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**ORIGINAL RESEARCH ARTICLE**

# A COMPARATIVE STUDY OF EPIDURAL BUTORPHANOL AND EPIDURAL FENTANYL FOR THE RELIEF OF POST-OPERATIVE PAIN IN LOWER ABDOMINAL SURGERIES

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## ABSTRACT

### INTRODUCTION

Postoperative pain is acute with complex physiological responses to tissue injury. Epidural technique using opioids has been found to provide better pain relief than systemic opioids and also decreased incidence of postoperative complications.

### AIMS AND OBJECTIVES

The aim of this study was to compare the onset, duration, quality of analgesia, cardio-respiratory effects and side effects of epidural butorphanol with epidural fentanyl for the relief of postoperative pain.

### METHODOLOGY

60 patients of either sex, age group of 18- 60 years, belonging to ASA grade I and II, posted for elective lower abdominal surgeries were selected. They were randomly divided into 2 groups of 30 each. All surgeries were done under lumbar epidural anaesthesia. Postoperatively, when patient complained of pain, intensity of pain was assessed using Linear Visual analog scale (VAS) and when VAS score was >5, patients received either epidural butorphanol 2mg or epidural fentanyl 100µg diluted to 10ml with normal saline. Onset of analgesia, which is the time interval from administration of study drug till VAS score came down to < 5 was noted in both groups. Duration of analgesia, which is the time interval between start of analgesia (VAS score < 5) till patient complaints of pain (VAS score >5) was noted in both groups. Quality of analgesia was assessed using pain score in both the groups. Cardio-respiratory effects, heart rate, blood pressure and respiratory rate were monitored at regular intervals and were compared between the 2 groups. Side effects like sedation, pruritus, nausea, vomiting, hypotension and respiratory depression were noted.

### RESULTS

Demographic profile (age, sex) was comparable in both groups. The onset of analgesia was clinically and statistically significantly late (6minutes) in butorphanol group when compared to fentanyl group (3minutes). Duration of analgesia was longer in butorphanol group (350 minutes) in comparison to fentanyl group (230 minutes) which was clinically and statistically significant.

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

Quality of analgesia was better in butorphanol group. Sedation was the main side effect in butorphanol group. Incidence of pruritus, vomiting, hypotension and respiratory depression was more in fentanyl group.

**CONCLUSION**

Epidural butorphanol provides delayed onset but longer duration and better quality of analgesia than fentanyl with paucity of clinically significant side effects with both groups.

**KEYWORDS**

Epidural, Catheter technique, Butorphanol, Fentanyl, Postoperative pain.

## INTRODUCTION

Pain after surgery is inevitable. Hence, relieving pain is one of the fundamental responsibilities of anesthesiologists and is frequently a primary goal for which patients are seeking care. Severe acute pain produces an increase in sympathetic tone that manifests as an increase in heart rate, blood pressure, cardiac output, systemic and coronary vascular resistances. These adverse cardiovascular effects can be minimized by epidural anaesthesia. Pain associated with thoracic and upper abdominal surgery can cause significant postoperative respiratory dysfunction. Pain causes an increase in muscle tone around the site of injury. This "muscle splinting", coupled with voluntary reductions in respiratory muscle excursions, causes atelectasis resulting in reduced ability to cough, retention of secretions and increased risk of chest infections. Adequate perioperative pain relief coupled with breathing exercises, can reverse these adverse respiratory effects.

Epidural technique has been found to provide better pain relief than systemic opioids and also decreased incidence of postoperative complications. Lumbar epidural catheters can be kept in place for prolonged periods. Epidural catheter placed in a location congruent to the incisional dermatome has been shown to provide superior analgesia. Continuation of epidural anaesthesia with local anaesthetics for several days into the postoperative period helps not only to improve gastrointestinal motility through direct effect of the epidural blockade but also minimises the need for opioids. The neuroendocrine and metabolic changes that constitute the stress response to surgery result in an aggravated catabolic state that results in weight loss and negative nitrogen balance. Maintenance of epidural anaesthesia for 48 to 72 hours into the postoperative period has a salutary effect on these adverse metabolic effects.

In the present study, fentanyl and butorphanol have been selected for postoperative epidural analgesia. Fentanyl, a mu opiate receptor agonist has analgesic potency greater than morphine. Respiratory depressant effect of Fentanyl is less pronounced and of shorter duration of action as compared to morphine and pethidine. Butorphanol tartrate is a synthetically derived agonist-antagonist opioid analgesic. It is an agonist on kappa receptor and either antagonist or partially agonist on mu receptor. Epidural butorphanol has been employed successfully for the relief of postoperative pain. It is considered safer than pure agonist opioids because of its ceiling effect on respiratory depression, lower addiction potential, lesser nausea, vomiting, pruritus and urinary retention. It produces sedation comparable to or more than that of morphine, which is desired in postoperative period.

## MATERIALS AND METHODS

Sixty adult patients of ASA grade I and II, of either sex, belonging to 18-60 years of age, posted for elective lower abdominal in general surgery, gynecology, and urology were selected for the study. Lower abdominal surgery is defined as the incision below the umbilicus and different surgeons performed the surgery. Patients were randomly divided into two groups of 30 each.

Group A (N=30) –Butorphanol

Group B (N=30) – Fentanyl

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

**Inclusion Criteria**

1. Age group: 18-60 years of either sex.
2. ASA grade I and II.

**Exclusion Criteria**

1. Patients with ASA grade III and IV
2. Contraindications for epidural anaesthesia.
3. Patients physically dependent on narcotics.
4. Patients with history of drug allergy.

## RESULTS

The mean age of patients in group A was 40.80 ± 11.93 (Range: 18-60 yrs.) and in group B was 38.80 ± 11.41 (Range: 18-60 yrs.). Majority of the patients, about 30% in group A and 33.3% in group B belonged to age group between 31- 40 yrs.

| | **Group A** | | **Group B** | |
|---|---|---|---|---|
| **Age in years** | **(n = 30)** | | **(n = 30)** | |
| | **No** | % | **No** | % |
| 18-20 | 2 | 6.7 | 2 | 6.7 |
| 21-30 | 5 | 16.7 | 6 | 20.0 |
| 31-40 | 9 | 30.0 | 10 | 33.3 |
| 41-50 | 7 | 23.3 | 7 | 23.3 |
| 51-60 | 7 | 23.3 | 5 | 16.7 |
| **Total** | **30** | **100.0** | **30** | **100.0** |
| **Mean ± SD** | **40.80 ± 11.93** | | **38.80 ± 11.41** | |

***Table 1: Age distribution***

| **Name of Surgery** | **Group A** | **Group B** |
|---|---|---|
| | **(n = 30)** | **(n = 30)** |
| **General surgery** | 12 (40.0%) | 13 (43.3%) |
| **Gynecological surgery** | 14 (46.7%) | 15 (50%) |
| **Urological surgery** | 4 (13.3%) | 2 (6.7%) |
| **Total** | **30** | **30** |

***Table 2: Types of Surgery***

From the table 2 it can be noted that in group A, 12 patients (40%) underwent general surgery, 14 patients (46.7%) gynecological surgery and 4 patients (13.3%) urological surgery. In group B, 3 patients (43.3%) underwent general surgery, 15 patients (50%) gynecological surgery and 2 patients underwent (53.2%) urological surgery. In both the groups, majority of the patients (46.7% - 50%) underwent gynecological procedures. There was no significant difference in the type of surgeries in between the two groups.

| **Duration of Surgery** | **Group A** | **Group B** |
|---|---|---|
| **(minutes)** | **(n=30)** | **(n=30)** |
| <100 | 10 (33.3%) | 4(13.3%) |
| 101-150 | 13(43.3%) | 17(56.7%) |
| 151-200 | 5(16.7%) | 7(23.3%) |
| >200 | 2(6.7%) | 2(6.7%) |
| Mean ± SD | 126.50 ± 48.19 | 140.83 ± 40.43 |
| **Significance** | **Duration of surgery is statistically comparable** | |

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

| | |
|---|---|
| | **in both the group with t=1.557; P=0.217** |
| ***Table 3: Duration of surgery*** | |

Duration of surgery was not significantly different (t = 1.557; p=0.217) and were statistically comparable in both the groups.

| **Onset of analgesia (min)** | **Group A (n=30)** | **Group B (n=30)** |
|---|---|---|
| 2-4 | 0 | 25(83.3%) |
| 4-6 | 15 (50.0%) | 5(16.7%) |
| 6-8 | 13(43.3%) | 0 |
| >8 | 2(6.7%) | 0 |
| Mean ± SD | 6.38 ± 1.26 | 3.22 ± 0.93 |
| **Significance** | **Onset of analgesia in minutes is significantly latein Group B with t=11.07; P<0.001**** | |
| ***Table 4: Onset of Analgesia*** | | |

Statistical analysis showed that onset of analgesia in group A was delayed and statistically strongly significant with t=11.07 and p< 0.001.

| **Duration of Analgesia (min)** | **Group A (n=30)** | **Group B (n=30)** |
|---|---|---|
| 135 - 200 | 0 | 7(23.3%) |
| 201-300 | 9(30.0%) | 23(76.7%) |
| 301-400 | 16(53.3%) | 0 |
| 401-500 | 5(16.7%) | 0 |
| Mean ± SD | 344.00 ± 63.69 | 227.17 ± 38.12 |
| **Significance** | **Duration of analgesia in minutes is significantly less in Group B with t=8.620; P<0.001**** | |
| ***Table 5: Duration of analgesia*** | | |

Statistical analysis showed that duration of analgesia was significantly less in group B and statistically strongly significant with t=8.620; p<0.001.

| **HR (bpm)** | **0 min** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **120 min** |
|---|---|---|---|---|---|---|---|
| **Group A** | 80.97 | 79.03 | 77.60 | 78.20 | 79.93 | 80.30 | 82.20 |
| | ± 10.88 | ± 10.28 | ± 10.10 | ± 9.09 | ± 9.31 | ± 10.01 | ± 9.32 |
| **Group B** | 81.03 | 79.37 | 76.87 | 76.57 | 78.80 | 81.67 | 83.90 |
| | ± 9.87 | ± 11.07 | ± 10.13 | ± 9.01 | ± 8.49 | ± 9.34 | ± 8.57 |
| **P value** | **0.980** | **0.904** | **0.780** | **0.487** | **0.624** | **0.587** | **0.465** |
| ***Table 6: Mean Heart rate*** | | | | | | | |

There was no difference in the heart rate observed upto 2 hours after administration of the study drugs. Heart Rate was monitored every 4$^{th}$ hourly for 24 hours post operatively. Heart rate remained stable throughout upto 24 hours. Statistically there was no significant difference in the heart rate between the two groups with p >0.05.

| **SBP (mm Hg)** | **0 min** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **120 min** |
|---|---|---|---|---|---|---|---|
| **Group A** | 120.26 ± 0.69 | 116.63 ± 10.57 | 108.33 ± 10.37 | 106.67 ± 10.40 | 111.73 ± 9.98 | 116.23 ± 11.03 | 119.77 ± 10.93 |
| **Group B** | 122.43 | 110.17 | 107.23 | 105.53 | 111.10 | 117.20 | 120.73 |

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | ± 10.59 | ± 12.94 | ± 12.23 | ± 12.48 | ± 12.39 | ± 10.04 | ± 9.27 |
| **P value** | **0.434** | **0.038*** | **0.709** | **0.704** | **0.828** | **0.724** | **0.713** |
| **DBP (mm Hg)** | **0 min** | **5 min** | **10 min** | **15 min** | **30 min** | **60 min** | **120 min** |
| **Group A** | 73.57 ± 7.46 | 71.87 ± 8.05 | 66.13 ±6.97 | 65.17 ± 7.45 | 68.93 ± 8.35 | 71.50 ± 6.97 | 75.43 ± 7.47 |
| **Group B** | 75.93 ± 7.61 | 68.07 ± 8.42 | 66.57 ± 8.29 | 65.80 ± 7.58 | 71.23 ± 7.58 | 74.23 ± 7.66 | 75.53 ± 7.54 |
| **P value** | **0.229** | **0.079** | **0.827** | **0.751** | **0.283** | **0.151** | **0.287** |

***Table 7: Systolic and Diastolic blood pressure***

There were no differences with regard to blood pressure (both systolic and diastolic) between the two groups observed upto 2 hours after administration of the study drugs.

| Quality of analgesia | Group A | Group B | P value |
|---|---|---|---|
| | **(n=30)** | **(n=30)** | |
| No relief | - | - | - |
| Poor pain relief | 1 (3.3%) | 5(16.7%) | 0.195 |
| Fair pain relief | 2(6.7%) | 11(36.7%) | 0.005 |
| Good pain relief | 25(83.3%) | 14(46.7%) | 0.003 |
| Excellent pain relief | 2(6.7%) | 0 | 0.492 |
| Mean ± SD | 2.73 ± 0.64 | 2.47 ± 0.73 | - |

***Table 8: Quality of analgesia***

According to the above observations, butorphanol provides better quality of analgesia compared to fentanyl which is statistically significant ($p<0.01$)

| Side effects | Group A | Group B | P value |
|---|---|---|---|
| | **(n=30)** | **(n=30)** | |
| **Sedation** | 19 (63.3%) | 0 | <0.001** |
| **Pruritus** | 1(3.3%) | 4(13.3%) | 0.353 |
| **Nausea** | 4(13.3%) | 2(6.7%) | 0.671 |
| **Vomiting** | 2(6.7%) | 10(33.3%) | 0.010 |
| **Respiratory depression** | 0 | 2(6.7%) | 0.492 |
| **Hypotension** | 0 | 2(6.7%) | 0.492 |

***Table 9: Side effects***

| Sedation score | Group A | Group B | P value |
|---|---|---|---|
| | **(n=30)** | **(n=30)** | |
| **Grade 0** | 0 | 30 (100.0%) | <0.001** |
| **Grade I** | 14 (73.68%) | 0 | <0.001** |
| **Grade II** | 5(26.31%) | 0 | 0.011* |
| **Grade III** | 0 | 0 | - |

***Table 10: Sedation score***

The quality of sedation was acceptable in the interest of patients wellbeing.

## 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

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

humanitarian grounds and also in reducing postoperative morbidity, hence should be done by the treating anesthesiologist.

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. Recent studies would indicate that it is possible to achieve better analgesia with lower doses of opioid medication when these drugs are administered in extradural space as compared to intramuscular or intravenous routes of administration. 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), pruritus, 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, first introduced in 1978 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.

The present study is a prospective randomized controlled clinical comparative study done to assess the efficacy and safety of epidural butorphanol and epidural fentanyl for the management of postoperative pain. A total of 60 patients belonging to age groups 18-60 years have been taken, out of which majority of patients belonged to 31-50 years of age. Male and female patient ratio was equal. Patients undergoing elective lower abdominal and lower limb surgeries in general surgery, orthopaedics, gynaecology, urology and plastic surgery were selected. Out of 60 patients, 6 patients belonged to general surgery, 27 patients underwent gynaecological surgery, 19 patients underwent orthopaedic surgery, 6 patients underwent urological surgery and 2 patients underwent plastic surgery. During the preoperative assessment patients were explained about the epidural procedure and also educated about VAS. Pre-medication with Tablet diazepam 0.2mg/kg body weight orally was given the night before the surgery. Patients were randomly divided into two groups of 30 each, Group A – Butorphanol and Group B –Fentanyl. All surgeries were done under epidural anaesthesia. In the postoperative period, when patient complained of pain, intensity of pain was assessed using VAS and when VAS score was >5, patients in group A received epidural butorphanol 4mg diluted to 10ml in NS and patients in group B received epidural fentanyl 100μg diluted to 10ml in NS. It was found that all patients experienced some pain relief. However onset, duration and quality of analgesia was found to be variable because of differences in the type of drug used, severity of pain, pain threshold, type of surgery etc.

**Onset of Analgesia**

In our study, the mean time of onset of analgesia in group A (butorphanol) was 6.38 ± 1.26(S.D) minutes and in group B (fentanyl) was 3.22 ± 0.93(S.D) minutes. Majority of patients in butorphanol group had onset of analgesia between 4-8 minutes whereas in fentanyl group between

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

2-4 minutes. Statistical analysis showed that onset of analgesia was faster in fentanyl group compared to butorphanol group (t=11.07; p< 0.001).

Mok et al.,[1] in 1986 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. Onset of pain relief with epidural butorphanol appeared at 15 minutes and peaked at 30 minutes.

Maurice Lippmann[2] in 1988 has reported in his study that epidural butorphanol 4mg used for postoperative analgesia in non- obstetric abdominal surgeries has produced analgesia within 15 minutes.

Rutter DV et al,[3] in 1981 reported that 100µg of epidural fentanyl for postoperative pain relief had a rapid onset of action i.e almost 50% reduction in mean pain within 5 minutes.

In a study by Lomessay A et al.,[4] in 1984 concluded that epidural fentanyl 200µg provides rapid analgesia that remains optimum during 2 hours despite the intensity and pain stimulation.[4]

Naulty JS et al,[5] in 1985 used different doses of epidural fentanyl in parturients following caesarean delivery. They concluded that fentanyl 100µg produced pain scores of 0 in 3-6 minutes.

**Duration of Analgesia**

In the present study, duration of analgesia in group A( butorphanol group) ranged from 200-500 minutes(3.5 – 8.5 hrs) with a mean ± S.D of 344.00 ± 63.69 min and in group B (fentanyl group) ranged from 135- 300 minutes(2- 5 hours) with a mean ± S.D of 227.17 ± 38.12 min. The statistical analysis showed that duration of analgesia in group A was significantly longer when compared to group B (t=8.620; p<0.001).

Mok et al,[1] in 1986 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.

Therese K et al,[6] in 1987 conducted a study on parturients who underwent caesarean delivery with epidural anaesthesia using different doses of butorphanol and concluded that butorphanol 4mg produces 6-8 hrs of analgesia and in 17 patients of the 30 patients analgesia lasted for upto 6- 24 hrs.

Maurice Lippmann[2] in 1988 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 et al,[7] 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.

Rutter DV et al,[3] in 1981 reported that 100µg of epidural fentanyl for postoperative pain relief has a relatively shorter duration of action i.e by 3rd hour almost 50% of patients complained of increase in pain.

Premila malik, Chhavi manchanda, Naveen Malhotra[8] in 2006 conducted a study to assess and compare the safety and efficacy of postoperative analgesia with epidural butorphanol 2mg and fentanyl 50µg. They concluded that duration of analgesia with butorphanol 2mg was longer when compared to fentanyl 50µg.

**Quality of Analgesia**

In the current study, quality of analgesia was assessed using pain score. 83.3% of patients in butorphanol group had good pain relief and only 6.7% had excellent pain relief. In fentanyl group, 40.7% of patients had good pain relief and36.7% had fair pain relief. Accordingly, butorphanol provided fairly better quality of analgesia than fentanyl which was statistically significant (p< 0.01).

Quisqueya T et al,[7] in 1991 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).

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

Lytle SA et al,[9] in 1991 did a retrospective analysis with fentanyl (50µg) and showed that epidural fentanyl provides good to excellent pain relief.

Sugimoto M et al.,[10] in 1997 compared the degree of analgesia using different doses of epidural fentanyl and found that epidural fentanyl 25µg provided superior analgesia than 12.5µg.

Hwang KB, Chung CJ, Lee et al.,[11] in 2004 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.

**Cardio- Respiratory Effects**

In our present study heart rate, blood pressure and respiratory rate remained stable throughout the observatory period. 2 patients in fentanyl group had hypotension (fall in systolic BP <20% of basal reading) and respiratory depression (RR<10/min) which was not statistically significant (p> 0.05).

Gough et al.,[12] in 1988 used epidural fentanyl 1.5µg/ kg body weight in 10ml of sterile solution and concluded that the range of mean(S.D) of cardio- respiratory variables like heart rate 84(2)- 95(18) beats/ min, systolic BP of 121(19)- 133(14) mm of Hg, diastolic BP of 70(10)- 76(10) mm of Hg and RR- 21(3)- 23(4) / min varied negligibly from basal recordings.

Premila malik, Chhavi manchanda, Naveen Malhotra[8] in 2006 conducted a study to assess and compare the safety and efficacy of postoperative analgesia with epidural butorphanol 2mg and fentanyl 50µg. Their study showed that there was no significant changes in pulse rate, systolic and diastolic BP, RR and SpO2 in the 2 groups at different time intervals throughout the 24 hours study period (p> 0.05).

**Side Effects**

**Sedation**- was the main side effect in butorphanol group which constituted 63.3% andnone 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).

Catherine O Hunt[13] in his study has reported a higher incidence of sedation with epidural butorphanol and is a dose dependent side effect.

JS Naulty[14] in a study noted that sedation was the only significant side effect, was of mild type (arousable with verbal response).

A study by Therese K et al.[6] Showed 72% of patients on epidural butorphanol 2mg had clinically significant sedation.

Rutter DV et al.,[3] in 1981 reported that fentanyl 100µg for postoperative pain relief produced increase in sedation.

**Pruritus**

In present study 3.3% of patients in butorphanol group had pruritus and 13.3%of patients in fentanyl group had pruritus which was statistically not significant (p>0.05).

In a study by Ackermann et al,[15] in 1989, 7% of patients reported pruritus with 2mg of epidural butorphanol and in a study by Palacios et al in 1991, 1.4% of patients reported pruritus with 2mg of butorphanol.

In a study by Lytle SA et al,[9] in 1991 using fentanyl 50µg reported that 4% of patients had pruritus.

**Nausea and Vomiting**

In our study 13.3% of patients in butorphanol group had nausea whereas in fentanyl group only 6.7% of patients had nausea which was not significant statistically (p>0.05).

Vomiting was reported in 6.7% of cases in butorphanol group and 33.3% of cases in fentanyl group which was significant statistically (p=0.010).No patients on epidural butorphanol had nausea or vomiting in separate studies conducted by JS Naulty et al., and Catheline O Hunt et al.[13,14]

In a study by Lytle SA et al.,[9] in 1991, nausea was reported in 25.5% of cases.

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 8, 2024

Premila Malik, Chhavi Manchanda, Naveen Malhotra (8) in 2006 compared the efficacy of epidural butorphanol 2mg and fentanyl 50µg found that the incidence of nausea and vomiting was higher in fentanyl group.

**Respiratory Depression**

In our current study, 6.7% of patients in fentanyl grouphad respiratory depression and in none of the patients in butorphanol group which was not significant (p>0.05).

No patients had respiratory depression with butorphanol in studies conducted by Maurice Lippmann et al., in 1988, Catherine O Hunt et al in 1989, JS Naulty et al., in 1989.[2,4,13]

Rutter DV et al.,[3] in 1981 reported decrease in respiratory rate in patients who received 100µg of fentanyl.

## CONCLUSION

All cases were given epidural anaesthesia using 0.5% bupivacaine. In the postoperative period, when patient complained of pain, intensity of pain was assessed using Linear Visual analog scale and when VAS score was >5 they received epidural butorphanol 2mg (group A) or fentanyl 100µg (group B) diluted to 10ml with normal saline.

**Onset of Analgesia**

Mean onset of analgesia was rapid (3.22 ± 0.93(S.D) minutes) in fentanyl group when compared to butorphanol group (6.38 ± 1.26(S.D) minutes. This was clinically and statistically significant (p< 0.001)

**Duration of Analgesia**

Duration of analgesia was longer in butorphanol group which ranged from 200- 500 minutes with a mean of 344.00 ± 63.69 minutes compared to fentanyl group which ranged from 135- 300 minutes with a mean of 227 ± 38.12 minutes. This was clinically and statistically significant (p< 0.001).

**Quality of Analgesia**

Quality of analgesia was better with butorphanol group compared to fentanyl group. 83.3% of patients in butorphanol group had good pain relief whereas only 46.3% of patients in fentanyl group had good pain relief. Excellent pain relief was seen in 6.7% of patients in butorphanol group. This was clinically and statistically significant (p< 0.01).

**Cardio- Respiratory Effects**

There was no significant difference in heart rate, blood pressure and respiratory rate monitored at regular intervals for 24 hours postoperatively between the two study groups.

**Side Effects**

Sedation was the main side effect in butorphanol group. Nausea wasseen in 4 patients in butorphanol group and 2 patients in fentanyl group.

Frequency of pruritus and vomiting was more in fentanyl group. Hypotension and respiratory depression were seen in 2 patients in fentanyl group. All patients were monitored for 24 hours postoperatively for any untoward effects.

It can be concluded from the above study that epidural butorphanol though has a delayed onset of analgesia in comparison to fentanyl, provides longer duration of analgesia, better quality of analgesia with fewer side effects like sedation which are statistically significant when compared to epidural fentanyl. In view of safety profile, epidural butorphanol can be routinely employed in the management of postoperative pain relief for various surgical procedures. It is safe and effective in providing postoperative analgesia. However more studies with different dosages and different

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techniques (epidural bolus and infusion) of both the study drugs should be conducted to evaluate the efficiency and to conclude the above facts.

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