

Characterizing Dysphonia Following Pediatric Open Airway Reconstruction: A Systematic Review and Meta-Analysis

Zachary Dahan¹, Alix Pincivy², Carol Nhan³, Mathieu Bergeron³

Faculté de médecine



1. Faculty of Medicine, University of Montreal, Montréal, QC, Canada; 2. Medical Librarian, CHU Sainte-Justine, Montréal, QC, Canada; 3. Department of Pediatric Otolaryngology-Head and Neck Surgery, CHU Sainte-Justine, Montréal, QC, Canada.



Introduction

- Open airway reconstruction surgeries (**OARS**) are associated with the development of **dysphonia** in half of pediatric patients¹.
- Numerous studies in children with history of OARS have reported **voice outcomes**, including voice quality scales, vocal acoustic parameters, and quality of life (QOL) scores.
- The aim of this study is to characterize the voice outcomes of children who have had open airway reconstructive surgery.

Methods

Search strategy

- PRISMA Framework
- Databases: PubMed, Embase, CINAHL, Web of Science, Medline, EBM Reviews

Inclusion criteria

- Subjects 18 years or younger
- History of open airway reconstruction surgery
- Report qualitative or quantitative voice assessments

Results

Selection

- 4089 records were identified
- 2945 were excluded based on title and abstract screening
- 163 reports retrieved were assessed by full-text review
- 22 articles were included in this study

Articles

- Most articles were retrospective case series.
- All articles were judged to have a high risk of bias according to the RoBANS tool²

Patient characteristics

- Total of 545 patients; 49% male; Mean age 10.1 years.
- Mean of 1.7 of open airway surgeries per patient.

Other Findings

- Frequently reported endoscopic findings : Anterior commissure blunting; Posterior notching; Abnormal vocal cord mobility and/or contact; Supraglottic collapse/phonation.
- Vocal qualities reported: Hoarseness; Strain; Weakness; Breathiness.

Meta-Analysis of the Main Voice Findings in Children with Dysphonia Following OARS

Outcome Measure	Mean (95% CI)
Perceptual Voice Quality	
CAPE-V, total score (0-100)	55.6 (47.9-63.3)
Acoustic and Aerodynamic Measures	
Fundamental frequency (Hz)	210.5 (174.6-246.3)
Phonation time	7.7 (5.7-9.8)
Jitter (%)	1.5 (0.8-0.25)
Maximum intensity (dB)	79.9 (77.6-82.1)
Airflow (L/min)	180.8 (139.4-222.24)
Peak air pressure (cm H ₂ O)	10.9 (9.1-12.8)
Voice-related QOL	
pVHI, total score (0-92)	31.5 (19.9-43.0)
PVRQOL, total score (0-100)	83.7 (74.1-93.3)

OARS = Open airway reconstruction surgeries; CAPE-V = Consensus Auditory-Perceptual Evaluation of Voice; pVHI = Pediatric Voice Handicap Index; PVRQOL = Pediatric Voice-Related Quality of Life; CI = Confidence interval; Hz = Hertz; sec = second. L = Liter;

Discussion

- Children with dysphonia following OARS present :
 - **Moderately altered voice quality**, as demonstrated by the CAPE-V
 - **Strained, hoarse, and weak** voices.
 - **Reduced voice-related quality of life** as shown by the pVHI and PVRQOL.
- **Careful consideration** should be made to minimize risk of dysphonia by :
 - Avoiding complete laryngofissure³
 - Ensuring precise reapproximation of vocal folds after laryngofissure⁴
 - Using narrower posterior grafts⁴
- **Limitations** of this study include use of a heterogeneous set of retrospective case series, as well as possible overestimation of degree of dysphonia due to selection bias.

Conclusion

- Childrens' **voice can be substantially altered** following open airway reconstruction surgery, with negative impacts on voice-related quality of life.
- Care must be taken to avoid this long-term consequence.
- Future studies should focus on using prospective, standardized protocols and outcome measures consistent with the literature.

References

1. Clary RA, Pengilly A, Bailey M, et al. Analysis of voice outcomes in pediatric patients following surgical procedures for laryngotracheal stenosis. Arch Otolaryngol Head Neck Surg. Nov 1996;122(11):1189-94. doi:10.1001/archotol.1996.01890230035008
2. Kim SY, Park JE, Lee YJ, et al. Testing a tool for assessing the risk of bias for nonrandomized studies showed moderate reliability and promising validity. J Clin Epidemiol. Apr 2013;66(4):408-14. doi:10.1016/j.jclinepi.2012.09.016
3. Macarthur C, Kearns GH, Healy GB. Voice Quality after Laryngotracheal Reconstruction. Arch Otolaryngol. Jun 1994;120(6):641-647.
4. de Alarcon A, Rutter MJ. Revision Pediatric Laryngotracheal Reconstruction. Otolaryng Clin N Am. Oct 2008;41(5):959-+. doi:10.1016/j.otc.2008.04.004