

Covering the tonsillar fossa with mucosal flaps: A different method for reducing pain after tonsillectomy

Tonsil lojunun mukozal fleplerle örtülmesi: Tonsillektomi sonrası ağrıyı azaltmada farklı bir yöntem

Cevat Uçar¹, Ömer Sağlam²

¹Department of Otolaryngology, Türkiye Hospital, Istanbul, Türkiye

²Department of Otolaryngology, Kasımpaşa Naval Hospital, Istanbul, Türkiye

ABSTRACT

Objectives: In this study, it was aimed to reduce pain morbidity and provide early return to social life through early oral feeding by covering the tonsillar fossa with mucosal flaps during tonsillectomy.

Patients and Methods: This randomized controlled trial was conducted with a total of 231 patients (160 males, 71 females; mean age: 9.7±9.1 years; range, 2 to 57 years) who underwent tonsillectomy between April 2012 and April 2019. Patients were divided into two groups: the study group (n=158; 105 males, 53 females; mean age: 9.1±9.2 years; range, 2 to 57 years), in which tonsillectomy with the classic cold knife technique and covering the tonsillar fossa with mucosal flaps was performed, and the control group (n=73; 55 males, 18 females; mean age: 10.9±8.8 years; range, 2 to 51 years), in which tonsillectomy with the classic cold knife technique was applied. Postoperative pain complaints, painless nutrition, and operation time were evaluated.

Results: The mean operation time was 46 min in the study group and 38 min in the control group. A statistically significant difference was observed between the groups in mean operation time, postoperative pain, and painless nutrition (p<0.001). No significant complications were observed in both groups.

Conclusion: Tonsillectomy by covering the tonsillar fossa with mucosal flaps method significantly decreased postoperative pain and facilitated painless nutrition.

Keywords: Mucosal flaps, postoperative pain, surgery, tonsillectomy.

ÖZ

Amaç: Bu çalışmada, tonsillektomi sırasında tonsil loju mukozal fleplerle kapatılarak ağrı morbiditesinin azaltılması ve erken oral beslenme ile sosyal hayata erken dönüşün sağlanması amaçlandı.

Hastalar ve Yöntemler: Bu randomize kontrollü çalışma, Nisan 2012-Nisan 2019 tarihleri arasında tonsillektomi yapılan toplam 231 hasta (160 erkek, 71 kadın; ort. yaş: 9.7±9.1 yıl; dağılım, 2-57 yıl) ile yürütüldü. Hastalar iki gruba ayrıldı: klasik soğuk bıçak tekniği ile tonsillektominin yapıldığı ve tonsil lojunun mukozal fleplerle kapatıldığı çalışma grubu (n=158; 105 erkek, 53 kadın; ort. yaş: 9.1±9.2 yıl; dağılım, 2-57 yıl) ve klasik soğuk bıçak tekniği ile tonsillektominin uygulandığı kontrol grubu (n=73; 55 erkek, 18 kadın; ort. yaş: 10.9±8.8 yıl; dağılım, 2-51 yıl). Ameliyat sonrası ağrı şikayetleri, ağrısız beslenme ve ameliyat süresi değerlendirildi.

Bulgular: Ortalama ameliyat süresi çalışma grubunda 46 dk, kontrol grubunda 38 dk idi. Ameliyat süresi ortalaması, ameliyat sonrası ağrı ve ağrısız beslenme açısından gruplar arasında istatistiksel olarak anlamlı bir fark bulundu (p<0.001). Her iki grupta da bir komplikasyon gözlenmedi.

Sonuç: Tonsil lojunun mukozal fleplerle örtülmesi yöntemiyle yapılan tonsillektomi, ameliyat sonrası ağrıyı azalttı ve hastaların normal diyetle beslenmesini kolaylaştırdı.

Anahtar sözcükler: Mukozal flepler, ameliyat sonrası ağrı, cerrahi, tonsillektomi.

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Correspondence: Cevat Uçar, MD. Türkiye Hastanesi Kulak Burun Boğaz Kliniği, 34381 Şişli, İstanbul, Türkiye.
e-mail: hcucar@yahoo.com

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Tonsillectomy with or without adenoidectomy is one of the most common surgical procedures performed by otolaryngologists in children for obstructive sleep apnea and recurrent tonsillitis.^[1,2] There are many different surgical techniques for the resection of tonsillar tissue. The purpose of developing different surgical techniques is to prevent or reduce morbidity and complications associated with surgery. Various criteria such as pain, duration of surgery, wound healing, time to return to normal activity, postoperative otalgia, dysphagia, bleeding status, cost effectiveness, and patient and physician preferences are important in selecting the surgical method.^[3,4]

Pain after tonsillectomy, bleeding, infection in the tonsil area, dysphagia, otalgia, and voice and speech disorders are common symptoms after tonsillectomy. Pain after tonsillectomy is observed in almost all cases. It occurs most frequently on the third postoperative day, decreases from the fourth day, and lasts for more than seven days.^[5] In this study, tonsillectomy was performed with a mucosal flap method to ensure an early return to social life through early oral feeding and to improve patient comfort by reducing the morbidity of pain occurring after tonsillectomy.

PATIENTS AND METHODS

This randomized controlled trial was conducted with 231 patients (160 males, 71 females; mean age: 9.7 ± 9.1 years; range, 2 to 57 years) who underwent tonsillectomy between April 2012 and April 2019. The study was prospectively conducted in multiple centers. Patients with bleeding disorders, systemic diseases, and adenoid hypertrophy were excluded

from the study. Patients were divided into two groups: the study group ($n=158$; 105 males, 53 females; mean age: 9.1 ± 9.2 years; range, 2 to 57 years), in which tonsillectomy with the classic cold knife technique and covering the tonsil area with mucosal flaps was performed, and the control group ($n=73$; 55 males, 18 females; mean age: 10.9 ± 8.8 years; range, 2 to 51 years), in which tonsillectomy with the classic cold knife technique was applied.

Surgical procedure

All patients were operated on under general anesthesia in Rose's position. After endotracheal intubation, the patient's face was covered so that the nose and mouth were open. The Davis-Meyer mouth gag was used for mouth opening.

The tonsil was pulled to the midline with a clamp. The anterior plica mucosa covering the tonsil tissue was cut with a no. 12 scalpel at the border of the tonsillar crypts (Figure 1). The tonsil was elevated to the base of the tongue with sharp and blunt dissections in a plane between the tonsillar capsule and the pharyngeal muscles. The posterior tonsillar mucosa was carefully dissected from the tonsillar capsule at the tonsil crypt border.

Anterior and posterior mucosal flaps were obtained by protecting the anterior and posterior plica mucosa (Figure 2). After the bleeding was stopped, the anterior mucosal flap was pulled as far as possible and sutured to the tonsillar fossa with a sharp-needled, absorbable 4/0, Pegelak suture (Doğsan, İstanbul, Türkiye). Subsequently, the posterior mucosal flap was sutured by passing the edges of the anterior mucosal flap. The tonsillar fossa was completely

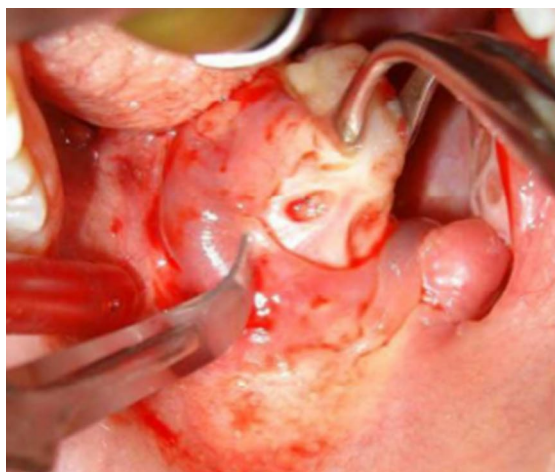


Figure 1. Anterior plica mucosa covering the tonsil tissue is cut with a no. 12 scalpel from the joint location of tonsil crypts.

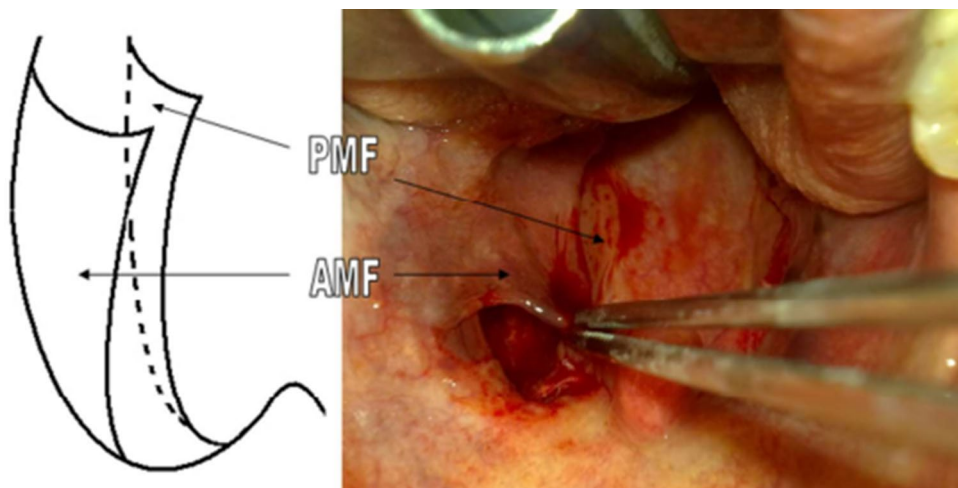


Figure 2. Anterior (glossopharyngeal) mucosal flap and posterior (palatopharyngeal) mucosal flap are obtained to cover the tonsillar fossa after tonsillectomy.

PMF: Posterior mucosal flap; AMF: Anterior mucosal flap.

covered with both flaps, secured to the tonsillar fossa, and sutured, taking care not to stretch (Figure 3).

In the control group, the anterior plica mucosa was cut with a no. 12 scalpel without the injection of drugs into the tonsillar fossa. It was removed from the tonsillar fossa with the tonsillar capsule by sharp and blunt dissections between the tonsillar capsule and the pharyngeal muscles. After the bleeding was stopped, the operation was terminated by leaving the tonsillar fossa for secondary healing. The timing of surgery was determined from the application of the oral gag to the last suture in the study group and to the end of bleeding control in the control group.

No patient bled during or after surgery. All patients were prescribed 10 mg/kg/day of acetaminophen suspension and 40 mg/kg/day of amoxicillin clavulanic acid, and they were discharged from the hospital the same day after surgery. The patients took their medications for seven days after surgery.

Patients in each group were started on oral nutrition at postoperative 3 h. Patients were advised to consume ice cream, cold drinks and soft foods for the first three days. They were advised to eat normal food if they had no pain on the third day. Patients' pain was assessed even though they were taking acetaminophen suspensions. Patients or their parents were instructed

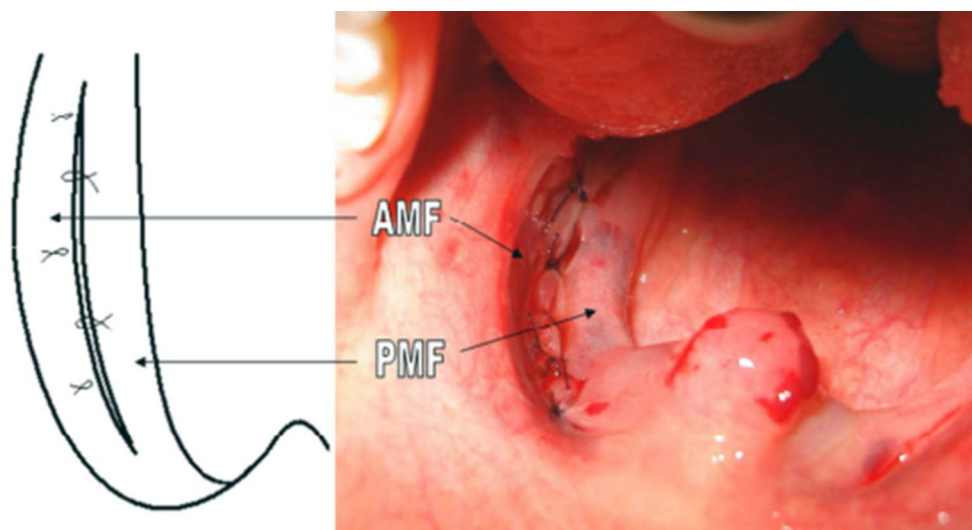


Figure 3. The anterior mucosal flap is sutured to the tonsillar fossa, and then the posterior mucosal flap is sutured to the tonsillar fossa and to the anterior mucosal flap.

PMF: Posterior mucosal flap; AMF: Anterior mucosal flap.

to note the day with the most pain, the day the pain stopped, and the day they started the pain-free diet. Their follow-up examinations were performed on the 3rd, 7th, and 10th postoperative days. They were assessed for pain duration, survey, and Visual Analog Scale scoring. The results were collected from the patients on the 10th day. The final checks were performed at the end of the third month.

Statistical analysis

Data were analyzed using SPSS version 13.0 software (SPSS Inc., Chicago, IL, USA). Continuous variables were reported as mean \pm standard deviation (SD), and categorical variables were expressed as frequencies and corresponding percentages. A t-test was used to analyze the parametric data. A *p* value <0.05 was considered statistically significant.

RESULTS

There was no statistically significant difference between the control and study groups in terms of age and sex ($p=0.836$). The mean operation time was 46.3 ± 5.9 min in the study group and 38.3 ± 4.3 min in the control group. There was a statistically significant difference between the groups in operation time (approximately 8 min longer in the study group than in the control group; $p<0.001$).

In the postoperative period, pain ended after 4.0 ± 0.8 days in the study group and after 7.2 ± 1.2 days in the control group. The difference was statistically significant ($p<0.001$).

Postoperative pain was most severe on day 3.0 ± 0.4 in the study group and day 3.3 ± 0.8 in the control group. There was no statistically significant difference between the groups in terms of the day on which pain was most severe ($p=0.228$).

The day on which the pain-free diet started was 4.3 ± 1.1 in the study group and 7.5 ± 1.1 in the control group. There was a statistically significant difference between the control group and the study group in terms of postoperative pain-free diet ($p<0.001$).

DISCUSSION

Tonsillectomy is one of the oldest and most commonly performed surgeries in the world, first performed by the Roman physician Cornelius Celsus about 2000 years ago (by crushing the inflamed tonsils with the fingers).^[1-6] In classical tonsillectomy, the tonsils are removed with the capsules by dissection between the tonsillar capsule and the superior and medial pharyngeal constrictor muscles. However,

some surrounding mucosa and muscle tissues are usually removed along with the tonsils so that no residual tonsil tissue remains during surgery.^[7-9]

After tonsillectomy, the tonsillar fossa is usually left for open wound healing without primary closure. During the healing process (wound closure with granulation tissue and scar), the surface of the tonsillar fossa is in contact with oral pathogens and food for a long time.^[10-12] The exposed muscle fibers cause postoperative complications.^[9]

Pain, such as sore throat and earache, occurs in all patients.^[13,14] Irritation of sensory nerve endings, spasm of pharyngeal muscles, and surgical techniques play an essential role in pain mechanisms. Physical and chemical irritation of the tonsils, irritation of sensitive branches of the vagus and glossopharyngeal nerves, tension in the nerves due to edema, infection in the tonsil area, pharyngeal muscle injury and spasm, torn mucosa, posterior plica injury, excessive use of cautery, tissue necrosis, and ischemia cause pain. The incidence of postoperative pain increases with age.^[13-17]

Postoperative pain reduces oral fluid intake, increasing the risk of dehydration in patients. If oral fluid intake is not corrected, hospitalization for intravenous fluid replacement may be required. Postoperative pain presents a social and emotional challenges for the patient and family members, such as anxiety, irritability, and discomfort. Pain limits the patient's respiratory effort and is a predisposing factor for pulmonary complications.^[18-22] Therefore, medical applications and surgical techniques have been developed to reduce postoperative pain, limited activity, and morbidities, such as bleeding and dehydration.^[4,5]

Postoperative pain can be controlled by the administration of analgesics. Paracetamol provides postoperative analgesia but is inadequate for many patients. Nonsteroid anti-inflammatory drugs increase the risk of postoperative bleeding and platelet dysfunction, and opioids have side effects such as respiratory depression, nausea, and vomiting.^[23,24]

Various methods have been developed to reduce postoperative morbidities, such as cold dissection, guillotine, monopolar and bipolar dissection, bipolar scissors dissection, laser tonsillectomy, cryosurgery, ultrasonic scalpel, microdebrider, coblation, thermal welding, and plasma knife tonsillectomy. Despite the widespread use of cold dissection techniques, there is no single technique worldwide that is universally preferred among the other techniques.^[4]

Saengpanich et al.^[25] suggested that the pain associated with tonsillectomy is due to inflammation and exposed nerve endings and persists until the

inflamed muscle tissue is covered by the mucosa. They compared radiofrequency and conventional tonsillectomy and found no difference between the two techniques in terms of pain or otalgia. Parsons et al.^[26] compared ultrasonic knife, electrocautery, and coblation in 134 patients and found that coblation was less painful (pain ceased 10 days after tonsillectomy) and that similar pain occurs with electrocautery. With the coblation method, they showed a faster transition to a normal diet. Philpott et al.,^[27] in a study of 92 adult patients, demonstrated that coblation caused more pain compared to cold dissection and did not provide symptomatic benefit to patients. Oko et al.^[28] studied a group of 122 pediatric patients and found that pain from the harmonic scalpel was more severe compared to blunt dissection with bipolar cautery.

Consistent with the literature, we found that pain was most severe on average on the third day in both the study and control groups. There was no statistical difference between the study and control groups. Postoperative pain was significantly less by the technique of covering the tonsil area with mucosal flaps compared to blunt dissection with a cold knife. After the day with the most severe pain, pain decreased more rapidly in the study group compared to the control group. The time to the onset of the pain-free diet was significantly earlier in the study group than in the control group. However, the operation time was significantly shorter in the control group. The preparation of the flaps and the covering of both tonsil areas by suturing the flaps were considered to be the cause of this loss of time during surgery.

Bercin et al.^[29] found that delayed food intake due to postoperative pain was higher in 95 patients operated with bipolar cautery compared to classical dissection tonsillectomy. Ayanoğlu Aksoy et al.^[30] applied adenotonsillectomy with thermal welding in 23 pediatric patients and found that there was no difference in postoperative pain compared to the cold knife method. Lachanas et al.,^[31] in a study of 200 adult patients, found that pain was less and operative time was shorter with ligasure tonsillectomy compared to cold knife tonsillectomy.

In conclusion, new techniques and devices for tonsillectomy shorten the operation time and reduce bleeding; however, there is no difference between cold knives and our technique of covering the tonsillar fossa with mucosal flaps in terms of pain. Surgical pain periods are less severe and last shorter with our technique, and patients start a normal diet earlier than those operated with a cold knife. Our surgical technique is cost effective since no additional medical equipment is needed. However, the surgery takes longer than the

classical methods, and we believe that this time will decrease as surgeons' experience in suturing the mucosa increases.

Ethics Committee Approval: The study protocol was approved by the Cerrahpaşa Medical Faculty, Istanbul University Ethics Committee (date/no: 2012/B.30.2.D ST.0.30.90.00/10206). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from the parent of each patients.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Concept, design, supervision, analysis, writing, critical reviews: C.U.; Resource, materials, data collection, literature search, writing, critical reviews: Ö.S.

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