Original Research Article

Comparative study of intrathecal buprenorphine and fentanyl along with 0.5% hyberbaric bupivacaine for postoperative analgesia in LSCS patients under spinal anaesthesia

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Abstract

Background: The common anaesthetic technique used in obstetric anaesthesia is spinal anesthesia. The main disadvantage is its limited duration of action and thus, lack of postoperative analgesia. Short acting Opioids like Fentanyl and Sufentanil have been used intrathecally to provide pain relief . It is an effective analgesic with low intrinsic activity and can also be administered safely in the subarachnoid space. **Aim**: To compare onset of sensory and motor blockade and post operative analgesia between intrathecal buprenorphine and fentanyl along with 0.5% Hyberbaric bupivacaine for postoperative analgesia in LSCS patients under spinal anaesthesia **Materials and methods**: Patients with ASA Grade I and II of age 18-35 years were included in this study. The study group were randomly divided into two groups with 26 patients in each group. Group B-1.6ml of 0.5% Heavy Bupivacaine + 0.2ml (60 microgram) Buprenorphine + 0.2(distilled water) – total volume 2ml and group F -1.6ml of 0.5% Heavy Bupivacaine + 0.4ml (20 microgram) Fentanyl – total volume 2ml **Results** : Buprenorphine 60mcg added to 1.6 ml of 0.5% Hyperbaric Bupivacaine has comparable clinical onset of sensory and motor blockade, time for two segment regression, total duration of motor blockade but longer effective analgesia time when compared to Fentanyl 20 microgram added to 1.6 ml of 0.5% Hyperbaric Bupivacaine in patients undergoing LSCS under spinal anaesthesia **Conclusion**: So buprenorphine can be used as an adjuvant to bupivacaine in spinal anesthesia in addition to Fentanyl as it gives better post operative analgesia

Key words: Buprenorphine, Fentanyl, Bupivacaine, spinal anesthesia, post operative analgesia

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INTRODUCTION

The common anaesthetic technique used in obstetric anaesthesia is spinal anesthesia. The main advantage with this is – relative simplicity, rapidity, certainty, low failure rates, minimal side effects, an awake mother. The main disadvantage is its limited duration of action and thus, lack of postoperative analgesia. Short acting Opioids like Fentanyl and Sufentanil have been used intrathecally to provide pain relief[1] .Buprenorphine is a mixed agonist - antagonist Opioid with high affinity at both μ and kappa opiate receptors. It is an effective analgesic with low intrinsic activity and can also be administered safely in the subarachnoid space[2].

Aims and Objectives: To evaluate and compare the synergistic effect of Bupivacaine 0.5% with Fentanyl versus Bupivacaine 0.5% with Buprenorphine, in patients undergoing LSCS under spinal anaesthesia regarding:

- Onset and duration of sensory blockade
- Onset and duration of motor blockade

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- Time for two segment regression from highest sensory level
- Duration of postoperative analgesia
- Complications or side effects, if any

MATERIALS AND METHODS

The study was conducted in the department of Anaesthesiology, *Rural development trust hospital, Bathalapalli, Anantapuramu*

Inclusion Criteria

1. Singleton full term pregnant patients undergoing elective lower segment Caesarean Section.
2. Age: 18-35yrs.
3. ASA Grade I and II.

Exclusion Criteria

1. Patients unwilling for Spinal anaesthesia/infection over lumbar region.
2. ASA grade III-IV
3. Patients posted for emergency LSCS

Sixty three patients (will be selected based on inclusion and exclusion criteria) scheduled for LSCS under spinal anaesthesia will be randomly allocated (using sealed envelope technique) into one of the two groups of twenty six each.

Group B -1.6ml of 0.5% Heavy Bupivacaine + 0.2ml (60 microgram) Buprenorphine + 0.2(distilled water) – total volume 2ml

Group F -1.6ml of 0.5% Heavy Bupivacaine + 0.4ml (20 microgram) Fentanyl – total volume 2ml

Procedure:

After thorough pre-anaesthetic examination, consent was taken.Baseline vitals are noted.Upon arrival in the operation theatre, an IV line is secured .Monitors were connected – Base line Heart rate, Oxygen Saturation, blood pressure were recorded and ECG was monitored.With patient in the left lateral position each patient is premedicated with ondansetron 4mg and ranitidine 50 mg iv and pre-loaded with 15ml/kg Ringer lactate over a period of 10 minutes. In left lateral position subarachnoid block was given under aseptic precautions after local infiltration**,** by midline approach**,**with OT table in neutral position**,** with 25G lumbar puncture needle**,** in L_3 – L_4 intervertebral space**.**Immediately following the injection patients will be turned to supine position and left uterine displacement was given.All Patients were supplemented with O2 (4 L/min) via a facemask Vital parameters will be measured after SAB every 3 min for 20 min, every 5 min thereafter till the end of surgery.Post-operative analgesia will be evaluated using ***VAS score***.Rescue analgesia in the form of Diclofenac sodium 1.5 mg/kg I.M. will be given at the VAS score of >4.

Parameters observed:

1. Onset of sensory blockade: It is the time taken from deposition of study drug till the patient does not feel the pin prick at L1 level.
2. Onset of motor blockade: Is defined as time taken from deposition of the study drug till the patient develops modified Bromage scale Grade 2 motor blockade.
3. Time for two segment regression of sensory blockade: It is the time in minutes taken to regress the level of loss of pin prick sensation achieved to two lower sensory dermatomal level.
4. Duration of motor block: Is defined as the time taken from onset of motor block till the patient attains complete motor recovery (modified Bromage 0).
5. Effective analgesia time: Time taken between the injection of intrathecal drug and onset of unbearable pain - VAS score of >4
6. Side effects and complications

RESULTS: Demographic data like Age, Weight, Sex and ASA Grade were similar in both the groups.

TABLE I: TIME TO ONSET OF SENSORY BLOCK

	GROUPB	GROUPF	P value
Onset of sensory block (MIN)	2.86 ± .503	3.05±.551	0.45

Time taken to the onset of sensory block in the Group B was 2.86 ± .503 min and in the Group F was 3.05 ± .551 min. The shortest duration was 2 min and the longest duration was 4 min in both the groups. The onset time of sensory block was comparable in both the groups as indicated by the (p value = 0.45)

TABLE II: Time to reach Highest Sensory Level

	GroupB	Group F	'p' value
Time to reach highest sensory level (min)	5.86 ± 0.503	5.71 ± 0.490	0.109

The mean time to reach the highest level in group B was 5.86 ± 0.503 min and in group F was 5.71 ± 0.490 min. The mean time to reach highest sensory level was comparable in both the groups (p value = 0.109).

TABLE III: Mean duration of onset of motor block

	GroupB	Group F	'p' value
Time to onset of motor block	4.79 ± 0.513	4.68 ± 0.502	0.222

The mean time of onset of motor blockade was 4.79 ± 0.513 min in Group B and 4.68 ± 0.502 min in Group F respectively. Mean duration of onset of motor blockade was comparable in both the groups (p value- 0.222).

TABLE IV: Total duration of Motor blockade in the two groups

Duration of motor block	Group B	Group F	Total	*P value*
120	61.9%	61.9%	61.9%	0.801
150	27.0%	30.2%	28.6%	
180	11.1%	7.9%	9.5%	
Total	**100%**	**100%**	**100**	

The total mean duration of motorblockade was 134.76 ± 20.780 min in Group B and 133.81 ± 19.296 min in Group F respectively. Mean duration of onset of motor blockade was comparable in both the groups (p value 0.801)

TABLE V: Time for two segment regression of sensory blockade

	Group B	Group F	'p' value
Time for two segment regression (min)	82.62 ± 16.797	82.86 ± 15.676	0.935

The mean time for two segment regression in the group B was 82.62 ± 16.797 minutes and in group F was 82.86 ± 15.676 minutes. There was no significant difference in the two groups(p value 0.935).

TABLE VI: Effective analgesia time

Effective analgesia time(min)	Group B	Group F	Total	*P value*
201 - 300	0 %	11.1%	5.6%	***<0.001***
301 - 400	6.3%	27.0%	16.7%	
401 - 500	20.6%	57.1%	38.9%	
501 - 600	65.1%	4.8%	34.9%	
Above 600	7.9%	0%	4%	
Total	**100%**	**100%**	**100**	

The mean effective analgesia time in group B was 547.60 ± 80.276 minutes and that in group F was 410.00 ±67.942. 57.1 % of patients in group F had 401-500 minutes of duration of analgesia. 65.1% of patients in group B had 501-600 minutes of duration of analgesia. The shortest duration of analgesia was 210 minutes and 360 minutes in group F and group B respectively. The longest duration of analgesia was 600 minutes and 720 minutes in group F and group B respectively. Significantly prolonged effective analgesia time was found in Buprenorphine group with 'p' value <0.001.

TABLE VII: Comparison of side effects/Complications

Side effects	Group B	Group F	Total	P value
Nausea	4.8%	4.8%	4.8%	
Vomiting	1.6%	4.8%	3.2%	
Hypotension	15.9%	15.9%	15.9%	
Pruritus	1.6%	4.8%	3.2%	0.704
None	76.2%	69.8%	73.0%	

The incidence of hypotension considered to be present whenever systolic blood pressure decreased to less than 90mm of Hg or <20% of the baseline whichever appears first was 15.9% in group F (10 patients) and in group B was 15.9% (10 patients) which is equal in both the groups Other common side effects noted in all the patients under the study were pruritis, nausea and vomiting. 3 patients in group F experienced pruritis with the incidence of 4.8% and 1 patient in group B experienced pruritis with the incidence of 1.6%, but there was no statistical difference in the incidence of pruritis between the two groups (p > 0.05).

DISCUSSION

Spinal subarachnoid block is one of the most versatile regional anaesthesia techniques available today especially in patients undergoing LSCS. Regional anaesthesia offers several advantages over general anaesthesia - blunts stress response to surgery, decreases intraoperative blood loss, lowers the incidence of postoperative thromboembolic events, and provides analgesia in early postoperative period. Spinal opioids and local anaesthetics have been shown to act synergistically at the spinal level in animal studies[3] .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 activating the opiate receptors in the substantia gelatinosa, whereas local anaesthetics provide analgesia by blocking impulse transmission at the nerve roots and dorsal root ganglia[4] The studies conducted by Rahul Seewal *et al.*. and Gajanan Chavan, Aparna Chavan *et al.*.[5] on different doses of intrathecal fentanyl showed that even if we increase the dose of fentanyl after 25mcg, there is no much variation in the duration of analgesia. Hence, we chose 20 micrograms of Fentanyl as the optimal dose to be added as an adjuvant to Bupivacaine Studies conducted by Sandhya Gujar, Pradnya Jagtap *et al.*.[6], G. CAPOGNA *et al.*. and Sunil Dixit demonstrated that increasing doses of buprenorphine from 30mcg to 60mcg prolonged duration of analgesia without significant complications like respiratory depression.Hence we chose to use 60micrograms of buprenorphine as an optimal dose to be added to bupivacaine as an adjuvant. The mean time taken to the onset of sensory block in the Group B was 2.86 ± .503 minutes and in the Group F was 3.05 ± .551 minutes. Fauzia A. Khan, Gauhar A. Hamdani in a study titled found that onset of sensory blockade with fentanyl 10 microgram was 3.2±2.0min and with buprenorphine 30microgram was 3.15±1.0min which was statistically comparable with 'p' value 0.94. This is in accordance with our study.[7] In our study, the mean time for two segment regression in the group B was 82.62 ± 16.797 minutes and in group B was 82.86 ± 15.676 minutes. There was no significant difference in the two groups as indicated by the 'p' value 0.935. Harbhej Singh *et al.*. found that the time for two segment regression from the highest sensory level was 93.4±22minutes in a group which received 25microgram

of fentanyl with 3ml of 0.5% hyperbaric bupivacaine this is accordance with our study group fentanyl.[8] G, Priyanka V *et al.*. found that the 2 segment regression time was 122.00±9.85 minutes in a group which received 3cc of 0.5% hyperbaric bupivacaine with 100 µg of buprenorphine which did not match with our study group buprenorphine.[9] The mean time to onset of motor blockade (modified Bromage 2) was 4.79 ± 0.513 minutes in Group B and 4.68 ± 0.502 minutes in Group F respectively. Mahima Gupta *et al.*. found the onset time of motor blockade (Bromage 2) in a group who received 60µg of buprenorphine with 3ml of 0.5% hyperbaric bupivacaine was 3.30±0.97 minutes which did not match with our study as this is faster.[10] In our study the mean effective analgesia time in group B was 547.60 ± 80.276 minutes and that in group F was 410.00 ±67.942. Significantly prolonged effective analgesia time was found in Buprenorphine group with 'p' value <0.001.Rashmi Pal, K. K. Arora *et al.*. in a study found that the duration of analgesia is more in buprenorphine group than in fentanyl which is in accordance with our study.[11]

CONCLUSION

Buprenorphine 60mcg added to 1.6 ml of 0.5% Hyperbaric Bupivacaine has comparable clinical onset of sensory and motor blockade, time for two segment regression, total duration of motor blockade but longer effective analgesia time when compared to Fentanyl 20 microgram added to 1.6 ml of 0.5% Hyperbaric Bupivacaine in patients undergoing LSCS under spinal anaesthesia.

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