ORIGINAL ARTICLE

Comparison of Tramadol and Butorphanol for Analgesic Efficacy and Safety

Neru Gupta, Smriti Anand, Smriti Gulati, Stya Dev Gupta, B B Kapoor

Abstract

The objective of the present study was to compare the analgesic efficacy and side effects of butorphanol and tramadol.Equianalgesic doses of butorphanol (1mg) and tramadol (1mg/Kg) were compared in 50 adult patients (ASA-I) undergoing any kind of surgery requiring general anesthesia. The patients were divided into two groups of 25 each (n = 25). One of the study drugs (butorphanol/tramadol) was given intravenously just prior to induction of anesthesia in a double blind fashion. Following induction with standard doses of propofol/thiopentone Na and succinyl choline and intubation, anaesthesia was maintained with N2O/O2/Halothane. Heart rate and blood pressure were recorded from preoperative to post operative period in the recovery room and the frequency of side effects was noted by the trained nursing staff on duty following direct questioning of the patients. The proportion of patients with moderate to severe pain during postoperative period was significantly higher in tramadol group as compared to butorphanol group ($p < 0.05$). Time to first rescue analgesic was significantly prolonged in butorphanol group compared to tramadol group. The incidence of side effects was comparable in both the groups.To conclude according to our study, butorphanol is a very effective analgesic and contributes to balanced anaesthesia.

Key Words

Butorphanol, Tramadol, General Anaesthesia, Analgesic

Introduction

Opioids are powerful centrally acting analgesic agents, used widely as a part of balanced anaesthesia. They act to smoothen the intraoperative course and decrease the requirement of other anaesthetic agents as well as to minimize post operative pain with minimum side effects (1). Butorphanol is mixed agonist – antagonist(1-5) opioid where as tramadol is an agonist at mu opioid receptors. The purpose of this study was to compare the analgesic efficacy and side effects of equipotent moderate doses of tramadol & butorphanol.

Material and Methods

After approval from departmental ethics committee and written informed consent from the patient, a randomized study was conducted on 50 adult patients (ASA I), planned for elective surgery under general anaesthesia. The patients were divided into two groups of 25 each. All patients were premedicated with standard doses of tablet diazepam and Injection glycopyrrolate. Two minutes before induction of anaesthesia equianalgesic doses of butorphanol(1 mg) or tramadol (1mg/Kg) were given to the patients intravenously in a double blind fashion. Induction of anaesthesia was done with either STP(5 mg/Kg) or propofol (2 mg/Kg) I/V followed by succinylcholine (2 mg/Kg) followed by tracheal intubation. Anaesthesia was maintained with 60% nitrous oxide in oxygen & halothane (titrated doses) and muscle relaxant neuromuscular blockade was reversed with neostigmine (0.04 mg/Kg) & atropine (0.02 mg/Kg) I/V.

From the Postgraduate Department of Anaesthesia & ICU Govt Medical College Jammu-J&K- India

Correspondence to : Dr. Satya Dev Gupta, Former Professor & Head , PG Deptt. of Anaesthesia, Govt. Medical College Jammu J&K

Ventilation was mechanically controlled through out the procedure. Arterial blood pressure (non-invasive), heart rate (non-invasive) & O2 saturation via pulse oximetery were measured before during & after anaesthesia at an interval of 5-10 minutes until stable in the recovery room. The frequency of side effects e.g. nausea, vomiting, sedation, respiratory depression, recall of events during surgery were noted by the trained nursing staff in the recovery room. Nausea & vomiting were graded according to four point scale 3 as 0-3. O is no N/V, 1 - nausea only, 2 - vomiting once in last hour & 3-vomiting more than once in last hour. Sedation score 2,6 was graded from 0-4. Grade 0 is no drowsiness, grade 1 is response to speech, grade 2 is response to touch, grade 3 is response to painful stimulus and grade 4 is unresponsiveness. Pain was also graded from 0-3 where grade 0 is comfortable, grade 1 is slight pain, grade 2 is moderate pain and grade 3 is equal to severe pain .Respiratory depression was noted from the pulse oximetery.Rescue analgesia was provided with standard doses of diclofenac intramuscularly to those with grade 2 or 3 pain. The data was analysed using Anova "t" test. p value < 0.05 was taken significant.

Results

The two groups were comparable with respect to age, weight and sex of the patients (Table-I). There was no pressor response seen after intubation in patients who received butorphanol where as pressor response was not attenuated in tramadol group (Table-II). The time to first rescue analgesic was significantly higher in butorphanol group than tramadol group. There were more number of patients who complained of moderate to severe pain in tramadol group than butorphanol group (Table-III). Post operative side effects were elicited by direct questioning of the patients (Table-IV). Incidence of nausea and vomiting was higher in butorphanol group than in tramadol group but it was statistically insignificant. Sedation (Group 3 & 4) was seen more in butorphanol group than tramadol group (about 10 patients of butorphanol group and 4 patients of tramadol group). There is a histogram summarizing various observations.

Table –I Base Line Characterstics

	Group-I	Group-II
Mean weight (Kg)	56.25	56.96
Age (Year)	52.4	51.6
Male:Female	14: 11	13 : 12

Table –II Haemodynamic Changes After Intubation

	Butorphanol	Tramadol	P Value
HR	80 + 5	100 + 30	< 0.05
SBP	130 + 5	150 + 20	< 0.05
DBP	80 + 5	100 + 30	< 0.05

Table –III Time to First Rescue Analgesic(TFRA) and Intensity of Pain

	Butorphanol	Tramadol	P Value
TFRA(Min)	180 + 40	150 + 30	< 0.05
Moderate–Severe pain	4 (16%)	14 (56%)	< 0.05

Table –IV Incidence of Post Operative Side Sffects

	Butorphanol	Tramadol	P Value
N/V4	(16%)	3 (12%)	> 0.05
Sedation10	(40%)	4 (16%)	< 0.05
Recall of events during surgery	Nil	1(4%)	< 0.05
Respiratorydepression	NiL	Nil	

Discussion

The basic difference between the two drugs is their characteristics to bind different opioid receptors of activate the same opioid receptor in a different way. Butorphanol is a mixed agonist antagonist (1,6). Butorphanol is a kappa receptor agonist as well as weak mu-receptor antagonist (1). Because of its antagonist action on mu receptors which are involved in supraspinal analgesia; it results in a low incidence of respiratory depression. Butorphanol has a ceiling effect on respiratory depression, again mediated by mu receptors. It is also a Kappa receptor agonist where as tramadol has a weak affinity on mu receptors as an agonist. It also enhances spinal pain inhibiting pathways by inhibiting neuronal uptake of serotonin.

In this study, we used equipotent moderate doses of each drug used routinely by most of anesthesiologists.Patients in butorphanol group demonstrated better protection against autonomic stimulation to tracheal intubation as

these patients were haemodynamically more stable through out the operation. This is consistent with previous reports by Pandit *et al (6)* & Philip *et al* (7) .Butorphanol leads to more sedation due to its action on kappa receptors (1), where as incidence of sedation is less in tramadol group. This property of sedation & efficient analgesia provided by butorphanol has been used in some minor out patient surgical procedure like oral surgery (8,9).

The rescue analgesia required in butorphanol group was far less than tramadol group because of longer duration of action.The enhancing action of tramadol on serotinin often contribute to occurence of emesis (10). The incidence of nausea and vomiting was not as high with butrophanol as reported by Pandit *et al* (6).Butorphanol does not increase the incidence of postoperative nausea and vomiting (9). Respiratory depression was not seen in any of the patients in both the groups.Neither patient in butorphanol group had any recall of procedure (11). Our study suggests that butorphanol is a better choice than tramadol for use in balanced anaesthesic technique because of it ability to produce prolonged analgesia and amnesia, stable haemodynamic parameters and no post operative respiratory depression.

Also butorphanol is effective for relieving postanesthesia shivering without producing any significant respiratory depression, nausia, vomiting or reccurrence of shivering (12-14).Moreover, butorphanol as the advantage of being non-narcotic and having a low propensity for addiction (5,15,16).Becuse o its potent analgesic effects, alternative routes of butorphanol have come up like caudal epidural (17), nasal (18) and aslo in labour analgesia (19).

Conclusion

Butorphanol is very effective and contributes to balanced anaesthesia.

References

1. Hammad usmani A Q. Comparison of butorphanol and Fentanyl for balanced anaesthesia in patients undergoing Laproscopic Cholecystectomy.*J Anaesth ClinPharmacol* 2004; 20:251- 54
2. Pircio AW, Gylys JA, Cavanaugh RL *et al*. The pharmacology of butorphanol, a 3,14 – dihydroxy morphinan narcotic antagonist analgesic. *Arch Int Pharmacodyn Ther* 1976; 220: 231 – 57.
3. RoscowCE. Butorphanol in perspective. *Acute Care* 1988; 12 : 2-7
4. Vandam LD . Butorphanol *N Eng J Med* 1980; 302; 381 –84.
5. Vogelsang J, Hayes SR Butorphanol tartarate (stadol) : a review. *J Pst Anaesth Nurs* 1991; 6: 129-35.
6. Pandit SK, Kothary SP. Comparison of fentanyl and butorphanol for outpatient.*Anaesthesia* 1987; 34:130 -34
7. Philip RK, Scott AD, Freiberger D, Gibbs RR *et al*. Butorphanol compared with fentanyl in general anaesthesia for ambulatory laproscopy. *Can J Anaesth* 1991; 38 :183 – 86.
8. Gutsteen HB, Akil H. Opioid analgesics. In Gilman AG, Hardman JG, Limberd (eds) . The Pharmacological basis of Therapeutics, 10 ed , New York, Macgraw Hill 2001.pp. 569-620.
9. Onake M, Yamamoto H. Comparison of analgesics used during balanced anaesthesia on the incidence of PONV. *Masui* 2004; 53: 161-6
10. Martin B, Bernd U, Utrike S, *et al* . Effects of Tramadol and circulating demethyl tramadol on human 5HT reuptake carriers and human 5HT 3 A receptors: A possible mechanism for tramadol induced early emesis. *Eur J Pharmacol* 2006 ; 531: 54-55
11. Sung YF, Weinstein MS. Balanced Anaesthesia : a comparison of butorphanol & morphine. *South Med J* 1984 ;77:180 - 82
12. Mishra D, Sinha H. Butorphanol in postanesthesia shivering. *Ind J Anaesth* 2005; 49 (6): 505-07.
13 Alfonsi P. Postanesthetic shivering : epidemology, pathophysiology and approaches to prevention and management. *Drugs* 2001; 61(15) ; 2193-205
14. Willian E. Postoperative shivering: causes , prevention and treatment. *Update Anesthesiology* 2002; 15: 3
15. Charlton E. The management of postoperative pain. *Update Anaesthesia* 1997; 7 : 1-17
16. Steg NL. Use of intramuscular butorphanol for the treatment of postoperative orthopedic pain in adolescents. *Clin Ther* 1988 ; 10: 406 -13.
17. Singh V, Kanaujia A, Singh GP. Efficay of caudal Butorphanol. *Ind J Pediatr* 2006; 73(2): 147-50.
18. Shyu WC, Morgenthien EA, Barbaiya RH. Pharmacokinetics of butrophanol nasal spray in patients with renal element. *Br J Clin Pharmacol* 1996; 41: 397-402.
19. Shrestha CK, Sharma KR, Shrestha RR. Comparative study of epidural administaration of 10 ml of 0.1 % Bupivacaine with butorphanol and 10 ml of 0.25 % plain bupivacaine for anelgesia during labour. *J NMA* 2005; 46(165): 1-6.