

# **Laryngoscopic and acoustic voice data of children following laryngo-tracheal reconstruction and cricotracheal resection surgery: a long term follow up**

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## Objectives

Laryngeal airway narrowing from subglottic stenosis (SGS) may be congenital or acquired, with many cases of SGS acquired following intubation or laryngotracheal injury. Two main approaches to reconstructive surgical management exist: laryngotracheal reconstruction (LTR) and partial cricotracheal resection (CTR). Primary surgical outcome indicators continue to be survival or decannulation of the tracheostomy.

LTR and CTR procedures have been undertaken in Glasgow since the early 1980s. A retrospective audit of parents' perspectives on quality of life for their children showed overwhelming concerns relating to breathing, respiratory tract infections and voice quality in their children; in addition to concerns relating to independence and the ability to lead a normal life.

This study evaluated the voice outcomes of children over the age of 5 who have had LTR/CTR at the hospital in Glasgow. This paper explores specifically the laryngeal vibratory mechanisms used by children who have undergone LTR or CTR in order to produce voice and how this relates to acoustic features of voice for each child compared to published normative acoustic data for an English speaking paediatric/adolescent population.

## Methods

Participants were recruited through a cohort analysis. All surviving children who had undergone LTR or CTR at the hospital and were >5years (n = 56) were invited to take part in this study through postal information leaflets. 16 participants opted in to the study, 12 attended for data collection appointments, 1 withdrew participation and 3 failed to attend the appointment. Awake laryngoscopy and voice recordings were taken for each participant. Audio recordings followed a standard protocol where each child produced a single sustained vowel sound [a] four times. The audio recordings took place in a sound-proofed audiology room located in the children's hospital to reduce the impact of background noise on the stability of the audio files. Acoustic analysis was performed from the recording of the sustained vowel [a] using the acoustic analysis software Multi-Dimensional Voice Programme (MDVP). Fundamental frequency and three perturbation measures (jitter percentage, shimmer percentage and noise to harmonic ratio) were measured from the middle 3.5 seconds of the voiced segment produced in the fourth recording.

## Results

There was a range of vibratory mechanisms observed in all of the participants. For four children, all the acoustic analysis findings were within the normal range. These four participants are discussed in relation to the laryngeal visualisation observations.

## Conclusions

Normal voice outcome is a potential outcome for children evaluated long term following LTR/CTR. The extent to which these outcomes relates to initial surgical intervention is worthy of exploration.