

Surgical management of paediatric chronic rhinosinusitis: review of 10 years' experience

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Abstract

Objective: To assess the outcome of children with chronic rhinosinusitis who were managed surgically, over a 10-year study period.

Method: From January 1999 to December 2008 inclusive, 136 children diagnosed with chronic rhinosinusitis underwent surgery following unsuccessful medical treatment. The operations ranged from adenoidectomy to functional endoscopic sinus surgery.

Results: The surgical procedures performed were: adenoidectomy ($n = 69$), antral washouts ($n = 54$), middle meatal antrostomy ($n = 82$), endoscopic ethmoidectomy ($n = 66$), nasal septal reconstruction ($n = 10$), and inferior turbinate outfracture ($n = 23$) or inferior turbinate reductions ($n = 55$). Follow-up duration ranged from 6 months to 9 years (average 3.2 years). Three patients required revision surgery: adenoidectomy in two patients and adenoidectomy with turbinate reductions in another.

Conclusion: This study demonstrates the benefits of focused surgical treatment for paediatric chronic rhinosinusitis. Surgical treatment can be an appropriate and effective option for children with chronic rhinosinusitis when medical management is unsuccessful.

Key words: Pediatrics; Sinusitis; Paranasal Sinus Diseases; Nasal Polyps; Surgery; Treatment

Introduction

Medical treatment for children with chronic rhinosinusitis may provide temporary symptomatic relief. Surgical treatment is a relatively low-risk option that may offer more effective and robust long-term outcomes.¹ Surgery allows clearance of sinonasal obstruction, improves sinus drainage and ultimately facilitates better medical management.²

There are several surgical options available, ranging from antral washouts to functional endoscopic sinus surgery (FESS). Antral washouts are traditionally first-line treatment. This procedure facilitates microbiology to help direct antibiotic therapy.^{3–5} Adenoidectomy is a first-line treatment for chronic rhinosinusitis in children for whom medical management has been unsuccessful.⁶ Procedures to aspirate the maxillary sinus or obtain cultures from the middle meatus can be performed at the same time as surgery to allow directed antibiotic therapy. Functional endoscopic sinus surgery is currently the standard surgical treatment option for children with chronic rhinosinusitis who respond poorly to medical management and experience ongoing symptoms post-adenoidectomy.¹ This surgery is considered a low-risk, safe and effective treatment with excellent outcomes.^{7,8}

In addition, FESS facilitates the management of associated pathology such as nasal septal deviation, turbinate hypertrophy, an obstructive adenoid and nasal polyps.

There is no clear consensus regarding the timing of FESS. The literature supports FESS when maximal medical therapy, adenoidectomy and culture-directed systemic antibiotics are unsuccessful.⁹ Surgical intervention is necessary for patients who do not respond to prolonged medical treatment.¹⁰ Functional endoscopic sinus surgery is especially effective in children with anatomical abnormalities that predispose them to chronic rhinosinusitis and persisting sinonasal disease. The procedure allows the removal of sinonasal polyps and the opening of obstructed sinonasal drainage pathways, and it facilitates the application of topical steroids.¹¹ It may also be an adjunct to aspirin desensitisation treatment in aspirin-sensitive patients. Functional endoscopic sinus surgery is clearly indicated for the treatment of orbital or intracranial complications of sinonasal disease.¹² Selected patients with cystic fibrosis may undergo the procedure to improve quality of life and facilitate the application of topical antibiotics with activity against *Pseudomonas aeruginosa*.¹ Functional endoscopic sinus surgery may be a safe and effective treatment for

children with chronic rhinosinusitis in whom medical management has been unsuccessful.

This paper reports 10 years' experience (at the Prince of Wales Private Hospital and Sydney Children's Hospital) of the surgical management of children with chronic rhinosinusitis. The study aimed to assess the long-term outcomes post-surgery. The algorithm for patient management and the treatment guidelines are presented, together with a focused review of the relevant international literature.

Materials and methods

The patients reported in this study represent a consecutive series. All patients were operated on at the Prince of Wales Private Hospital or the Sydney Children's Hospital. From January 1999 to December 2008 inclusive, 136 patients underwent surgery after unsuccessful medical treatment. Medical treatment included saline nasal sprays and irrigations, antibiotics for acute episodes of sinusitis, and topical nasal steroids.

Patient age, gender, diagnosis, symptoms and duration of medical management prior to surgical treatment were recorded. Patients' allergy status was assessed by radioallergosorbent testing. Clinical evidence of rhinosinusitis included nasal congestion and obstruction, rhinitis, nasopharyngeal obstruction, fever, mid-facial pain and headache. Patients with cystic fibrosis or those with complications of sinusitis necessitating emergency surgery were excluded from this study.

Surgical intervention was recommended for patients whose symptoms persisted following two months of medical management. Operations were performed as indicated by the clinical and imaging findings for individual patients, based on fibre-optic nasendoscopy and computed tomography (CT) imaging results (a Lund-McKay score¹³ of four or greater). Procedures included adenoidectomy, antral washouts, endoscopic middle meatal antrostomy, endoscopic ethmoidectomy, outfracture of inferior turbinates, endoscopic turbinate reductions and nasal septoplasty (Table I). All patients were followed up clinically. Figure 1 outlines a flow diagram of treatment.

Results

Patient ages ranged from 3 to 16 years (average 8.6 years). Follow-up duration ranged from 6 months to 9

years (average 3.2 years). The presenting symptoms included fever, headache, nasal congestion, nasal obstruction and rhinorrhoea. Radioallergosorbent testing revealed positive allergy status results for 32 patients (24 per cent). The average duration of symptoms, from initial consultation to surgery, was two months (range of one week to five months).

The procedures performed were: adenoidectomy ($n = 69$), antral washouts ($n = 54$), middle meatal antrostomy ($n = 82$), endoscopic ethmoidectomy ($n = 66$), nasal septal reconstruction ($n = 10$), and inferior turbinate outfracture ($n = 23$) or inferior turbinate reductions ($n = 55$). Systemic antibiotics and corticosteroids were administered routinely, on induction of anaesthesia. The surgical procedures were performed on a day-stay basis in 84 patients; 51 patients required an overnight stay in hospital and one patient required a 2-night stay. No acute post-operative complications were recorded.

Following surgery, 60 patients (44 per cent) experienced ongoing mucosal disease, which was successfully managed medically. Medical maintenance treatment comprised a combination of saline nasal irrigations and nasal corticosteroids, and this was effective. Regarding long-term complications, five patients (3.7 per cent) developed intranasal adhesions, which did not require further treatment. Thirteen patients (9.6 per cent) developed recurrent sinusitis, which was successfully managed medically. Only three patients (2.2 per cent) required revision surgery: adenoidectomy was performed in two of the patients and adenoidectomy with turbinate reductions was undertaken in the other.

Discussion

This paper reviews the outcomes of paediatric patients who underwent elective surgery for chronic rhinosinusitis. Children were initially managed conservatively with medical treatments for a minimum of two months. If symptomatic relief was not achieved following this period, children were referred for surgical consultation. Those with anatomical variants and/or positive CT scores underwent surgery as appropriate. The procedures performed included adenoidectomy, septoplasty, antral washouts, inferior turbinate outfracture or reduction, and FESS. On the whole, surgical outcomes (assessed upon follow up) were positive. There were no severe complications as a result of surgery, and a low rate of revision surgery was observed. For the majority of patients, surgery was a successful treatment strategy.

The diagnostic criteria for chronic rhinosinusitis are based primarily on clinical symptoms and CT findings.¹⁴ Clinical symptoms often exhibit a poor correlation to diagnostic imaging findings. The diagnostic guidelines for chronic rhinosinusitis were reviewed in 2006.¹⁴ For a diagnosis of chronic rhinosinusitis to be established, the patient needs to exhibit 2 or more of the following symptoms for 12 weeks: anterior, posterior (or both) mucopurulent drainage, nasal

TABLE I
SURGICAL TREATMENT OPTIONS

Pathology	Treatment
Obstructive adenoid	Adenoidectomy
Obstructive nasal septal deviation	Septoplasty
Inferior turbinate hypertrophy	Outfracture or reduction
Maxillary sinus	Antral washout, endoscopic uncinectomy or middle meatal antrostomy
Ethmoid sinus	Endoscopic anterior ethmoidectomy

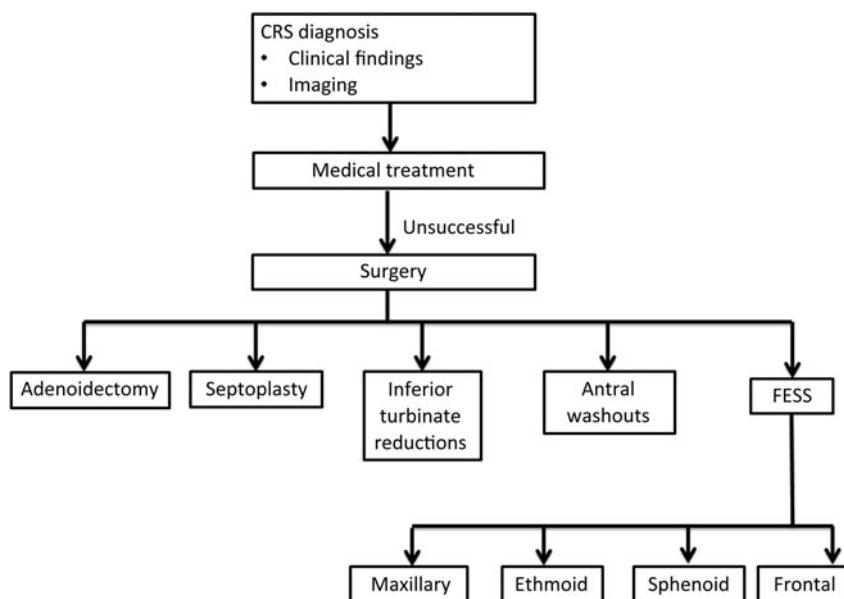


FIG. 1

Treatment flow diagram. CRS = chronic rhinosinusitis; FESS = functional endoscopic sinus surgery

obstruction or congestion, facial pain (pressure and/or fullness), and impaired sense of smell. In addition, at least one objective measure of inflammation is required to complete the chronic rhinosinusitis diagnosis, which includes the observation of purulent mucus or oedema in the middle meatus or the ethmoid, radiographic evidence of inflammation of the paranasal sinuses, or the presence of polyps in the nasal cavity or the middle meatus.¹⁵ We based our clinical diagnosis upon these guidelines, together with a Lund–MacKay score of four or greater.¹⁶

Figure 1 outlines our treatment algorithm. Medical management is initially recommended following diagnosis (in the absence of complication). If no symptomatic improvement has been observed following two months of medical treatment, surgery should be considered, especially in the setting of anatomical obstruction.

A number of medical management options exist. Corticosteroids are a common treatment modality. Topical corticosteroids can provide effective symptom control in patients with chronic rhinosinusitis without polyps, with a low risk of adverse effects.^{17,18} Recent evidence suggests that a long-term, low-dose schedule of antibiotics may improve the symptoms of chronic rhinosinusitis.¹⁹ Nevertheless, controversy surrounds this practice as many chronic rhinosinusitis exacerbations are of viral or inflammatory aetiology.¹⁵ Topical antibiotics aim to deliver a higher dose directly to the site of infection. However, there is little evidence to suggest that this treatment confers any significant benefit in chronic rhinosinusitis patients with or without polyps.²⁰ These treatments are not always successful and the patient may require surgical management. The results of this study indicate that medical management is more likely to be successful following surgery, once the anatomical obstruction has been tackled.

Patients in this study were primarily selected on the basis of failed medical management. All children initially received medical treatment, including antibiotics and corticosteroids, for a minimum of two months. Those who did not experience any symptomatic relief in this period were referred for surgical opinion. Patients underwent CT imaging as appropriate. Those patients with significant anatomical obstruction, including septal deviation, enlargement of the adenoid, concha bullosa or paradoxical middle turbinates, were identified as good surgical candidates. Appropriate surgical options (based on individual patient pathology) were discussed with the child and their parents, and consent was obtained. Findings on CT imaging were scored according to the Lund–MacKay system, and those with a score greater than four were evaluated for surgical treatment.

The adenoid is a likely source of paranasal sinus infection. The role of adenoidectomy in the management of paediatric sinusitis is debated; opinion varies depending on the size of the adenoid and associated diseases. There was a statistically significant reduction in the number of rhinosinusitis and obstructive sleep disorder episodes per year post-adenoidectomy in children with an obstructive sleep disorder and an adenoid-nasopharyngeal ratio of more than 0.7.²¹ Adenoidectomy should be considered as a surgical option before FESS, especially in younger children with obstructive symptoms.²² There is a higher risk of surgical failure in children aged less than seven years, and patients with asthma are more likely to require FESS post-adenoidectomy.²³ Allergic rhinitis, CT score and gender have little influence on outcomes. Functional endoscopic sinus surgery is a superior option for the treatment of refractory chronic rhinosinusitis in children following adenoidectomy.²⁴

Wide middle meatal antrostomy and polypectomy can be effective treatments for recurrent antrochoanal polyp in children.²⁵ Endoscopic wide middle meatal antrostomy is a useful and easily applicable technique to manage recurrent antrochoanal polyps in children. Powered and/or angled instruments (such as 45° and 70° endoscopes) allow identification of the origin of a polyp in the maxillary antrum, thereby enabling complete clearance of the polyp. Functional endoscopic sinus surgery allows the treatment of associated pathology, such as nasal septal deviation, turbinate hypertrophy, an obstructive adenoid and chronic rhinosinusitis.

The role of nasal septoplasty in children is still open to debate. Surgery performed on a developing structure may adversely affect normal nasal growth. In addition, disruption of the developing nasal septum may alter craniofacial growth patterns.²⁶ However, recent literature suggests that septoplasty, performed via an endonasal approach, does not interfere with the normal growing nasal process.²⁷ Paediatric septoplasty may be indicated in selected cases of obstructing nasal septum deformities.

Balloon catheter sinuplasty is an emerging treatment option for chronic rhinosinusitis. Its role may become more widespread in the future. Although adenoidectomy is the first step in the surgical management of children with chronic rhinosinusitis, this treatment alone is only effective in 50 per cent of patients. Balloon catheter sinuplasty may provide a minimally invasive, effective treatment option for paediatric chronic rhinosinusitis. Studies comparing balloon catheter sinuplasty to adenoidectomy for treatment of chronic rhinosinusitis found that the former produced superior outcomes to adenoidectomy, especially in older children.²⁸

- **Children with chronic sinusitis should be offered surgical treatment if medical management is unsuccessful**
- **Adenoidectomy is an appropriate first-line surgical treatment, and can be followed by functional endoscopic sinus surgery if needed**
- **Endonasal cartilage sparing septoplasty is helpful for coexisting nasal septal deviation and is unlikely to alter normal craniofacial growth**
- **Endoscopic powered turbinate reductions are effective for inferior turbinate enlargement**
- **Endoscopic uncinectomy, wide middle meatal antrostomy and polypectomy are preferred for unilateral sinusitis and antrochoanal polyp**

Based on the findings of this study and the review of the international literature, it is concluded that children with chronic rhinosinusitis, for whom medical management has been unsuccessful, can be effectively treated

surgically. Surgical treatment should be directed based on clinical, radiological and endoscopic findings. With appropriate patient selection, surgical treatment can provide successful, long-term outcomes for children with chronic rhinosinusitis.

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