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Balloon Frontal Sinuplasty for Intracranial Abscess in a Pediatric Acute Sinusitis Patient

Lauren T. Roland, MD^a, Andre M. Wineland, MD, MSCI^a, and David S. Leonard, MBBCh, SM^a

^aDepartment of Otolaryngology – Head and Neck Surgery, Washington University in St. Louis School of Medicine, St Louis, MO, USA 63110

Abstract

A case of balloon frontal sinuplasty in a 12 year old male with intracranial abscess from acute sinusitis is presented. The patient experienced photophobia, fever, headache, nausea and vomiting. Frontal sinusitis with intracranial abscess was diagnosed on imaging. The patient was taken to the operating room for drainage with left frontal balloon sinuplasty. The patient showed immediate clinical improvement, did not suffer from any complications of surgery and was further managed with long term intravenous antibiotics. We believe that balloon frontal sinuplasty is potentially safe and effective in the treatment of complicated acute frontal sinus obstruction in children.

Keywords

pediatric sinusitis; complications from acute sinusitis

1. INTRODUCTION

1.1 Pediatric acute sinusitis

Acute bacterial sinusitis is a common health problem in the pediatric population. It is estimated that between 6–7% of pediatric patients seeking care for respiratory complaints are diagnosed with acute bacterial sinusitis [1]. Complications are rare but can be very serious and include orbital cellulitis or abscess, cavernous sinus thrombosis, meningitis and intracranial abscess.

Traditional treatment options for complicated cases of acute frontal sinusitis leading to intracranial abscess include surgical drainage with trephination, craniotomy or functional endoscopic sinus surgery (FESS) and long term targeted intravenous antibiotics [2].

Trephination allows drainage through a burr hole drilled through the anterior wall of the

Corresponding Author: Lauren T. Roland, Department of Otolaryngology – Head and Neck Surgery, Washington University in St. Louis School of Medicine, 660 S Euclid Ave, PO Box 8115, St. Louis, MO, USA 63110, 1-314-362-5296, RolandL@ent.wustl.edu.

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frontal sinus and has been shown to be effective for complicated frontal sinusitis. However, this method will cause a scar and does not correct the obstructed drainage pathway of the frontal sinus, which is the underlying cause of disease. In select cases, balloon sinuplasty offers an additional treatment modality that addresses the obstructed outflow tract with less morbidity than trephination.

1.2 Balloon catheter sinuplasty

The successful use of balloon sinuplasty has been reported for acute frontal sinusitis in an adult patient [4]. The authors report resolution of opacification of the left frontal sinus after dilatation, irrigation, and drainage with a frontal sinus catheter.

Although balloon sinuplasty has not been described for treatment of acute sinusitis in children, it has previously been shown to be effective and safe for treatment of chronic sinusitis in pediatric patients [5]. We elected to attempt drainage of an intracranial abscess resulting from acute frontal sinusitis using balloon sinuplasty in order to avoid the possible complications associated with trephination.

2. CASE REPORT

2.1 The Patient

A 12 year old, otherwise healthy, male presented to an outside emergency department with a 4 day history of photophobia, eye pain, nasal congestion, fever, headache, nausea, decreased oral intake and vomiting. A head CT revealed opacification of the left frontal and maxillary sinuses and an associated 1 × 2 cm intracranial extra-axial area of pneumocephalus and fluid collection, concerning for abscess (Figure 1). He was given ketorolac and ampicillin/sulbactam and then transferred to our facility for further evaluation by Pediatric Neurosurgery and Otolaryngology. The patient was admitted and started on vancomycin, cefotaxime and metronidazole. A stereotactic sinus CT was obtained for surgical planning and the patient was prepped for surgery the following morning. A joint decision between the Otolaryngology and Neurosurgery teams was made to attempt to avoid unnecessary invasive cranial surgery if possible.

2.2 Intraoperative Details

The patient underwent limited FESS with CT navigation guidance including uncinectomy, maxillary antrostomy and anterior ethmoidectomy. Next, attention was directed towards the left nasofrontal recess. A lit Relieva Flex® guidewire (Acclarent, Menlo Park, CA) was passed into the frontal sinus and a Relieva® 5×16 mm balloon catheter (Acclarent, Menlo Park, CA) was advanced over the guidewire after visualization of correct placement. The nasofrontal recess was dilated to 5 mm at 12 atm of pressure, resulting in immediate release of significant gross mucopurulence. The balloon dilator was exchanged for a Relieva Vortex® irrigator (Acclarent, Menlo Park, CA) which was used to expel more purulent drainage. Multiple irrigations were needed until drainage became clear.

Intraoperative aerobic and fungal cultures were collected and sent to the microbiology department. The final report was positive for polymicrobial growth and negative for fungal growth.

2.3 Post Operative Course

The patient tolerated the procedure well with signs of clinical improvement and without any postoperative complications. He was evaluated by the infectious disease service for long term treatment strategies, and it was recommended that he undergo peripherally inserted central catheter (PICC) line placement for long-term antibiotics. The patient was closely followed by the Otolaryngology team and started 4 times daily nasal saline rinses on post-op day 1. Pain was well controlled and his headache completely resolved after surgery. Following final results of his cultures on post operative day 3, final intravenous (IV) antibiotic recommendations were made by the infectious disease team. On post operative day 4, the patient was eating and drinking well, performing nasal saline rinses on his own and his pain was well controlled. At this time, he was deemed stable for discharge home on IV antibiotics and nasal rinses.

At a 6-week follow-up appointment, the patient was found to have recovered completely without neurological concerns. An MRI performed approximately 6 weeks following his surgery date revealed near complete resolution of the left frontal abscess and minimal residual dural enhancement (Figure 2). Due to his drastic improvement at the time of the MRI, the decision was made to stop his antibiotics after 6 weeks of IV therapy. Institutional Review Board approval from the Human Research Protection Office at Washington University in St. Louis was obtained for this case report.

3. DISCUSSION

Here we present a case of acute sinusitis with the rare complication of intracranial abscess. We demonstrate the successful recovery of a 12 year old male from intracranial abscess after frontal sinuplasty while avoiding the need for an invasive cranial surgery.

Although complications of acute sinusitis are rare, they can be life-threatening. Pediatric intracranial complications have been found to occur in approximately 3 percent of patients who require admission to the hospital for treatment of sinusitis [6]. Signs of intracranial infection include headache, seizures and meningeal signs [7]. Infection of the frontal sinus has been thought of as a risk factor for intracranial disease due to location and anatomy. Although not yet well studied, one analysis done in the pediatric population calculated an odds ratio of 20:1 for intracranial disease if the frontal sinus was involved [8]. Adolescent males have been noted to be at greatest risk of intracranial infection secondary to frontal sinusitis [9], possibly due to vascularity changes and stage of development of the frontal sinuses in that age group [10].

Treatment of acute sinusitis in children may be complicated by the anatomy of developing sinus structures. Shah et al. demonstrated radiographically that the paranasal sinuses reach full development in a specific order, with the ethmoid sinuses developing first, followed by the maxillary, sphenoid and finally the frontal sinuses [11]. Due to an unpredictable growth

rate of the frontal sinus [7], commonly used techniques for frontal sinusitis complications in the adult population, such as trephination and endoscopic surgery, may be particularly challenging.

In this case, the decision to use balloon sinuplasty was made in order to avoid cranial surgery and the potential difficulties and risks of frontal endoscopic surgery in an acutely inflamed pediatric patient. While balloon sinuplasty has not been well documented in this setting, our experience with this patient suggests that it may be an option for children with intracranial abscess following acute sinus infection. Further investigation will be needed to establish if this technique provides a true financial and safety advantage over pure endoscopic techniques.

4. CONCLUSION

In this pediatric case report, we describe a hybrid technique using frontal balloon sinuplasty and limited FESS. Through the use of frontal balloon sinuplasty for complicated acute frontal sinusitis, we have established adequate drainage through the frontal recess while avoiding the potential difficulties associated with external techniques. Further experience is needed to better determine the safety of balloon sinuplasty for acute sinusitis in children. Intracranial abscess from frontal sinus obstruction is a very rare complication of acute sinusitis, making treatment options difficult to study. We believe that the use of balloon dilation is a possible safe and effective procedure for complications of acute sinusitis due to frontal sinus obstruction in children.

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Figure 1.
CT scan revealing A) fluid collection and pneumocephalus, B) opacified left frontal sinus
and C) opacified left maxillary sinus

Figure 2.
Resolved abscess with residual dural enhancement (arrow)