

# A comparative study of analgesic efficacy of fentanyl and butorphanol for adult tonsillectomies under general anesthesia

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## Abstract

**Background:** Relief of perioperative pain is a major concern for anaesthesiologists, surgeons, patient and relatives. Post-tonsillectomy pain is attributed to a combination of nervous irritation, inflammation, and spasm of the pharyngeal muscles. Acute postoperative pain after tonsillectomy surgery is an important factor as it causes many complications which can lead to morbidity, sometimes mortality also. Various analgesic drugs are in use for post tonsillectomy surgery and we plan to study fentanyl and butorphanol as analgesic for tonsillectomy. **Aims and Objectives:** To evaluate and compare efficacy of intravenous fentanyl and intravenous butorphanol intraoperative, and postoperative analgesia in tonsillectomy surgery. **Materials and Methods:** This study was done at Tertiary care hospital. ASA-I or II patients between 18-30 years of age, scheduled for Tonsillectomy surgery were randomly divided in two groups of 30 each. The patients receiving inj. Fentanyl(2mcg/kg) included in group A while-patients receiving inj. Butorphanol(40mcg/kg) included in group B for elective tonsillectomy under GA at time of induction for study purpose. Parameters recorded were Visual Analogue Scale(VAS), Pulse rate, Mean arterial pressure, Spo<sub>2</sub>, duration of surgery, duration of analgesia, need for rescue analgesia and complications. Statistical analysis was done by using SSEP 22 version. **Results:** Data so collected was statistically interpreted. During postoperative follow-up intervals Butorphanol showed little longer duration of analgesia but there was no difference in VAS scores compared to Fentanyl. 4 patients from butorphanol group and 2 patients from fentanyl group complained of nausea. **Conclusion:** Compared to fentanyl, butorphanol is more effective for post-operative analgesic in terms of duration in patients undergoing for tonsillectomy surgeries. **Key Word:** Analgesia, Butorphanol, Fentanyl, Pain, Tonsillectomy, VAS score

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## INTRODUCTION

Pain has been defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (International Association for the Study of Pain (IASP)

1986). Post-tonsillectomy pain is attributed to a combination of nervous irritation, inflammation, and spasm of the pharyngeal muscles. Acute post operative pain after tonsillectomy surgery is an important factor for post tonsillectomy Bleed which can lead to morbidity, sometimes mortality also. As pain increase patient hemodynamics may alter, irritability, nausea and vomiting hemorrhage, aspiration may occur. Various analgesic drugs are in use for post tonsillectomy surgery and we plan to study fentanyl and butorphanol as analgesic for tonsillectomy. Fentanyl Citrate Injection, is a potent opioid agonist. Fentanyl interacts predominately with the opioid mu-receptor but also binds to kappa and delta-type opioid receptors. These mu-binding sites are discretely distributed in the human brain, spinal cord, and other tissues. The principal actions of therapeutic value are analgesia and sedation. It has a rapid onset and effects generally last less

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than an hour or two. The analgesic effect of fentanyl is likely due to its metabolite morphine, which induces opening of G-protein-coupled inwardly rectifying potassium (GIRK) channels and blocks the opening of N-type voltage-gated calcium channels, thereby resulting in hyperpolarization and reduced neuronal excitability

**Butorphanol** is a morphinan-type synthetic agonist-antagonist opioid analgesic. Butorphanol blocks pain impulses at specific sites in the brain and spinal cord. The exact mechanism of action is unknown Butorphanol is a mixed agonist-antagonist that exerts antagonistic or partially antagonistic effects at mu opiate receptor sites, but is thought to exert its agonistic effects principally at the kappa and sigma opiate receptors The purpose of this study is to evaluate the efficacy of postoperative analgesia by butorphanol tartrate in comparison with fentanyl hydrochloride after tonsillectomy

### MATERIAL AND METHODS

After IEC approval all adult patients of ASA grade I and II admitted for elective Tonsillectomy surgeries with adequate starvation under GA included for the study. After thorough pre anesthetic checkup patient has been explained regarding procedure and after taking consent. After receiving the study subject in pre anesthesia room, the baseline parameters noted. The patients have been explained about VISUAL ANALOGUE SCALE. All the patients premedicated with injection ondansetron 4 mg iv, injection glycopyrolate 0.2 mg iv, injection midazolam 1mg iv, injection fentanyl 2 mcg /kg iv or injection butorphanol 40mcg/kg iv, and anesthesia induced with injection propofol 2mg/kg and injection vecuronium 0.08-0.1 mg/kg. After direct laryngoscopy and endotracheal intubation done with appropriately sized endotracheal tube, anesthesia was maintained with sevoflurane 0.5-1.5% along with oxygen and nitrous oxide in a ratio of 1:2. Inj vecuronium 0.1mg/kg repeated as it was required. Reversal of muscle relaxation was done with injection neostigmine 0.05 mg/kg and injection glycopyrolate 8mcg/kg. Intraoperative monitoring was done as per standard protocols. Vital parameters such as Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure SPO<sub>2</sub> and VAS score was monitored at 0min, 5min, 10min, 15min, 30min, 1hr, 2hr and 4hr, 6hr, 8hr, 10hr noted. Duration of analgesia is calculated as the time gap between the first injection of drug and subsequent dose on demand by patient. Duration of surgery was also recorded. Rescue analgesic in the form of injection Tramadol 50 mg intravenously will be given if VAS score is > 3. All the patients observed in post anesthesia recovery room and later in high dependency ward as per institutional protocol. A questionnaire prepared was filled

up as per response of patients and charts will be maintained.

**Group A:** receiving drug fentanyl(2mcg/kg) will be included in group A

**Group B:** receiving drug butorphanol(40mcg/kg) will be included in group B

#### Exclusion Criteria

1. Patient refusal for procedure.
2. Age <18yrs and >50yrs
3. ASA grade III and IV
4. Patient with known allergy to drugs to be used
5. Mentally retarded and who can not comprehend VAS score
6. Emergency surgery
7. Inadequate starvation

**Statistical Analysis for sample collection:** Minimum sample size

$$n = \frac{2(Z_{\alpha} + Z_{\beta})^2 \cdot \sigma^2}{\delta^2} = 30 \quad \text{where } \alpha = 5\%, \text{ power} = 80\%$$

Statistical analysis: The data was entered in microsoft excel data sheet and analysed using spss22 version software. Categorical data represented in form of frequencies and proportions. Chi-square test used to analyse qualitative data. Continuous data represented as mean standard deviation. Paired t-test wastest of significance for paired data. p-value<0.05 was considered significant.

### OBSERVATION AND RESULTS

Table 1: Demographic data

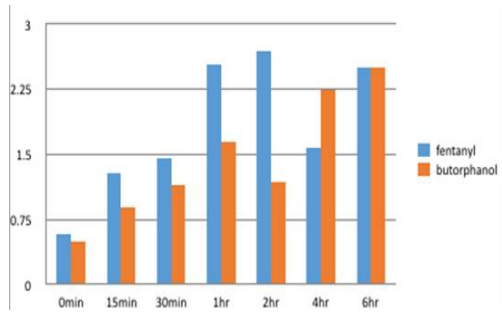
Variables	Group-A n-30	Group-B n-30	P value	significance
Age(year)	21.5±2.8	21.6 ±2.9	0.92	NS
Weight(kg)	57.5±4.8	56.38±4.6	0.3156	NS
ASA I/II	30/0	28/2	0.043	NS
Sex (male/female)	22/8	20/10	0.167	NS
Duration of surgery	33.83±7.15	35.33±7.30	0.153	NS

Demographic data was comparable with respect to Age, Weight, ASA physical status, Gender status and duration of surgery in both groups

**Pain Assessment:** Pain assessment was done by recording the intensity of pain in a fixed-intervals by using VAS and rescue analgesic drug was used injection tramadol 50mg. The mean VAS for fentanyl group was 91.47min and for butorphanol group was 101min with P value <0.05

Table 2: VAS scores at 1st hour and 2 nd hour

Fentanyl	2.5	0.572	0.104	6.3	0.001
Butorphanol	1.63	0.49	0.089		
Fentanyl	2.63	0.49	0.089	10.647	0.001
Butorphanol	1.2	0.551	0.101		



Graph 1: comparison of VAS scores in both the groups

The graph is drawn VAS score against duration for fentanyl and butorphanol.

## RESULT

There was no difference in VAS scores

Table 3: Rescue analgesic time

Group	Mean	SD	SEM	Unpaired t statistics	p value
Fentanyl	91.47	6.073	1.109	-5.473	0.001
Butorphanol	101	7.358	1.343		

Table 4: Complications

Adverse effects	Group A (n=30)	Group B (n=30)
Nausea	2	4
Vomiting	0	0
Respiratory depression	0	0
Abd pain	0	0

2 patients in fentanyl group and 4 patients from butorphanol group complained of nausea

## DISCUSSION

The present study included and compared two opioids - butorphanol and fentanyl as choice of analgesic for tonsillectomy surgeries. Butorphanol is used to treat moderate to severe acute pain. Butorphanol injection was approved in 1978. It is an agonist at kappa-receptor, but is a weak antagonist at mu-receptor<sup>3</sup>. Several clinical studies with the injectable form of butorphanol have shown its effectiveness in relieving moderate-to-severe postoperative pain. Fentanyl was discovered in 1960 by Paul Janssen. It predominantly acts at Mu receptor<sup>9, 10</sup>.<sup>11</sup> Since the study used identical protocols, the results obtained were comparable. A combined analysis of the trial was valid. The aim of this study was to know the efficacy of butorphanol in comparison with fentanyl with regard to postoperative pain. The patient's age, gender, weight, duration of surgery was statistically not significant in two groups. Therefore, the effect of age, gender, weight, and duration of surgery would be minimized. Many of the earlier studies have used varying doses of butorphanol (20 µg/kg-40 µg/kg) and fentanyl (1-3 µg/kg). The study shows that butorphanol provides a little longer duration of analgesia than fentanyl. Pandit *et al* compared butorphanol

40 µg/kg with fentanyl 2 µg/kg and reported a higher incidence of pain in the fentanyl group and more drowsiness in the butorphanol group. 40% of patients in each group required anti-emetic therapy. Hammad Usmani compared the same doses of butorphanol and fentanyl, but the incidence of drowsiness was not significantly different in both groups<sup>6</sup>. In a study conducted by Wetchler, he compared Butorphanol 20 µg/kg, butorphanol 40 µg/kg, and fentanyl 2 µg/kg and concluded 20 µg/kg butorphanol and 2 µg/kg of fentanyl appear to be suitable to use as a pre-induction narcotic analgesic<sup>7</sup>. Whereas Butorphanol 40 µg/kg appears to be unsuitable due to increased duration of nausea, dizziness, time to reach a score of 10 on APARS and discharge-ready status. Patients in the Butorphanol group showed significant levels of sedation, for the first half hour none of the patients had any episode of desaturation (SpO<sub>2</sub> <95%) and did not require any further intervention. This may be due to the kappa agonist effect of butorphanol. Usmani *et al* found that the incidence of drowsiness in the fentanyl group was as comparable as in the butorphanol group<sup>6</sup>. Ahire SS *et al.* study during the first 30 minutes in the postoperative period, patients receiving butorphanol had not complained of any pain whereas the mean VAS score was 3.13 in patients receiving fentanyl. Seventeen out of 30 patients (56%) required rescue analgesia in group F while no one from group B required rescue analgesia in the first half hour postoperative period and the VAS score was found to be lower in group B when compared with group F till 1 hour postoperatively<sup>2</sup>. Post-operative side effects were compared in both groups. In our study 4 patients in the butorphanol group complained of nausea and 2 patients in the fentanyl group. Findings of Pandit *et al* also demonstrated that nausea and vomiting were the most common side effects in 55% of patients in the butorphanol group and 61% in the fentanyl group. Thus, in the present study, results suggested that butorphanol is an acceptable alternative opioid to fentanyl for its use as an analgesic for tonsillectomy surgeries.

## CONCLUSION

On the basis of the present study, both fentanyl and butorphanol were found to be safe and comparable as analgesics in patients posted for tonsillectomy surgeries, though butorphanol showed better results for the duration of analgesia but with no difference in VAS scores.

## REFERENCES

- Stanley, T. H. (1992). *The history and development of the fentanyl series*. *Journal of Pain and Symptom Management*, 7(3), S3-S7. doi:10.1016/0885-3924(92)90047-1
- Ahire SS, Laheri V. Study to compare the effect of equipotent dose of butorphanol versus fentanyl on intraoperative anaesthesia course and postoperative recovery

- characteristic in patient undergoing laparoscopic surgery. *Int J Res Med Sci* 2016; 4: 3838-44.
3. Fricke Jr JR, Hewitt DJ, Jordan DM, Alan Fisher, Rosenthal NR. A double-blind placebo-controlled comparison of tramadol/ acetaminophen and tramadol in patients with postoperative dental pain. *Pain* 2004;109: 250-25
  4. Silver S. Balanced anaesthesia. *J Am Dent Soc Anesthesiol.* 1959;6(7):11.
  5. Pandit SK, Kothary SP, Pandit UA, Mathai MK. Comparison of fentanyl and butorphanol for outpatient anaesthesia. *Can J Anaesth.* 1987; 34:130-4.
  6. Usmani H, Quadir A, Jamil SN, Bahl N, Rizvi A. Comparison of Butorphanol and fentanyl for balanced anaesthesia in patients undergoing laparoscopic cholecystectomy. *Journal of Anaesthesia and Clinical Pharmacology.* 2004; 20: 251-4.
  7. Wetchler BV, Alexander CD, Shariff MS, Gaudzels GM. A comparison of recovery in outpatients receiving fentanyl versus those receiving Butorphanol. *Journal of Clinical Anesthesia.* 1989;1(5):339-43.
  8. Philip BK, Scott DA, Freiberger D, Gibbs RR, Hunt C, Murray E. Butorphanol compared with fentanyl in general anaesthesia for ambulatory laparoscopy. *Canadian Journal Anaesthesia.* 1991; 38: 183-6.
  9. Rosow CE. Butorphanol in perspective. *Acute care* 1988; 12(suppl 1): 2-7.
  10. Jaffe JH, Martin WR. Opioid analgesics and antagonists. In: Gilman AG, Goodman LS, Rail TW, Murad F (Eds.). *The Pharmacological Basis of Therapeutics*, 7th ed., New York: MacMillan Publishing Co., 1985, 491-531.
  11. Fine J, Finestone SC. A comparative study of the side effects of butorphanol, nalbuphine and fentanyl. *Anesthesiology Review* 1981; 8(9): 13-7.

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