Minimally Invasive Endoscopic Sinonasal and Skull Base Surgery in Children Using Image Guidance Systems

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ABSTRACT:

Objective: To evaluate the use of image guidance systems to facilitate an endoscopic minimally invasive approach to sinonasal and skull base surgery in a pediatric population.

Study Design: Retrospective cohort study at a tertiary pediatric hospital.

Methods: Thirty-three children (age range: 5–18 years, median age: 13 years) who underwent image-guided sinonasal and skull base surgery between March 2000 and April 2007 were included in this study. The diagnoses were divided into infectious, congenital, neoplastic, and traumatic conditions. The surgeries were performed using computer-assisted navigation (CAN) and/or laser-dacryocystorhinostomy (LDCR) technology.

Results: Twenty-seven patients (82%) underwent endoscopic sinus surgery and six (18%) underwent skull base surgery. Indications included infectious complications of acute sinusitis (14), neoplasms (12), choanal atresia (9), and cerebrospinal fluid leak (5). Thirty patients (91%) required only one procedure. No surgical complications were reported.

Conclusions: Image guidance systems are safe and effective tools that facilitate a minimally invasive approach to sinonasal and skull base surgery in children. Consistent with adult literature, initial use of image guidance during the learning period tends to involve routine procedures while over time image guidance is used for difficult or revision cases. The additional anatomic information obtained by image guidance systems helps in the minimally invasive endoscopic approach for sinonasal and skull base pathologies.

INTRODUCTION:

Image-guided surgery (IGS) is rapidly becoming the standard of care for adult revision sinus surgery. Despite the intense research on IGS in adults, there is very little published literature on the use of this technology in the pediatric population. In children with smaller and more variable anatomy, the risks and benefits of IGS should be studied further. The goal of this study is to report our experience of IGS in complicated endoscopic skull base and sinonasal surgery with regard to indications, outcomes, complications, and surgeon comfort.

METHODS:

Retrospective cohort study of 33 patients who underwent sinonasal or skull base surgery at a tertiary pediatric hospital.

A. RESULTS: Surgeon experience

Initially, the image guidance system was used only a few times in the majority of cases. By 2002, image guidance was used in > 15 times in 100% of cases.

B. RESULTS: Surgical procedures and outcomes

Twenty-seven patients underwent sinusoidal surgery. Six patients underwent skull base surgery.

91% were disease free after one procedure.

Three patients required revision surgery:
- JNA recurrence
- Choanal atresia re-stenosis
- Subperiosteal abscess recurrence

CONCLUSIONS:

Image-guided surgery is safe and effective in children.

IGS was rated as very helpful for a variety of infectious, congenital, neoplastic, and traumatic conditions.

Potential benefits include:
- Assistance in defining landmarks
- Avoidance of complications
- Increasing surgeon confidence
- More thorough procedures
- Decreased need for facial or intraoral incisions
- Decreased long term effects on facial growth

SELECTED CASES:

Case 1: (a and b) Osseifying fibroma involving the right ethmoid and frontal sinuses with bowing of the lamina papyracea and mass effect on the optic nerve. (c) Post-operative view with resolution of proptosis.

Case 2: Neurofibroma of the right infratemporal fossa. The major vessels are displaced posteromedially.

Case 3: (a) Recurrent JNA arising in the nasopharynx posterior to the left maxillary sinus. (b) Post-operative view.

Case 4: (a) Post-traumatic CSF leak showing the bony defect of the sphenoid roof with opacification of the sphenoid sinus. (b) Post-operative view of repaired sphenoid roof.

References:


