Swinging Door Flap Technique for Endoscopic Transeptal Repair of Neonatal Bilateral Choanal Atresia.

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History

CA was first described by Roeder in 1755. Otto was credited with first describing it to Roeder in 1830. In 1845, Emmert reported the first successful operation on CA using a curved trocar transnasally.
**Embryology**

### Four theories for the development of CA

1. Persistence of a **buccopharyngeal membrane**.
2. Persistence of the **nasobuccal membrane** of Hochstetter - most commonly accepted theory.
3. The abnormal persistence or location of mesodermal adhesions in the choanal region.
4. **A misdirection of mesodermal flow** secondary to local genetic factors.

**Persistence of Buccopharyngeal Membrane**

Only 11 cases reported thus far. It is inserted at the junction of the anterior two-thirds and posterior one-third of the tongue, bounded laterally by the anterior faucial pillars and the soft palate superiorly.
Persistence of Nasobuccal Membrane

- Membranous atresia accounts for only 0-10% of cases.
- Only very unusual circumstances is the defect merely a thin membrane amenable to rupture and dilation. There is usually a bony abnormality.

Mesodermal Theory

Abnormal burrowing of the nasal pits.
Choanal atresia is considered a "red flag" diagnosis, prompting evaluation for comorbid conditions. This is epitomized by the term CHARGE which represents a constellation of associated manifestations including: ocular colobomas, heart defects, choanal atresia, retarded growth and central nervous system issues, genitourinary hypoplasia, and ear anomalies.

Mutations in CHD7 are present in the majority of patients with CHARGE syndrome.

Carbimazole embryopathy is a recently recognized and defined phenotype. It includes choanal atresia, gastrointestinal anomalies, particularly esophageal atresia; athelia or hypothelia; developmental delay; hearing loss; aplasia cutis; and dysmorphic facial features.
Aim of the study

- To review our experience in the diagnosis and perioperative management of infants with bilateral CA.
- A description of the endoscopic transeptal approach using the swinging door flap technique will be provided with special emphasis to the postoperative care and surgical outcomes.

Materials and Methods

A prospective analysis of infants with bilateral choanal atresia who were treated by the endoscopic transeptal approach at the Department of Otorhinolaryngology, Alexandria University between July 2003 and December 2005 was undertaken.

Fourteen neonates with BCA. Age = 2-25 days at time of surgery.
**Clinical Picture**

- Obligate nasal breather
- Cyclic respiratory distress during closure of mouth or during feeding and relieved by crying.
- Inability to pass a catheter through the nose into the nasopharynx.

**Management**

* Bilateral choanal atresia is a medical urgency, but not a surgical emergency.
* From an anesthetic standpoint, preoperative cardiac evaluation is mandatory.
Axial CT scan is the imaging modality of choice.

Nature of Atretic Plate

The old classification scheme originally developed by Fraser in 1910, and perpetuated in the literature for decades, stated that the obstruction was 90% bony and 10% membranous.

Fraser had no access to modern methods of evaluating CA in 1910.
Nature of Atretic Plate

A more modern analysis using computed tomography (CT) scan determined that the classification is probably closer to 70% mixed bony-membranous and 30% bony.

Assessment of Vomer Width & Choanal Air Space

\[ \text{CAS} = 0.67 \quad (0.34-1.01) \]
\[ \text{VW} = 0.23 \quad (0.11-0.34) \]
Differential Diagnosis

Bilateral Bony Midnasal Stenoses

Encephalocele
Surgical correction is usually necessary early in life.

With patent choanae, an infant can breathe and feed simultaneously with a low aspiration risk.

Transnasal Puncture

It seems unlikely that puncture and curettage techniques will adequately resect the posterior vomer or medial pterygoids, and this may lead to a higher incidence of postoperative stenosis.

It often then requires multiple staged dilations with the patient under general anesthesia.

(Munz, 1999)
In 1965, Owens presented a transpalatal approach for repair of posterior choanal atresia that was successful in over 90% of patients.

- Increased operative time.
- Blood loss.
- Palatal fistula.
- Palatal muscle dysfunction.
- Maxillofacial growth disturbance.
- Cross-bite.

Better used for revision surgery.
- In older children.
- When the transnasal visualization is difficult.

(Richardson & Osguthrope, 1988)

Not in patients younger than 6 years.
(Pirsig, 1986)
With the advent of miniaturized endoscopic equipment and powered instrumentation, the most popular and successful method over the past decade has been the endoscopic transnasal technique.
Mucosal flaps

Only epithelial lining will prevent scar contracture and closure of a circumferential epithelial defect in a hollow tube or duct in the body, mucosal flaps would be expected to help maintain the patency of a posterior choanal atresia repair.

(Neel et al., 1987)

Endoscopic Transeptal Approach
**Anesthesia**

*Neonates have a higher risk of developing intraoperative hypothermia.*

- Impaired platelet function and coagulation.
- Decreased drug metabolism.
- Increased wound infection rate.
- Cardiac arrhythmias.
- Delayed recovery.

**OR temperature not less than 26**  
Adequate wrapping.

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**Endoscopic Transeptal Approach**

**Elevation of Mucosal Flap**
Endoscopic Transeptal Approach

Elevation of Mucosal Flap
Endoscopic Transeptal Approach

Resection of Posterior Septum

Endoscopic Transeptal Approach

Widening of Neochoana
The benefits vs the risks of stenting after repair has been hotly debated in the otolaryngology literature for all airway procedures.

- Discomfort.
- Localized infection and ulceration.
- Circumferential scar tissue.
- Injury to surrounding normal tissues.
- Difficult to manage.
- May migrate or break.

*Zalzal GH, 1988*
The benefits vs the risks of stenting after repair has been hotly debated in the otolaryngology literature for all airway procedures.

- Stabilizing the nasal airway
- Keep mucosal flaps in position.
- Remodeling of lateral nasal wall.

Zalzal GH, 1988
### Assessment of Outcomes in CA Surgery

#### Three to four weeks after surgery.

#### Video

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### Endoscopic Transeptal Approach

<table>
<thead>
<tr>
<th>Number</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2-25 days</td>
</tr>
<tr>
<td>Type of atresia</td>
<td>12 Mixed / 2 bony</td>
</tr>
<tr>
<td>Two cardiac anomalies</td>
<td></td>
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<tr>
<td>Stent/Duration</td>
<td>Upper lip edema.</td>
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<tr>
<td>Bleeding &amp; Hypothermia.</td>
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<tr>
<td>Palatal fistula.</td>
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<td>Death.</td>
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<tr>
<td>Complications</td>
<td></td>
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<tr>
<td>Follow up</td>
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Assessment of Outcomes in CA Surgery

Is it accurate?

Most series, including our own, report subjective outcomes, namely the number of children who have been made asymptomatic by surgery. Few children will have normal-calibre choanae after surgery as some degree of restenosis almost always occurs, but normal-calibre choanae may not be necessary to render the child asymptomatic.

Truly objective outcomes such as direct measurement of choanal diameter and rhinomanometry are required.

Bilateral choanal atresia in the neonate is a medical emergency that should be treated as early as possible. Thorough investigation for associated congenital anomalies should be performed.
The introduction of endoscopes and microinstruments for transnasal approach gives a wide view, which permits a precise technique and minimizes the chances of complications and restenosis.