in his study on labor patients, analgesic duration with intrathecal fentanyl and sufentanil was 76±33 min and 101±58 min respectively.[5] This study also shows the prolonged analgesic effect of Sufentanil.[6,7]

Stroger et al reported use of intrathecal lignocaine with sufentanil for shorter post op recovery for outpatient rectal surgery.[8] In his study there was a significant shorter ambulation time (120±26 min) after intrathecal low dose lignocaine with 10 µg sufentanil compared to 50 mg of intrathecal lignocaine alone (102±32 min). David et al reported synergism between intrathecal opioids and local anaesthetics and with this combination it may be possible to achieve reliable spinal anaesthesia with minimal hypotension.[9] Roscow et al reported pruritis associated with spinal opioids but was an opinion that it was unlikely to be due to histamine release since pruritus occurred with fentanyl which does not cause systemic release of histamine.[10] Cooper et al studied the effect of intrathecal dimorphine or intrathecal fentanyl to supplement spinal anesthesia as post caesarean section analgesia.[11] 50 patients received 2 ml of bupivacaine with 50 µg of fentanyl versus 50 patients receiving dimorphine with bupivacaine. Ashehoune et al in his study showed that small dose of bupivacaine with sufentanil administered intrathecally prevented the cardiac output modification in patients undergoing elective urological, lower abdominal and lower limb surgeries when compared to large dose conventional bupivacaine.[12] Final results showed fentanyl group had good analgesia, better haemodynamic stability and lesser side effects.

CONCLUSION

This study confirms the safety and efficacy of intrathecal low dose localanaesthetic opioid combination in patients undergoing surgeries of inguinal region. When compared to intrathecal bupivacaine fentanyl and intrathecal bupivacaine sufentanil combination with sufentanil provided prolonged post-operative analgesia. When compared with fentanyl and sufentanil group, the sufentanil group shows a lesser duration of motor blockade thus allowing early post-operative ambulation. The side effects of intrathecal opioids are not significant and can be easily managed.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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