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Clinically evaluation of the efficacy of post-operative analgesia with epidural bupivacaine with butorphanol, bupivacaine with fentanyl and bupivacaine with nalbuphine

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Abstract

Background: Pain has already been accepted as the sixth vital sign. Hence, attenuation of pain and alleviation of human suffering is of paramount importance in respect to the service provided by anaesthesiologists, for whom the patients submit a virtual suicidal note in the form of expressed consent. Hence, the importance of the study is self-explanatory.
Objective: The purpose of this study was to clinically evaluate the efficacy of post-operative analgesia with epidural Bupivacaine with Butorphanol, Bupivacaine with Fentanyl and Bupivacaine with Nalbuphine.
Material & Method: 75 patients belonging to ASA I and II, undergoing lower abdominal surgeries were divided into three groups.
Group A: 0.125% bupivacaine + 2 mg butorphanol.
Group B: 0.125% bupivacaine + 100 mcg. Fentanyl.
Group C: 0.125% bupivacaine + 10 mg Nalbuphine Under all aseptic conditions patients were given epidural block with loss of resistance technique.
Results & Conclusion: Conclusions are drawn from the Study: Opioid analgesics with local anesthetics are extremely safe, effective and reliable method of postoperative pain relief. Fentanyl produces faster onset of analgesia with fewer adverse effects like sedation, pruritus, and nausea and vomiting than butorphanol and nalbuphine when given epidurally along with 0.125% bupivacaine. Butorphanol administered epidurally has advantage of longer duration of analgesia than fentanyl or epidural nalbuphine with side effects like nausea vomiting and sedation.

Keywords: Epidural, bupivacaine, butorphanol, fentannyl

Introduction

Pain is an unpleasant sensory, emotional & psychological response associated with potential tissue damage or described in such terms [1]. Acute post-operative pain is associated with lots of adverse events like [2] administration of analgesics through the epidural route is a more popular technique for postoperative pain management as it can be used alone or in combination with general anaesthesia. Epidural technique has been found to provide better

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pain relief than systemic opioids and also decreased incidence of postoperative complications. Epidural catheter placed in a location congruent to the incisional dermatome has been shown to be useful in providing superior analgesia.
Continuation of epidural analgesia with local anaesthetics for several days in the postoperative period helps not only in improving gastrointestinal motility through direct effect of the epidural blockade but also minimizes the need for opioids.

Aims and Objectives

The aim of the present study is to evaluate postoperative analgesic benefits in patients administered epidural butorphanol, nalbuphine and fentanyl as adjuvants with local anaesthetics postoperatively for surgery under epidural anaesthesia.

The study is undertaken in view of the following objectives:
1. To assess the efficacy of epidural butorphanol, nalbuphine, fentanyl for postoperative analgesia after lower abdominal surgeries.
2. To compare the observations of above 3 groups for postoperative analgesia after lower abdominal surgeries in terms of:

- The onset of analgesia.
- The duration of analgesic effect.
- Overall hemodynamic variations due to these agents in the postoperative period.
- Side effects attributable to these agents.

Material and Methods

After its approval of Ethical committee a total of 75 patients were selected for the study.
Type of study: It is a prospective randomized double blind study.

Patient profile

The study was confined to the hospital inpatients only who were scheduled for surgeries of lower abdomen. Seventy five patients of age ranging from 20- 60 years (25 in each group) of ASA I and ASA II group were selected on basis of inclusion and exclusion criteria outlined below.

Inclusion criteria

a) ASA I and II patients.
b) Surgeries of lower abdomen.
c) Patients were eligible for enrolment in the study if they were >18 yr old, within ±50% of their ideal body weight, had no clinically significant cardiovascular or central nervous system diseases.

Exclusion criteria

1) Pregnant patients.
2) Breast feeding patients.
3) ASA III and IV patients.
4) Local infection.
5) Known allergy to study drugs.
6) Coagulopathies.

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7) Vertebral anomalies.
8) Neurological diseases.
9) Spinal level blockade above T_6.
10) Renal insufficiency.
11) Peptic ulcer disease.
12) History of drug abuse.
13) Patients in whom epidural anaesthesia was not adequate and supplemented with other types of anaesthesia.

Patients were randomly divided into three groups of 25 each
Group A: Butorphanol group.
Group B: Fentanyl group.
Group C: Nalbuphine group.

Anaesthesia

Epidural technique was adopted for surgery of the lower abdomen for all patients with 0.5% bupivacaine. The patient was made to lie supine on the operation table. An intravenous line was secured with 18G canula and infusion of 5% Ringer Lactate was started. Routine monitors like ECG, NIBP, and pulse oximetry were connected for every case and basal vital signs were recorded before starting the epidural technique. Drugs and equipments necessary for resuscitation and general anaesthesia administration were kept ready.
An autoclaved epidural tray was used. The patient was placed in sitting or lateral position. Under aseptic precautions, a skin wheal was raised at L2- L3 or L3- L4 interspace with 2 ml of 2% lignocaine. The epidural space was identified using 18G disposable Tuohy needle with loss of resistance technique. Then 20G catheter was passed through the epidural needle till about 2-3 cms of the catheter was in the space. The needle was withdrawn keeping the inserted epidural catheter in situ and was fixed to the back using adhesive tape. 3ml of 2% lignocaine with adrenaline 1:2,00,000 was injected through the catheter as a test dose and observed for any untoward reactions including drug interactions as well as intravascular or intrathecal injection.
After confirming correct placement of the catheter, epidural anaesthesia was activated using 16 to 18 ml bolus dose of 0.5% bupivacaine. Subsequent top up doses were given depending on the duration of surgery and intensity of pain. No narcotics were administered throughout the intraoperative period.
Fluid management: The patients were infused and maintained with crystalloids and colloids. Blood was transfused only when indicated.

Observation

A clinical study including 75 patients of either sex belonging to 20-60yrs of age with ASA grade I & II, who underwent lower abdominal surgeries, were evaluated. The patients were randomly allocated to 3 equal groups of 25 each.
Gr.-I: 0.125% Bupivacaine + Inj. Butorphanol 2mg
Gr-II: 0.125% Bupivacaine + Inj. Fentanyl 100µgs.
Gr-III: 0.125% Bupivacaine + Inj. Nalbuphine 10mg.

The volume was ma de up to 10 ml in each group.
The demo graphic profile, onset of analgesia, changes in pulse rate, Mean Arterial Pressure (MAP), Respiratory rate (R.R), postoperative pain score and side effects were noted in each group.

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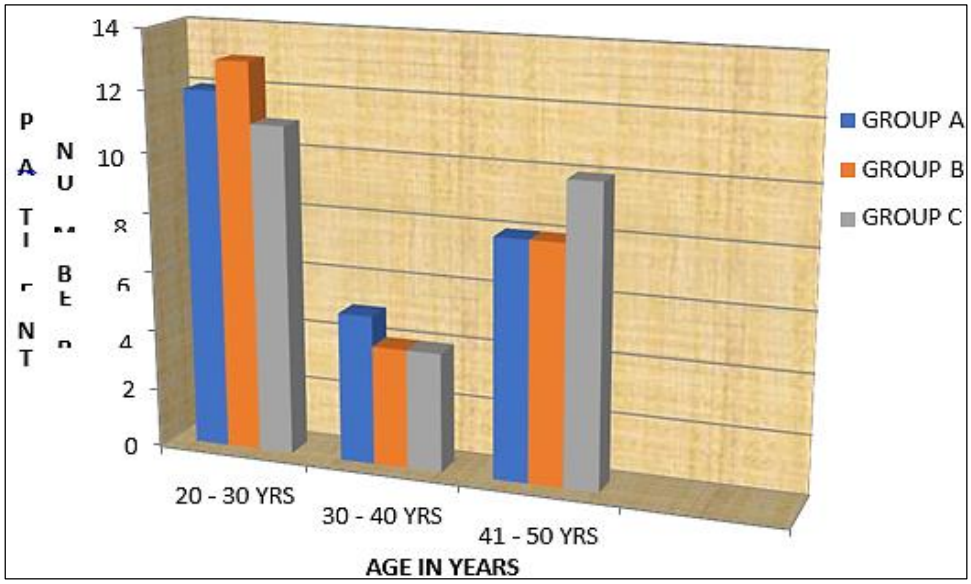
Table I: Age Distribution

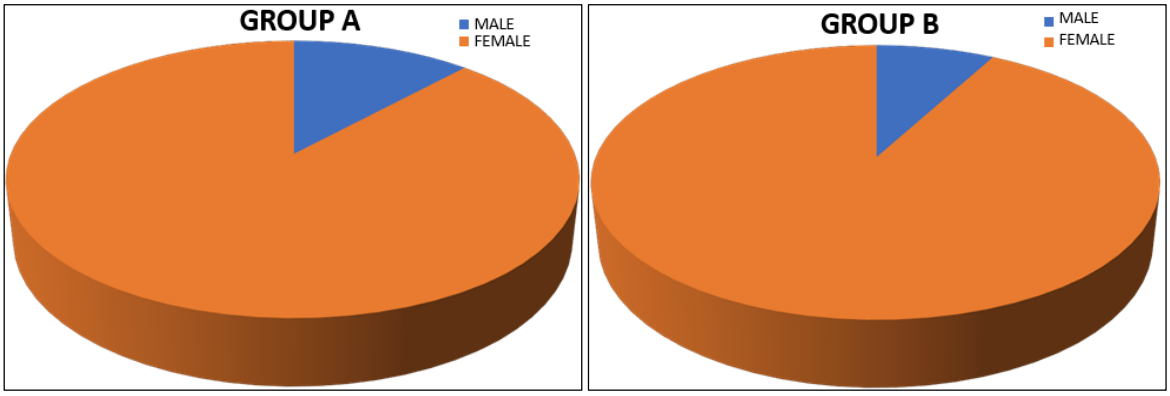
Age in years	Gr. -A	Gr. -B	Gr. -C
20-30	12	13	11
31-40	5	4	4
41-50	8	8	10
Mean ± S.D	34. 4±11.9	33. 8 ± 10.53	34. 67 ± 10.80
Range	20-50	20-50	21-48



The Table-I shows age distribution in different groups of patients. In terms of age all the groups were comparable (F = 0. 032 P=. 992 Not significant)

Table II: Sex Distribution

Sex	Gr. -A	Gr. -B	Gr. -C
Male	3	2	2
Female	22	23	23



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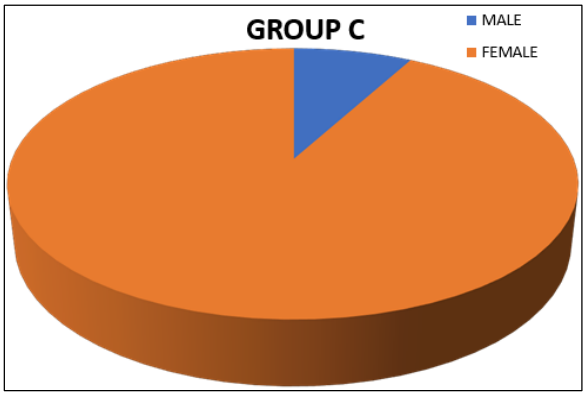
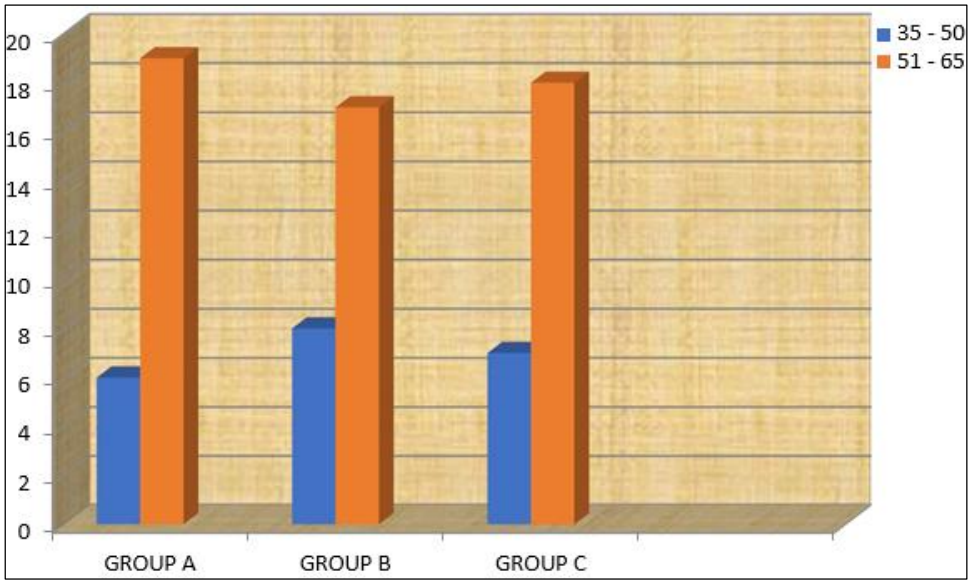


The study was carried out in both male and female patients as enumerated in table II. The male and female ratio was comparable in all the groups using the Chi-Square test. (P= 0. 947, Not Significant)

Table III: Distribution of Weight

Weight in Kg.	Gr.- A	Gr.- B	Gr.- C
31-50	6	8	7
51-65	19	17	18
Mean ± S.D	54. 47±5.491	54. 30±6.35	53. 92±5.25
Range	44-63	40-62	44-60



The Table-III shows weight distribution in various groups. The patients were between 35-65 kilograms. The mea n age in each group was comparable. (P= 0.982, N.S)

Table IV: Onset of Analgesia (Mins)

Time in Min	Gr.-A	Gr.-B	Gr.-C
Mean ± S.D	11. 24±2.989	6.320±3.555	14. 64±2.234
Range	7-18	5-9	10-19

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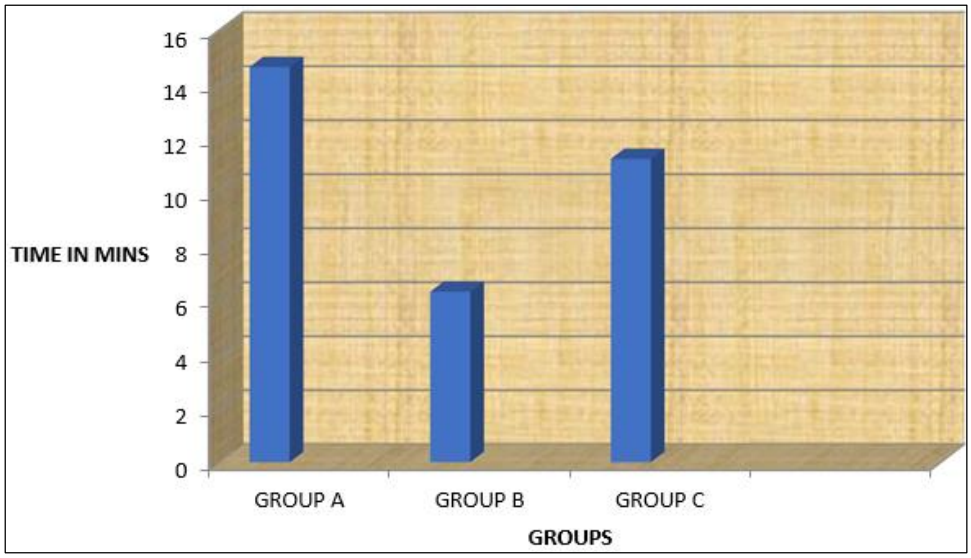

Table-IV shows the time for onset of analgesia. The statistical analysis using A NOVA and Post Hoc test revealed that there was significant difference between Group-A and Group-B, between Group-B and Group-C and also Group-A & Group-C in terms of onset of analgesia.

Table V: Comparison of Significance between Groups

Group	Comparison with	P-Value
Gr. -A	Gr.- B	0.0025
Gr. -B	Gr.- C	0.0004
Gr. -C	Gr.- A	0.0011

Thus the onset of sensory block was significantly earlier in Group-B as compared to Group-A and Group-C.

Table VI: Maximum Height of Block

Height	Gr.- A	Gr.- B	Gr.- C
T7-T8	5 (20.3%)	7 (32%)	8 (28%)
T9-T10	16 (64.7%)	16 (60%)	16 (64%)
T11-T 12	4 (16%)	2 (8%)	2(8%)

The Table-VI shows the maximum height of block attained in the groups. The heights of block in three groups are comparable as shown by applying Chi-Square test. (P = 0. 7013 N.S)

Table VII: Duration of Analgesia

Time in Mins	Gr.- A	Gr.- B	Gr.- C
Mean ± S.D	481. 68±73. 80	178. 60±21. 217	294. 68±22. 137
Range	292-558	120-210	240-350

The mean duration of Analgesia was significantly different in all the three groups. The duration was maximum in Group-A ANOVA and Post-hoc analysis revealed that $p< 0.001$ in comparison between any two groups.

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Table VIII: Change in Pulse Rate

Time	Gr. -A	Gr. -B	Gr. -C	P-value
Pre. Op.	82.32 ± 10.83	84.76 ± 11.16	82.8 ± 11.47	0.742
30 min	84.92± 9.836	82.64 ± 10.263	81.68 ± 9.538	0.496
60 min	84.52 ± 8.078	81.28 ± 9.830	93.20 ± 7.377	0.040
2 hours	86.96 ± 7.396	93.96 ± 9.730	81.84 ± 7.838	0.268
4 hours	80.72 ± 6.643	90.73 ± 11.667	87.77 ± 9.272	0.391
8 hours	87.60 ± 6.165	81.72 ± 9.689	81.52 ± 8.564	0.213
12 hours	82.47 ± 9.332	84.07 ± 9.351	78.20 ± 7.676	0.164
16 hours	88.44 ± 6.35	90.24 ± 9.36	90.4 ± 9.47	0.116
20 hours	82.44 ± 10.28	81.72 ± 10.95	84.64 ± 11.20	0.140
24 hours	82.30 ± 10.32	81.70 ± 10.93	82.60 ± 11.426	0.132

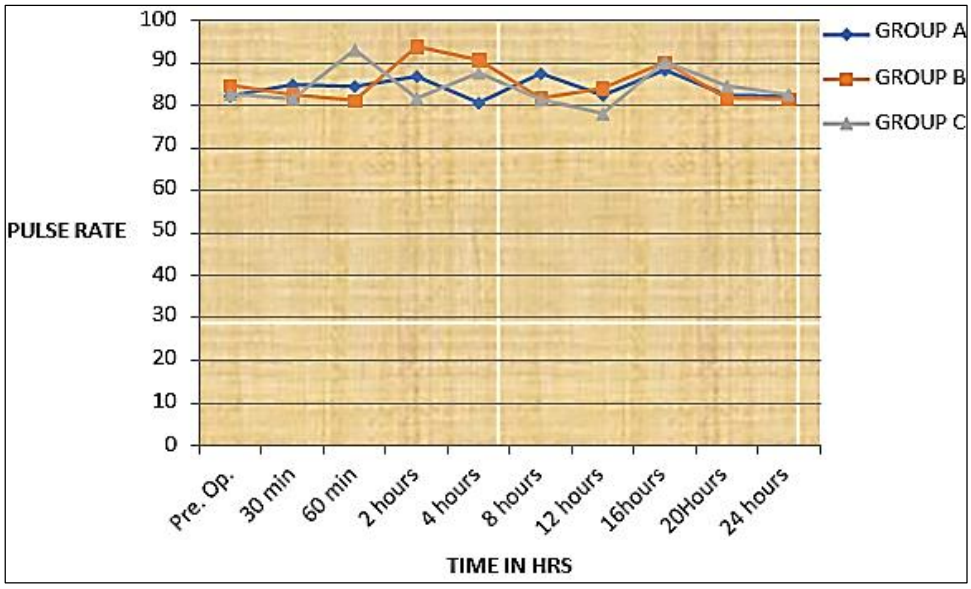

Table-X depicts the mean pulse rate trend in the groups. The pulse rate increased at 6-8 hours in group A, 2-4 hours in group B and group C. This coincided with the onset of pain in each of the groups.

Table IX: Change in Mean Arterial Pressure (MAP)

Time	Gr. -A	Gr. -B	Gr. -C	P-value
Pre. Op.	94.56 ± 5.888	94.60 ± 8.016	93.64 ± 8.465	0.087
30 mins	94.04 ± 5.948	94.16 ± 7.962	93.08 ± 8.381	0.085
60 mins	92.64 ± 8.072	93.24 ± 7.960	93.56 ± 8.196	0.817
2 hours	91.20 ± 5.612	92.72 ± 6.871	92.96 ± 8.147	0.104
4 hours	91.88 ± 5.612	93.80 ± 7.638	91.48 ± 9.028	0.792
8 hours	93.00 ± 7.179	93.87 ± 6.750	93.57 ± 4.662	0.067
12 Hours	91.23 ± 7.592	92.93 ± 6.757	93.57 ± 4.392	0.577
16 Hours	90.76 ± 7.983	92.93 ± 6.633	92.80 ± 4.515	0.0749
20 Hours	94.88 ± 7.30	94.53 ± 6.857	89.87 ± 4.416	0.070
24 Hours	93.86 ± 7.20	94.82 ± 7.70	94.86 ± 9.14	0.877

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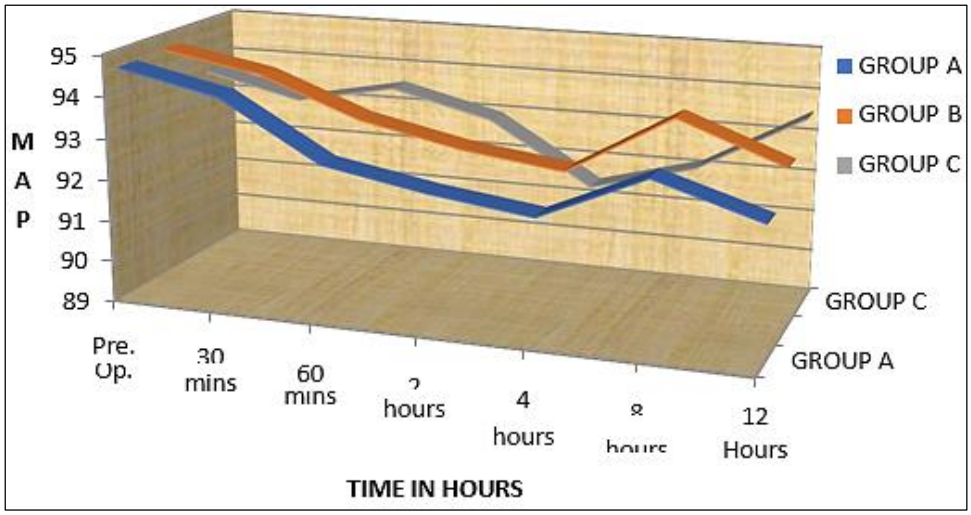
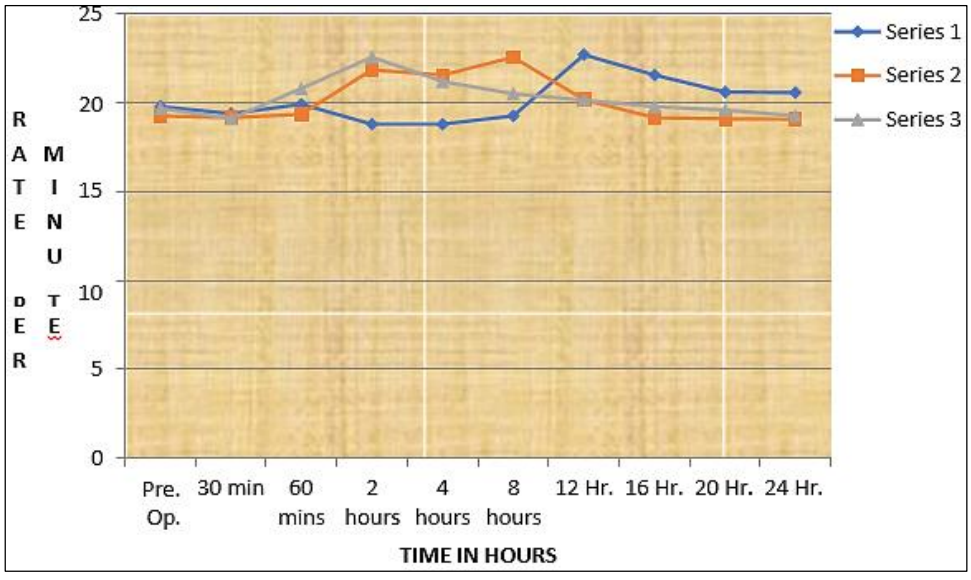


The Table-IX depicts the MAP trend in the three groups. I n terms of incidence of hypotension, all the three groups were comparable and there was no significant difference among the three groups.

Table X: Change in Respirator Y rate

Time	Gr. -A	Gr. - B	Gr. -C	P value
Pre. Op.	19.80 ± 1.29	19.27 ± 1.70	19.70 ± 2.00	0.387
30 min	19.43 ± 2.54	19.20 ± 2.73	19.13 ± 2.37	0.833
60 mins	19.93 ± 1.59	19.4 ± 2.73	20.83 ± 2.42	0.660
2 hours	18.82 ± 2.42	21.87 ± 2.52	22.60 ± 2.61	0.483
4 hours	18.83 ± 2.32	21.60 ± 2.34	21.24 ± 2.42	0.674
8 hours	19 27 ± 1.73	22.6 ± 2.20	20.53 ± 2.45	0.266
12 Hr.	22.73 ± 2.2	20.20 ± 1.79	20.17 ± 4.21	0.000
16 Hr.	21.60 ± 2.10	19.20 ± 2.02	20.8 ± 2.20	0.0092
20 Hr.	20.63 ± 2.5	19.13 ± 2.12	19.60 ± 2.60	0.0858
24 Hr.	20.6 ± 2. 5	19.1 ± 2.1	19.3 ± 3.10	0.0931



The Table-X shows that the Respiratory rate in the three groups from pre-operative period to immediate post-operative period is comparable. There was a n increase in rat after 8 hours in Group A, 2-4 hours in group B, 4-6 hours in Group C. This coincided with the onset of pain

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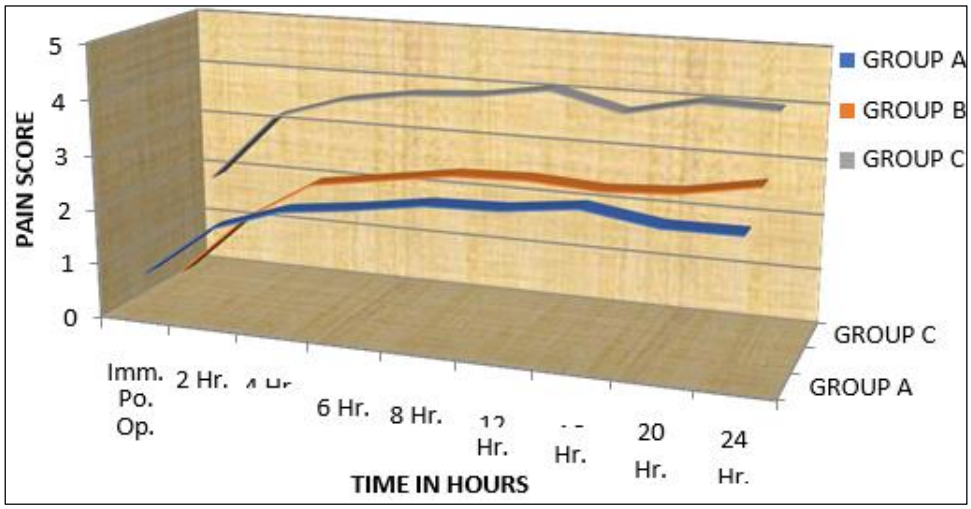
in the respective groups. The rate normalized over time in all the three groups.

Table XI: Mean Pain Score

Time	Gr. -A	Gr. -B	Gr. -C	P-value
Imm. Po. Op.	0.76 ± 0.779	0.40 ± 0.500	1.92 ± 0.702	0.000
2 Hr.	1.72 ± 0.357	1.56 ± 0.65	3.200 ± 0. 57	0.003
4 Hr.	2.16 ± 0.943	2.32 ± 0.557	3.60 ± 0.707	0.000
6 Hr.	2.32 ± 0.748	2.52 ± 0.586	3.80 ± 0.635	0.000
8 Hr.	2.52 ± 0.770	2.72 ± 0.678	3.88 ± 0.600	0.003
12 Hr.	2.56 ± 0.712	2.76 ± 0.779	4.08 ± 0.640	0.004
16 Hr.	2.72 ± 0.792	2.68 ± 0.802	3.76 ± 0.663	0.000
20 Hr.	2.52 ±0. 714	2.76 ± 0. 597	4.04 ± 0.611	0.005
24 Hr.	2.53 ± 0.653	3.00 ±0.707	4.00 ± 0.577	0.000



The table-XI shows mean pain scores post-operatively. The observations were conducted every 2 hourly up to 8 hours; thereafter, every 4 hourly up to 24 hours, so as to exclude any delayed unto ward consequences of the drugs. The score shows gradual progressive trend over first 8hrs, 2-4hrs and 2hrs in Group A, Group-B and Group-C respectively. The pain scores were not recorded after supplemental analgesics.

Table XII: Analgesic Supplementation in 24 hour duration

1st top up dose

Group	0-2hr	2-4hr	4-6hr	6-8hr	810hr	1012hr	12-24hr
A	-	-	-	8	16		-
B	-	17	8	-	-	-	-
C	-	22	3	-	-	-	-

All the patients in Group-B and Group-C required analgesic supplementation within first 2-4 hours and 4-6 hours respectively. Whereas, 8 patients of Group-A required supplementation within 6-8 hours, 16 patients between 8-10 hours.

2nd top up dose

Group	0-2hr	2-4hr	4-6hr	6-8hr	8-10hr	10-12hr	12-24hr
A	-	-	-	-	-	7	18
B	-	-	-	14	11	-	-
C	-	-	-	20	5	-	-

All the patients in Group-B and Group-C required analgesic supplementation as 2nd top up dose within first 8-10 hours. Whereas, 7 patients of Group-A required supplementation within 10-12 hours.

3rd top up dose

Group	0-2hr	2-4hr	4-6hr	6-8hr	8-10hr	10-12hr	12-24hr
A	-	-	-	-	-	-	-
B	-	-	-	-	-	12	13
C	-	-	-	-	-	19	6

All the patients in Group-B and Group-C required analgesic supplementation as 3rd top up dos e within first 12-24 hours. None of the patients required a 3rd top up dose in Group A.

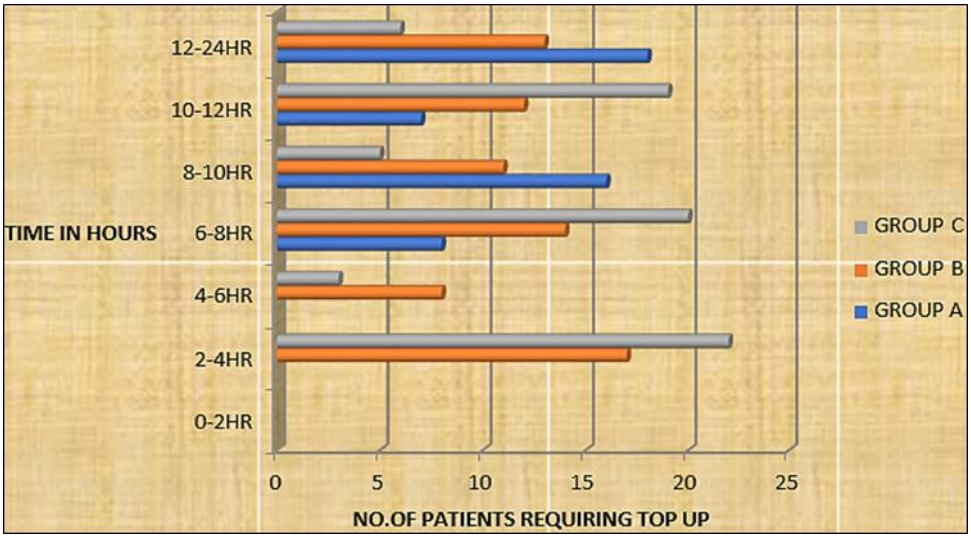


Table XII: Complications

Complication	Group-A	Group-B	Group-C	P-Value
Nausea & Vomiting	3 (12%)	4 (16%)	12 (48%)	0.484
Urinary Retention	4 (16%)	1 (3.3%)	0 (0.0%)	0.6
Respiratory Depression	0 (0.0%)	0 (0.0%)	0 (0.0%)	-
Sedation	8 (32%)	7 (20%)	2 (8%)	0.001
Pruritus	1	0	1	-

Table-XIII depicts the complications which occurred in the groups as enumerated below:

Nausea and vomiting

Group A and Group C X2 = 5. 094; P = 0. 024 (Significant).
Group B and Group C X2 = 9.41; P = 0.004 (Significant).
Nausea and vomiting was significantly more in nalbuphine group (48%).

Pruritus, respiratory depression, urinary retention

There no significant difference among the groups in terms of incidence of urinary retention, respiratory depress ion and pruritus as depicted by the P value.

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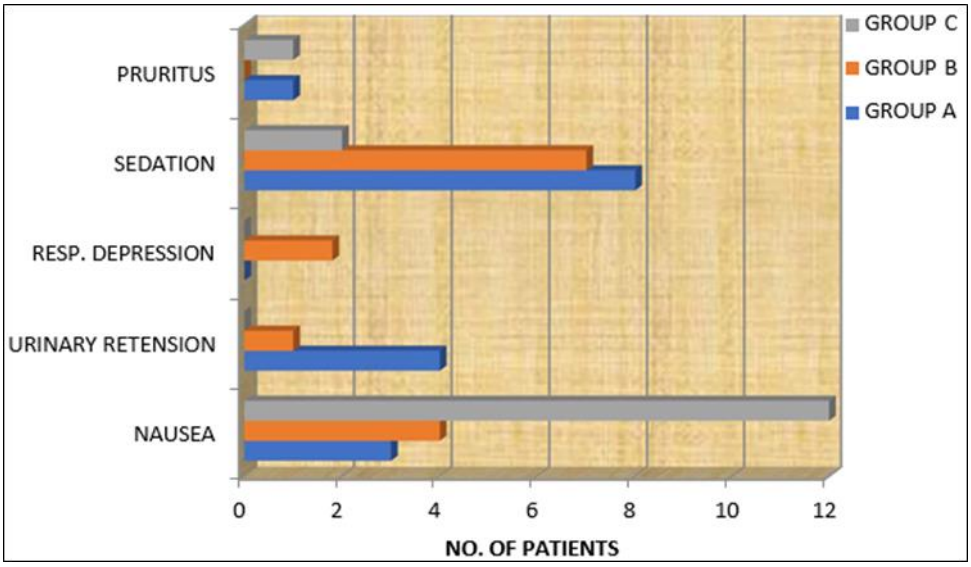
Sedation

There is significant difference among the groups in the incidence of sedation.
Group A and Group B X2 = 3.84; P = 0. 05 (No t-Significant).
Group B and Group C X2 = 4. 50; P = 0.001 (Significant).
Group B and Group C X2 = 3.38; P = 0. 85 (Not-Significant).



Discussion

Postoperative pain is an acute pain, which starts with the surgical trauma and usually ends with tissue healing. It diminishes with time after surgery and responds to analgesics. The effective relief of pain to the patients undergoing surgery is essential and is of paramount importance both on humanitarian grounds and also in reducing postoperative morbidity, hence should be duly imparted by the treating anaesthesiologist.
Severe pain can result in splinting, with resultant atelectasis and hypoxia. In addition, poor control of pain may result in increased catecholamine secretion in response to pain, which may in turn increase myocardial oxygen demand. A number of studies in the past have proved that improved postoperative analgesia may reduce the incidence of cardiac and pulmonary morbidity and mortality in patients undergoing major abdominal surgery.
Since the discovery of opioid receptors in the spinal cord, the action of narcotics through opioid receptors has become more clearly understood. One of the opioid receptors, kappa are mainly involved with the mediation of visceral pain. After this, achieving satisfactory postoperative analgesia with epidural and intrathecal administration of narcotics has been the subject of much research. The use of epidural opioids had become an increasingly popular technique for management of acute postoperative pain in recent times. However, there are disadvantages associated with narcotics as they are not always simple to use and may be associated with some unpleasant adverse effects, like nausea and vomiting (PONV), pruritis, respiratory depression and urinary retention.
Stimulation of spinal opiate receptors (kappa, κ) can also produce spinal analgesia but with fewer side effects. Therefore, a drug such as butorphanol, a mixed narcotic agonist/antagonist, acts as a mu (μ) agonist/antagonist and kappa agonist, also produces analgesia, associated with fewer side effects and also low abuse potential. Its high lipid solubility and high affinity for opioid receptors are additional factors that contribute to paucity of side effects with its use.
Fentanyl was chosen for the study for advantages like no neurolytic preservatives, highly

lipophilic, so better retained within the epidural space, short half-life, so less circulating blood levels resulting from absorption and finally because it is stable in salt solutions for more than 72 hours.
Nalbuphine is an agonist-antagonist, equipotent to morphine also has a low abuse potential. It is known to produce profound analgesia and is known to be associated with side effects like sedation. It commonly finds its place in clinical practice as it has a ceiling effect on respiratory depression.
The present study is a prospective randomized controlled clinical comparative study done to assess the efficacy and safety of epidural butorphanol, epidural fentanyl and epidural nalbuphine, each combined with 0.125% bupivacaine for the management of postoperative pain. A total of 75 patients belonging to age groups 18-60 years have been taken, out of which majority of patients belonged to 20-50 years of age. Patients undergoing elective lower abdominal surgeries in general surgery, gynaecology, urology and plastic surgery were selected.
The observations of the study were analysed and are discussed below.

Demographic data

All the three groups were comparable in terms of age, sex and weight.
Study done by Pokharel K *et al*. who studied the efficacy and safety of low dose epidural butorphanol on postoperative analgesia following cesarean delivery had compared 35 patients in each group with mean age limit mean height, and mean weight comparable in all the three groups. It correlates with the present study which also observes no difference between the groups in terms of age, sex weight and the height of block.

Onset of analgesia

The mean time of onset of analgesia was 11.24 mins, 6.32 mins, and 14.64 mins in group A, B and C respectively. Statistical analysis showed that onset of analgesia was faster in fentanyl group compared to other two groups.

This can be correlated with the studies conducted by:

- Mok MS, Tsai YJ., in 1986 [3], who did a study to evaluate the analgesic efficacy and safety of epidural butorphanol(4mg) in comparison to that of epidural morphine 5mg in patients with postoperative pain. In their study, it was observed that the onset of pain relief with epidural butorphanol appeared at 15 minutes and peaked at 30 minutes.
- Maurice Lippmann in 1988 [4] has reported in his study that epidural butorphanol 4mg used for postoperative analgesia in non-obstetric abdominal surgeries has produced analgesia within 15 minutes.
- Rajni kapoor, Rajni gupta, Virendra Bahadur Singh, Anita malik, Sobhnna Jafa, Jyostna Aggarwal [6] conducted a study to compare the safety and efficacy of postoperative analgesia with epidural butorphanol and fentanyl for caesarean section delivery and concluded that Fentanyl produced faster onset and more intense sensory blockade thus lesser incidence of supplemental analgesia requirement. Their results also correlate with the above studies.

Duration of analgesia

The mean duration of analgesia was 481.68 minutes in group A, 294.68 minutes in group B and 178.60 minutes in group C. The duration was thus significantly longer in butorphanol group.

- The above observation correlates with the works of Mok MS, Tsai YJ., in 1986 [3] who evaluated the analgesic efficacy and safety of epidural butorphanol 4mg in comparison to epidural morphine 5mg and concluded that duration of analgesia with butorphanol 4mg averaged 5.4 hrs.
- Maurice Lippmann in 1988 [4] reported in his study conducted for pain relief in non-obstetric patients after abdominal surgery using epidural butorphanol 4mg that duration of analgesia with epidural butorphanol 4mg was 5.6 hrs.
- Quisqueya T, Palacios, Monica M Jones, Joy L, Hawkins, Jayshree N., Adenwala, Stephen Longmire, Kenneth R Hess, Barbara S. Sknjonsby., in 1991 compared epidural butorphanol (1,2 and 4mg) and morphine 5mg for post caesarean section analgesia and concluded that epidural butorphanol 4mg produced duration of analgesia for 8hrs.
- Rajni kapoor, Rajni gupta, Virendra Bahadur Singh, Anita Malik, Sobhnna jafa, Jyostna aggarwal [6] who conducted a study to assess and compare the safety and efficacy of postoperative analgesia with epidural butorphanol and fentanyl for caesarean section delivery and concluded that epidural Butorphanol is also associated with greater duration of analgesia than epidural Fentanyl.
- Camann WR, Hurley RH, Gilbertson LI, Long ML, Datta S [3] studied the analgesic profile of epidural nalbuphine for postoperative pain relief and the impact of local anaesthetic choice upon this profile in 58 patients undergoing elective Caesarean delivery under epidural anaesthesia and concluded that epidural nalbuphine provides analgesia for only two to four hours following Caesarean delivery.

Changes in pulse rate and mean arterial pressure

In all the three groups there was no change observed in pulse rate and mean arterial pressure. This finding correlates with the following studies:

- Catherine O Hunt J Stephen Naulty, Andrew M Malinow, Sanjay datta, Gerard W Ostheimer, in 1989 used increasing dose of epidural butorphanol (1,2,3 mg) along with LA (0.25% bupivacaine) in 42 term multiparous for labour analgesia and noted no hypotension in any of the patients.
- Baxter AD, Langaniere S, Samson B, McGilveray IJ, Hull K. in 1991(10) compared the analgesic efficacy and side-effects of epidural nalbuphine with epidural morphine and found haemodynamics to be stable in all the patients receiving nalbuphine epidurally
- Kim DH, Kim TJ, Park NH in 2002(8) studied the infusion dosage and the side effects of epidural butorphanol and compared with those of epidural fentanyl and found stable heart rate and blood pressure in both the groups.

Change in respiratory rate

The mean respiratory rate increased 6-8 hours onwards postoperatively in group I, 4 hours onwards in group B and immediately postoperatively in group C.
This hyperventilation was probably due to onset of pain after analgesic effect of respective drugs curtailed off over time. The rate came down after administration of rescue analgesic, further confirming the assumption.

Comparison of mean pain score

- The mean pain score recorded was significantly lower in group A and group B than in group C. All the patients in Group-B and Group-C required analgesics upple mentation within first 2-4 hours and 4-6 hours respectively. Whereas, 8 patients of Group-A required supple mentation within 6-8 hours, 16 patients between 8-10 hours and rest 2

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between 10-12 hours. These observations correlate with the following studies:

- Quisqueya T Quisqueya T, Palacios, Monica M Jones, Joy L, Hawkins, Jayshree N., Adenwala, Stephen Longmire, Kenneth R Hess, Barbara S. Sknjonsby., in 1991(36) compared epidural butorphanol-1,2 and 4mg with morphine 5mg. He concluded that each dose of butorphanol produced greater pain relief than morphine at 15, 30, 45 and 60 minutes ($p < 0.05$).
- Hwang KB, Chung CJ, Lee e., in 2004 [7] compared analgesic efficacy of Epidural butorphanol and epidural fentanyl and concluded that there was no significant difference in the quality of analgesia between the two groups.
- Rajni Kapoor, Rajni Gupta, Virendra Bahadur Singh, Anita Malik, Sobhnna Jafa, Jyostna Aggarwal [6] conducted a study to assess and compare the safety and efficacy of postoperative analgesia and concluded that Fentanyl produced faster onset and more intense sensory blockade thus lesser incidence of supplemental analgesia requirement.
- Etches RC, Sandler AN, Lawson SL in 2007 [9] studied the comparison of the analgesic and respiratory effects of epidural nalbuphine or morphine in post thoracotomy patients. They concluded that lumbar epidural nalbuphine does not provide adequate analgesia after thoracotomy.

Complications

In this study, 12% patients in group A, 16 % patients in group B and 48 % patients in group C had nausea and vomiting. The high female proportion in the study group and the fact that pain and opioids themselves are emetogenic may be the underlying reasons.
No patients on epidural butorphanol had nausea or vomiting in study reported by Catheline O Hunt *et al*. in 1989 [5].

Sedation

This was the main side effect in butorphanol group which constituted 32% and 20% of the patients in fentanyl group had sedation. Majority of the patients had mild sedation, patient awake but drowsy. This was statistically significant ($p < 0.001$) as compared to nalbuphine group.

- Catherine O Hunt *et al*. in their study, in 1989 [5] have reported a higher incidence of sedation with epidural butorphanol and is a dose dependent side effect.
- Patients on epidural butorphanol 2mg had clinically significant sedation in a study by Therese K Abboud, M Moore, J Zhu, K Murakawa, M Minehart, M Longhitano, J Terrasi, ID Klepper as repoted in their study of epidural butorphanol and morphine for the relief of postcesarean section pain Ventilatory responses to carbon dioxide in 1987.

Respiratory depression

In the current study, none of patients in any group had respiratory depression. This finding is in parallel with the following study:

- No patients had respiratory depression with butorphanol in studies conducted by Maurice Lippmann *et al*., in 1988 and by Catherine O Hunt *et al*. in 1989.

Pruritus

In the current study, one patient in nalbuphine group and in butorphanol group had pruritus. Pruritus was elicitable only on direct questioning. Pruritus induced by epidural opioids is likely due to interaction with trigeminal nucleus in medulla. The observations of the current

study correlate with:

- Catherine O Hunt J Stephen Naulty, Andrew M Malinow, Sanjay datta, Gerard W Ostheimer, in 1989 who did not record priritus as a side effect in any of the patients receiving butorphanol in their study.
- Palocios Monica M Jones, Joy L Hawkins, Jayshree N Adenwala, Stephen Longmire, Kenneth R Hess, Barbara S Sknjonsby in 1991, who found a greater percentage of patients complaining of pruritus in patients receiving epidural morphine as compared to patients receiving epidural butorphanol.

Summary and Conclusion

The purpose of this study was to clinically evaluate the efficacy of post-operative analgesia with epidural Bupivacaine with Butorphanol, Bupivacaine with Fentanyl and Bupivacaine with Nalbuphine. 75 patients belonging to ASA I and II, undergoing lower abdominal surgeries were divided into three groups.
Group A: 0.125% bupivacaine + 2 mg butorphanol.
Group B: 0.125% bupivacaine + 100 mcg. Fentanyl.
Group C: 0.125% bupivacaine + 10 mg Nalbuphine.

Under all aseptic conditions patients were given epidural block with loss of resistance technique. The following parameters were compared between groups

- Onset of analgesia
- Maximum height of block
- Degree of sensory block
- Duration of analgesia
- Postoperative pulse rate and mean arterial pressure
- Postoperative respiratory rate
- Complications in the postoperative period.

The following conclusions are drawn from the study:

1. Opioid analgesics with local anesthetics are extremely safe, effective and reliable method of postoperative pain relief.
2. Fentanyl produces faster onset of analgesia with fewer adverse effects like sedation, pruritus, and nausea and vomiting than butorphanol and nalbuphine when given epidurally along with 0.125 % bupivacaine.
3. Butorphanol administered epidurally has advantage of longer duration of analgesia than fentanyl or epidural nalbuphine with side effects like nausea vomiting and sedation.
4. Although none of the patients in the present study developed respiratory depression, it is strongly recommended in concurrence with other authors that monitoring for clinical respiratory depression be made in all patients during the period of analgesia.

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