**ABSTRACT**

**Outcome Objectives**
1. Apply Diffusion tensor imaging (DTI) and fiber tractography of the auditory nerve. 2. Investigate whether a 1.5T MRI System can be used for fiber tractography of the auditory nerve.

**Methods**
Five healthy volunteers underwent 1.5-T MRI including a diffusion-weighted data set with six gradient directions. Fiber tractography of the auditory nerve based on DTI was performed using an open source software. The anatomical accuracy of calculated fiber pathways was analyzed using T1- and T2-weighted images.

**Results**
DTI-based fiber tractography allowed successful visualization of auditory nerve fibers in all five subjects. In all cases, fiber bundles were displayed with different anatomical accuracy.

**Conclusion**
A 1.5-T MRI system can be successfully used for fiber tractography of the auditory nerve. This imaging tool requires further investigation to improve the anatomically accurate fiber display.

**INTRODUCTION**

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Diffusion Tensor Imaging (DTI) is a MRI technique that uses anisotropic water diffusion in neural fibers to estimate the axonal organization. Using DTI data fiber tractography can calculate and visualize the course of nerve fibers (Figure 1.). There have been few reports on the use of DTI and fiber tractography to visualize cranial nerves [1-3]. These studies have been conducted with 3T MRI. The aim of our study was to investigate feasibility of DTI and fiber tractography of the auditory nerve with 1.5T MRI.

**METHODS AND MATERIALS**

Five healthy volunteers (m=3; f=2; 28-34 y) underwent T1- and T2-weighted MRI including a diffusion-weighted data set with six gradient directions (b-value 1000s/mm²). Imaging was performed using a 1.5T scanner (Magnetom Avanto, Siemens, Erlangen, Germany). 3D segmentation was used to define Regions of interest (Fig. 2.). Fiber tractography of the auditory nerve was performed using an open source software [4]. The anatomical accuracy of calculated fiber pathways was analyzed using T1-/T2-weighted images.

**RESULTS**

DTI-based fiber tractography enabled successful visualization of auditory nerve fibers in all five subjects (Fig. 3.). In all cases, fiber bundles were displayed with different anatomical accuracy (Fig.4).

**DISCUSSION**

DTI and fiber tractography are novel techniques to calculate and visualize the course of cranial nerves. A visualization method for nerve's displacement (e.g., by tumors) would be a helpful tool preoperatively (1). Furthermore axonal integrity can be estimated by calculation of fractional anisotropy using DTI. Changes in neural microstructure could be observed by these methods in a noninvasive way (3). Depending on data acquisition bias and the choice of DTI-calculation mode interindividual differences in anatomical accuracy of nerve fibers can be observed.

**CONCLUSIONS**

A 1.5-T MRI system can be successfully used for DTI and fiber tractography of the auditory nerve. This novel method requires further investigation to improve the anatomically accurate fiber display.

**REFERENCES**