

## **Effect of MRI on distortion product otoacoustic emissions in neonates: a pilot study**

### **Authors**

Hannah Keppler <sup>1,2</sup> (PhD), Sofie Degeest <sup>1</sup> (PhD), Bart Vinck <sup>1</sup> (PhD), Els De Leenheer <sup>2,3</sup> (MD, PhD), Koenraad Smets <sup>4</sup> (MD, PhD), Kris De Coen <sup>4</sup> (MD)

<sup>1</sup> Department of Rehabilitation Sciences, Ghent University, Belgium

<sup>2</sup> Department of Ear, Nose and Throat, Ghent University Hospital, Belgium

<sup>3</sup> Department of Head and Skin, Ghent University, Belgium

<sup>4</sup> Department of Neonatal Intensive Care, Ghent University Hospital, Belgium

### **Corresponding author**

Hannah Keppler

Ghent University (Hospital)

C. Heymanslaan 10

9000 Ghent

Belgium

Telephone number: 0032/9/332 04 08

### **Background/ aims**

Excessive noise exposure can lead to temporary and/or permanent damage to the cochlea. In adults, the effect of MRI on hearing thresholds and distortion product otoacoustic emissions (DPOAEs) while using hearing protector devices was inconclusive. Neonates could be more prone to the effects of noise; however, to the best of our knowledge, no results regarding MRI on cochlear function in neonates are available. The goal of the current study was to investigate DPOAEs before and after MRI in neonates using earmuffs.

### **Method**

Eight neonates with a congenital cytomegalovirus infection, 4 girls and 4 boys, ranging in age between 8 and 32 days, undergoing 1.5 Tesla MRI of the head (30-45 minutes) as part of a standard clinical assessment were tested with DPOAEs at four moments: before (pre), immediately after (post 1), within 30 minutes after (post 2), and within 24 hours after (post 3) MRI. During MRI, the neonates' ears were protected using earmuffs. Non-parametric tests were used to evaluate changes in DPOAE amplitudes before and after MRI.

### **Results**

The highest amount of present DPOAEs was seen during pre-measurement, and at half-octave frequency bands above 1.5 kHz. Using Friedman's test, no significant changes in DPOAE amplitudes were found between the four moments, except at half-octave frequency band 2.0 kHz. However, pairwise comparison between pre and post 1, and between pre and post 3, did not reveal any significant changes in DPOAE amplitudes. Based on individual data, temporary emission shifts were mostly seen between the measurements before and immediately after MRI, and at half-octave frequency bands between 2.0 and 6.0 kHz.

### **Conclusions**

Although no significant changes in DPOAE amplitudes were seen before and after MRI, individual emission shifts give rise to concern. The cochlear function of neonates, especially those with cytomegalovirus infection, might be more sensitive to the effects of noise. Adequate hearing

protection especially designed for neonates during MRI should be used. Future research with more subjects tested at least 72 hours after MRI is needed to exclude permanent cochlear damage caused by noise.

### **Highlights**

- Distortion product otoacoustic emissions (DPOAEs) in neonates can be used to evaluate cochlear damage after noise exposure.
- In this pilot study, no significant changes in DPOAE amplitudes in neonates before and after MRI were found, although individual emission shifts were seen.
- Hearing protector devices should be used in neonates during MRI.

### **Key words**

- Distortion product otoacoustic emission
- MRI noise
- Neonates

### **Poster presentation**