ORIGINAL ARTICLE

Functional Endoscopic Sinus Surgery in Treating Pediatric Chronic Rhinosinusitis: The Aseer Region Experience

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ABSTRACT

Objectives: This study aimed to investigate the clinical outcomes of functional endoscopic sinus surgery (FESS) in treating chronic rhinosinusitis (CRS) in Aseer Region children, and to look at the most likely etiologies that might be attributed to the need of surgical intervention in these children. **Methods:** Hospital charts for 47 children underwent FESS for CRS were retrospectively reviewed. We looked at the demographic information, clinical presentation, preoperative CT-scan reports and indications for the surgical procedure. Exclusion criteria include cases of FESS done by other surgeons, children below 4years and above 15 years, allergic fungal sinusitis, cystic fibrosis, mucocele and cases of antro-choanal polyps. **Results:** The majority of patients 38 (81%) presented with CRS were under the age of 8 years. The mean age was 6.5 years at presentation. There were 31 (66 %) males and 16 (34)% females. The persistent nasal discharge was the main symptom in 38 (81%) of the children. Eight (17%) children only presented with an associated nasal obstruction that was attributed directly to adenoid hypertrophy. Nineteen (40.4%) patients had obstructive anatomical variants and 28 (59.6%) patients were diagnosed having allergic rhinitis. Forty- one (87.2%) patient improved and required no further treatment and the remaining 6 (12.8%) patients required revision. **Conclusions:** Results of the present study are commensurate with findings from prior research in that they confirm that the FESS procedure is recommended to those who fail medical therapy and continue to have bothersome symptoms. Congenital anatomical obstruction (concha bullosa and Haller cells) followed by allergic rhinosinusitis havebeen found to be the most common etiological factors among the experimental group of children treated surgically.

Keywords: Endoscopic surgery, Paranasal sinuses, Chronic Rhinosinusitis, Pediatrics

INTRODUCTION

Chronic rhinosinusitis (CRS) has been defined by the American Academy of Otolaryngology- Head and Neck Surgery in 2012 as "a clinical disorder characterized by inflammation of the mucosa of the nose and paranasal sinuses with associated signs and symptoms of 12 week consecutive duration. CRS is characterized by 2 or more symptoms, one of which is nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip), with or without facial pain/pressure and reduction or loss of smell with endoscopic evidence of mucopurulence, edema, and/or polyps and/or CT presence of mucosal thickening or air-fluid levels in the sinuses".[1]

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Although maxillary and ethmoid are the only sinuses present at birth,paranasal sinuses growth in general accelerates between 4 -7 years of life and reach full growth by age of 18 years. This explains why CRS involves mainly ethmoid and maxillary sinuses in early childhood. [1,2,3]

Differential diagnosis of CRS should include viral infections, adenoiditis and allergy symptoms. It is estimated that CRS tends to complicate approximately 10% of upper respiratory tract infections in early childhood. Majority of children diagnosed having CRS respond well to medical therapy and seldom need surgical intervention. [2, 3]

Management of CRS in children differ in many aspects from that in adults, the history being typically passed down from the parents or guardians to children. In case of children, diagnosis usually requires more time and special settings to determine. Due to the fact that there is always parenteral emotional involvement, children sinuses are under-developed as compared to adults. One more reason is that the nasal space for endoscopic instrument is narrower in childrenwhich makes it more difficult to manipulate and move instruments easily as compaired to adults and finally most of the parents have high expectations for surgical treatment. These factors make the job of pediatric otolaryngologist more challenging.[1,3]

Clinical presentation of CRS in children may vary according to their age. Older children present with nasal obstruction, headache and younger children, on the other hand, usually present with thick and colored nasal discharge and cough.Physical examination may be facilitated in children by using fibrooptic endoscopy that may show sinus discharge, polyps, concha bullosa, deviated nasal septum or adenoid hypertrophy. Radiological imaging especially getting CT-scan cuts of paranasal sinus are quite helpful to demonstrate the anatomy of the area and especially the middle meatus obstructive lesions and the extent of the disease within the sinuses. [2]

The endoscopic sinus surgery in pediatrics was first described successfully by Gross et al. in 1989; since then, his report was followed by many others all of whom discussed its success in treating CRS etiologies in case routine medical therapy proves a failure.[4]

The aim of this study was to check and validate the outcomes of resorting to FESS for treating cases of CRS in our community children in Aseer region.

METHODS

A retrospective study was conducted at the Department of Otolaryngology & Head and Neck Surgery (ACH and APH) between January 1st, 2001 and December 31st, 2014. The Research Ethical Committee of the School of Medicine at King Khalid University approved the procedures of conducting this study. The hospital files of 251 pediatric patients diagnosed and treated from chronic sinusitis were reviewed. The author treated all cases included in the study both medically and surgically.Inclusion criteria include recruiting for the sample all patients who have CRS between 4-15 years of age and continue to have bothersome symptoms after 3 weeks of medical therapy.Forty-seven 47 (18.7%) children underwent FESS for treating their CRS were included in the study; all other patients were excluded. Exclusion criteria included doing away with cases of FESS done by other surgeons, children below four years and above 15 years, cases which had an incomplete course of medical therapy or were treated using different antibiotics, allergic fungal sinusitis, cystic fibrosis, cases of the immotile cilia syndrome, mucocele and cases of antro-choanal polyps and all complicated chronic sinusitis cases were also excluded.We also looked at the patient's gender, history, clinical presentation, and notes of the pediatrics allergy clinic, preoperative CT-scan report, previous medical treatment and the indication for endoscopic surgery. The researcher further looked at the patient's operative, postoperative and outpatient clinics follow-up notes for all patients at issue.

All patients were routinely treated after being diagnosed having CRS with three weeks of Amoxicillin trihydrate/ clavulanic acid.In addition, those who were diagnosed to have an associated allergic rhinitis were treated with local nasal steroid spray (Mometasone furoate monohydrate) and antihistamine syrup (cetirizine hydrochloride). A positive response to medical therapy is usually taken in consideration in all children who show a complete disappearance of nasal symptoms. Those who continue to have persistence of some or all of their symptoms

and those who have a recurrence of symptoms are considered for FESS.

All patients underwent the usual FESS technique of Messerlinger and Stamberger with a similar preoperative and postoperative medical therapy protocol.[4,5] We routinely used size 0, 4mm Hopkins telescope for better visualization in patients. The nose is usually decongested using 0.5 % Oxymetazoline drops on soaked ribbon gauze. If the patient was found to have concha bullosa or polyps, it was generally corrected at the start of the operation in order to give better exposure to the middle meatus area. This step usually was followed by removal of the inferior part of the uncinate process to open the maxillary ostium and ventilate the maxillary sinus and opening the ethmoidal bulla to establish drainage and ventilation of the anterior ethmoid air cells. It is our surgical routine to avoid mucosal stripping and to protect the mucosa as much as possible to avoid the formation of postoperative adhesions. The frontal recess is routinely kept untouched unless there is an obstructive polyp.

A second look at the operative site under general anesthesia was performed only for selected cases, especially for those young children in which their postoperative physical examination was difficult and they had associated symptoms of nasal obstruction or excessive nasal crusting.

All children were routinely seen one week postoperatively for examination and cleaning of the nose, and after six months for final examination and check-ups.

RESULTS

Forty-seven children (aged 4-15 years) suffering from chronic sinusitis underwent FESS. The majority of patients were males and younger than 8 years (Table 1)The mean age was 6.5 years at presentation. Thirty-five (74.5%) children were presented to the outpatient clinic at the end of the winter and early spring (between February and April). Patients in this study presented with different and multiple symptoms (Table 1). Persistent nasal discharge was the main symptom in 38 (81%) of the patients.Twenty-seven (57%) children reported evident purulent discharge following common cold infection.

Table 1: Demographic and clinical data

Gender	Male 31 (66%), Female 16 (34%)
Age	<8 y; 38 (81%) >8 y; 9 (19%)
Nasal discharge	38 (81%)
Persistent Cough	35 (74%)
Nasal obstruction	30 (64%)
Halitosis	21 (45%)
Headache	11 (23%)

Nasal obstruction attributed directly to adenoid hypertrophy was noted in 8 (17%) patients only. Preoperative CT-scan reports of the paranasal sinues indicated multiple oseiomeatl area anatomical obstructive findings (Table 2). Ninteen (40.4%) had isloated congenital anatomical anomalies i.e no associated allergic rhinitis. Concha bullosa and Haller cells respectively were the most common anatomical obstructive lesion found in these children.Removal of these congenital anatomical obstructive lesions of the middle meatus resulted in success of FESS in these children with no need for revison.

Table 2: CT-scan preoperative findings

Concha bullosa	32 (68%)
Haller cells	19 (40%)
Deviated Nasal Septum	12 (26%)
Mucosal thickening	9 (19%)
More than one anatomical anomalies	26 (55%)

Allergic rhinosinusitis was diagnosedin more that half of studied patients 28 (59.6%), while some of them had indicated family history of allergic rhinitis and many of these patients were under treatment for bronchial asthma at the time of surgery (Table 3).

Forty-one (87.2%) patient had complete resolution of their symptoms and required no further treatment and the remaining 6 (12.8%) patients required revision. All the cases that failed FESS and required revision found to be younger than six years and were previously diagnosed having allergic rhinosinusitis. FESS alone was done in 39 (83%) and in combination with adenoidectomy in 8 (17%) children. All the eight patients treated for adenoidectomy in combination with FESS had complete resolution of their symptoms.

All patients were routinely seen 2-3 weeks after surgery in the outpatient clinic for cleaning and examination of the nasal cavity. A second look under general anesthesia was required in 8(17%) patientsonly. All those who needed a second look were younger than 8 year old.

Table 3: Allergy Rhinosinusitis Cases

Allergic rhinitis	28 (59.6%)
Bronchial Asthma	26 (55%)
Family History of Nasal Allergy	20 (43%)
Failure of FESS in these cases	6 (12.8%)
Correlation Coefficient	r = 0.94

DISCUSSION

Endoscopic sinus surgery in pediatric patients isan internationally accepted procedure for treating complicated sinus disease, nasal polyposis, antro-choanal polyps, tumors and allergic fungal sinus infections, especially in cases where CRS failed medical therapy, and in cases of cystic fibrosis, immotile cilia syndrome and in children having bronchial asthma [6, 7,8] In this study we carefully selected children suffering from CRS that failed medical therapy and were treated with FESS.

One of the common etiologies of CRS is the obstruction of the ostiomeatal area located in the middle meatus. This obstruction results in poor ventilation and stasis of secretions, resulting in sinus infection. The obstruction can result from anatomical anomalies (concha bullosa, Haller cells, large ethmoid bulla, agger nasi, sever nasal septal deviation), viral infection, allergic rhinitis or chronic presence of the foreign body. It may also occur as a result of conditions that affect of mucociliary clearance of the sinuses as in cystic fibrosis, immotile cilia syndrome, and ciliary dyskinesia. The response of CRS to medical treatment may be severely affected by conditions like allergic rhinosinusitis, gastric reflux and in immune compromised children.[3,4] Ostiomeatal obstructive anatomical anomalies (e.g Chonca Bullosa, Haller Cells) and allergic rhinitis were the main etiological factors for medical tharpy failure in our patients.

The majority of patients in this study were seen at the end of winter and early spring. Upper respiratory tract infections that occur more often at this time of the year seems to be the main predisposing factor for sinus infection that becomes chronic and even fail medical therapy in presence of anatomical obstruction and or allergic rhinitis. The most common clinical presentation in these patients was persistent nasal mucopurulent discharge associated with chronic nocturnal cough.

Radiological evaluation of the paranasal sinuses is mandatory in all patients undergoing FESS procedure. It confirms the diagnosis of CRS, diagnose possible etiological factors and enable the surgeon to study the anatomical roadmap of surgery prior to FESS. It is helpful in showing the extent of sinus opacification, sinus drainage pathways, anatomical variants, critical variants, and condition of surrounding soft tissues of the neck, brain and orbits.[9,10] Preoperative CT-scan imaging was very helpful for us in delineating the anatomical variants casing narrowing and or obstruction of the middle meatus and the extent of disease in these children. It was also very useful in those who needed revision of their FESS.

We routinely perform a consrevative FESS in pediatric CRS that is usulay limited to opening of the maxillary sinus and anterior ethmoid air cells to establish ventilation of these infected sinuses. In comparison with patients suffering from allergic rhinitis, all patients who failed medical treatment due to an atributed isolated antomical obstructive anamloies were obsreved to have complete recovery after FESS. This is comparable to what was previously published in the literature.[11,12,13] It is also our surgical routine to minimize manipulation and avoid mucosal stripping at the middle meatus as possible.This will help to minimize postoperative adhesions and excessive crusting formation.

Older children in general found to have a better response and more satisfying results after FESS in comparison to younger children. This is most likely attributed higher incidence of upper respiratory tract infection in younger kids and to easier preoperative, intraoperative and postoperative care in older children than younger children. [14,15]

The adenoid tissue may work as reservoir of pathogenic bacteria, which may provoke sinus infection during upper respiratory tract infection. [15,16] Patients presented with CRS and an associated nasal obstruction due to adenoid tissue hypertrophy and underwent adenoidectomy at the same time of FESS had full recovery of their symptoms and required no revision.

Allergic rhinosinusitis contributed to majority of failures in the surgical therapy of this group of children. It was found in 12.8 % of patients who needed revision with correlation coefficient of 0.94, indicating that 88.4 % of those failed their first FESS were directly related to allergic rhinosinusitis (table 3). Some other studies also considered allergic rhinosinusitis as one of the poor prognostic factors for long-outcome after FESS for treating CRS.[17]

Postoperative examination of the middle meatus area is extremely difficult in young children unless done under general anesthesia. Mitchell et al..[18] had suggested that adopting a selective approach to second-look endoscopy under general anesthesia after FESS may lead to no deterioration in overall results, but on the other hand it might not alter the outcome of FESS in treating pediatric CRS. We limit endoscopic second-look under general anesthesia to young children who are difficult to examine and have an associated nasal obstruction either due to excessive nasal crusting or abundant nasal discharge.

The success rate of FESS in treating CRS in the current study found comparable to other studies. The presence of obstructive isolated anatomical anomalies of the middle meatus contributing to CRS in this group of patients is higher than previously published. On the other hand allergic rhinitis cases treatment and success rate was comparable to other studies.[11,14,119]

We recommend that all cases of CRS that fail medical therapy should be carefully investigated for middle meatus obstruction whether that obstruction due to congenital anatomical variant or mucosal edema due to allergic rhinitis. Parents of children diagnosed having allergic rhinitis and failed medical therapy should be counseled for FESS and the possible need for revision of surgery.

CONCLUSIONS

In this group of patients we have observed that congenital anatomical variants obstructing the middle meatus (e.g. large concha bullosa and Haller cells), and allergic rhinitis are the most common etiological factors found directly attributed to pediatric CRS that fails medical therapy. Those who have isolated anatomical obstructive anomalies do well after FESS. On the other hand, younger children and those who have an associated allergic rhinosinusitis have a higher incidence of failure of both medical and surgical therapy.

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Competing interest: None

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