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Comparison of Epidural Butorphanol and Fentanyl as Adjuvants in the Lower Abdominal Surgery

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Abstract: ***Background: Inrecent time it is very popular technique to use epidural opioids in management of acute post-operative pain. Aim: 1) To assess & compare the onset & duration of sensory block. 2) To assess & compare the onset & duration of motor block. 3) To assess & compare duration of post-operative analgesia. Material and methods: A Prospective Randomized control double blind study of 75 adult patients of either sex with ASA 1 & 2 aged 20 - 60 years under going lower abdominal surgery under epidural anesthesia were enrolled in this study. Result: Onset and completion of sensory analgesia was earliest in Bupivacaine-Fentanyl (BF) group followed by Bupivacaine-Butorphanol (BB) group and Bupivacaine (B) group, duration of analgesia were prolonged significantly in BB group followed by BF group as compared with B group . Conclusion: Addition of a single bolus dose of Butorphanol and Fentanyl along with Bupivacaine given at the start of epidural anesthesia provides good intraoperative and post-operative analgesia & Butorphanol is an attractive alternative as an adjuvant to bupivacaine as it has excellent sedation in postoperative period & longer duration of analgesia.***

Keywords: Epidural, Butorphanol, Fentanyl, Lower abdominal surgery

1. Introduction

The most common and anticipated problem during & following surgery is pain. Inadequate pain control, apart from being inhumane, may result in increased morbidity or mortality. Inadequate postoperative pain relief may increase the incidence of surgical wound infection, delayed recovery, increase health-care costs, decrease patient satisfaction, increase patient discomfort and the risk for pulmonary and cardiovascular complications.

These advances in the under-standing of pain have led to implementation of acute pain management programs with the objective of controlling postoperative pain.

Regional anesthesia is a safe, inexpensive technique with the advantage of prolonged post-operative pain relief. It has become a common practice to use a poly pharmacological approach for treatment of postoperative pain, because no drug has been identified that specifically inhibits nociception without associated side effects

Epidural anesthesia is the most commonly used technique for providing not only peri-operative surgical anesthesia but also post-op analgesia in lower abdominal and limb surgeries [1]. Early postoperative mobilization, minimally associated pain and discomfort are the most desirable feature in modern surgery [2-4].

Various adjuvants are used in regional anesthesia to enhance and prolong effect of local anesthesia. Narcotic analgesics are commonly used as adjuncts to local anesthetics (LA) in epidural anesthesia. Epidural opioids acting through the spinal cord receptors hasten the onset, improve the quality of the block, have a dose sparing effect on local anesthetics as well as prolong the duration of analgesia.

Butorphanol is a lipid-soluble narcotic with weak μ-receptor agonist and antagonist activity and strong k-receptor agonist [6]. It has strong analgesic and sedative properties without respiratory depression. Butorphanol has been frequently used for post-operative analgesia and labor analgesia [7, 8]. Fentanyl is a highly lipid-soluble, strong μ-receptor agonist and phenyl piperidine derivative with a rapid onset and short duration of action [9]. Previous studies have compared the two narcotics for post-operative epidural analgesia [10-12].

Our study compares the efficacy of epidural butorphanol versus efficacy of fentanyl as adjuvants to bupivacaine for intraoperative epidural anesthesia & postoperative analgesia in lower abdominal surgeries like open abdominal hysterectomy, vaginal hysterectomy & open appendicectomy done in gynecology & general surgery operation theatres at our institute.

2. Materials and Methodology

After Institute's ethical Committee approval, the study was conducted at BJMC & Civil Hospital, Ahmedabad. Written and informed consent from all the patients was obtained. It was a prospective study in which 75 patients who were posted for lower abdominal surgery were selected and randomly divided in to three groups. First group (B) received 0.5% 20ml Bupivacaine , second group (BB) received a combination of 0.5% 20ml Bupivacaine with 1mg Butorphanol & third group (BF) received 0.5% 20ml Bupivacaine with 100μg Fentanyl . Patients were familiarized with visual analog scale (VAS) scoring pre-operatively and taught to grade their pain on the scale.

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3. Observations & Results

It was a prospective study in which 75 patients who were posted for lower abdominal surgery were selected and randomly divided in to three groups.
Group B: BUPIVACAINE 0.5% 20cc.
Group BB: BUPIVACAINE 0.5% 20cc + BUTORPHANOL 1 mg.
Group BF: BUPIVACAINE 0.5% 20cc + FENTANYL 100 mcg.

Table 1: Demographic Data

Group	*B (n=25) Mean ± SD*	*BB (n=25) Mean ± SD*	*BF (n=25) Mean ± SD*
Sex (M:F)	07:18	07:18	05:20
Weight (kg)	70.60 ± 10.44	68.84 ± 9.54	70.12 ± 9.74
Height (cm)	161.84 ± 5.06	159.08 ± 6.83	161.24 ± 5.88
Type of surgery			
Gynecologic	15	18	17
General surgery	10	7	8

The observed difference in mean age, sex, weight, height & type of surgery between Groups are not significant (p value>0.05)

Table 2

Group	B	BB	BF	P value		
				B & BB	B & BF	BB & BF
Onset of Sensory Block (min)	14.08±2.78	11.80±2.46	10.80±1.25	0.0035	<0.001	0.0762
Duration of Sensory Block (min)	229.6 ± 9.15	347.8 ± 12.73	296.6 ± 14.40	<0.001	<0.001	<0.001
Onset of Motor Block (min)	30.0±0.82	29.58±1.02	31.45±0.91	>0.05	<0.001	<0.001
Duration of Motor Block (min)	221.6±18.8	222.8±15.49	222.2±11.05	0.8065	0.8912	0.8754
Duration of Analgesia (hrs)	4.74±1.47	7.64±1.41	5.96±1.30	<0.001	<0.001	<0.001
Duration of Surgery (min)	96.80±26.57	97.40±23.05	100.80±17.30	0.9324	0.5313	0.558

Table 3: Visual Analog Scales
This table shows comparison of three groups in regard to mean change in VAS score ± S.D at various time intervals.

TIME	GROUP	MEAN±SD	P Value		
			B & BB	B & BF	BB & BF
1hr	B	1.56 ± 2.10	< 0.001	< 0.05	< 0.05
	BB	0.08 ± 0.27			
	BF	0.36 ± 1.03			
2hr	B	2.16 ± 0.54	< 0.001	< 0.001	< 0.05
	BB	0.44 ± 0.49			
	BF	0.62 ± 0.87			
3hr	B	3.24 ± 0.42	< 0.05	< 0.05	<0.05
	BB	0.88 ± 0.32			
	BF	1.70 ± 1.65			
4hr	B	4.08 ± 0.56	< 0.05	< 0.05	< 0.05
	BB	1.76 ± 0.64			
	BF	2.55 ± 1.76			
5hr	B	5.16 ± 0.36	< 0.05	< 0.05	< 0.05
	BB	3.4 ± 0.48			
	BF	4.12 ± 0.43			
6hr	B	1.72 ± 0.44	< 0.05	< 0.05	> 0.05
	BB	4.12 ± 0.32			
	BF	5.12 ± 0.43			
9hr	B	2.08 ± 0.56	< 0.05	< 0.05	< 0.05
	BB	5.08 ± 0.62			
	BF	1.92 ± 0.27			
12hr	B	3.08 ± 0.62	<0.001	<0.001	<0.05
	BB	1.8 ± 0.74			
	BF	2.48 ± 0.49			
24hr	B	2.8 ± 0.48	<0.001	<0.001	<0.05
	BB	1.6 ± 0.51			
	BF	1.84 ±0.46			

Table 4: Complications

Complications	*B*	*BB*	*BF*
Nausea& Vomiting	0	2	3
Pruritis	0	1	4
Bradycardia	0	0	0
Hypotension	2	2	3
Respiratory Depression	0	0	0
Urinary Retention	0	0	0

4. Discussion

RA techniques like central and peripheral neuroaxial block can provide adequate anesthesia and decrease postoperative analgesic requirements for lower abdominal surgeries. Opioids when used as epidural adjuvants to LA improve the quality of the block and provide a dose-sparing effect [14, 15]. We chose to investigate fentanyl, a μ-receptor agonist and butorphanol, a strong k-receptor agonist and a partial μ-receptor agonist- antagonist administered in the epidural space along with Bupivacaine for intraoperative and post-operative analgesia.

In our study we compared the efficacy of butorphanol & fentanyl when administered as adjuvants to bupivacaine in epidural space for lower abdominal surgeries.

There was no statistical significant difference between the mean age, height & weight among the three groups. The addition of fentanyl or butorphanol to Bupivacaine(B) quickens the onset of sensory block. In B group the onset of sensory block was 14.08±2.78 min which is consistent with study done by Moore *et al*[11]. In group BB the onset of sensory block was 11.80±2.46 min consistent with studies done by Abboud*etal*[12]&Mok et al[13].Onset of sensory block was fastest in group BF as it was 10.80±1.25 min. Cousin & Mather *et al*[14] have reported time of onset of sensory block with 100µg fentanyl added as adjuvant to bupivacaine to be 4-10min. The mean time of onset had significant difference between the groups BB & BF & between groups B & BF but duration of motor block was comparable in all the three groups**.** The pain scores as assessed on the VAS were low and remained low for a significant time in the post-operative period with the addition of fentanyl or butorphanol to Bupivacaine [Table 3]. The duration of analgesia was also significantly prolonged with the addition of narcotics to LA.The pain scores as assessed on the VAS were low and remained low for a significant time in the post-operative period with the addition of fentanyl or butorphanol to Bupivacaine [Table 3]. We observed duration of analgesia with 20 ml 0.5% B alone to be 2-7 h (mean 4.74±1.47 hrs) &

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is consistent with other studies such as Modig and Paalzov[15] (range 2.7-5 h; mean 4.3) and Paech et al.[16] (mean 5.2 h). The duration of analgesia was prolonged with the addition of 100 µg fentanyl (3-9 h; mean 5.96±1.30 hrs) in our study, consistent with that given by Cousins and Mather[14] (5.7 h) and Paech et al.[16] (5.2 h).

The duration of analgesia was longest with B-butorphanol combination (5-10 h; mean 7.64±1.41 hrs). Various studies using epidural butorphanol for post-operative analgesia have reported the duration of analgesia to be 4-6 hrs, 5 hrs and 5.35 hrs with 0.5 mg, 1 mg, 2 mg and respectively.[12,15,16] Malik et al.[10] have also reported in their study that butorphanol provides a longer duration of analgesia than fentanyl, similar to our study.Narcotic analgesics are known to cause potential side effects such as pruritus, nausea, vomiting, urinary retention and respiratory depression.[17]The incidence of pruritus was higher in group BF (25%) as compared to group (BB). Previous studies have documented the incidence of pruritus with epidural fentanyl to be 23%, 41%.[10,18]. Pruritus has been observed in few patients receiving epidural butorphanol in previous studies, 1.4% and 3%.[10,20] Delayed respiratorydepression is the most troublesome side effect. This is thought to be due to transport of drug in cerebrospinal fluid from the lumbar region to the fourth ventricle, with consequent depression of medullary respiratory centers. The incidence of delayed respiratory depression appears to be greatest with poorly lipid-soluble narcotic drugs, like morphine.Bromage[1] suggested that lipid-soluble, highly protein bound narcotic analgesics might be less likely to exhibit this phenomenon and this appears to be true for both butorphanol and fentanyl. The patients were continuously observed for respiratory depression with SpO2 (< 90%) and RR (< 10). No case of respiratory depression was observed in any group, consistent with other studies.[10,18,19] Three cases in group BF and one in group BB had nausea. Two patients in group BF had vomiting and were administered injection ondansetron 4 mgintravenously slowly. These observations are comparable with those reported by Abboudet al.[12] and Naulty et al.[18] No patient had urinary retention in either of the groups, consistent with the study by Ackerman et al[21]. The side-effect observed in the majority of patients with butorphanol was somnolence as observed by other authors as well.[10,18,19] The sedation caused by epidural butorphanol is often desirable in the perioperative period.

5. Summary & Conclusion

It is a study conducted to look for efficacy of epidurally administered opioids such as butorphanol & fentanyl along with bupivacaine in lower abdominal surgeries. A randomize control study in 75 patients to assess the onset, duration of motor and sensory block, duration of analgesia, hemodynamic changes, visual analog score in postoperative period and complications in lower abdominal surgeries was carried out in our institute. After the institutional ethical committee approval and valid informed consent, 75 patients were randomly divided into three groups. First group (B) received combination of 0.5% 20ml Bupivacaine , second group (BB) received a combination of 0.5% 20ml Bupivacaine with 1mg Butorphanol & third group (BF) received 0.5% 20ml Bupivacaine with 100μg Fentanyl.

The following observations were made:

1) Addition of the opioids, i.e., butorphanol and fentanyl significantly quickens the onset of sensory block/ analgesia and provide more effective and longer duration of analgesia as compared with Bupivacaine alone.
2) There were significantly greater visual analog scores & sedation scores in group BB when compared to B & BF.

Thus we conclude that addition of a single bolus dose of butorphanol and fentanyl along with Bupivacaine given at the start of epidural anesthesia provides good intraoperative and post-operative analgesia & butorphanol is an attractive alternative as an adjuvant to bupivacaine as it has excellent sedation in postoperative period & longer duration of analgesia.

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