A Comparative Study of Intrathecal Fentanyl and Sufentanil with Bupivacaine Heavy for Postoperative Analgesia

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Citation

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Abstract

Sixty ASA Grade – I/II patients, scheduled for elective vaginal hysterectomy, we have combined Inj. Fentanyl (25µg) and Inj. Sufentanil (5µg) with hyperbaric Bupivacaine (0.5% 2.75 ml) using the intrathecal route for post operative analgesia. 30 patients in Group F (Fentanyl 0.5 ml) and Group S (Sufentanil - 0.1 ml + NS – 0.4 ml) added to 2.75 ml hyperbaric Bupivacaine. Onset and duration of sensory and motor blockade, surgical condition and side effects were assessed. The duration of effective postoperative analgesia as assessed by Visual analogue scale (VAS) was significantly more prolonged in Group S (266.5 + 114.5 min) than Group F (145 + 84.08 min). Cardiovascular and respiratory stability was maintained with no significant incidence of side effects in either group. 6% patients in Group F developed hypotension and nausea-vomiting which was 3% in Group S. No incidence of bradycardia, tachycardia or drowsiness of either group. The addition of Fentanyl (25 µg) and Sufentanil (5µg) intrathecally provide improved postoperative analgesia and hemodynamic stability. Sufentanil prolongs the postoperative analgesia significantly as compare to Fentanyl, however Fentanyl is a cost effective alternative to Sufentanil.

INTRODUCTION

Adequate postoperative pain control is essential to prevent adverse consequences of surgical insult. Spinal anesthesia has the advantage of simplicity of technique, rapid onset of action and reliability in producing uniform sensory and motor blockade. Its main disadvantage relates to its limited duration of action and hence lack of long lasting postoperative analgesia. To overcome these problems, administration of local anesthetics in combination with opioids intrathecally[12] is an excellent technique for managing postoperative pain. Discovery of opioid receptors in spinal cord triggered the usage of intrathecal opioids[3].

Local anesthetics with opioids demonstrate significant synergy. They provide excellent analgesia with fewer drug requirements and decreased side effects. The use of intrathecal Fentanyl, a lipophilic opioid and recently Sufentanil, an even more lipophilic opioid improve intraoperative and postoperative analgesia with no adverse effects. The aim of this study was to compare the efficacy of intrathecal Fentanyl and Sufentanil with Bupivacaine for vaginal hysterectomy.

MATERIAL AND METHODS

The present study was conducted in Department of Anesthesiology, Guru Govind Singh Hospital, Jamnagar, Gujarat, India after obtaining institutional official committee clearance and written informed consent. Sixty ASA Grade – I/II females aged 20-60 years scheduled for elective vaginal hysterectomy were selected. Exclusion criteria taken were, known contraindication to regional anesthesia, known sensitivity to study drugs and patients taking drugs that modified pain perception.

All patients were examined and investigated a day before surgery. Visual Analogue Scale (VAS) of 0-10 was shown to the patients and the procedure of postoperative measurement was explain in detail, with 0 corresponding to no pain and 10 to the worst pain imaginable. All were kept fasting overnight and received Inj. Glycopyrrolate 4 µg/kg and Inj. Phenargan 0.5 mg/kg I.M. 45 minute before surgery. I.V. line was secured and all were preloaded with compound Ringer Lactate 10 ml/kg. These patients were randomly assigned using sealed envelop technique to two groups in double blind manner. Group F (n= 30) received 2.75 ml of heavy Bupivacaine with 25 µg (0.5 ml) Fentanyl and Group S (n= 30) received 2.75 ml of heavy Bupivacaine with 5 µg (0.1 ml) of Sufentanil made up to 3.25 ml with NS (0.4 ml). Subarachnoid block was performed at L3-L4 interspace with 25 G Quincke's Spinal needle with patients in lateral position under all strict aseptic and antiseptic precaution after identification of clear free flowing CSF; study solution

was injected. Patients were made supine and following were noted: Onset of spinal anesthesia (assessed by pinprick), Maximum level of sensory block (T6 dermatome level), Duration of sensory and motor blockade, Surgical time and Time for rescue analgesia.

Motor block was assessed using modified Bromage Scale[4]:

0 = No paralysis
1 = Inability to raise extended leg, 33% blockade
2 = Inability to flex knee, 66% blockade
3 = Inability to flex the ankle, (Complete motor block)

The patients were assessed for the degree of somnolence using the Campbell Score[5]:

1 = Wide awake
2 = Sedated, easily arousable
3 = Drowsy and difficult to arouse
4 = Unarousable

Temperature, Pulse, B.P., Respiratory Rate, Oxygen Saturation, E.C.G. were monitored every 15 min till completion of surgery then at 2 hours, 3 hours, 6 hours, 9 hours, 12 hours and 24 hours. Pain relieve in form of complete analgesia assessed using a standard 10 cm linear Visual Analogue Scale (0 – no pain, 10 – worst pain). Postoperative complete analgesia, define as the time from the intrathecal injection to the first perception of pain i.e. VAS >0 was recorded. Patients were also observed for side effects like nausea vomiting, pruritus, hemodynamic alterations, drowsiness, hypoxemia (SpO2 <90%) or respiratory depression (RR< 8/min). post operative rescue analgesia was provided by I.M. Diclofenac Sodium 1.5 mg/kg. Data was analyzed using statistical tests, chi-square test and student's t test. P <0.05 was considered statistically significant and p < 0.001 as highly significant.

RESULTS

All female patients have no significant difference in patients' age, weight, height and duration of surgery between two groups as shown in Table 1.

Figure 1

Table 1: Demographic Profile In Group F And Group S

	GROUP F	GROUP S
No. of patients	30	30
Age (Years)	40.35 ± 2.23	41.90 ± 2.55
Weight (Kgs)	48.83 ± 5.83	52.60 ± 6.70
Height (Cms)	156.18 ± 3.34	155.80 ± 3.89
Duration of surgery (Min.)	85.00 ± 26.23	90.25 ± 24.00
Demographic data values are Mean ± SD		

The differences on mean pulse rate, mean arterial pressure between the groups were statistically insignificant (p>0.05) intraoperatively. Postoperative increase in mean pulse rate in group F due to pain. None of the patients experienced respiratory depression, hypoxemia or sedation score >2.

All patients included in the study attained a T6 sensory level within 10 min. of intrathecal injection to allow surgery to proceed. The mean duration of pain free period was statistically highly significant (p < 0.001) in favor of Sufentanil group. Time to achieve peak sensory blockade, duration of sensory and motor blockade and duration of pain relief is shown in Table 2 in both the groups.

Figure 2

Table 2: Onset and duration of analgesia following intrathecal fentanyl vs. Sufentanil with bupivacaine

	Group F	Group S	Statistical significance
No. of Patients	30	30	
Time to achieve peak sensory blockade (min)	6.13 ± 3.31	4.93 ± 1.50	p = 0.075 Not significant
Duration of sensory blockade (min)	155.5 ± 26.24	168.00 ± 24.5	p = 0.06 Not significant
Duration of motor blockade (min)	131.17 ± 27.17	141.3 ± 15.8	p = 0.08 Not significant
Duration of pain relief (min)	145.00 ± 84.08	266.5 ± 114.5	p < 0.001 Highly significant

The patients were given injection Diclofenac sodium 1.5 mg/kg I.M. when patients complained of pain postoperatively. No patients in the two groups required additional analgesics intraoperatively. Side effects in form of nausea vomiting and hypotension seen in 6% patients in Group F compared to 3% patients in Group S as shown in Table 3. Hypotension is treated with Inj. Mephentermine 9 mg IV along with fluids.

Figure 3

Table 3: Side Effects Following Intrathecal Fentanyl Vs Sufentanil With Bupivacaine

	Group F No. of Patients	Group S No. of patients
Nausea / vomiting	2	1
Bradycardia	-	-
Hypotension	2	1
Drowsiness	-	-
Pruritus	-	-
Respiratory depression	-	-

DISCUSSION

We found that onset of sensory block was faster and time to achieve peak sensory level was lesser with Sufentanil as compared to Fentanyl but not significant. However there was highly significant difference ($p < 0.001$) in duration of analgesia where Sufentanil group it was 266.5 ± 114.5 and 145 ± 84.08 in Fentanyl group.

Intrathecally injected Fentanyl/Sufentanil travel cephalad within the CSF, enter the spinal cord, where they bind to specific opioid receptors (μ1 and μ2) within the dorsal horn and non-specific sites within the white matter and traverse the dura matter to enter the epidural space where they bind to epidural fat. This results in rapid onset, limited and brief spread. Sufentanil (Octanol/water partition coefficient 1778) is considered 10 times as potent as Fentanyl (octanol/water portion coefficient 8130 when systemically administered.

Systemic opioid potencies correlate directly with opioid lipophilicity neglecting the need to cross the blood brain barrier to gain access to the receptor site. But intrathecal drugs bypass the blood brain barrier and therefore their systemic potencies do not predict intrathecal potency, Sufentanil is nearly twice as potent as Fentanyl when administered intrathecally.

Dahlgren[6] compared the effects of intrathecal Fentanyl, Sufentanil and placebo when administered with hyperbaric Bupivacaine for caesarean delivery in 80 healthy patients. He concluded that addition of small doses of Fentanyl and Sufentanil to Bupivacaine intrathecally increased the duration of analgesia in the post operative period.

Roxane Fournier et al[7] compared post operative analgesic effects of intrathecal Fentanyl and Sufentanil added to normal saline 2 ml given postoperatively intrathecally after elective total hip replacement surgery under continuous spinal anesthesia in geriatric patients as soon as they had a pain score more than 3. They concluded that both the opioids provided satisfactory analgesia.

We came to the conclusion that intrathecal Sufentanil markedly prolongs the duration of postoperative analgesia as compared to Fentanyl. Both opioids are respiratory and cardiovascular stable at administered dose with minimal nausea-vomiting and hypotension.

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