



COMPARATIVE EVALUATION OF EPIDURAL MORPHINE, BUTORPHANOL & TRAMADOL FOR POST OPERATIVE PAIN RELIEF IN LOWER ABDOMINAL SURGERIES

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ABSTRACT

Background: Neuraxial blockade is the preferred technique over general anesthesia for most of the lower abdominal surgeries. Effective post operative analgesia can be achieved by epidural anesthesia.

Depositing opioids in the epidural space helps in extending the postoperative analgesic duration. We want to evaluate the effectiveness of Morphine, Butorphanol and Tramadol for the post operative period in combined spinal & epidural anesthesia.

Study design: This study was double blind randomised controlled study carried out on 75 patients undergoing herniorrhaphy, in three groups of 25 each. The patients were randomly allocated into three groups. Group 'M' was taken as Morphine study group, Group 'B' as Butorphanol study group and Group 'T' as Tramadol study group. L2-L3 interspace was identified and using a 18 gauge combined spinal and epidural needle, epidural space was identified after which a long spinal needle (27G) is inserted into sub arachnoid space, about 0.5% hyperbaric bupivacaine 15mg was injected. Then the epidural catheter is inserted in the usual manner and kept 3 to 4 cms into the epidural space. At the end of surgery in group 'M' (morphine group) 50 mcg / kg of morphine in 10ml saline was injected through the epidural catheter. In the Group 'B' (butorphanol group) 40 mcg/ kg of butorphanol in 10 ml saline was injected through the epidural catheter. In group 'T' (tramadol group), 1.5mg / kg of Tramadol in 10 mg saline was injected through the epidural catheter and the catheter was removed in all the three groups. Time of epidural opioid injection was noted. The level of consciousness was assessed every hour and graded according to the sedation score. The pain relief is graded as VAPS and was assessed every hour and the total duration of post operative analgesia was taken as the period from the time of giving epidural drugs till the patients first requirement of rescue analgesic. Patients were observed for any side effects like respiratory depression, nausea, vomiting, urinary retention, hypotension, pruritus, headache for 24 hours. Kruskal - Wallis 'one way analysis of variance test' was performed to find out the level of significance in the duration of analgesia, quality of analgesia, sedation between the three study groups.

Results: Morphine produces excellent post operative analgesia for a duration of 14-16 hours compared to butorphanol with a duration of 7-9 hours, and tramadol with a duration of 4-6 hours. The onset of action of morphine was delayed by 60-90 minutes while butorphanol and tramadol had an earlier onset of pain relief with in 5-10 minutes. There was no correlation between sedation score and quality of analgesia. Morphine in these doses epidurally does not produce respiratory depression and butorphanol which had ceiling effect does not produce the same while no such respiratory depression occurred in tramadol. The incidence of vomiting is high with tramadol group 40% while 20% 20% each in butorphanol and morphine. Hence routine use of antiemetics is advisable after epidural opioids. The incidence of urinary retention is 28% with morphine while no such events occurred in other two groups.

Conclusion: It has been found out by this study that Morphine epidurally provides excellent long lasting pain relief compared to butorphanol and tramadol. Morphine, the queen of opioids with respect to quality and duration of pain relief cannot be compared with any other opioids. Hence it remains the gold standard opioid for post operative analgesia epidurally.

KEYWORDS : Epidural analgesia, Combined epidural analgesia, Morphine, Butorphanol, Tramadol, Postoperative pain relief, lower abdominal surgeries

INTRODUCTION:

The relief of pain during surgery is the *raison d'être* of anesthesia. Effective post operative analgesia reduces post operative morbidity, allows early ambulation and discharge. Post operative analgesia is achieved by various techniques using various drugs among which neuraxial blockade plays an important role. The spinal cord has taken the centre stage in analgesia practice following the demonstration of analgesia with intrathecal morphine by Yaksh & Rudy (1977). Deposition of drugs in the subarachnoid space and epidural space paved a new era for pain relief. Opioids are powerful centrally acting analgesic agents, which however also have peripheral effects. Morphine, butorphanol and tramadol when given epidurally provides good post operative analgesia.

AIM OF THE STUDY:

To compare the efficacy of epidural morphine, butorphanol and tramadol for post operative analgesia for lower abdominal surgeries particularly herniorrhaphies, to compare the duration and quality of post operative analgesia of morphine, butorphanol and tramadol and to study the side effects associated with epidural morphine, butorphanol and tramadol.

MATERIALS AND METHODS:

This study was double blind randomised controlled study carried out on 75 patients in three groups of 25 each. Patients who are coming for herniorrhaphies were selected for the study. All the patients belonged to ASA risk I and II with age distribution between 20 to 70 are selected. Patients who are opioid addict, emotionally unstable and asthmatics were excluded. After getting, informed consent the patients were randomly allocated into three groups. Group 'M' was taken as Morphine study group, Group 'B' as Butorphanol study group and Group 'T' as Tramadol study group. Patients were assessed under the 10 point visual analogue pain scale. All the patients were premeditated with Inj. Glycopyrrolate 4 mcg/ Kg intramuscularly 45 minutes prior to anaesthesia. Baseline measurements of pulse rate, respiratory rate, blood pressure and SpO₂ were done.

Technique:

An intravenous infusion line with dextrose normal saline was started. After strict aseptic precautions L2-L3 interspace was identified and using a 18 gauge combined spinal and epidural needle, epidural space was identified after which a long spinal needle (27G) is inserted into sub arachnoid space, about 0.5% hyperbaric bupivacaine 15mg was injected. Then

the epidural catheter is inserted in the usual manner and kept 3 to 4 cms into the epidural space. The pulse rate and blood pressure were monitored every 5 minutes and continuous SpO2 monitoring was done. A fall of systolic pressure by 20% from the base line value was considered as hypotension and managed with intravenous fluids, oxygen and inj. Ephedrine in titrated incremental doses. At the end of surgery in group 'M' (morphine group) 50 mcg / kg of morphine in 10ml saline was injected through the epidural catheter. In the Group 'B' (butorphanol group) 40 mcg/kg of butorphanol in 10 ml saline was injected through the epidural catheter. In group 'T' (tramadol group), 1.5mg / kg of Tramadol in 10 mg saline was injected through the epidural catheter and the catheter was removed in all the three groups. Time of epidural opioid injection was noted. The level of consciousness was assessed every hour and graded according to the sedation score. The pain relief is graded as VAPS and was assessed every hour and the total duration of post operative analgesia was taken as the period from the time of giving epidural drugs till the patients first requirement of rescue analgesic. Patients were observed for any side effects like respiratory depression, nausea, vomiting, urinary retention, hypotension, pruritus, headache for 24 hours.

Data Analysis:

Descriptive statistical analysis of all the data collected in the present study was performed. Kruskal – Wallis 'one way analysis of variance test' was performed to find out the level of significance in the duration of analgesia, quality of analgesia, sedation between the three study groups.

OBSERVATION AND RESULTS:

Patients in all the three groups were comparable in age, weight distribution and the site and type of surgery.

Age Distribution:

Patients in the age group between 20 and 70 were selected for the study.(Table 1 & 2). The lowest age of a patient in the group 'M' was 25 and the highest age was 60 years. In group 'B' the lowest age of a patient was 28 and the highest age was 65. In group 'T' the lowest age of a patient was 20 and the highest age was 64.

Table 1.

Age in years	20-29	30-39	40-49	50-70
Group 'M'	6	5	8	6
Group 'B'	2	5	8	10
Group 'T'	2	12	5	6

Age comparison (in years) among three groups

Table 2.

	Mean	S.D	Standard
Group 'M'	39.960	11.275	2.255
Group 'B'	44.560	10.755	2.151
Group 'T'	39.680	12.906	2.581

Hence the age between the three groups are comparable as there is not a statistically significant difference p = 0.259.

Weight Distribution:

In group 'M' the minimum weight of a patient was 40kgs and maximum of 60 kgs. In group 'B' the minimum weight of a patient was 45kgs and maximum of 62 kgs. In group 'T' the minimum weight of a patient was 45kgs and maximum of 64 kgs (Table 3).

Table 3.

Weight (kgs)	Mean +/- Standard Deviation
Group M	51.4 +/- 5.537
Group B	52.56 +/- 6.014
Group T	52.44 +/-5.233

Hence the weight in between the groups are comparable as there is no statistically significant difference with 'p' value >0.286.

Duration of postoperative analgesia

In group 'M' the minimum duration of post operative analgesia was 840 minutes and the maximum duration was 975 minutes with a mean of 919.2 minutes and standard deviation of 38.36 minutes. In group 'B' the minimum duration of post operative analgesia was 420 minutes and the maximum duration was 570 minutes with a mean of 505.6 min and standard deviation of 49.08. In group 'T' the minimum duration of post operative analgesia was 240 minutes and the maximum duration was 330 minutes with a mean of 272.4 min and standard deviation of 28.61(Figure 1). Applying Kruskal – Wallis one way analysis of variance the duration of post operative analgesia showed the significant statistical difference between the three groups with p value <0.001.

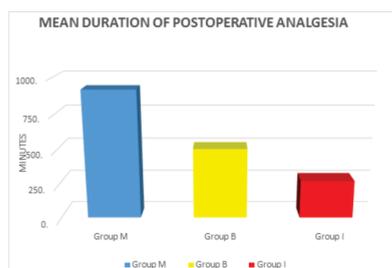


Figure 1.

Quality of analgesia:

VAPS score (Table 4 & 5) judged the quality of analgesia(10). In group 'M' the quality of analgesic was good with a score of 2-4 in first hour in 20 patients, but the analgesic quality increases after 1 hour to excellent pain relief with score of 0-1 in 17 patients. In group 'B' the quality of analgesia at first hour was excellent with pain score of 0-1 in 6 patients and good in 19 patients with pain score of 2-4. At fourth hour all the 25 patients were with good pain relief with score of 2-4. In group 'T' the quality of analgesic at first hour was good with pain score of 0-2 in 22 patients but the analgesic quality does not last longer. At fourth hour the analgesic quality was fair with pain score of 5-6 in 18 patients and good with a score of 2-4 in 7 patients(Figure 2 & 3). Patients were given the first dose of parental analgesic when the pain score was 6 and above.

Table 4. VAPS SCORE (1ST HOUR)

Pain Score	GROUP 'M'		GROUP 'B'		GROUP 'T'	
	No.of Patients	%	No.of Patients	%	No.of Patients	%
0-1	0	0	6	24	0	0
2-4	20	80	19	76	22	88
5-6	5	20	0	0	3	12
>7	0	0	0	0	0	0



Figure 2.

Table 5. VAPS SCORE (4TH HOUR)

Pain Score	GROUP 'M'		GROUP 'B'		GROUP 'T'	
	No.of Patients	%	No.of Patients	%	No.of Patients	%
0-1	8	32	0	0	0	0

2-4	17	68	25	100	7	28
5-6	0	0	0	0	18	72
>7	0	0	0	0	0	0

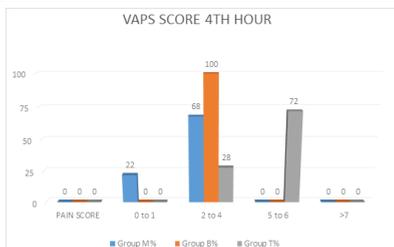


Figure 3

Applying Kruskal – Walis one way analysis of variance the quality of analgesia showed the significant statistical difference between the three groups with p value < 0.001.

Sedation score:

At the first hour(Table 6 & Figure 4) in group 'M' out of 25 patients 17 patients were fully awake but as the time progress sedation scale increases. It took around 60 to 75 minutes to reach a sedation score of 2-3 in group 'M'. At fourth hour 18 patients were with a sedation score of 3. In group 'B' at the first hour 2 patients were with a sedation score of 1, 17 patients with score of 2 and 6 patients with score of 3. At fourth hour (Table 7& Figure 5) 7 patients were with score of 1 and 18 patients with score of 2. In group 'T' at the first hour 19 patients were with score of 1, 6 patients with score of 2 but at the fourth hour all the patients were fully awake.

Table 6. SEDATION SCORE (1ST HOUR)

Sedation score	GROUP 'M'		GROUP 'B'		GROUP 'T'	
	No.of Patients	%	No.of Patients	%	No.of Patients	%
1	17	68	2	8	19	76
2	8	32	17	68	6	24
3	0	0	6	24	0	0
4	0	0	0	0	0	0

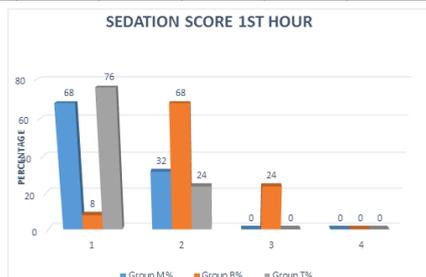


Figure 4.

Table 7. SEDATION SCORE (4th HOUR)

Sedation score	GROUP 'M'		GROUP 'B'		GROUP 'T'	
	No.of Patients	%	No.of Patients	%	No.of Patients	%
1	0	0	7	28	25	100
2	7	28	18	72	0	0
3	18	72	0	0	0	0
4	0	0	0	0	0	0

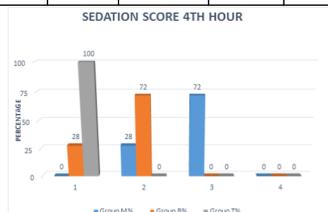


Figure 5.

Applying Kruskal – Walis 'One Way Analysis of Variance' the sedation score showed the significant statistical difference between the three groups with P Value < 0.001.

RESPIRATION:

Respiration was not depressed in any patients(10). Even patients who had a sedation score of 2 or 3 had no airway obstruction due to falling back of tongue. No significant change in respiratory rate and tidal volume were observed.

COMPLICATIONS:

In group 'M' 5 Patients had vomiting 1 patient had pruritus and 7 patients had urinary retention (Table 8 & Figure 6). In group 'B' 5 Patients had vomiting while in group 'T' vomiting occurred in 10 Patients.

Table 8. COMPLICATIONS

Group	Vomiting	Urinary retention	Pruritus	Respiratory depression
Group 'M'	5	7	1	0
Group 'B'	5	0	0	0
Group 'T'	10	0	0	0

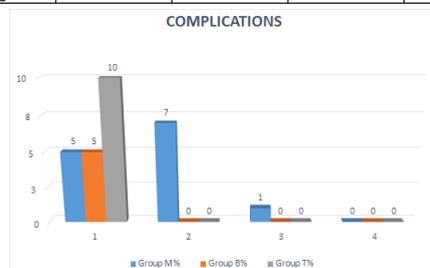


Figure 6.

DISCUSSION :

The demonstration of opiate receptors(3) in the spinal cord and the role played by the spinal cord in the nociception and its modulation has helped managing the post operative pain effectively. A single dose of an opioid(7) given epidurally provides excellent pain relief for a reasonable period came as a blessing for the anaesthesiologist to extend his services well into the post operative period.

Duration of post operative analgesia:

The mean duration of post operative analgesia in group 'M' was 919.20 minutes(1,9), in group B was 505.6 minutes(2), and in group 'T' was 272.4 minutes(8) when given epidurally for post operative analgesia at the end of surgery. Applying Kruskal – Wallis 'one way analysis of variance' the differences in the duration of post operative analgesia between the three groups was statistically significant with 'p' value < 0.001.

Quality of Analgesia:

The quality of analgesia(4) in group 'M' was excellent in 20% and good in 80% which increased after first hour to excellent pain relief. At fourth hour 68% of patients had excellent pain relief. This showed the hydrophilic nature of epidural morphine which had delayed onset time. In group 'B' at first hour 24% had excellent pain relief and 76% good, which at fourth hour all the patient were with good pain relief. The result correlated with lipophilic nature of butorphanol with an early onset. In group 'T' at first hour 88% of patients had good pain relief(12) but it does not last longer. At the fourth hour 72% were in fair pain relief 24% patients had VAS score of 6 and they need resource postoperative pain relief. Applying Kruskal Wallis "one way Analysis of variance" there was a statistically significant difference between the three group with respect of quality of analgesia with P value < 0.001.

Sedation Scale:

In group 'M' sedation scale increased from 1 to 3 after first hour

explaining the delayed onset. In group 'B' the initial sedation score was 2 which sustained after fourth hour and it gradually waned to score of 1 after 6th hour. In group 'T' at first and fourth hour all the patients were fully awake with a sedation score of 1 as tramadol inhibits nor adrenaline uptake and stimulates serotonin release responsible for their wakefulness. Applying Kruskal Wallis "one way Analysis of variance" there was a statistically significant difference between the group with respect to sedation with p value < 0.001.

Hemodynamic Status:

There was no significant change in heart rate or fall in blood pressure in any of these patients.

RESPIRATION:

Respiration was not depressed in any of the patients in all the groups. There was no significant change in respiratory rate and tidal volume. Even patients with a sedation score of 2 or 3 had no airway obstruction due to fall back of tongue. All the patients maintained APO₂ > 95% without any oxygen supplementation(6).

COMPLICATIONS:

Vomiting occurred in 20% of patients in group 'M', 20% in group 'B' and 40% of patients in group 'T' and hence routine use of antiemetics is recommended when opioids are administered epidurally. Urinary retention occurred in 28% patients in group 'M' while no such complications reported in group 'B' or group 'T'. Pruritus occurred in one patient in group 'M' while no such complications occurred in other groups. There was no respiratory depression observed in all the three groups.

SUMMARY:

This study done to comparatively evaluate the efficacy of Epidural Morphine, Butorphanol and Tramadol for post operative analgesia bears the following results. Morphine produces excellent post operative analgesia for a duration of 14-16 hours compared to butorphanol with a duration of 7-9 hours, and tramadol with a duration of 4-6 hours. The onset of action of morphine was delayed by 60-90 minutes while butorphanol and tramadol had an earlier onset of pain relief with in 5-10 minutes. There was no correlation between sedation score and quality of analgesia. Morphine in these doses epidurally does not produce respiratory depression and butorphanol which had ceiling effect does not produce the same while no such respiratory depression occurred in tramadol. The incidence of vomiting is high with tramadol group 40% while 20% 20% each in butorphanol and morphine. Hence routine use of antiemetics is advisable after epidural opioids. The incidence of urinary retention is 28% with morphine while no such events occurred in other two groups.

CONCLUSION:

Morphine epidurally provides excellent long lasting pain relief compared to butorphanol and tramadol. The delayed onset of action of morphine epidurally compared to butorphanol and tramadol can be nullified by its administration epidurally within the two segment regression time. Morphine, **the queen of opioids** with respect to quality and duration of pain relief cannot be compared with any other opioids. Hence it remains the **gold standard opioid** for post operative analgesia epidurally.

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