Measurement of the curvature of the cochlear spiral

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INTRODUCTION
To non-invasively measure the curvature of the cochlea, the curvature of the cochlea at the base was measured based on the central line of the cochlear spiral: the base, the middle and the apex. Three parts could be measured in this study had good agreement with that defined by anatomy.

RESULTS AND DISCUSSION:
The length of the cochlea measured based on the central line of cochlear spiral was 1.82 cm to 5.96 cm, and the mean length was 3.67 cm which was different from the anatomy for 4.8%. The mean curvature was 2.97 at the base, 4.72 at the middle, and 5.63 at the apex.

Significance:
The geometry of the cochlea of inner ear was measured in this study. The cochlea was divided into three regions by the central line of the cochlear spiral: the base, the middle and the apex. Three parts could be measured in this study had good agreement with that defined by anatomy.

METHODS AND MATERIALS
The MRI, MAGNETOM Trio with TIM, was utilized. The magnetic field intensity of MR scanner was 3T. The sequence for MR image was constructive interference in steady state (CISS). The repetition time (TR) was 5.65 ms. The echo time (TE) was 2.6 ms. The voxel size was 0.5 mm × 0.5 mm × 0.5 mm. There were 48 slices. 12 normal inner ears were measured based on the central line of cochlear spiral: the base, the middle and the apex.

Figure 3.

REFERENCES:

Figure 1. The model of inner ear by geometrical recognition (a) semitranslucent (b) wall (c) cochlea.

Figure 2. The cross-sectional model of the original cochlea.

Figure 3. The cochlea was divided by the central line of cochlear spiral.

Figure 4. The curve of the cochlea at the base, the middle and the apex for bilateral ears.

Figure 5. The curve of the cochlea at the base, the middle and the apex for the left ear.

Figure 6. The curve of the cochlea at the base, the middle and the apex for the right ear.

For bilateral ears, the mean length of the cochlea for the right ear was longer than that for the left ear. The length of the cochlea at the right ear was 1.57 mm to 5.63 mm, and the mean length was 3.67 mm. The length of the cochlea at the left ear was 1.51 mm to 5.61 mm, and the mean length was 3.47 mm. Therefore, when producing the electrode sites for the cochlear implant devices, the size of the other parts would be made smaller because the curvatures of the cochlea at the middle and at the apex were smaller.

CONCLUSIONS:
The geometry of the cochlea of inner ear was measured in this study. The cochlea was divided into three regions by the central line of the cochlear spiral: the base, the middle and the apex. Three parts could be measured in this study had good agreement with that defined by anatomy.

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