

# Efficiency of Repetitive Topical Corticosteroid Embedded Nasopore Tamponing on Wound Healing After Endoscopic Sinus Surgery

Umit TASKIN\*, Kadir YUCEBAS\*\*, Sahin OGREDEN\*\*\*,  
Mehmet ERDİL\*\*\*\*, Mehmet Faruk OKTAY\*\*\*\*\*,  
Necip Ozan TIRYAKIOGLU\*\*\*\*\*, Abdullah Yüksel BARUT\*\*\*\*\*

## Abstract

**Aim:** We aimed to maximize the efficiency of topical steroid use in the sinus cavity by application for an extended duration after endoscopic sinus surgery. We also evaluated the efficiency of repetitive application of a topical steroid through the sinus cavity directly on wound healing and earlier postoperative complications.

**Method:** Thirty-five patients who underwent bilateral endoscopic sinus surgery were included in our study. Upon completion of the surgery, randomly, one side of the middle meatus was packed with NasoPore, embedded with a nasal steroid (budesonide 0.5µg/2ml), plus antibiotic cream, and the other side was packed with NasoPore embedded with only antibiotic cream. All the patients were scheduled for follow-up visits at 1, 2, 4, 8, and 12 weeks after surgery for the assessment of outcome measures.

## Özgün Araştırma Makalesi (Original Research Article)

**Geliş / Received:** 26.12.2017 & **Kabul / Accepted:** 31.01.2018

\* Assoc. Prof. Dr., Istanbul Gelisim University, School of Health Sciences, Istanbul, Turkey,

E-mail: [utaskin@gelisim.edu.tr](mailto:utaskin@gelisim.edu.tr) [ORCID ID https://orcid.org/0000-0002-1696-9081](https://orcid.org/0000-0002-1696-9081)

\*\* Assist. Prof. Dr., Bagcilar Education and Research Hospital, Otorhinolaryngology Department, Istanbul, Turkey, E-mail: [drkykbb@gmail.com](mailto:drkykbb@gmail.com) [ORCID ID https://orcid.org/0000-0002-7159-4307](https://orcid.org/0000-0002-7159-4307)

\*\*\* Op. Dr., Bagcilar Education and Research Hospital, Otorhinolaryngology Department, Istanbul, Turkey, E-mail: [drsahinogreden@gmail.com](mailto:drsahinogreden@gmail.com) [ORCID ID https://orcid.org/0000-0001-5513-8224](https://orcid.org/0000-0001-5513-8224)

\*\*\*\* Dr., Bagcilar Education and Research Hospital, Otorhinolaryngology Department, Istanbul, Turkey, E-mail: [mterdil@gmail.com](mailto:mterdil@gmail.com) [ORCID ID https://orcid.org/0000-0001-6742-8464](https://orcid.org/0000-0001-6742-8464)

\*\*\*\*\* Assoc. Prof. Dr., Bagcilar Education and Research Hospital, Otorhinolaryngology Department, Istanbul, Turkey, E-mail: [farukoktay@hotmail.com](mailto:farukoktay@hotmail.com) [ORCID ID https://orcid.org/0000-0001-5708-4813](https://orcid.org/0000-0001-5708-4813)

\*\*\*\*\* Assist. Prof. Dr., Istanbul Gelisim University, School of Health Sciences, Istanbul, Turkey, E-mail: [notiryakioglu@gelisim.edu.tr](mailto:notiryakioglu@gelisim.edu.tr) [ORCID ID https://orcid.org/0000-0002-3122-3050](https://orcid.org/0000-0002-3122-3050)

\*\*\*\*\* Assist. Prof. Dr., Istanbul Gelisim University, School of Health Sciences, Istanbul, Turkey, E-mail: [aybarut@gelisim.edu.tr](mailto:aybarut@gelisim.edu.tr) [ORCID ID https://orcid.org/0000-0002-7861-0736](https://orcid.org/0000-0002-7861-0736)

**Findings:** The mean score of synechia, mucosal edema, and granulation tissue was lower in steroid embedded group than nonembedded one, during the first three months after surgery. However, there were no statistically significant differences between the two groups. The mean score of edema was significantly decreased in steroid embedded group when compared to other group.

**Conclusion:** We believe that the use of a steroid embedded in an absorbable nasal packing after ESS is highly safe and effective in prevention of early postop ESS complications, including synechia and granulation.

**Keywords:** Endoscopic surgical prosedure, postoperative period, wound healing.

## **Endoskopik Sinus Cerrahisi Sonrası Tekrarlı Topikal Kortikosteroid Uygulamasının Etkinliđi**

### **Öz**

**Amaç:** Endoskopik sinus cerrahisi (ESC) sonrası sinus boşluğunda uzun süreli topikal steroid uygulamasının etkilerini arttırmayı hedefledik. Ayrıca sinus boşluğuna tekrarlı topikal steroid uygulamasının doğrudan yara iyileşmesine ve erken postoperative komplikasyonların önlenmesine olan etkisini değerlendirdik.

**Yöntem:** Çalışmaya bilateral endoskopik sinus cerrahisi uygulanan otuz beş hasta dahil edildi. Cerrahi müdahalenin tamamlanması sonrası orta meatusun bir tarafına nazal steroid içeren NasoPore (budesonide 0.5µg/2ml) ve antibiyotik krem diğer tarafına sadece antibiyotik krem yerleştirildi. Bütün hastalar 1.,2.,4.,8., ve 12. haftalarda müdahale sonuçlarının gözlemlenmesi amacıyla muayene edildi.

**Bulgular:** Operasyon sonrası ilk üç ayda steroid uygulanan grupta ortalama sineşi, mukozal ödem ve doku granülasyonu skorları uygulanmayan gruba göre daha düşüktür. Fakat iki grup arasında istatistiksel olarak anlamlı bir fark gözlemlenememiştir. Ortalama ödem skoru steroid grubunda diğer gruba kıyasla önemli derecede daha düşüktür.

**Sonuç:** ESC sonrası emilebilir nazal paket aracılığıyla steroid kullanımının oldukça güvenli olduğuna ve sineşi ve granülasyon gibi erken postoperatif ESC komplikasyonlarının önlenmesinde etkili olduğunu düşünmekteyiz.

**Anahtar Sözcükler:** Endoskopik cerrahi işlem, postoperatif dönem, yara iyileşmesi.

## Introduction

The primary goals of early postoperative care after sinus surgery are to reduce mucosal inflammation and infection, to improve short-term patient discomfort, to promote early return of ciliary function, and to prevent complications<sup>1</sup>. However, there is no standardized approach to postoperative care. Because of numerous reported strategies, there remains a debate regarding what constitutes an optimal postoperative care protocol<sup>1</sup>. The most commonly described postoperative care modalities include nasal saline irrigations, sinus cavity debridement, topical nasal steroid sprays, and systemic steroids and antibiotics. The success of topical applications depends on the duration of treatment and how much medication reaches through the newly developed sinus cavity.

In this study, we aimed to maximize the efficiency of topical steroid use in the sinus cavity by application for an extended duration after endoscopic sinus surgery (ESS). We also evaluated the efficiency of repetitive application of a topical steroid through the sinus cavity directly on wound healing and earlier postoperative complications.

## Material and Method

Approval was obtained for the study from the institutional clinical research ethics board. Informed consent was also obtained from all patients undergoing ESS for nasal polyposis or chronic rhinosinusitis (CRS) between 2012–2014 in Bağcılar Education and Research Hospital.

Thirty-five patients (21 men and 14 women) aged 24 to 58 years who underwent bilateral ESS due to nasal polyposis or CRS were included in our study. Exclusion criteria for the subjects included unilateral CRS, unilateral nasal polyp, history of previous ESS or nasal surgery, sinonasal neoplasm, patients with inflammation (Wegener's Granulomatosis, sarcoidosis), systemic disease affecting the nose (Cystic Fibrosis, Kartagener syndrome), and pregnancy. All patients underwent bilateral ESS without septoplasty under general anesthesia and the procedure was performed by the same surgeon in all cases. Throughout the surgical procedure, attention was given to minimizing mucosal trauma, to avoiding stripping the mucosa of the sinus walls, and thus, to limit the amount of bare bone exposed. Complete hemostasis was conducted by

using epinephrine soaked gauze. Upon completion of the surgery, after control of bleeding, randomly, one side of the middle meatus was packed with NasoPore (Stryker Canada, Hamilton, Canada) embedded with a nasal steroid (budesonide 0.5µg/2ml), plus antibiotic cream (Group 1), and the other side was packed with NasoPore embedded with only antibiotic cream (Group 2). Topical corticosteroid spray was used bilaterally with 2 puffs, 2 times a day in each nasal cavity during the follow-up period. No nasal douche was advised during the follow-up period.

All the patients were discharged one day after surgery without acute complication and were scheduled for follow-up visits at 1, 2, 4, 8, and 12 weeks after surgery for the assessment of outcome measures. At each visit, all patients underwent nasal endoscopy by a surgeon blinded to the packing methods. The presence of synechiae between the middle turbinate and the lateral wall, infection, granulation, as well as an objectively graded degree of mucosal edema were recorded. All parameters were graded using a visual analogue score (VAS) and an ordinal scale (Table 1). Observed synechiae was corrected at that time. NasoPore packing was not removed during the follow-up period and was retained for spontaneous dissolving. During the follow-up period, suction cleaning was performed only when non-adherent crusts obstructed the nasal cavity. After evaluation of the nasal cavity by a blinded surgeon, the non-blinded surgeon, who had operated on the patient, inserted a new NasoPore with the previous packing method into the middle meatus at each of the follow-up visits, if complete mucosal healing was not obtained.

### **Statistical Analysis**

Statistical analysis was performed using SPSS version 10.0 (SPSS, Inc., Chicago, IL). The Mann-Whitney U test and a paired t-test were used to compare groups. A value of  $p < 0.05$  was accepted as statistically significant.

**Table 1:** Ordinal scale used during endoscopic evaluation of outcome measures at follow-up visits 2, 6, and 12 weeks post- endoscopic sinus surgery

<b>Criteria</b>	
<b>Synechia</b>	
No visible synechia	0
One or several visible synechia, but no obvious interference with sinus ventilation	1
Synechia with interference to sinus ventilation and drainage	2
Complete scarring between the middle turbinate and lateral nasal wall	3
<b>Edema</b>	
No visible mucosal edema	0
Mild mucosal edema without obliteration of the ethmoid cavity	1
Severe mucosal edema obliterating most of the ethmoid cavity	2
Frank polyposis	3
<b>Granulation</b>	
No visible granulation tissue	0
One or several visible granulation without obliterations of the ethmoid cavity	1
Severe granulation obliterating most of the ethmoid cavity	2
Frank granulation	3
<b>Evidence of infection</b>	
No visible evidence of infection	0
Mild mucopurulent drainage	1
Gross mucopurulent drainage with obvious frank infection	2

## Findings

Thirty-five patients (21 men and 14 women) were enrolled in this study. The average age was 43.5 years (range: 24 to 58 years). There were no statistically significant differences in demographics, diagnosis, extent of operation, preoperative Lund-Mackay CT score, eosinophil count, presence of allergic rhinitis, and follow-up period.

The mean score of synechia, mucosal edema, and granulation tissue was lower in Group 1 than in Group 2, during the first three months after surgery. However, there were no statistically significant differences between the two groups (Table 2). The mean score of

edema was significantly decreased in Group 1 from 4 to 8 weeks after surgery, and again from 8 to 12 weeks after surgery, whereas, in Group 2 the mean score of edema was significantly decreased from 8 to 12 weeks after surgery (Table 2). There was no infection in either group of patients (Table 2).

**Table 2:** Endoscopic finding scores at 1., 2., 4., 8. and 12. weeks

Weeks	Synechia		Granulation		Infection		Edema	
	G1	G2	G1	G2	G1	G2	G1	G2
1	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.85(0.80)	0.97(0.90)
2	0.00(0.00)	0.02(0.40)	0.00(0.00)	0.02(0.40)	0.00(0.00)	0.00(0.00)	0.56(0.73)	0.75(0.76)
4	0.00(0.00)	0.08(0.29)	0.02(0.40)	0.08(0.29)	0.00(0.00)	0.00(0.00)	0.38(0.81)	0.56(0.73)
8	0.00(0.00)	0.08(0.29)	0.05(0.25)	0.17(0.39)	0.00(0.00)	0.00(0.00)	0.18(0.56)	0.44(0.73)
12	0.02(0.40)	0.14(0.35)	0.02(0.40)	0.05(0.25)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.02(0.40)

G1: Nasopore with steroid, G2: Nasopore without steroid

## Discussion

The primary goals of early postoperative care after sinus surgery should be to reduce mucosal inflammation and infection, to promote early return of ciliary function, and to prevent complications such as synechiae, middle turbinate lateralization, ostial stenosis, and rapid polyp recurrence<sup>2</sup>. Following ESS, blood clot, exposed bone, unresorbed packing, and retained secretions may predispose the patient to infection and inflammation, and provide the potential framework for scarring and early disease recurrence. The most commonly described postoperative care modalities include: nasal saline irrigations, sinus cavity debridement, and systemic and local steroids<sup>3</sup>. However, there is no standardized approach to postoperative care. Although the use of nasal irrigations with saline solutions has been well established, the role of saline irrigation in the early postoperative period remains controversial. It is believed that nasal irrigation softens the debris and makes debridement of the postoperative sinus cavity easier, which optimizes the early mucosal healing by reducing the inflammatory load and lowering the risk of local infection<sup>4</sup>. On the other hand, arguments against debridement include: exposing patients to increased pain, potential mucosal stripping, and epistaxis. So, the timing and frequency of debridement is somewhat controversial<sup>5</sup>.

Topical nasal corticosteroid therapy is another important and the most effective, described postoperative treatment after sinus surgery<sup>3</sup>. The effect of steroids is on preventing edema and inflammation. This decreases the risk of accumulation of

secretions and secondary infection. The absence of edema also decreases the incidence of synechia. A variety of application techniques has been described including nasal sprays, atomizers, drops, and irrigation to increase the local effect of steroids on the sinus cavity. Nasal sprays tend to provide more nasal coverage, whereas irrigation and drops tend to provide improved sinus penetration. However, these applications remain in the sinonasal cavity only for a short time<sup>6</sup>. Most researchers agree that a high concentration of topical steroid solution may reduce the risk of ostial stenosis and decrease recurrences of diseases<sup>6,7,8</sup>. Therefore, when the amount of local steroid is increased to a maximum level, the effect of the steroid on the recovery of the sinus cavity increases. In this study, we aimed to increase the concentration and duration of local steroid on the sinus cavity. We used steroid embedded in self-absorbable nasal packing to prevent cloth collection, crusting, granulation, and mucosal inflammation and to increase the duration and effect of the steroid on the sinus cavity. Thus, we obtained the optimum concentration of sinus penetration and maximized the anti-inflammatory effect of the steroid. We obtained decreased scores of edema and granulation tissue at the steroid embedded nasal packing sites of patients. We preferred self-absorbable nasal packing to avoid any adverse side effects from removable of nasal packing such as pain, discomfort, mucosal trauma, and synechia. The remnants of NasoPore were still in the meatal cavity during the follow-up period. This explains the improved duration of the local effect of the steroid on the sinus cavity. Additionally, the use of a nasal steroid spray during the follow-up period may also increase topical steroid concentration in the sinus cavity by absorption of the steroid by the NasoPore remnants. In addition to the positive effect of a topical steroid on the healing period, the compressive effect of NasoPore in the sinus cavity may also improve the reepithelization, because with compression newly developed mucosa are not prone to edema. The significant improvement in the healing period and the decreased rate of complications, compared to the control group, explains the efficiency of steroid embedded NasoPore in the sinus cavity.

Mucosal recovery and ciliary function usually return after 12 weeks following surgery, therefore, postoperative follow-up is often recommended to ensure an adequate healing of the sinus cavity<sup>9</sup>. We followed the patients for up to three months, until full mucosal recovery was obtained.

The main disadvantage of increased concentrations of local steroid therapy is the unknown systemic absorption profile with a potential for adrenal suppression and other systemic side effects. We used budesonide, whose safety was shown in the literature, to avoid adverse side effects<sup>10</sup>. The main weakness of our study was that we did not have a non-packing group and we could not evaluate the positive effects of nasal packing. In future studies, packing and non-packing groups might be compared. Another disadvantage of our study is that we did not evaluate long-term results. We did not evaluate whether this approach prevents the recurrence of nasal polyposis in the long term.

## Conclusion

We believe that the use of a steroid embedded in an absorbable nasal packing after ESS is highly safe and effective in prevention of early postop ESS complications, including synechia and granulation. The advantage of the application of a steroid topically with an absorbable nasal packing is that the duration of application of the topical steroid on the wound is prolonged. Because nasal packing is absorbable, there is less discomfort, less pain, and no mucosal trauma.

## REFERENCES

1. Wee JH, Lee CH, Rhee CS, Kim JW. Comparison between Gelfoam packing and no packing after endoscopic sinus surgery in the same patients. *Eur Arch Otorhino*. 2012;269(3):897–903. doi: 10.1007/s00405-011-1768-7.
2. Antisdell JL, West-Denning JL, Sindwani R. Effect of microporous polysaccharide hemospheres (MPH) on bleeding after endoscopic sinus surgery: Randomized controlled study. *Otolaryngol Head Neck Surg*. 2009;141(3):353–357. doi: 10.1016/j.otohns.2009.06.078.
3. Singhal D, Psaltis AJ, Foreman A, Wormald PJ. The impact of biofilms on outcomes after endoscopic sinus surgery. *American Journal of Rhinology & Allergy*. 2010;24(3):169-174. doi: 10.2500/ajra.2010.24.3462.
4. Brown CL, Graham SM. Nasal irrigations: Good or bad? *Curr Opin Otolaryngol Head Neck Surg*. 2004;12(1):9-13.



5. Ramakrishnan VR, Suh JD. How necessary are postoperative debridements after endoscopic sinus surgery? *Laryngoscope*. 2011;121(1):8-9. doi: 10.1002/lary.21351.
6. Li PM, Downie D, Hwang PH. Controlled steroid delivery via bioabsorbable stent: Safety and performance in a rabbit model. *Am J Rhinol Allergy*. 2009;23(6):591-596. doi: 10.2500/ajra.2009.23.3391.
7. Cote DW, Wright ED. Triamcinolone-impregnated nasal dressing following endoscopic sinus surgery: A randomized, double-blind, placebo-controlled study. *Laryngoscope*. 2010;120(6):1269-1273. doi: 10.1002/lary.20905.
8. Zitt M, Kosoglou T, Hubbell J. Mometasone furoate nasal spray: A review of safety and systemic effects. *Drug Safety*. 2007;30(4):317-326.
9. Kastl KG, Betz CS, Siedek V, Leunig A. Effect of carboxymethylcellulose nasal packing on wound healing after functional endoscopic sinus surgery. *Am J Rhinol Allergy*. 2009;23(1):80-84.
10. Welch KC, Thaler ER, Doghramji LL, Palmer JN, Chiu AG. The effects of serum and urinary cortisol levels of topical intranasal irrigations with budesonide added to saline in patients with recurrent polyposis after endoscopic sinus surgery. *Am J Rhinol Allergy*. 2010;24(1):26-28. doi: 10.2500/ajra.2010.24.3418.