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Balloon catheter sinuplasty in pediatric chronic rhinosinusitis

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In this article, we review indications for balloon catheter sinuplasty in children with chronic rhinosinusitis who have failed medical therapy and adenoidectomy. We will discuss our surgical approach, complications, postoperative care, and share some tips and pearls about the procedure. Balloon sinuplasty is a safe procedure that can be used alone or concomitantly with other procedures such as adenoidectomy and/or endoscopic sinus surgery. Balloon catheter sinuplasty has been shown to be effective in selected cases, and in isolation or in combination with other procedures, and has resulted in great outcomes for these children.

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Introduction

Chronic rhinosinusitis (CRS) is one of the most common diseases affecting the general population.¹ In the United States, \$1.8 billion is spent on CRS in children under 12 years of age annually.¹ Most children will improve with medical therapy.² These therapies include oral antibiotics, saline irrigation, topical nasal steroids, antihistamines, allergy therapy, and asthma control. However, when symptoms continue despite maximal medical management, surgical intervention is indicated.²

Adenoidectomy is currently the first-line surgical intervention for pediatric CRS.³ Nevertheless, it is only effective in 50% of cases,^{4,5} and success rate declines with the presence of asthma.⁴ Endoscopic sinus surgery (ESS) has been shown to be more effective than adenoidectomy

alone.⁶ However, it can be technically difficult and has the potential for serious complications.⁷

Balloon catheter sinuplasty (BCS) was described in 2006. The maxillary, frontal, and sphenoid sinuses may be approached with this modality. BCS of the maxillary sinus has been proven to be effective for CRS in children. A previous study looked at the success rate of BCS⁸ in the first year, and found that 81% of children achieved significant symptomatic improvement based on the SN-5 questionnaire.⁹

Indications

There are no clear indications for when to use BCS for pediatric CRS. Surgical treatment is considered when maximal medical therapy has failed. Options available include adenoidectomy, ESS, and BCS. BCS is thought to be safe and less invasive than ESS as recently reported by the American Academy of Otolaryngology consensus statement.¹⁰ The short-term effectiveness of BCS has been shown by previous studies.^{8,9} Evidence for long-term benefit is lacking. A hybrid surgery (BCS with ethmoidec-

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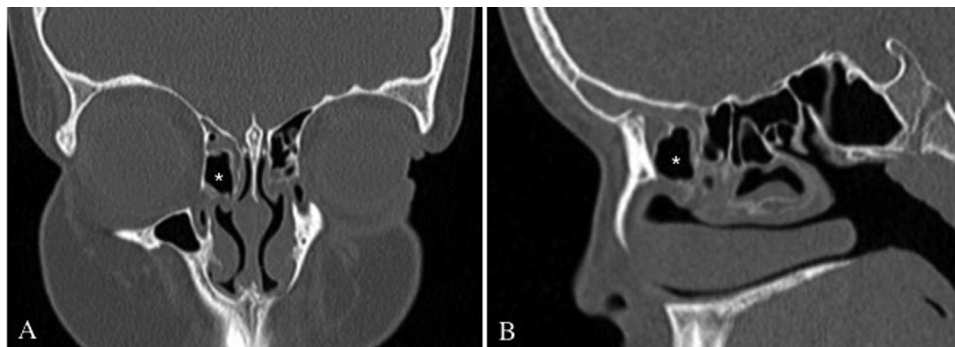


Figure 1 Computed tomography (CT) scan of the sinuses in the bone window of an 11-year-old boy presented with right forehead pressure headache with a history of recurrent sinus infections. CT scan was obtained after appropriate medical therapy. The scan shows obstruction and opacification of the right frontal sinus with a large obstructing agger nasi cell (asterix). Balloon catheter sinuplasty of the right frontal sinus was performed under general anesthesia. Adenoidectomy was also performed at the same time.

tomy) may also be considered in select cases.¹¹ BCS can be offered as a treatment alternative at the time of adenoidectomy or prior to ESS after an adenoidectomy has failed to resolve symptoms.

Pre-op evaluation

A computed tomography (CT) scan of the sinuses is always obtained prior to consideration for BCS. Based on the CT scan findings, BCS can be tailored to the specific sinus/sinuses (Figure 1). BCS may not be suitable for some children, specifically those who have a hypoplastic maxillary sinus (Figure 2) or children with significant ethmoid sinusitis. Contraindications for BCS are summarized in Table 1. It is also helpful to have experience with using balloons in adults prior to working on children.

Surgical technique

Most of the pediatric BCS cases are done under general anesthesia in the operating room. In-office, dilation under local anesthesia may be considered in select older cooperative children. When performed under general anesthesia, initial vasoconstriction is performed with topical



Figure 2 A contraindication to balloon catheter dilation is hypoplastic sinus, as these have been shown to be more difficult to cannulate.

oxymetazoline (0.05%) pledgets. The surgical field may be prepped with iodine paint, and the eyes are kept in the surgical field. Injection of 1% lidocaine with 1:100000 epinephrine is performed along the lateral nasal wall in the region of the maxillary line, the anterior face of the middle turbinate, and along the uncinat process. Further injection is performed if further ESS (eg, ethmoidectomy) is being considered. Care should be taken not to exceed the total amount of lidocaine injection in children (7 mg/kg of the 1% lidocaine with 1:100000 epinephrine).

Two sinus balloon companies (Acclarent and Entellus) provide different systems for dilation of sinuses. Both devices at this point come in 1 package. The Acclarent system has a guide catheter for the respective sinuses (maxillary, frontal, and sphenoid), whereas the Entellus system has a probe that can be fashioned according to which sinus is targeted.

With the 4-mm endoscope used for direct visualization, the sinus guide wire/probe light is inserted behind the uncinat process to introduce the flexible guide wire into the maxillary sinus (Figure 3), or into the frontal recess area for the frontal sinus, or into the sphenothmoidal recess for the sphenoid sinus. Proper placement of the balloon is confirmed with transcutaneous illumination (except for sphenoid sinus) (Figure 4). Once that is done, the sinus balloon catheter is passed over the guide wire into the sinus and placed across the ostium. Markers on the balloon

Table Contraindications to isolated BCS in children

<i>Contraindications to isolated BCS in children</i>
Previous sinonasal surgery in target ostia
Cystic fibrosis
Allergic fungal rhinosinusitis
Extensive polyposis
Extensive sinonasal osteoneogenesis
Sinonasal tumors or obstructive lesions
History of facial trauma that distorts sinus anatomy and precludes access to the sinus ostium
Ciliary dysfunction
Hypoplastic sinus, as these have been shown to be more difficult to cannulate

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