Endonasal repair of choanal atresia, does stenting have a better outcome?

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Abstract Background: A prospective study designed to compare the short term and long term operative outcomes of transnasal endoscopic repair of congenital choanal atresia (CCA) with and without postoperative stenting.
Methods: Twelve cases from 2008 to the beginning of 2010 with either unilateral or bilateral choanal atresia of neonates have been endoscopically repaired, stents were used in seven cases where the other five cases did not have any stenting. Careful follow-up for about 9 months with postoperative CT was done for every case.
Results: Twelve patients were treated for CCA—between 2008 and 2010—7 patients (4 females and 3 males) (5 unilateral and 2 bilateral) (age range 4 days–17 years) were put in the first group, where stents were used, while the other group comprised five patients (3 females and 2 males) (4 unilateral and 1 bilateral) (age range 2 days–2 years) where no postoperative stents were used. Patent choanae resulted in 4 patients only (57%), with three patients (43%) in the first group needed revision (diagnosed on routine endoscopic follow-up after stent removal), while only on case (20%) in the second group, needed revision (granulations and synechiae almost occlude the new choana). Severe signs of inflammation and irritation were noted in the three stented failed cases (2 bilateral and one unilateral cases) at the columella and anterior nares in addition to dysphagia reported by parents.
Conclusion: The transnasal endoscopic technique is the approach of choice for repair of CCA because of good visualization of the posterior choana and the ability to open the defect with a high
1. Introduction

Congenital choanal atresia (CCA) was first described by Johann Roderer in 1755 in the clinical evaluation of a newborn with total choanal obstruction. Otto, however, was the first to describe it to Roderer in 1830. In 1854, Emmert reported the first successful operation for repairing CCA on a 7-year-old boy, which he had performed 3 years earlier using a curved trocar transnasally.

Although CCA is a rare cause of upper airway obstruction, it is considered the most common congenital anomaly of the nose. Its incidence varies from between 1 in 5000 to 1 in 8000 live births. Anatomically, it consists of an enlarged vomer and medialized lateral pterygoid plate causing a complete nasal obstruction. It is more frequently unilateral (usually the right side) and seems to affect girls more than boys. Although the unilateral condition may be left undiagnosed, bilateral CA may be life-threatening, newborns being solely nasal breathers. Some CCA may be associated with other congenital anomalies; however, in 50% of cases, no genetic relationship may be found.

The embryologic mechanism seems to be a combination of the persistence of either the nasobuccal membrane of Hochstetter or the buccopharyngeal membrane of the foregut, incomplete resorption of nasopharyngeal mesoderm, and locally misdirected mesodermal flow. This occurs between the fourth and 11th fetal week.

Imaging has allowed a better comprehension of the nature of the nasal obstruction.

In 30% of the cases, it is purely a bony obstruction; in 70%, the obstruction is a mixed bony and membranous anomaly.

Many approaches have been used to repair CA, including transpalatal and transnasal routes. Until recently, the transpalatal technique was the method preferred by most surgeons for reasons of excellent visualization and success rates of around 80–90%. The appreciable incidence of surgical failure with CCA repair led to a search for better surgical alternatives. Technical advances in endoscopic visualization and newer sinonasal powered instruments for endonasal surgical procedures have provided the opportunity to use the transnasal endoscopic route.

In this work, we explored our results in repairing 12 cases of choanal atresia, we used postoperative stents in seven cases (for different durations) while the other five cases were left without stenting. Our experience in using the transnasal route and the results of comparison between stented and non-stented cases will be discussed.

2. Patients and methods

Cases were assessed with respect to type and side of the anomaly, associated symptoms, age at diagnosis and treatment, sex, surgical complications, use and duration of stenting, need for surgical revision, and time of follow-up. All patients had a preoperative and postoperative CT scans and were operated by the same surgeons. Surgical technique was standard for every case and included the following steps:

- Under general anesthesia all patients undergo endonasal surgery.
- The nasal cavity was examined with a 2.7, 4.0-mm, 0° telescopes, and diagnosis was confirmed.
- The atretic plate was carefully examined.
- Cotton pledgets irrigated with solution of lidocaine hydrochloride 1% and xylometazoline (0.05% for children) are carefully placed in the nasal cavity.
- A solution of 1% xylocaine with 1:100,000 adrenaline is infiltrated with a long needle under telescopic vision in and around the stenotic area in order to obtain optimal decongestion and hemostasis.
- A tonsil sponge is positioned high in the nasopharynx, distending the soft palate caudally. The sponge serves as a landmark during the procedure.
- Using a power soft tissue shaver under endoscopic visualization, the mucosa over the atretic plate is carefully removed. A round cutting Burr was then used staying posterior, inferior, and medial in the nasal cavity, the surgeon perforates the atretic bony plate.
- Visualizing the tonsil sponge previously placed in the nasopharynx ensures correct fenestration. Once this is ascertained, the neochoana is completed by drilling laterally, enlarging to the lateral edge of the nasopharynx.
- Backbiting forces are then used to reduce a portion of the posterior bony septum. This further enlarges the neochoana. In 2 cases, one in each group, the soft tissue shaver was also used to remove a hypertrophied adenoid, for the stented group, anesthetic endotracheal tubes (with comparable size to the age of the patient), were used and fixed in place by a trans-septal suture, its anterior end tailored to be 3–4 mm behind the alar rim and its posterior end did not reach the posterior pharyngeal wall. Duration of stenting ranged from 2 to 6 weeks.
- Postoperative drainage of secretions and crusts was performed using an abundant isotonic sodium chloride (saline) wash. Revision endoscopy was systematically performed 1 week after surgery with the patient under local anesthesia (topical 1% lidocaine). After surgery, airway patency and the choanal size were checked regularly in all cases, every month for the first 3 months and then once every 6 months, using a 3.5-mm flexible nasal endoscope.

Patients who remained free of symptom during the follow-up period and whose choana remained patent under fiberoptic examination were considered as operative successes. The need
for choanal dilatation or surgical revision for persistent or recurring obstruction was considered a failure.

3. Results

Twelve patients were treated for CCA—between 2008 and 2010—with the transnasal endoscopic technique. Of these, 7 patients (4 females and 3 males) (5 unilateral and 2 bilateral) (age range 4 days–17 years) were put in the first group, where stents were used, (Fig. 4) while the other group comprised 5 patients (3 females and 2 males) (4 unilateral and 1 bilateral) (age range 2 days–2 years) where no postoperative stents were used (Tables 1–3 & Figs. 1–3), all surgeries were done using powered instruments (drill & microdibrider).

CT scanning was performed preoperatively on all patients to confirm the presence of atresia (Fig. 5), and to determine if the atresias were of the bony (4 patients) or membranous (1 patient) type or of mixed bony and membranous elements (2 patients) in the first group, and (3 patients), (1 patient)
and (1 patient), respectively, in the second group. After the operation, stents were left in place (Figs. 4 and 5) for 2–6 weeks, 2–3 weeks for unilateral atresia, 6 weeks for bilateral atresia.

Patient choanae (Fig. 5) resulted in 4 patients (57%) only with 3 patients in the first group needed revision (43%), diagnosed on routine endoscopic follow-up after stent removal, while only one case (20%) in the second group, needed revision (granulations and synechiae almost occlude the new choana, Fig. 6) Severe signs of inflammation and irritation were noted in the three stented failed cases at the columella and anterior nares (2 bilateral and one unilateral cases) in addition to the signs of dysphagia reported by parents. Absence of obstructive respiratory symptoms and patency of the choana on endoscopic examination were our success parameters. Two patients (1 in each group) had concurrent adenoidectomy at the time of the atresia repair. No any accompanying congenital anomalies were noted in any of the 12 cases of our study.

4. Discussion

Since newborns completely depend on nasal breathing during the first three weeks of life, bilateral CA is considered a medical emergency, while unilateral CA rarely presents with significant respiratory distress and diagnosis may be delayed for years.

CT scanning is the procedure of choice in the evaluation of choanal atresia, it serves to confirm the diagnosis (unilateral or bilateral), evaluate choanal atresia (vomer bone width and choanal airspace distance), exclude other possible nasal sites of obstruction, determine the degree of bony, membranous, or mixed atresia and delineate abnormalities in the nasal cavity and nasopharynx. More than 300 articles have been published on CA, this alone is the evidence of the difficulties and controversies otolaryngologist, head and neck surgeons encounter in the management and surgical treatment of this disorder.

Surgeons who perform surgical repair of CA have sought (this is the past participle of seek) a technique that offers direct access, good visualization, short operating times, and low morbidity.

Currently, transnasal and transpalatal approaches are the most commonly used and safest methods of surgical repair. The transpalatal approach has the disadvantages of long operative times, and risks of palatal fistula, crossbite, palatal muscle dysfunction, and dentoalveolar growth disturbance.

Endoscopic transnasal repair carries the risk of disruption of growth centers, cerebrospinal fluid leaks, skull base injury, and injury to the sphenopalatine artery. Endoscopic repair allows for excellent visualization of the choana, short operative times, and very minimal bleeding. Several authors even advocate endoscopic repair in an effort to be able to fashion flaps over raw areas to prevent possible postoperative stenosis. There is considerable debate on the benefits of using stents in surgical correction of CA. Many authors have argued that the use of stents is absolutely necessary for successful repair.

Stents have been used in most, if not all, reported surgical procedures. Many authors believe that stenting prevents postoperative restenosis. The duration and material of stenting vary from one study to another, and the former can range from several weeks to months, however, stents are associated with local infections and pain, formation of granulation tissue, and nasal synechia. Stent management is often complicated by migration or excessive pressure on the nasal ala. The use and duration of stenting following surgical management of CA remains under significant controversy in the literature. It must be noted that most case series are small and frequently reflect the collective experience of several surgeons. Most authors agree with the use of a stent for any surgical approach, although exact duration is still controversial, ranging from 4 months to 2 days. Recent studies suggest, however, that with the endonasal approach, where tissue manipulation and trauma are less significant, the use of stent may not be necessary.

Our results regarding to the method of choice are matching many authors like Natacha et al. and Wang et al. who found that, in general, a transnasal endoscopic approach with the aid of a power instrument is a safe useful procedure for the repair of CA, and see that this technique permits an angled vision, excellent visualization and magnification of the atretic plate. Compared with traditional techniques, this technique allowed a shorter hospital stay and less blood loss. Regarding to postoperative stenting our results show that the incidence of failure with the first (stented) group (43%) was higher than happened with the second group (20%) (non-stented) in addition to failure of maintaining a new choana, some problems related to the stent were reported by the parents like severe irritation and ulceration at the region of the columella, signs of severe inflammation (blockage by mucopus, bad odor, repeated cough and fever) and dysphagia in some cases. These
results are in agreement with what was reported by Josephson et al.13 and Wang et al.18 who see that the stents may act as a nidus for infection and recommended the endonasal repair of the CA in neonates without using stents, also it agrees with Abbeele et al.9 who stated that postoperative stenting is not necessary, provided that the nasal cavity is washed with abundant saline, especially in small children.

However we, and many authors like Schoem8 and Josephson et al.15 see that the use and duration of stenting following surgical management of CA remain under significant debate in the literature till now, and some authors like Ahmed23 reported in his study on 31 patients of CA that postoperative stenting showed a poor outcome in unilateral cases and the use of stents in bilateral CA may be associated with improved outcome, and this result may coincide with that seen in our study where we found that among the failed 3 cases in the stented group, there were 2 unilateral cases as a non statistically significant result. In conclusion we recommend the transnasal technique with the adjunctive use of drill and micridibrider as the best way for repairing both unilateral and bilateral CA, postoperative stenting do not have a better outcome especially in unilateral cases and further studies should be carried on stenting for bilateral CA.

References