

# Comparison of the Efficacies of Ketamine and Fentanyl on Prevention of Early Post-Operative Pain After Tonsillectomy

## Tonsillektomi Sonrası Erken Post-Operatif Ağrının Önlenmesinde Fentanil ve Ketamin Etkinliğinin Karşılaştırılması

### Hafize Öksüz

Asst. Prof., M.D.  
Department of Anesthesiology and Reanimation  
Sütçü İmam University Medical Faculty  
drhoksuz@hotmail.com

### Nimet Şenoğlu

Asst. Prof., M.D.  
Department of Anesthesiology and Reanimation  
Sütçü İmam University Medical Faculty  
nimetsenoglu@hotmail.com

### Zafer Doğan

Asst. Prof., M.D.  
Department of Anesthesiology and Reanimation  
Sütçü İmam University Medical Faculty

#### Abstract

**Purpose:** In this study, we aimed to compare the efficacies of ketamine and fentanyl administered intramuscularly to prevent early post-operative pain in pediatric patients undergoing tonsillectomy.

**Material and Methods:** Forty children were randomly divided into two groups (Group K and F). Following routine anesthetics administration, Group K was treated with 0.5 mg/kg intramuscular (i.m.) ketamine whereas group F was treated with 1 mcg/kg i.m. fentanyl. Patients were monitored for the parameters including pain scores, postoperative analgesic requirements and possible adverse effects.

**Results:** There were no statistically significant difference between the Group K and Group F for the demographic findings and pain scores but ketamine gave rise to prolonged sedation and side effects.

**Conclusion:** We found that ketamine and fentanyl had similar analgesic potency when administered with i.m. route whilst ketamine caused prolonged sedation. We believe that IM fentanyl administration can be a good alternative to ketamine in early post-operative pain management after tonsillectomy.

Key Words: **Fentanyl; Ketamine; Pain, Postoperative; Tonsillectomy.**

#### Özet

**Amaç:** Bu çalışmada, tonsillektomi operasyonu planlanan olgularda postoperatif erken dönem ağrının önlenmesinde intramüsküler uygulanan fentanil ve ketamin etkinliğinin karşılaştırılması amaçlandı.

**Gereç ve Yöntemler:** Kırk çocuk hasta, rastlantısal olarak olarak 2 gruba ayrıldı (Grup K ve F). Rutin anestezi uygulamasını takiben, Grup F'de bulunan çocuklara 1mcg/kg im fentanil verilirken Grup K'da bulunan çocuklara 0.5 mg/kg im ketamin verildi. Hastalar, olası yan etkiler ve postoperatif analjezik gereksinimi, ağrı skorlarını içeren parametreler yönünden takip edildi.

**Bulgular:** Demografik veriler ve ağrı skorları için Grup K ve Grup F arasında anlamlı fark yoktu, ancak ketamin grubunda yan etkiler ve sedasyonda uzama vardı.

**Sonuç:** Ketamin sedasyonda uzamaya neden olurken im uygulandığında ketamin ve fentanilin benzer analjezik etkinliği bulundu. Tonsillektomi sonrası erken postoperatif ağrı tedavisinde im fentanil uygulanmasının iyi bir alternatif olacağı kanısındayız.

Anahtar kelimeler: **Ağrı, Postoperatif; Ketamin; Fentanil; Tonsillektomi**

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#### Corresponding Author:

Dr. Hafize Öksüz,  
Department of Anesthesiology and Reanimation  
Sütçü İmam University Medical Faculty  
Kahramanmaraş, Turkey

Telephone: +90- 0344 2212337  
E- mail: drhoksuz@hotmail.com

## Introduction

Pain provoked by swallowing is the main postoperative complaint after tonsillectomy in children (1). This complaint give rise to inadequate oral intake, vomiting, dehydration and fever. Although the utilization of modern electrodissection techniques has virtually eliminated immediate postoperative hemorrhages, they may cause more local inflammation, edema, nerve irritation and laryngeal muscle spasm and hence more pain and discomfort during swallowing (2). A smooth awakening and rapid recovery to consciousness and the return of protective airway reflexes are desirable after tonsillectomy in children in order to prevent bleeding and aspiration (3). The prevention of bleeding and aspiration after tonsillectomy in children can be achieved by smooth awakening and rapid recovery to consciousness and the return of protective airway reflexes.

Ketamine, which is an N-methyl-D-aspartate (NMDA) channel blocker (4), greatly alleviates provoked pain by preventing postoperative hyperalgesia. Ketamine reduces the severity of pain caused by swallowing in glossopharyngeal neuralgia. NMDA receptors may play a significant role in the pathogenesis of the previous pain syndrome (5).

Post-operative pain after tonsillectomy is a highly encountered problem in spite of massive and pre-operative Nonsteroid Antiinflammatory Drug (NSAID) administration (6). There are a lot of clinical protocols about the early period pain management after tonsillectomy (and/or adenoidectomy) in children but evidences about their efficacies are insufficient (7). Administered NSAIDs increase the risk of bleeding in the post-operative period (8) and opioids have the effects such as respiratory depression or prolonged sedation (9).

The aim of this study was to compare the analgesic efficacies of IM ketamine and fentanyl on prevention of early post-operative pain in children undergoing tonsillectomy operation under standardized general anesthesia.

## Materials and Methods

Following institutional review board approval, and after obtaining written parental informed consent, 40 children were scheduled for elective tonsillectomy. Forty children aged between 3 and 10 years old with American Society of Anesthesiology (ASA) physical I or II, were randomly divided into two groups named K and F. Cases with the

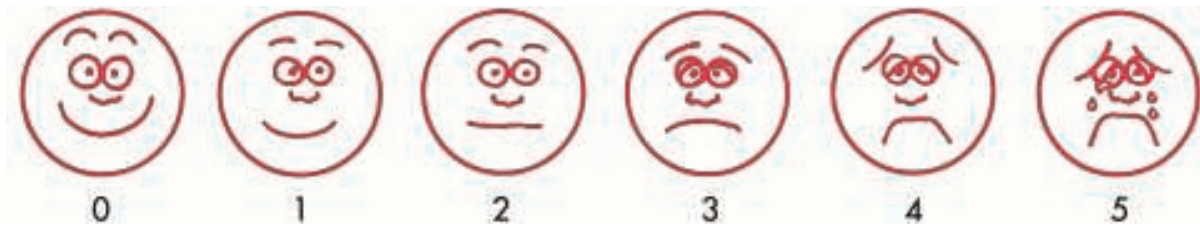
history of drug sensitivity were excluded from the study. Premedication was not applied for the cases and they were intravenously cannulized on dorsal side of their hands after EMLA (%5 cream- eutectic mixture of local anesthetics, lidocaine and prilocaine; Astra Pharma, Laboratoire ASTRA, Manterre, France) cream application in the recovery room. All cases were anesthetized with standard procedure (1 mg.kg<sup>-1</sup> lidocaine, 1.5-2 mg.kg<sup>-1</sup> propofol and 1.5-2.5% MAC (Minimum Alveolar Concentration) Sevoflurane in 50% O<sub>2</sub>-N<sub>2</sub>O, intubation with 1.5 mg.kg<sup>-1</sup> succinylcholine) and then cases in the K group were given 0.5 mg.kg<sup>-1</sup> ketamine and F group 1 mcg.kg<sup>-1</sup> fentanyl IM before the surgical procedure began. Patients were observed by another anesthesiologist who was not involved in the study), in the recovery room "regarding the time after extubation as basis" after the termination of the surgical procedure and monitored for the parameters such as hemodynamic variables, pain scale (with Wong-Baker FACES Pain Rating Scale. Fig.1), recovery period, post-operative analgesic requirements and possible side effects (10). Patients' eyes openings in response to verbal stimuli were recorded as recovery time. Patients with pain scale 4 or more were treated with rectal 10 mg.kg<sup>-1</sup> paracetamol (without phenobarbitale).

Since demographic data of the cases, operation time, recovery period, post-operative pain mean values did not follow a normal distribution we used the nonparametric Mann Whitney U test for intergroup comparisons. Chi-Square (x<sup>2</sup>) test was used for statistical analysis of differences regarding gender with side effects. P values appropriate for these tests were determined. P<0.05 was accepted as statistically significant.

## Results

There were no statistically significant differences between the groups for demographic data, operation time and period (p>0.05). However, mean recovery time period of group K was significantly longer than group F (p<0.001; Table I). There were no statistically significant differences between groups for the mean pain scores evaluated at four different time points (p>0.05; Table II).

Ketamine had effects such as prolonged sedation and side effects. In the recovery room, hallucination, agitation and increased secretion were noted in some cases of group K (hallucination 6/20, agitation 8/20, increased secretion 11/20) but not in those of group F. We did not detect any respiratory problem in our cases treated with fentanyl.



**Figure 1.** Wong-Baker FACES Pain Rating Scale.

**Table 1-**Comparison of the demographic data, operation and recovery periods of the cases.

GROUP	Age (year)	Gender (M/F)	Weight (kg)	Length (cm)	Operation Time (min)	Recovery Time (min)
Group K	6.10±1.97 (3-10)	16/4	22.35±4.29 (12-27)	118.55±10.74 (82-134)	58.25±23.27	21.15±2.54
Group F	6.15±2.25 (3-10)	15/5	20.35±6.21 (11.5-28)	117.45±12.91 (84-138)	59.65±17.66	12.45±2.86
p values	>0.05	>0.05	>0.05	>0.05	>0.05	<0.001

**Table II.** Pain scores with respect to time after extubation.

GROUP	Pain scores with respect to time after extubation			
	After 30 min.	After 60 min	After 120 min	After 240 min
Group K	2.00±0.65	2.35±0.59	3.20±0.69	4.05±0.76
Group F	1.80±0.62	2.05±0.69	3.25±0.72	3.95±0.83
P values	0.461	0.211	0.820	0.718

## Discussion

Tonsillectomy is one of the most frequently performed surgical procedures in childhood having various morbidities including pain, bleeding (11). Post-operative pain following tonsillectomy is a common problem even in the cases treated with NSAIDs. There are various clinical protocols for the early post-operative pain management of children undergoing tonsillectomy and/or adenoidectomy, the evidences for their efficacies are not enough. NSAIDs along with ketamine and opioids have been used for analgesic purposes. NSAIDs may give rise to post-operative bleeding, ketamine to increased secretion, hallucinations, bad trips and agitation and also opioids to respiratory depression (12).

In our study, we investigated the analgesic effectiveness of IM ketamine and fentanyl following tonsillectomy and evaluated pain at four different time points postoperatively. Although no significant difference was found between

pain levels, ketamine caused prolonged sedation. Fentanyl is a short acting, low molecular weighted opioid analgesic which is 75 -100 times more potent than morphine and can be administered transdermally and intramuscularly because of its prominent solubility in lipids. Analgesic efficacy and furthermore elimination half-life of parenteral fentanyl is shorter (13). With the light of these data, we investigated to administer IM fentanyl after tonsillectomy for analgesic purposes. Although there were a lot of reports regarding the various administration routes of fentanyl (7,14-16), as far as we know, its IM route was not studied sufficiently. Although morphine have the effects such as respiratory depression or prolonged sedation (9,12), we did not note any respiratory problem in our cases treated with fentanyl, which is consistent with literature. There are criticisms about morphine because of its long acting period, prolonged recovery period and its potential for nausea and vomiting and search for alternatives are in progress (17). Fentanyl may be an alternative for morphine because of its short acting characteristics.

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