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Comparative Study between Intrathecal Nalbuphine and Fentanyl with Hyperbaric Bupivacaine for Postoperative Analgesia in Caesarean Section

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Original Research Article

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Abstract: Intrathecal opioids increase postoperative analgesia "to compare the clinical and anaesthetic effects between intrathecalnalbuphine and fentanyl with hyperbaric bupivacaine for post-operative analgesia in caesarean section" Hospital based interventional prospective study. Sample size was calculated , 55 subjects for each of two groups at α error 0.05 and power 80% assuming difference to be mean detected in duration of analgesia in both nalbuphine & fentanyl group(11±20) as per seed article. 110 eligible patients undergoing caesarean section on first come first serve basis and were allocated in 2 groups using chit in box method. The onset of complete motor block was significantly more rapid in fentanyl group than in nalbuphine group. The duration of post-operative analgesia was more prolonged in nalbuphine group. There is significant difference was found between both groups as regards the duration of sensory block, motor block, duration of analgesia, No significant difference was found in Apgar score, hemodynamic parameters and oxygen saturation. Adverse effects were less common in nalbuphine group but the difference was insignificant. We conclude that intrathecalnalbuphine 0.8 mg is effective in enhancing postoperative analgesia as compare to intrathecal fentanyl.
Keywords: Nalbuphine fentanyl bupivacaine.

INTRODUCTION

Pain [1] as defined by the International Association for the Study of Pain (IASP) is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" Effective management of postoperative pain relievers suffering and leads to earlier mobilization, fewer pulmonary and cardiac complications, a reduced risk of deep vein thrombosis, faster recovery with less likelihood of the development of neuropathic pain, reduced cost of care and increased patient satisfaction [2] Lower Segment Caesarean Section is commonly performed via a Pfannestiel incision [5] and causes significant moderate to severe pain that requires multimodal postoperative pain management. Pain after LSCS is often multifactorial and arises from different sources. The sources of pain mayinclude a combination of incision pain, pain from deeper visceral structures, and dynamic pain or pain on movement, such as during straining, coughing or mobilizing that may be severe. Subarachnoid Block is the preferred means of anaesthesia for obstetric and gynaecological procedures being simple to perform, economical and produces rapid onset of anaesthesia and complete muscle relaxation.

It carries high efficiency, involves less drug dosage.Spinal adjuvant drugs have been used since the beginning of subarachnoid anaesthesia, the neuraxial route to inject opioids as adjuvants drugs grew logarithmically. In the context of augmentation strategies, a number of adjuvants had been added to spinal local anaesthetic agents. E.g. α2-adrenergic agonist (clonidine)11,anticholinesterases (neostigmine) 12, benzodiazepines(midazolam)13, steroids (dexamethasone)14, N-methyl-d-aspartate (NMDA) antagonists(Ketamine)15, opiod receptor agonist (nalbuphine)16 ,fentanyl and others (octreotide17, calcitonin18, adenosine19). There are many receptors which modulate spinal pain response; however, there are only few FDA approved drugs to be used via subarachnoid as adjuvants or sole medications.

The purpose of this study is to compare the effect of Nalbuphine hydrochloride and fentanyl as an adjuvant to intrathecal Bupivacaine for post-operative analgesia in lower segmental caesarean section.

MATERIAL AND METHODS

Materials

- Pre-sterilized equipment for subarachnoid block
  - Spinal needle 25G
  - 10ml disposable syringe
  - 5ml disposable syringe
  - Sponge holding forceps
  - Gauge pieces
  - Drapes
  - Povidine iodine and spirit

- **Drugs used**
  - Inj. Bupivacaine 0.5% heavy (5mg/ml)
  - Inj. fentanyl (50mcg/ml)
  - Inj. Nalbuphine (10 mg/ml)
  - Inj. Mephentermine (30mg/ml)
  - Inj. Atropine (0.6mg/ml)
  - Inj. Ranitidine (25mg/ml)
  - Inj. Metoclopramide (5mg/ml)
  - Normal saline , ringer lactate

Boyle's anaesthesia machine with oxygen source
Resuscitation drugs

Other

Autoclaved gown, pair of sterilized gloves, suction machine &catheter, laryngoscope, endotracheal tubes of different internal diameter, sphygmomanometer, intravenous cannula 18G,sterile 5cc and 1cc syringe, blood transfusion set, IV infusion set, ECG electrodes etc.

Monitor

ECG monitor, pulse oximetry, non-invasive blood pressure instrument

METHOD

The study was conducted in the Department of Anaesthesiology, Sawai Man Singh Medical College and Attached Group of Hospitals (GANGORI HOSPITAL), Jaipur after the approval of local institutional ethical committee and obtaining written informed consent from all patients before participation.

STUDY DESIGN

Prospective, randomized, double blinded, interventional study

OBSERVATIONS

Table-1

	STUDY GROUP F	STUDY GROUP N	TEST	p VALUE	INFERENCE
Number of Patients	55	55	-	-	-
Age (Yrs)	25.4 ±3.252	24.91 ±2.877	t Test	0.404	Non-Significant
Weight (Kgs)	62.5±9.47	60.16±6.54	t Test	0.135	Non-Significant
Height (cm)	153.6 ±3.31	154.9 ±4.066	t Test	0.08	Non-Significant
ASA Grade (I/II)	48/7	51/4	Chi Square	0.525	Non-Significant
Onset of sensory block (mins)	1.291 ±0.6287	2.355 ±0.8696	t Test	0	Significant
Onset of motor block (mins)	1.582 ±1.308	4.618 ± 2.969	t Test	0	Significant
Total duration of Analgesia (mins)	359 ±264.2	388.9 ±166.4	t Test	0.479	Non-Significant
Duration of Surgery (mins)	36.8 ±8.744	36.04 ±7.237	t Test	0.619	Non-Significant
Time for 2 segment regression(mins)	158.3 ±81.24	164.1 ±78.15	t Test	0.045	Significant
Total duration of Motor Block (mins)	178.2±97.46	195.2 ±95.6	t Test	0.358	Non-Significant

Table-2: Distribution of Adverse-Effects

SIDE-EFFECTS	GROUP (F) N 55	GROUP (N) N 55	ChiSquare test P value
Hypotension	6	4	0.740
Bradycardia	04	2	0.98
Respiratory Depression	0	0	1
Nausea, Vomiting	3	2	1
Pruritus	0	0	-

DEGREE OF SEDATION

Table-3: Degree of sedation

Degree of Sedation	GROUP (F) n 55	GROUP (N) n 55	P value
1. Awake & Fully alert	48	51	0.525
2. Awake but drowsy, responding to verbal stimulus	7	4	
3. Drowsy but arousable, responding to physical stimulus	-	-	
4. Unarousable, not responding to physical stimulus	-	-	

Table shows the degree of sedation in both groups. In fentanyl group, forty eight out of fifty five patients showed Sedation Score 1 and the rest seven showed Sedation Score 2. In nalbuphine group fifty one out of fifty five patients respectively, were awake and alert (Sedation Score 1) while four showed mild sedation of Sedation Score 2. p value= 0.525 (*p values>0.05,insignificant*)

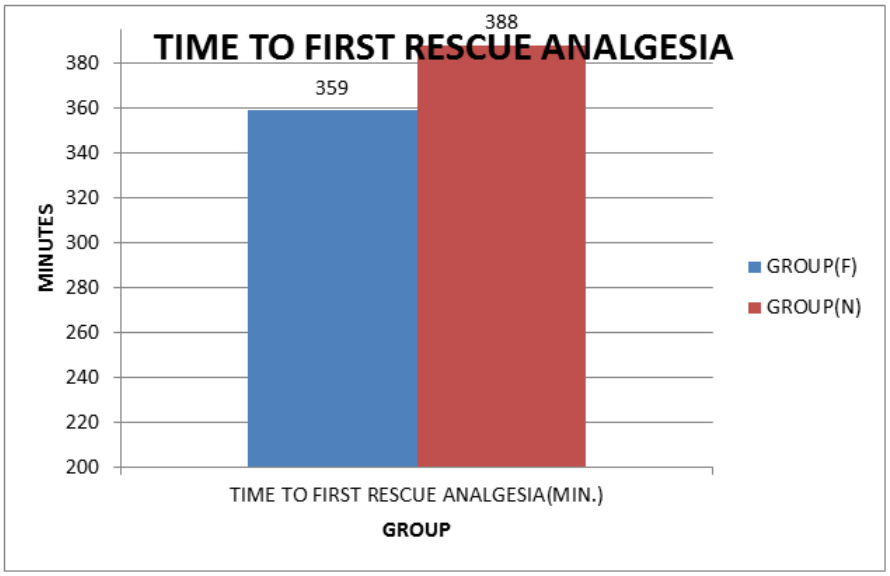

Fig-1: Time to First Rescue Analgesia

DISCUSSION

In our study there was no significant difference in the demographic data (age, sex, weight and height) and ASA physical status.

The *Onset of sensory block* is significant in fentanyl (1.29±0.63 min) and nalbuphine group (2.36 ± .86 min). Our result is strengthened by the studies done by Arghya Mukherjee *et al*. [18] in nalbuphine (1.59 ± 0.18) and Jaishri Bogra *et al.* [15] & Singh *et al.* in fentanyl.

The *onset of motor block* was significant in fentanyl (1.58±1.3 min) and nalbuphine group (4.61 ± 2.9 min). This is supported by studies done by Swati Bisht(p value < 0.001), Arghyamukherjee *et al.* [18] innalbuphine (5.6 ± 0.53) and Culebras X *et al*. [16]

In our study The *duration of motor blockade* was increase in nalbuphine group (195.2 ±95.6 min) then fentanyl (178.2±97.46 min). No statistically significant difference is found in our study (p-value 0.358). Hala Mostafa Gomaa *et al*. [12] also showed similar results in caesarean section (p- value 0.897)

The Time for two segment regression (minutes) was less prolonged from 158.3±81.24 min in patients receiving in hyperbaric bupivacaine with fentanyl to 164.1 ±78.15 minutes in patients of nalbuphine. This prolongation of two segment regression by nalbuphine as an adjuvant was supported by, Tiwari AK *et al*. [13] (p value <0.05), Culebras X *et al*. [8] and Ahmed F *et al.* [14]. While studies done by Abhishek Bhattacharjee 2015 have established upon the prolongation of two segment regression by fentanyl as adjuvant intrathecally (p-value <0.05). Our study demonstrated that addition of nalbuphine prolongs the time for two segment regression more when compared to Fentanyl.

In our study *Duration of analgesia* of intrathecal fentanyl was 359±264.2 minutes, while it increased to 388.9±166.4 when bupivacaine was used in combination with nalbuphine respectively. Our results coincide with Kang *et al*. [20] who combined it with heavy bupivacaine during cesarean section to provide adequate depth of anesthesia. The duration of complete analgesia was longer in (bupivacaine and fentanyl) group 146 ±47 min versus bupivacaine alone 104 ± 44 min. This comparison was also done by Biswas *et al*. [19] in cesarean section. Effective analgesic time was in fentanyl group 248±11.76 minutes contrary to bupivacaine heavy 0.5% (150 ± 10.48) and concluded the same results. No statistically significant difference was found between both group.

Our study demonstrated no clinically significant difference in the hemodynamic parameters and adverse effects among the 2 groups. In our study there was no significant difference in the incidence of hypotension, bradycardia, nausea, vomiting. Opioid related side effects were not encountered significantly in nalbuphine group due to its mu (μ) antagonist property. Respiratory depression was not observed in any of the patient among the 2 groups. While not a single patient of fentanyl &nalbuphine group reported with pruritis. Reduced incidence of opiod related side effects in nalbuphine group is supported by Culebras x *et al*. [8].

Degree of sedation produced in 2 groups was comparable. 48 out of 55 in fentanyl group , 51 out of 55 in nalbuphine group were fully awake and alert (grade 1) respectively. While 7 out of 55 in fentanyl group, 4 out of 55 in nalbuphine showed mild sedation of Grade 2. No statistically significant difference was found between these groups.

CONCLUSION

Nalbuphine (0.8mg) when used as an adjuvant to 0.5% hyperbaric bupivacaine resulted in prolonged post-operative analgesia along with longer duration of motor blockade and two segment regression as compared to fentanyl (25mcg) without significant adverse effects and hemodynamic alterations. But fentanyl produced faster onset of sensory and motor blockade.

Hence we conclude that intrathecalnalbuphine 0.8 mg is effective in enhancing postoperative analgesia as compare to intrathecal fentanyl.

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