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Original Research Article

A COMPARATIVE STUDY OF INTRATHECAL FENTANYL AND BUPRINORPHINE AS ADJUVANT TO 0.5% HYPERBARIC BUPIVACAINE IN SPINAL ANAESTHESIA FOR LOWER ABDOMINAL AND LOWER LIMB SURGERY.

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Abstract

Background: Intrathecal opioids as adjuvant to local anesthetics, act synergistically to overcome the shortcomings of reduced duration and postoperative analgesia. Short acting opioid like fentanyl enhance the sensory blockade of local anesthetics without affecting the sympathetic activity. Buprenorphine a mu receptor partial agonist, administered intrathecally with bupivacaine improved the quality and duration of postoperative analgesia. This study was conducted to evaluate and compare the characteristics of spinal block and its side effects in patients undergoing lower abdominal surgeries using intrathecal bupivacaine and its combination with fentanylor buprenorphine.

Methods: In our Prospective Interventional study (March 2021- August 2021), 60 patients aged between 18-70 years of ASA 1 and 2 undergoing lower abdominal surgeries were included, after ethical clearance. Two groups of 30 each were randomly allocated by computer generated random number table, Group A received 3ml of intrathecal hyperbaric bupivacaine with 0.5mcg\KG of fentanyl and group B received 3ml of intrathecal hyperbaric bupivacaine with 2mcg\kg of buprenorphine. Onset and regression of sensory and motor blockade, duration of analgesiawas noted in both the groups. Sedation scores and side effects were evaluated. Statistical analysis was by Student's t-test and Chi-square test.

Results: The mean time of onset of sensory, motor blockade and the time to achievemaximum sensory level and sedation scores was comparable in both the groups ($p > 0.005$). Duration of motor blockade and analgesia, two segment regression time was significantly prolonged in Group B compared to Group F ($p<0.001$). Side effectsnoted were pruritis, nausea and vomiting in both the groups.

Conclusion:

Intrathecal Buprenorphine (60mcg) in combination with bupivacaine provides comparable onset of sensory and motor blockade but longer total duration of motor blockade and analgesia as with intrathecal fentanyl (25mcg).

Keywords: Intrathecal, fentanyl, buprenorphine, bupivacaine

Introduction

Spinal aneasthesia is the most commonly used technique for lower abdominal surgeries as it is very economical and easy to administer. The advantages of subarachnoid block are limited by its short duration of action and lack of postoperativeanalgesia.In recent years, the supplementation of local anaesthetics with adjuvants is widely in practice, to reduce the dose of local anaesthetic, minimize side effects and prolong the duration of anaesthesia Opioid added to local anaesthetic for spinal anaesthesia was first introduced into clinical practice in 1979 with intrathecal morphine as a forerunner. Neuraxial administration of opioids

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along with local anaesthetics improves the quality of intraoperative analgesia and also provide postoperative pain relief for longer duration[3.4]. Intrathecal morphine provides prolonged postoperative analgesia but is associated with increased risk of nausea, vomiting, itching and respiratory depression [5].Fentanyl, a lipophilic opioid, has rapid onset of action following intrathecal administration. It does not tend to migrate to the fourth ventricle in sufficient concentration to cause delayed respiratory depression when administered Intrathecally[6]. Addition of fentanyl to spinal anaesthesia produces synergistic analgesia for somatic and visceral pain without increased sympathetic block[7] .Therefore, fentanyl provides better intraoperative analgesia and a safer alternative to morphine for management of early postoperative pain.Buprenorphine is a centrally acting lipid soluble analogue of alkaloid thebaine. It exhibits analgesic property both at spinal and supraspinal level, when used intrathecally in combination with bupivacaine it has known to improve the quality and[8,9] duration of postoperative analgesia compared to bupivacaine alone.This study was conducted to evaluate and compare the characteristics of spinal block and its side effects in adult patients undergoing lower abdominal surgeries who received a subarachnoid block with either bupivacaine with buprenorphine or bupivacaine with fentanyl.

MATERIALS AND METHODS

SOURCE OF DATA

In patients posted for major surgeries below umbelical level in Gulbarga Institute Of Medical Sciences Kalaburgi.

Study Design: Prospective Interventional Study.

Duration of study: 6 months march 2023 to August 2023.

Sample size: 60 patients 30 patients in each group□ Group A will receive 3ml 0.5% hyperbaric bupivacaine + fentanyl 0.5mcg/kg Group B will receive 3ml 0.5% hyperbaric bupivacaine+ buprinorphine 2mcg/kg

METHOD OF COLLECTION OF DATA

Sixty patients aged between 18 to 70 years of physical status ASA grade 1 and ASA grade 2,undergoing below umbelical surgeries were included in the study after ethical clearance. Preoperative evaluation of the patient was done on the day before surgery. After explaining theprocedure, written and informed consent was obtained.

Patients were advised overnight fasting and were premedicated with tablet Alprazolam 0.5 mg thenight before and on the day of surgery.

INCLUSION CRITERIA

All the patients who were posted for elective lower abdominal surgeriesAge group- 18- 70 years. ASA 1 and 2 of either sex

EXCLUSION CRITERIA.

Patients with emergency surgery Hypersensitivity to any of the drugSpine deformities.
Bleeding diathesis and coagulopathy.

Data collected was analyzed by IBM SP SS2.0 version software. Data was spread in excel sheet mean, SD and other measures was calculated. For quantitative data analysis t-test and ANOVA test was applied for qualitative data analysis chi-square test was applied for significant if $P<0.05$ was consider as significant

RESULTS

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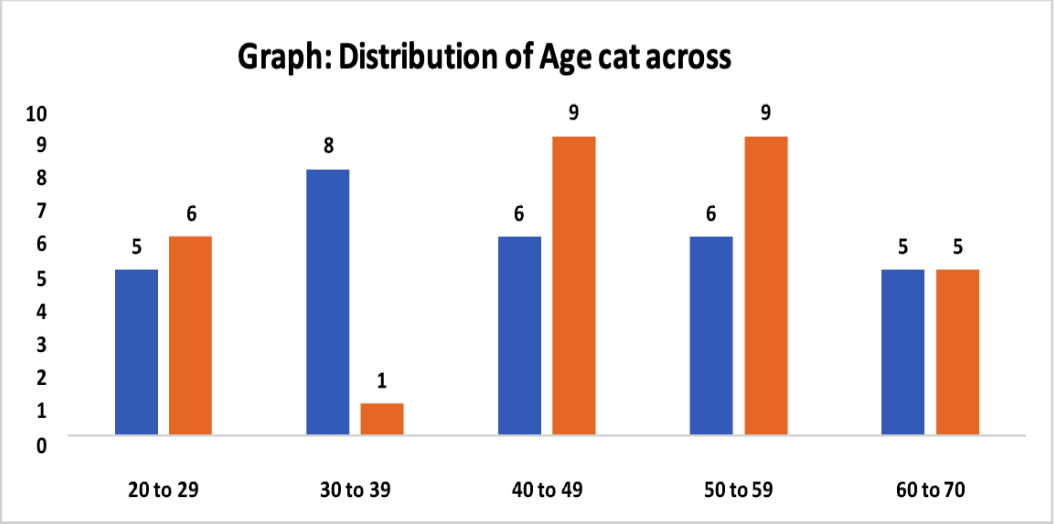
Age distribution of patient studied

Table 1: Shows the age distribution of the patients studied. Age of the patient ranged from20 -70 years.

Age cat	Group		Total	p value
	Group A	Group B		Chi square
20 to 29	5(16.67%)	6(20%)	11(18.33%)	.151
30 to 39	8(26.67%)	1(3.33%)	9(15%)	
40 to 49	6(20%)	9(30%)	15(25%)	
50 to 59	6(20%)	9(30%)	15(25%)	
60 to 70	5(16.67%)	5(16.67%)	10(16.67%)	
Total	30(100%)	30(100%)	60(100%)	



Graph 1: Comparison of the mean age of the study group

Graphs 1 represent the comparison of mean age among the study group. Samples were comparable in terms of age with p=0.151

Sex distribution

Table 2: Shows the sex distribution of the patient studied.

Sex	Group		Total	p value
	Group A	Group B		Chi square
Female	16(53.33%)	15(50%)	31(51.67%)	.796
Male	14(46.67%)	15(50%)	29(48.33%)	
Total	30(100%)	30(100%)	60(100%)	

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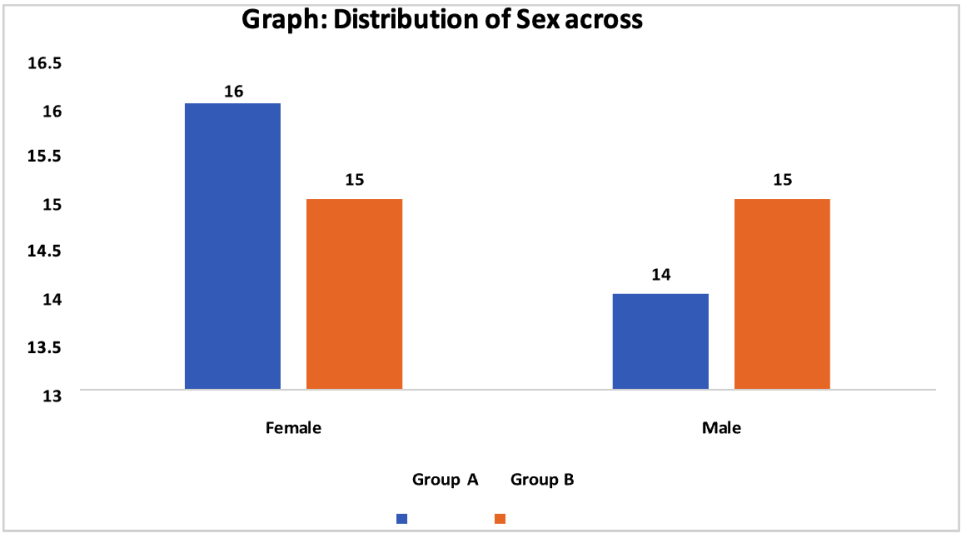
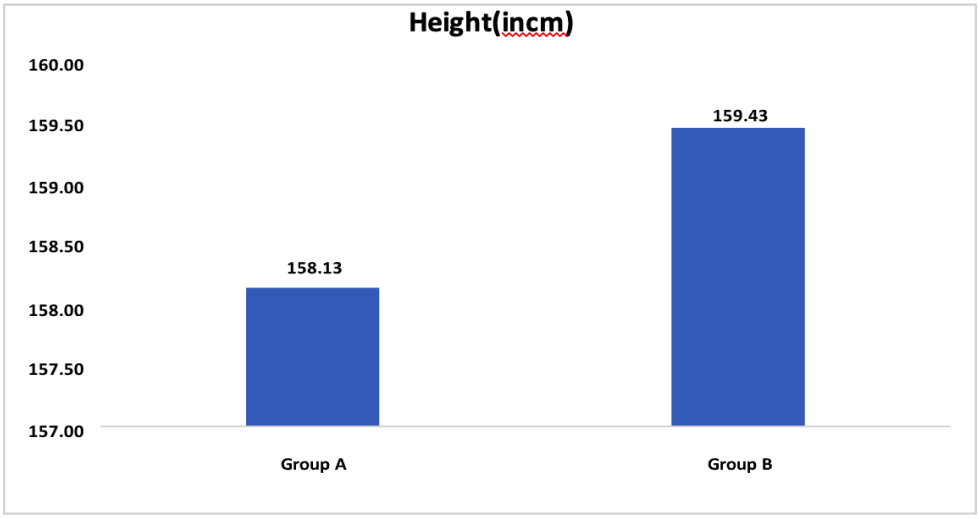


Graph 2: represent the comparison of sex of the patient studied in the group A and group B. Samples were comparable with p=0.796

ANTHROPOMETRIC MEASUREMENT

Table shows the height distribution of the patients studied. Height of the patients ranged from 150cm-170cm.thw minimum height was 150cm and maximum height was 169cm in group A. The minimum height was 154cm and maximum height was 170cm in group B.



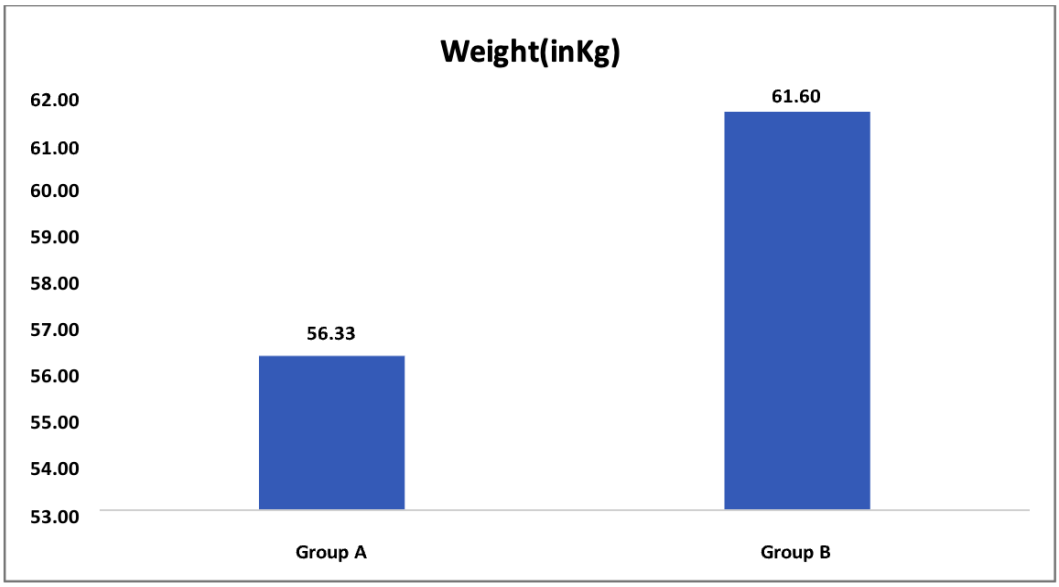
The mean height of the patient studied in group A and group B was 158.13cm and 159.43cm respectively.

There was no difference in the two groups in terms of height,p=0.164

Table 3: Weight distribution of the patient studied

`Group[Mean(sd)]	n1/n2	Group A	Group B	p value- Student t test
Weight(inKg)	30//30	56.33(±5.23)	61.6(±7)	.002

Table shows the weight distribution of the patients studied. The weight of the patient ranged from 50 -79 kg. The minimum weight was 50kg and maximum weight 79kg in group A. The minimum weight was 50 kg and maximum weight was 75kg in group B



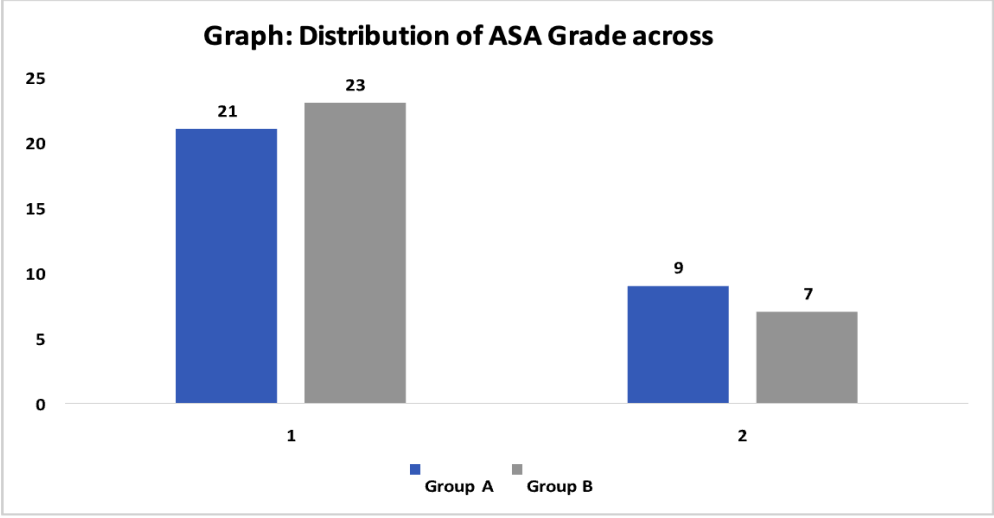
Graph 4: Comparison of mean weight among the study group

The mean weight of the patient studied in group A and B was 56.33 kg and 61.60kg respectively
There was a difference in two groups in terms of weight, p0.002

ASA GRADE
The table and graph shows that the patients in both groups were comparable with respect to theirASA physical status.

Table 4 : Comparison of ASA grading in the study group

ASA Grade	Group		Total	p value
	Group A	Group B		Chi square
1	21(70%)	23(76.67%)	44(73.33%)	.559
2	9(30%)	7(23.33%)	16(26.67%)	
Total	30(100%)	30(100%)	60(100%)	



Graph 5: Comparison of ASA grading among the study group

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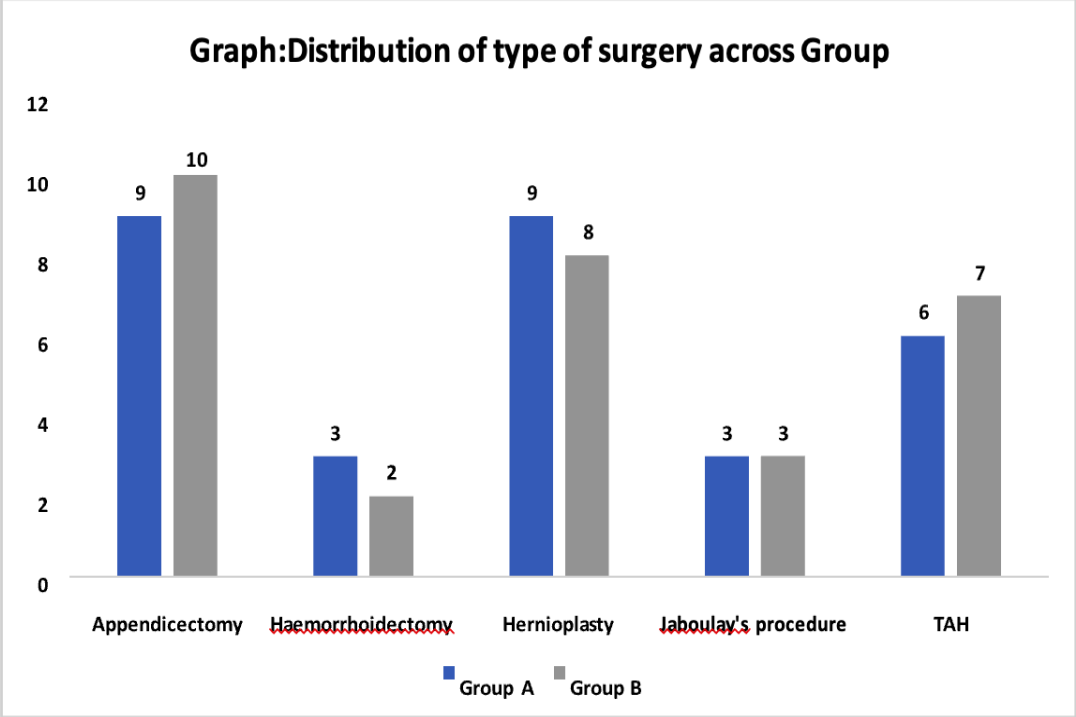
Table 5: Distribution of type of surgery among study group

type of surgery	Group		Total	p value
	Group A	Group B		Chi square
Appendicectomy	9(30%)	10(33.33%)	19(31.67%)	.983
Haemorrhoidectomy	3(10%)	2(6.67%)	5(8.33%)	
Hernioplasty	9(30%)	8(26.67%)	17(28.33%)	
Jaboulay's procedure	3(10%)	3(10%)	6(10%)	
TAH	6(20%)	7(23.33%)	13(21.67%)	
Total	30(100%)	30(100%)	60(100%)	

The table and graph shows the different type of surgeries performed in the study group.



Graph 6: Distribution of type of surgery

Table 6: Time for two segment regression of sensory block

`Group[Mean(sd)]	n1/n2	Group A	Group B	p value- Student t test
Time for 2 segment regression	30//30	92.97(±10.7)	110(±12.87)	.000

The mean time for two segment regression in group A was 92.97+10.7 minutes and in group B was 110+12.87 minutes.
There was a significant diffrence in the two groups as indicated by p <0.000.

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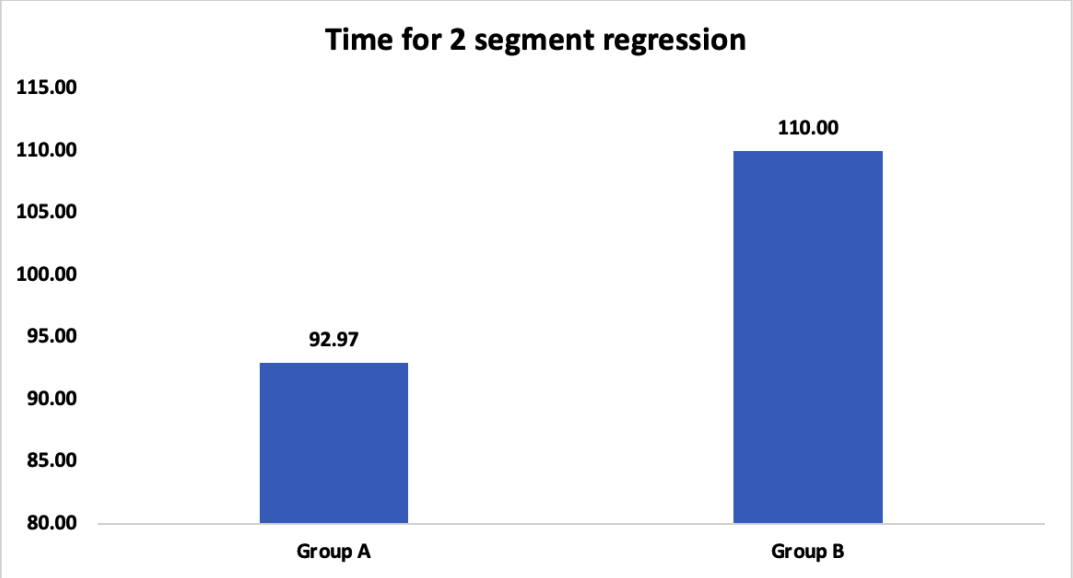
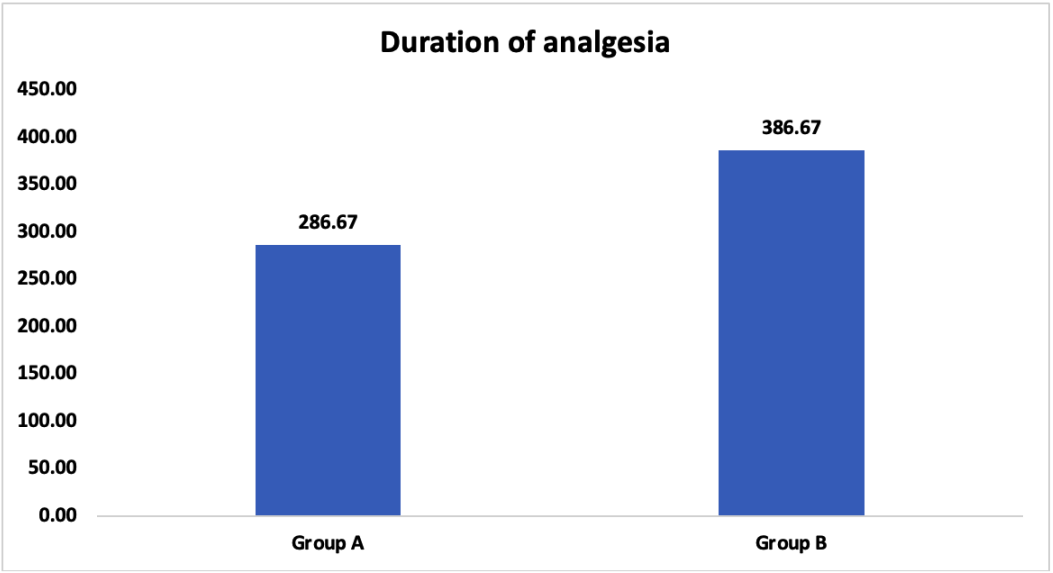


Graph 7 :Comparison of the time for two segment regression of sensory level in two groups

Table 7: Total duration of analgesia

`Group[Mean(sd)]	n1/n2	Group A	Group B	p value- Student t test
Duration of analgesia	30//30	286.67(±16.57)	386.67(±18.63)	***.000***

The mean duration of analgesia in group A was 286.67+16.57 minutes and in group B was 386.67+18.63 minutes. The shortest duration in group A was 260 minutes abd in group B was 360 minutes and longest duration in group A was 310 minutes and in group B was 410 minutes. Significant prolonged duration of analgesia was found with Buprinorphine group with p=<0.000.



Graph 8: Total duration of analgesia

DISCUSSION

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Spinal subarachnoid block is one of the most versatile regional anaesthesia techniquesavailable today. Regional anaesthesia offers several advantages over general anaesthesia-blunts stress response to surgery, decreases intraoperative blood loss, lowers the incidence ofpostoperative thromboembolic events, and provides analgesia in early postoperative period[10].Spinal opioids and local anaesthetics have been shown to act synergistically at the spinal level in animal studies[10]. The advantage of combining the two types of agents in this manner is thought to be explained by their different analgesic properties and their ability to block pain at two different sites. Opioids produce analgesia by specifically binding and activating the opiate receptors in the substantia gelatinosa, whereas local anaesthetics provideanalgesia by blocking impulse transmission at the nerve roots and dorsal root ganglia[11].Wong CA, Scavone BM, Slavenas JP et al[12]. conducted a study on 60 Parous parturients with cervical dilation between 3 and 5 cm who were randomized to receive intrathecal fentanyl 0 (control), 5, 10, 15, 20 or 25 micrograms, combined with bupivacaine 2.5 mg, found that the duration of analgesia was shorter for fentanyl groups 0, 5 and 10 micrograms, compared to groups 15, 20 and 25 micrograms, but there was no difference between the 15, 20 and 25 micrograms groups. There was no difference in the incidence of nausea and vomiting, or in FHR tracing changes. The incidence of pruritus was greater in all fentanyl groups compared to control. Reuben SS, Dunn SM et al[13]. studied 60 patients undergoing elective lower limb extremity revscularisation using continuous spinal aneasthetic technique. Patients were randomly divided into six groups to receive 0,5,10,20,40.50 microgram of fentanyl diluted with normal saline to make the final volume upto 1ml, through thespinal catheter postoperatively. Concluded in their study that beginning at 20 micrograms and higher concentration of fentanyl, patients experienced the onset of satisfactory analgesia. In the 50-micrograms group, five of ten patients complained of pruritus. Hence we chose 25microgramin our study.Rahul Seewal et al[14] in a study titled "Effect of Addition of Fentanyl (10, 20, 30, or 40 microgram), Intrathecally to 0.5% Hyperbaric Bupivacaine, on Perioperative Analgesia and Subarachnoid Block Characteristics, in Lower Abdominal Surgery. A Dose Response Study" found no significant increase in analgesic duration, when dose of fentanyl wasincreased from 10 to 20,30,or 40 microgram, and concluded that no additional benefit is obtained when the dose of intrathecal fentanyl is increased from 10 microgram to 20, 30, or 40 microgram, hence concluded that 10microgram appears to be the optimum dose.A GURBET, G TURKER et al[15] in a study titled "Combination of Ultra-low Dose Bupivacaine and Fentanyl for Spinal Anaesthesia in Out-patient Anorectal Surgery" concluded that 25 µg intrathecal fentanyl added to ultra-low dose (2.5 mg) bupivacaine provided good-quality spinal anaesthesia and reduced post-operative analgesic requirement with no significant hemodynamic alteration in patients undergoing ambulatory anorectal surgery except for pruritis. Gajanan Chavan, Aparna Chavan et al[16] in a study titled " Effect of Intrathecal Fentanyl on subarachnoid block with 0.5% hyperbaric bupivacaine" concluded that fentanyl (25microgram) mixed as an adjuvant to intrathecal 0.5% hyperbaric bupivacaine offersvarious advantages like better surgical analgesia, prolongs the duration of analgesia, reduces the intraoperative need of analgesic supplement, delays time of postoperative rescue analgesia and minimal side effects. Hence they recommended that, 25microgram of fentanyl is a safe and promising drug to be added with 0.5% hyperbaric bupivacaine for spinal anesthesia in infraumbilical surgeries. Based on the observations from the above mentioned study, we chose 25microgram of Fentanyl as the optimal dose to be added as an adjuvant to bupivacaine.G. CAPOGNA et al[17] conducted a study comparing addition of two different dosesof intrathecal buprenorphine 0.030mg and 0.045mg with bupivacaine, in elderly patients undergoing suprapubic prostatectomy. Demonstrated that the mean duration of pain free interval in buprenorphine (0.03mg) group to be 183.06±31minutes and that in buprenorphine (0.045mg) group to be 430.16± 24min. Concluded that the higher concentration of buprenorphine improved the quality and duration of analgesia. The only side effects found

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in the buprenorphine groups was nausea and vomiting. Sandhya Gujar, Pradnya Jagtap et al[18] in a study titled "Adjuvants to Spinal Anaesthesia –What is Better, Comparison Between Intrathecal Clonidine with Intratheal Buprenorphine" demonstrated that buprenorphine group (60 microgram), had longer durationof postoperative analgesia more than 12 hours in 90% of patients and risk of respiratory depression was also not statistically significant. Hence they recommended that using intrathecal buprenorphine gives adequate duration of anaesthesia for prolonged surgeries and also gives excellent post operative pain relief which is important in clinical recovery of patients.Sunil Dixit[19] in a study titled "Post Operative Analgesia After Caesarean Section: An Experience with Intrathecal Buprenorphine" concluded that intrathecal buprenorphine 60microgram added to bupivacaine is a suitable drug for postoperative analgesia, aftercesarean section, it enhances the sensory blockade of local anaesthetics without affecting the sympathetic activity and with minimal side effects. Anaesthesia was superior when buprenorphine is mixed with bupivacaine (0.5%) as compared to bupivacaine (0.5%) used alone.Based on the observations made from the above studies, we chose to use 2mcg\kg of buprenorphine as an optimal dose to be added to bupivacaine as an adjuvant. Khan FA, Hamdani GA[20] in a study to evaluate and compare the characteristics of spinal block, its postoperative analgesic effects and side effects using intrathecal bupivacaine 0.75% (2ml) and its combination with fentanyl (10microgram) or buprenorphine (30microgram) in elderly patients undergoing urological surgery. Concluded that Buprenorphine 30microgram in combination with bupivacaine 0.75% provided analgesia of comparable clinical onset and longer duration than fentanyl (10microgram) group, but was associated with a clinically increased incidence of nausea and vomiting in elderly patients.

CONCLUSION

Buprenorphine 2mcg\kg added to 3ml of 0.5% Hyperbaric Bupivacaine produced comparable clinical onset of sensory and motor blockade when compared to 0.5mcg\kg of Fentanyl.The mean time to achieve highest sensory level was comparable in both Buprenorphineand Fentanyl groups.The mean time for two segment regression was significantly prolonged when Buprenorphine was added to Bupivacaine compared to the addition of Fentanyl to bupivacaine.Total duration of motor blockade and duration of analgesia was of significantly longer duration in Buprenorphine group compared to Fentanyl group.

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