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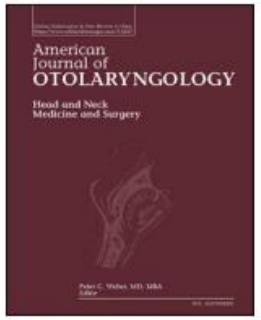

Pediatric endoscopic sinus surgery: Revisited 35 years later

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ABSTRACT

- **Evolution of PESS :** from **new procedure --> a key treatment** for pediatric sinus disorders over the past 35 years
- Developments :
  - More comprehensive guidelines
  - clearer surgical indications
- Advancements in medicine :
  - Improved diagnostics
  - less invasive procedures

- Better clinical outcomes：
  - Symptom relief
  - Disease control
  - Adenoidectomy mainly for refractory cases
- Goal :
  - Safe, effective, and patient-centered care
  - A sustained commitment to improving **quality of life** for pediatric patients

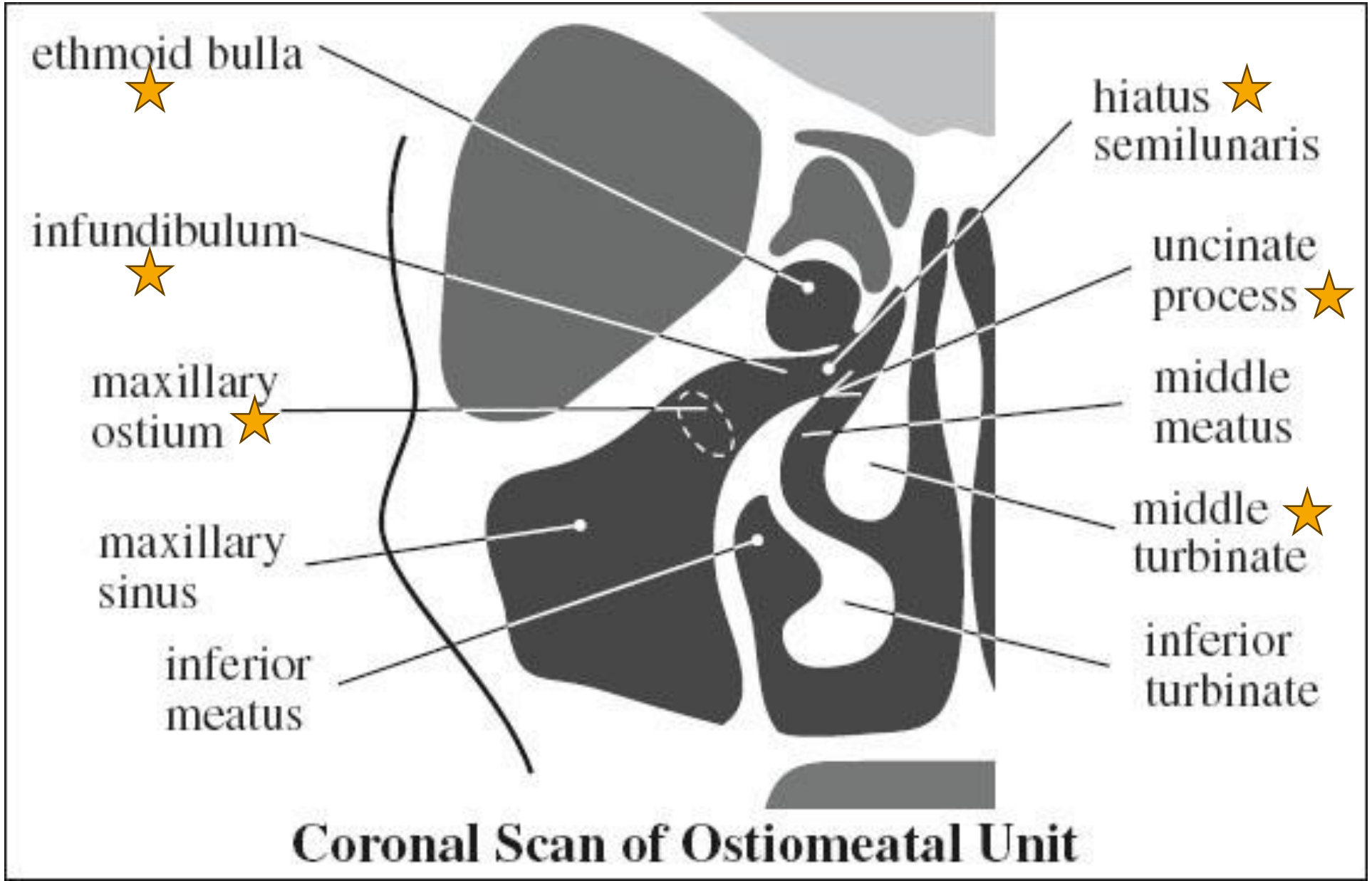
Introduction

- **Purpose :** Serves as a **key treatment** for both acute and chronic sinus disorders in children
- **Primary goal :** Restore normal drainage and ventilation of the paranasal sinuses
- **Method:**
  - Removing diseased tissue
  - Opening the obstructed **ostiomeatal complex (OMC)**
- **Benefits :**
  - Improved clinical outcomes
  - Faster recovery
  - Enhanced quality of life

•OMC (ostiomeatal complex)

- The area where sinus drainage pathways converge
- Composition :
  - **Middle turbinate**
  - **Uncinate process**
  - **Ethmoid infundibulum**
  - **Hiatus semilunaris**
  - **Ethmoid bulla**
  - **Natural ostia** of the **maxillary**, **frontal**, and **anterior ethmoid sinuses** – which all open into the **middle meatus** via the OMC.

•OMC (ostiomeatal complex)



- **Early development :**
  - PESS was introduced to the U.S. from Europe in the late 1980s – early 1990s.
- **Initial challenge :**
  - Before 1996 ：no standardized guideline for determining which pediatric patients should receive PESS.
- **Consensus milestone :**
  - In 1996, **indication criteria** was first established by multiple specialists in a international meeting

- Absolute indications :
  - Cystic fibrosis with complete nasal obstruction and massive nasal polyposis
  - Intracranial complications of sinus disease
  - Fungal sinusitis
  - Certain neoplasms (e.g., juvenile angiofibromas)
- Debated indication :
  - Pediatric chronic rhinosinusitis (PCRS) with frequent exacerbations unresponsive to optimal medical therapy
- **Impact :** The consensus standardized PESS indications, solidifying its role as a key and versatile procedure in pediatric ENT surgery

Methods

Literature search strategy

- **Search method :** A comprehensive **PubMed** literature search was conducted.
- **Time frame :** Included studies published from **1985 to 2023**.
- **Keywords used :**
    - “Pediatric Endoscopic Sinus Surgery”
    - “PESS”
    - “Pediatric Chronic Rhinosinusitis”
    - “sinus surgery in children”
- **Search strategy :** Terms were combined using **Boolean operators**

Selection criteria

- **Selection criteria :** Studies focused on the **development, techniques, and outcomes** of PESS in pediatric sinus management
- **Inclusion :** Articles providing insights into **surgical practices, medical management, or clinical outcomes** in pediatric patients
- **Exclusion :** Non-English studies, non-pediatric populations, and duplicate publications
- **Additional strategy :** References of key articles were **hand-searched** to ensure comprehensive coverage.

Data extraction and synthesis

- **Data extraction:** Relevant information was collected from selected studies
- **Synthesis method:** Data were **narratively synthesized** to trace the evolution and impact of PESS
- **Focus areas:** Highlighted **key advancements**, integrated findings into **pediatric otolaryngology**, and identified **future research directions**
- **Purpose of approach:** Narrative synthesis provided a cohesive understanding of complex topics through a **critical review spanning 35 years**

Results and discussion

Chronic rhinosinusitis in children

- **Prevalence:**
  - common in **children**
  - often following viral infections or allergic inflammation
- **Symptoms :**
  - **nasal congestion**
  - **nasal discharge**
  - **reduced sense of smell**
- **Course :** Most cases resolve spontaneously; only **a minority require medical treatment**

Chronic rhinosinusitis in children

- Classification :
  - Acute rhinosinusitis :
    - Duration：10 days to 12 weeks
    - may have **symptom-free intervals** if recurrent
  - Chronic pediatric rhinosinusitis (PCRS) :
    - Definition refined in 2012 (European Position Paper) and adopted in 2014 (AAO-HNS)
    - **Criteria :** ≥90 consecutive days of two or more **symptoms** (purulent rhinorrhea, nasal obstruction, facial pressure/pain, or cough)
    - **Objective findings:** Endoscopic evidence of mucosal edema, purulent drainage, or nasal polyps, and/or CT showing mucosal changes in the **ostiomeatal complex** or sinuses

Chronic rhinosinusitis in children

- **Shift in management** : Over the past 30 years, PCRS treatment has moved from primarily surgical to mainly medical interventions.
- **Reasons for change** :
  - Improved diagnostics
  - better understanding of disease pathophysiology
  - innovations in medical therapy
- **Medical therapy approach**: Guided by adult chronic rhinosinusitis guidelines
  - Antibiotics : Extended courses (3 – 6 weeks) targeting common pathogens: Streptococcus pneumoniae, Moraxella catarrhalis, Haemophilus influenzae, and beta-hemolytic Streptococcus pyogenes.

Chronic rhinosinusitis in children

- **Topical therapies** : Intranasal treatments are now a **cornerstone** of PCRS management.
- **Key** interventions:
  - **Nasal saline irrigation** : Safe, well-tolerated, reduces symptoms, and improves CT Lund – Mackay scores.
  - **Intranasal corticosteroids**: Effective in reducing inflammation and promoting nasal mucosa health.
- **Adjuvant therapies** : **Antihistamines** and additional intranasal **steroids** enhance medical management.
- **Overall approach** : Provides a **comprehensive, less invasive** strategy that emphasizes patient safety and optimized outcomes.

Chronic rhinosinusitis in children

- **Evolving** role of PESS : Now more targeted and selective, used mainly when medical therapy fails or complications arise.
- **Trend** in pediatric care : Emphasis on minimizing invasive procedures and reserving surgery for cases with clear benefit.
- **Significance** : Reflects improved understanding of pediatric sinus disease and a commitment to enhancing children’ s wellbeing.

Updated indications

- 2021 guideline updates (AAO-HNS) :
  - **Reaffirmed** absolute indications for PESS.
  - Added :
    - **recurrent** acute rhinosinusitis
    - PCRS **unresponsive** to conventional medical therapy.
- **Significance**: Highlights PESS’ s role when other treatments, including adenoidectomy, fail.
- Surgical candidacy: Determined by clinical judgment, as the definition of “maximal” medical therapy is **still debated**.
- Imaging: Advanced coronal and axial CT scans remain essential for planning, especially in complex cases.

Practice patterns

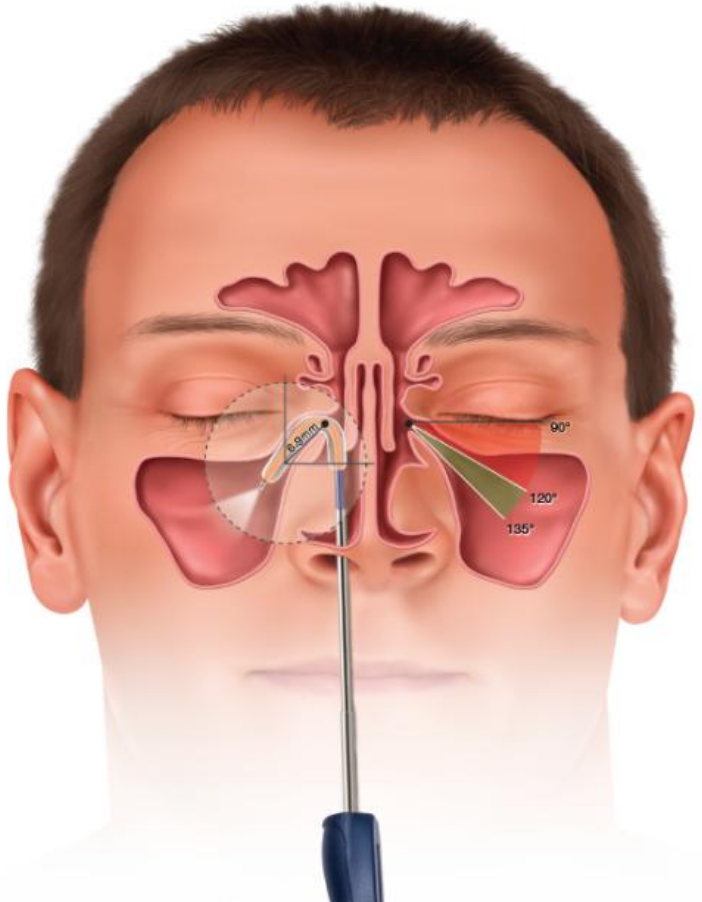
- Survey source: 2016 American Rhinologic Society (ARS)
- Main finding: 90% of respondents used adenoidectomy as the **first surgical step** for PCRS
- Procedure breakdown:
  - 43% – Adenoidectomy alone
  - 63% – Adenoidectomy with sinus lavage
- Other concurrent procedures:
  - 31% – Sinus lavage
  - 17% – Balloon catheter dilation (BCD)
  - 17% – Endoscopic sinus surgery (ESS)
  - 2% – Inferior turbinate reduction
- Key takeaway: Surgical approaches are **individualized** to match each child’s disease pattern and severity

Practice patterns

- When **initial surgery fails** : 85% of clinicians proceed to PESS as the next step.
- Significance: Highlights PESS as a key option for medically refractory PCRS.
- Common adjunct procedures:
  - Concha bullosa removal
  - Inferior turbinate reduction
  - Septoplasty
- Goal : Provide comprehensive management and optimize surgical outcomes

Practice patterns

- Balloon Catheter Dilation (BCD) : A newer, minimally invasive option for managing PCRS.
- Benefits:
  - Reduces dependence on PESS.
  - Demonstrated high safety and feasibility



Practice patterns

- BCD Effectiveness:
  - Ramadan et al. reported 81% success in children unresponsive to adenoidectomy alone — comparable to PESS success rates.
  - 2017 multi-institutional trial: Confirmed significant symptom improvement and safety.
  - No major difference in outcomes between **BCD alone and BCD combined** with other procedures (e.g., adenoidectomy, turbinate surgery, ethmoidectomy).
- Implication: BCD is now an effective alternative or adjunct in PCRS surgery, supporting a trend toward less invasive interventions

Practice patterns

- Some clinicians choose **not to perform PESS** even for refractory PCRS.
- Reported reasons include:
  - High revision rates – 18%
  - Perceived failure rates – 16%
  - Preference for alternative treatments – 16%
  - Concern over facial growth retardation – 12%
  - Complication risks – 8%
  - Technical difficulty – 4%
  - General anesthesia concerns – 2%
  - Stigma from frequent PESS use – 2%

Practice patterns

- Early in the development of PESS, there were major concerns about facial growth retardation
- However, **multiple studies** since the early 2000s have consistently shown no significant difference in facial growth between children who underwent PESS and those who did not.
- These findings have effectively dispelled concerns about facial growth impairment following PESS

Outcomes

- Pediatric sinus surgery **outcomes** vary depending on surgical **indications** and **perioperative management**
- **Research growth**: Last two decades have seen a **significant increase in studies** on PCRS and PESS outcomes
- **Trend** : More authors and comparative studies have emerged
- **Effectiveness** : PESS is **consistently** shown to be effective for conditions such as:
  - Allergic fungal sinusitis (AFS)
  - Mucoceles
  - Orbital subperiosteal abscesses
  - Pediatric chronic rhinosinusitis (PCRS)

Outcomes

- Adenoidectomy is a common **first-line** surgical option for children with chronic rhinosinusitis (CRS) due to its **safety and simplicity**
- Purpose :
  - Removes bacterial reservoirs
  - improves nasal drainage.
- Effectiveness : Resolves CRS in roughly 50% of pediatric cases.
- Considerations: Effectiveness varies among subgroups, e.g., **children with asthma** or **under 7 years** old may require additional surgery sooner

Outcomes

- **Balloon Catheter Dilation (BCD) :**
  - A newer, less invasive **alternative to PESS** for children with persistent CRS symptoms after adenoidectomy
- **Effectiveness** : Success rates are **comparable to PESS**, making it a viable surgical option
- **Trend** : With advances in medical management, the need for BCD has **decreased**

Outcomes

- **Trend : PESS** is used **less frequently**, but procedural advancements have improved outcomes.
- 1992 study (Lazar et al.):
  - 210 children with refractory PCRS (1986 – 1989)
  - Success rate: 79%
  - Complication rate: 9%
- 2013 systematic review (Makary et al.):
  - Reviewed 11 studies (1990 – 2012)
  - Success rate: 82 – 100%
  - Complication rate: 1.4%
- Conclusion: **Improved surgical techniques** and **perioperative care** have enhanced the **safety and efficacy** of **PESS** over time

Outcomes

- 2013 study (Vlastarakos et al.) : Systematic review and meta-analysis of 15 studies on PESS for PCRS
- Outcomes:
  - Significant improvement in sinusitis symptoms and overall quality of life.
  - Success rates: 71 – 100%.
  - Major **complication** rate: Low at **0.6%** (e.g., CSF leak, meningitis, significant bleeding).
- Clinical context:
  - PESS is **not usually first-line** due to its invasive nature.
  - Considered **the most effective surgical** option when indicated.
  - Serious **complications**, though **rare**, include hemorrhage, CSF leak, and orbital complications

Results and discussion

- **Evolution** of PESS : Over 30 years, transformed from an **innovative procedure to a key component** in pediatric sinus disorder management.
- Drivers of change :
  - Advances in **understanding** PCRS
  - Development of **new treatment modalities**
  - Establishment of comprehensive **guidelines** and refined surgical **indications**
- **Integration with less invasive methods** : Techniques like adenoidectomy complement PESS, reducing discomfort and recovery time.

- Efficacy : PESS **effectively relieves symptoms** and treats conditions such as:
  - Allergic fungal sinusitis
  - Mucoceles
  - Orbital subperiosteal abscesses
- **Future** direction : Continued innovation and collaborative research aim to refine surgical techniques and expand effective treatments.
- Core goal: Deliver safe, effective, and patient-centered care, enhancing quality of life for children with sinus disorders

Thanks