Our Results of Functional Endoscopic Surgery in Children with Chronic Rhinosinusitis

Kronik Rinosinüzitli Çocuklarda Gerçekleştirilen Fonksiyonel Endoskopik Sinüs Cerrahisi Sonuçlarımız

***Kazım BOZDEMİR, MD, **Behçet TARLAK, MD, *Hasan ÇAKAR, MD, *Akif Sinan BİLGEN, MD, *Ahmet DOBLAN, MD, *Ahmet KUTLUHAN, MD**

* Ankara Atatürk Training and Research Hospital, Clinic of Otolaryngology and Head and Neck Surgery, Ankara
** Şehitkamil State Hospital, Clinic of Otolaryngology and Head and Neck Surgery, Gaziantep

ABSTRACT

Objective: To evaluate our results of functional endoscopic sinus surgery (FESS) performed in children with chronic rhinosinusitis (CRS).
Material and Methods: Twenty-five children who underwent FESS due to CRS, between March 2009 and December 2010 were included in this retrospective study. Pre and postoperative symptoms of the patients were scored according to SN-5 (Sinus infection, Nasal obstruction, Allergy symptoms, Emotional distress, Activity limitations). Paranasal sinus computed tomography was scored with the Lund-Mackay scoring system. Patients were followed for 21 months. Pre and postoperative scores of the patients were compared.
Results: In 7 patients, mild intranasal synechia developed, and intervened in an outpatient setting. In two patients who had middle meatal antrostomy, a revision FESS with bilateral total ethmoidectomy was performed 11 months after the initial operation. The mean preoperative and postoperative SN-5 scores were 3.8±0.8 and 2±0.8, respectively ($p<0.001$). The mean pre and postoperative Lund-Mackay scores of the patients were 0.6±0.4 and 0.26±0.3, respectively ($p<0.001$).
Conclusion: FESS is an important option that can be used to treat pediatric patients with CRS when medical treatment fails. The success rate of FESS is rather high and the complications are usually minor.

Keywords
Sinusitis; paranasal sinuses; pediatrics; endoscopy

ÖZET

Amaç: Kronik rinosinüzitli (KRS) çocuklarda gerçekleştirilen fonksiyonel endoskopik sinüs cerrahisi (FESC) sonuçlarımızı değerlendirmektir.
Gereç ve Yöntemler: Mart 2009 ve Aralık 2010 tarihleri arasında KRS nedeniyle FESC uygulanan 25 çocuk retrospektif olarak değerlendirildi. Hastaların operasyon öncesi ve sonrası semptomları SN-5'e (Sinüs enfeksiyonu, Burun tıkanıklığı, alerji belirtileri, emosyonal distres, aktivite sınırlamalar) göre skorlandı. Paranazal sinüs bilgisayarlı tomografileri Lund-Mackay skorlama sistemi ile skorlandı. Hastalar 21 ay takip edildi. Hastaların operasyon öncesi ve sonrası skorları karşılaştırıldı.
Bulgular: Sineşi gelişen yedi hastaya poliklinik şartlarında müdahale edildi. Orta meatal antrostomi yapılan iki hastaya ilk operasyondan 11 ay sonra total ethmoidektomiyi içeren revizyon FESC yapıldı. Cerrahi öncesi ve sonrası ortalama SN–5 skorları sırasıyla 3,8±0,8 ve 2±0,8, ($p <0,001$) idi. Hastaların cerrahi öncesi ve sonrası ortalama Lund-Mackay skorları sırasıyla 0,6±0,4 ve 0.26±0,3, ($p <0,001$) idi.
Sonuç: FESC, KRS'de tıbbi tedavinin başarısız olduğu durumlarda pediatrik hastaları tedavi etmek için kullanılan önemli bir seçenektir. FESC'nin başarı oranı oldukça yüksektir ve komplikasyonları genellikle hafif düzeydedir..

Anahtar Sözcükler
Sinüzit; paranazal sinüs; pediatri; endoskopi

Çalışmanın Dergiye Ulaştığı Tarih: **04.07.2012** Çalışmanın Basıma Kabul Edildiği Tarih: **01.04.2013**

≈

Correspondence
Kazım BOZDEMİR, MD
Ankara Atatürk Training and Research Hospital,
Clinic of Otolaryngology and Head and Neck Surgery, Ankara
E-mail: kazimbozdemir@gmail.com

INTRODUCTION

Chronic rhinosinusitis (CRS) is a difficult problem in pediatric patients, and sometimes its management leads to a dilemma. There can be numerous underlying pathologies like immunodeficiency, ciliary dyskinesia, adenoid vegetation, allergy, anatomic problems, and reflux disease. However, CRS can occur in the absence of these known risk factors as well. Despite repeated or long term use of antibiotics, symptoms of CRS can still persist, and functional endoscopic sinus surgery (FESS) may be necessary.[1] The limited approach of FESS, a technique particularly designed for pediatric patients, is an effective treatment modality for severe medically refractory CRS in children.[2] In this study, we aimed to evaluate our results of FESS performed in children with chronic sinusitis.

MATERIAL AND METHODS

Twenty-five children who underwent FESS between March 2009 and December 2010 were included in this retrospective study. There were 17 boys and 8 girls with ages ranging from 7 to 16 years (mean 11, 8 years). Fifteen of 25 patients were the ones who did not have adenoid hypertrophy and were unresponsive to the medical therapy. The remaining 10 were the ones who had adenoidectomy surgery and did not respond to the medical therapy.

Patients were selected according to the following criteria; i) lack of response to medical treatment for the last 2 years; ii) at least 6 acute exacerbations of the symptoms per year; iii) presence of one or more of the sinonasal symptoms such as nasal discharge, nasal congestion, nasal obstruction, postnasal drip, day time cough or fetor oris; iv) lack of response to the medical therapy in the presence of adenoid hypertrophy; v) lack of improvement of sinonasal symptoms in the patients who had adenoidectomy vi) absence of cystic fibrosis, immune deficiency, ciliary dysfunction; and vii) lack of history of previous FESS.

After obtaining medical history and performing physical examination, symptoms of the patients were scored according to SN-5 (Sinus infection, Nasal obstruction, Allergy symptoms, Emotional distress, Activity limitations). The following tests were performed when needed; prick test for allergy; IgG, IgA, IgM and IgE for immune deficiency; and nasal mucosal biopsy and smear for cilliary dysfunction. Paranasal sinus computed tomography was obtained preoperatively and evaluated according to Lund-Mackay system in all patients.[3]

Optimal medical therapy administered 3 weeks prior to surgery facilitated surgical intervention. Preoperatively amoxicillin-clavulanate (40 mg/kg/day) was used. Additionally nasal decongestant spray, mucolytic agent, saline irrigation and a decongestant agent were used. Treatment was continued for 3-4 weeks unless the child was allergic to penicillin, cephalosporin, or macrolide. The patients who did not responsed to the treatment were evaluated with coronal paranasal sinus computed tomography (CT).

All patients with endotracheal intubation were operated under general anesthesia and FESS was performed (Table 1). Perioperative period was uneventful. Postoperatively, each patient was examined every 10 days for 1 month, once a month until 3 months, and then at 6th, 9th, 12th, 18th, and 21st months. At the end of 21st month, the patients were reevaluated according to SN-5 scale and Lund-Mackay scale after obtaining a paranasal sinus CT.

Statistics: SPSS 11.0 for Windows was used to compare preoperative and postoperative results of the patients. Paired samples t tests were used to compare Lund-Mackay and SN-5 scores, respectively.

Table 1. Operations performed in the paranasal area in 25 children.

Operation	Bilateral N	Unilateral N
Middle Meatal Antrostomy	6	19
Middle Meatal Antrostomy+Anterior Ethmoidectomy	9	7
Middle Meatal Antrostomy+Anterior Ethmoidectomy+Posterior Ethmoidectomy	8	7
Middle Meatal Antrostomy+Anterior Ethmoidectomy+Posterior Ethmoidectomy+Frontal and Sphenoid	4	0

RESULTS

Five of 25 patients, on whom anterior ethmoidectomy and middle meatal antrostomy was performed, had acute rhinosinusitis attacks 4 and 6 months after the operation, and their symptoms ceased with medical treatment. In 4 allergic patients, whose prick test was positive, topical nasal steroids were used for 6 months after the operation. In 7 patients, mild intranasal synechia developed, and we intervened in an outpatient setting. In two patients, who had middle meatal antrostomy, a revision FESS with bilateral total ethmoidectomy was performed 11 months after the first operation due to recurrence of the signs and symptoms of the sinonasal disease. In these patients, a complete remission of the symptoms could be achieved after the revision surgery. In the remaining patients, postoperative period was uneventful regarding the absence of sinonasal symptoms.

The mean preoperative and postoperative SN-5 scores were 3.8±0.8 and 2±0.8, respectively. There was a significant decrease in SN-5 scores of the patients after the operation (t=11.382, df=24, p<0.001) (Figure 1, Table 2).

The mean pre and postoperative Lund-Mackay scores of the patients were 0.6±0.4 and 0.26±0.3, respectively. There was significant decrease in the Lund-Mackay scores of the patients after the operation (t=5.487, df=24, p<0.001) (Figure 2, Table 3).

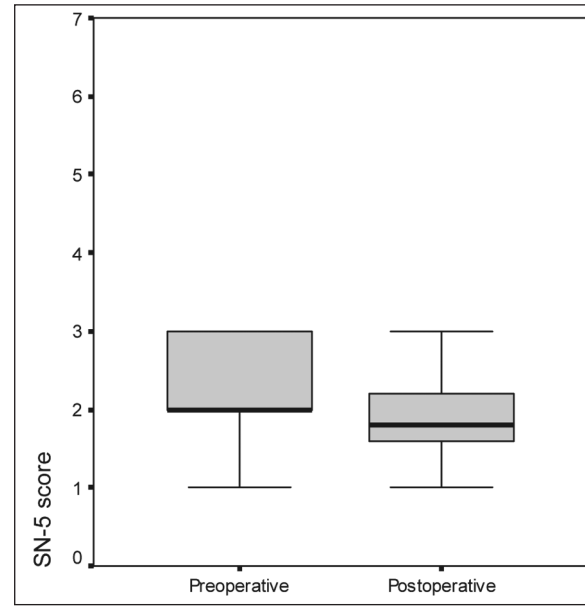

Figure 1. Pre and postoperative mean SN-5 scores of the patients (p<0.001).

Table 2. SN-5 scores of the patients.

SN-5 scale	Preoperative Mean±SD	Postoperative Mean±SD	Statistics P value
Sinus infection	4.6±1.3	2.3±1.3	<0.01
Nasal obstruction	4.8±1.3	2.3±1.2	<0.01
Allergy symptoms	2.1±1.4	1.8±1.4	<0.01
Emotional distress	3.4±1	1.9±0.9	<0.01
Activity limitations	3.9±1.3	1.6±0.9	<0.01

DISCUSSION

The initial treatment in pediatric CRS is usually made by oral antibiotics. Intravenous antibiotics may be beneficial in cases refractory to traditional antibiotic treatment.[4] However, there is still debate about appropriate duration of antibiotic treatment. On the other hand, there is no consensus regarding surgical treatment of pediatric CRS as well. In our series, antibiotics were administered to all patients before the operation. In patients having long-standing complaints for nearly 3-4 weeks, antibiotic treatment was stopped.

However current literature seems to support FESS when maximal medical therapy, adenoidectomy and culture-directed systemic antibiotics have all failed with the persistence of sinonasal disease or in the presence

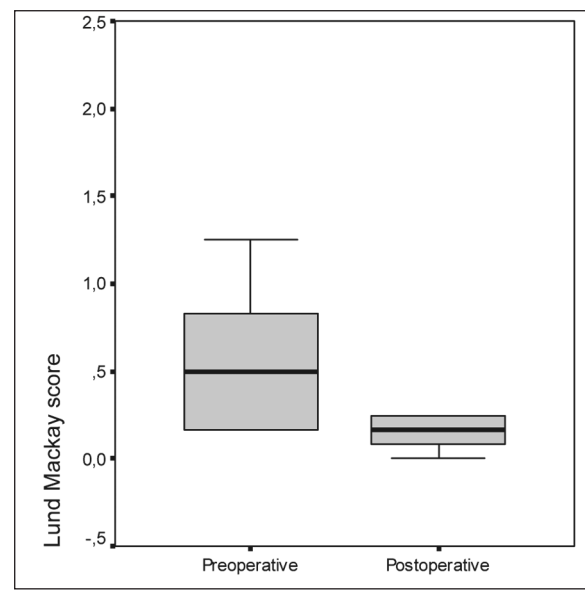

Figure 2. The mean Lund-Mackay scores of the patients (p<0.05).

Table 3. Lund-Mackay scores of the patients.

				Statistics
		Preoperative	Postoperative	P value
Sinus	Side	Mean±SD	Mean±SD	0,001
Maxillary	Right	1.08±0.57	0.72±0.46	0,031
	Left	1±0	0.76±0.52	0,002
Anterior	Right	0.6±0.7	0.16±0.37	0,000
ethmoidal	Left	0.68±0.7	0.16±0.37	0,000
Posterior	Right	0.6±0.58	0.16±0.37	0,011
ethmoidal	Left	0.4±0.57	0.16±0.37	0,161
Sphenoid	Right	0.2±0.5	0.04±0.2	0,134
	Left	0.24±0.6	0.04±0.2	0,185
Frontal	Right	0.2±0.5	0.08±0.27	0,057
	Left	0.2±0.5	0±0	0,002
Osteomeatal	Right	1.12±0.97	0.4±0.76	0,026
	Left	0.72±0.46	0.36±0.64	0,001

of complications.[5] Although recent studies have challenged the idea of FESS may inhibit midfacial growth; minimally invasive surgical techniques should be performed in children.[5,6] Sinus drainage is impeded by the transition spaces into which anterior paranasal sinuses drain rather than the ostia themselves. Addressing the transition spaces and leaving the ostia and normal mucosa intact, especially in the frontal recess region, using the minimally invasive sinus technique, should reverse chronic rhinosinusitis.[7,8] In this study, a minimal invasive surgery was also attempted in all cases. As far as the physiological function of the paranasal sinus drainage pathways can be restored after FESS, it was recommended as a safe and effective procedure for the treatment of CRS in children.[9]

There are numerous risk factors associated with CRS in children. Elimination of these risk factors can lead to recovery from CRS in some of the pediatric patients. One of these factors is allergy. In our series, 16% of children had allergy, and anti-allergic medications were needed postoperatively in these patients. One of the most important causes of CRS is adenoid vegetation in children. Even adenoidectomy alone yields a 58% recovery in pediatric CRS.[10] None of the patients in our study had adenoid vegetation. Thus, it was attempted to eliminate the impact of adenoid tissue on the treatment results of FESS.

It was suggested that adenoidectomy may be a reasonable surgical procedure for younger children prior to sinus surgery, and FESS is the treatment of choice for those with complications or older children.[11] However, in children with refractory CRS, FESS is required and the outcomes are better than adenoidectomy.[12] Long term results of pediatric FESS are encouraging, and advocated in cases refractory to medical treatment.[13] Success rate of FESS in children ranges from 80 to 93%.[1] In our study, pediatric FESS had a success rate of 92% in almost 2 years follow up.

Visualization of the paranasal sinuses with computed tomography has been the gold standard in the diagnosis of CRS in children as in adults.[14] In our study as radiologically detected, a significant decrease was observed in Lund-Mackay scores of the patients postoperatively. In addition, pediatric FESS alleviates the symptoms significantly.[15] Accordingly, a significant decrease was found in the symptoms of our patients as detected with SN-5 scale. These findings suggest that pediatric FESS is an effective procedure both in elimination of the sinus disease and symptoms of the patients.

Revisions and complications are likely after surgical treatment of CRS. In our series, 8% of children required a revision surgery. Adhesions and formation of narrow maxillary sinus ostium due to scarring are the most common causes of failure in children after FESS.[16] It was reported that significant adhesions between middle turbinate and septum were seen in 20% of the patients postoperatively.[1] In our series, no complication was encountered in the perioperative period except a mild synechia that was seen in 28% of the patients. It seems that although the complications are possible, these are minor complications and can be managed.

In conclusion, FESS is an important option that can be used to treat pediatric population when medical treatment fails. The success rate of the surgery is rather high, and the complications are minor.

REFERENCES

1. Lazar RH, Younis RT, Gross CW. Pediatric functional endonasal sinus surgery: review of 210 cases. Head Neck 1992; 14(2):92-8.
2. Chang PH, Lee LA, Huang CC, Lai CH, Lee TJ. Functional endoscopic sinus surgery in children using a limited approach. Arch Otolaryngol Head Neck Surg 2004;130(9):1033-6.
3. Lund VJ, Mackay IS. Staging in rhinosinusitis. Rhinology 1993;31(4):183-4.
4. Adappa ND, Coticchia JM. Management of refractory chronic rhinosinusitis in children. Am J Otolaryngol 2006; 27(6):384-9.
5. Lieser JD, Derkay CS. Pediatric sinusitis: when do we operate? Curr Opin Otolaryngol Head Neck Surg 2005;13(1):60-6.
6. Sivasli E, Sirikçi A, Bayazit YA, Gümüsburun E, Erbagci H, Bayram M, Kanlıkama M. Anatomic variations of the paranasal sinus area in pediatric patients with chronic sinusitis. Surg Radiol Anat 2003;24(6):400-5.
7. Salama N, Oakley RJ, Skilbeck CJ, Choudhury N, Jacop A. Benefit from the minimally invasive sinus technique. J Laryngol Otol 2009;123(2):186-90.
8. Pomar Blanco P, Martin Villares C, San Roman Carbajo J, Fernandez Pello M, Tapia Risueno M. [Minimally invasive surgery for treating of complicated fronto-ethmoidal sinusitis]. Acta-Otorrinolaringol Esp 2005;56(6):252-6.
9. Parsons DS, Phillips SE. Functional endoscopic surgery in children: a retrospective analysis of results. Laryngoscope 1993;103(8):899-903.
10. Vandenberg SJ, Heatley DG. Efficacy of adenoidectomy in relieving symptoms of chronic sinusitis in children. Arch Otolaryngol Head Neck Surg 1997;123(7):675-8.
11. Ramadan HH. Pediatric sinusitis: update. J Otolaryngol 2005;34 (Suppl 1):14-7.
12. Ramadan HH. Adenoidectomy vs endoscopic sinus surgery for the treatment of pediatric sinusitis. Arch Otolaryngol Head Neck Surg 1999;125(11):1208-11.
13. Lusk RP, Bothwell MR, Piccirillo J. Long-term follow-up for children treated with surgical intervention for chronic rhinosinusitis. Laryngoscope 2006;116(12):2099-107.
14. Bhattacharyya N, Jones DT, Hill M, Shapiro NL. The diagnostic accuracy of computed tomography in pediatric chronic rhinosinusitis. Arch Otolaryngol Head Neck Surg 2004; 130(9):1029-32.
15. Siedek V, Stelter K, Betz CS, Berghaus A, Leunig A. Functional endoscopic sinus surgery--a retrospective analysis of 115 children and adolescents with chronic rhinosinusitis. Int J Pediatr Otorhinolaryngol 2009;73(5):741-5.
16. Ramadan HH. Revision endoscopic sinus surgery in children: surgical causes of failure. Laryngoscope 2009;119(6): 1214-7.