The larynx after open airway surgery for laryngotracheal stenosis: static and dynamic MRI assessment

B Elders¹,², P Wielopolski³, P. Ciet¹,² H Tiddens¹,², B Pullens³

¹. Department of Pediatric Pulmonology, Erasmus Medical Centre - Sophia Children’s Hospital, Rotterdam, The Netherlands
². Department of Radiology and Nuclear Medicine, Erasmus Medical Centre, Rotterdam, The Netherlands
³. Department of Otorhinolaryngology and Head and Neck Surgery, Erasmus Medical Centre- Sophia Children’s Hospital, Rotterdam, The Netherlands

Conclusion

MRI has great potential to evaluate:
- morphology
- dynamics of the larynx and vocal cords in LTS children.

Background

• Laryngotracheal stenosis (LTS) after intubation occurs in 1% of pediatric patients
• LTS is often successfully corrected with open airway surgery
• Majority of LTS patients have respiratory and vocal sequelae
• To improve clinical care and surgical interventions in LTS better understanding of sequelae is needed
• MRI has great potential to image the pediatric larynx in static and dynamic conditions

Methods

• MRI protocol tested on 5 healthy volunteers
• 3T scanner (GE Healthcare), 6CH carotid coil
• MRI protocol:
  • Assessment of anatomy of the post-surgical larynx using high-resolution three-plane PROPELLER sequences
  • Tissue characterization using diffusion weighted imaging to visualize inflammation and fibrosis
  • Static and dynamic imaging of the vocal cords using SSFSE and cine-MRI sequences during inspiration and phonation

In LTS patients findings will be related to clinical and vocal status measured with health- and voice related questionnaires, spirometry and vocal tests.

Results

Pediatric laryngeal MRI protocol:
- 30 minutes
- Excellent anatomical detail
- No artefacts
- Dynamic 3D cine-MRI images, temporal resolution of 240 ms

Aim

To execute a prospective cohort study with morphological and dynamic MRI of the larynx and vocal cords in children after surgery for LTS.

Figure 1: High-resolution T2 weighted (PROPELLER) axial (A), coronal (B) and sagittal (C) images of the larynx of a healthy volunteer with a spatial resolution of 0.5x0.5x2 mm

Figure 2: Axial T2 weighted (PROPELLER) images of a 13 year old LTS patient, after double- stage laryngotracheal reconstruction, with complaints of shortness of breath and stridor. Obstruction at the level of the arytenoids of 75% of the upper airway diameter (A), the cricoid cartilage showing the posterior rib cartilage graft (arrow) (B)

Drs. B. Elders is currently working on her PhD on MR imaging of the pediatric airway and lungs. The MUSIC study, an MRI study in children who have undergone open airway surgery for LTS, is part of this.