Conclusion: Our study showed that though cochlea might vary in sizes, cochlear structures retain similar ratio, which could leave small cochlea unnoticed during routine examination. In patients with shorter cochlear basal length, cochlear electrode insertion was associated with encountering resistance points. Measuring cochlear basal length before cochlear implantation might alert surgeon about possible difficulties inserting cochlear electrode array.

Full cochlear electrode insertion might benefit patient hearing outcomes. Stimulating receptor hair cells along greater cochlear duct length could result in better language perception and sound quality, especially in high frequency sounds. Full cochlear electrode insertion is harder to achieve due to many factors including variations of cochlear anatomy. Precise preoperative examination of cochlear computed tomography (CT) images might suggest most appropriate electrode specifics, operative technique. Minimal damage to inner ear results in decline in postoperative complications and easier reimplantation operations.

Methods: Multiplanar reconstructions of high resolution CT defined by specific criteria were used to perform 3 measurements: cochlear basal length and width, basal turn lumen diameter (Fig. 1). Measurements plane was determined by one full cochlear duct turn, identifiable oval and round windows, visible vestibule and parts of lateral and superior semicircular canals. Cochlear duct length was calculated using mathematical methods described by Alexiades (2014). Patients implanted with 31,5mm Med-El FlexSoft (Innsbruck, Austria) electrode array were included. Implantations were performed in a single tertiary referral center by single surgeon between 2011 and 2016. Cochlear implantation performed in accordance with atraumatic surgical technique described by J. Kiefer (2004). Electrode insertion resistance was measured using determined criteria by operating surgeon. Data was analyzed with SPSS 21 statistics software.

Discussion: Cochlear dimensions vary, but cochlear structures retained constant ratio. This could leave small cochlea unnoticed during preoperative examination. Our study showed, that smaller than 8,99 mm cochlear basal length was associated with encountering resistance points during cochlear electrode insertion (p=0,022).

Results: 111 cochlear implantations were performed (27 bilateral CI). Cochlear basal length average was 8,9 (7,9-10,2) mm, basal width average – 6,2 (5,1-7,1) mm. Basal turn diameter was 1,6 (0,8-2,8) mm, second turn diameter – 1,3 (0,5-1,9) mm. Cochlear duct length was calculated 37,5 (33,1-42,6) mm. Correlations between cochlear dimensions were determined (Fig.3). No resistance was encountered during insertion of electrode array in 52,25% of implantations. In 18,92% electrode insertions strong resistance was observed. Data analysis showed smaller than 8,99 mm cochlear basal length was associated with encountering resistance points during cochlear electrode insertion (p=0,022).