Section: **Visualisierung**

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Abstract-Title:
ENDPOINT PLANNING FOR A TRAJECTORY OF A ROBOT-BASED COCHLEOSTOMY – SUGGESTION FOR RADIOLOGIC ARTIFICAL LINESPLANUNG DES TRAJEKTORIENENDPUNKTES EINER ROBOTER-GESTÜTZTEN COCHLEOSTOMIE – VORSCHLAG FÜR RADIOLOGISCHE HILFSLINIEN

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Abstract-Text:
Background: First attempts were undertaken to create a robot-assisted and navigated cochleostomy to achieve a preferably consistent opening of the scala tympani. A precise cochleostomy could represent one of the basic requirements to preserve residual hearing of cochlear implant patients. Preliminary results show an improved outcome in hearing performance if the electrode is inserted into the scala tympani. Using a guidance of a robot or a navigation system it is mandatory to define the possible path of the working instrument on the corresponding CT data beforehand. The best and most precise experimental robotic setup will be spoiled without a clearly defined target. Objective: Up to the present, a cochleostomy is defined by the surgeon on the bony surface of the promontory. It is a matter of experience, training and spatial sense to hit the scala tympani. Own results showed significant variations of cochleostomies of the same surgeon on the same temporal bone. By combination of a virtual 3D model and its corresponding axial CT slices we wish for a more consistent and accurate cochleostomy besides possible other factors. Methods: Therefore, we designed radiologic artifical lines to define the endpoint of the trajectory for the working instrument. Instead of determining the cochleostomy on the bony surface of the promontory, we are now able to define an area for best cochleostomy on the inner lining of the basal turn of the cochlea, the literally access to the inner ear. If insertion of an electrode via the round window is not preferred depending on the specific cochlear hook anatomy and the regidity of the specific used electrode a cochleostomy along the basal turn represents an often chosen alternative. According to histological studies the ideal point of cochleostomy should be directly inferior of the round window to hit the scala tympani. Results: The horizontal semicircular canal was put planar on the axial slice of a 64 CT (Siemens Sensation). Thereafter, the round window was located on the corresponding slice. One artifical line was drawn through the modiolus and two lines orthogonal to that. One of them was drawn through the one inner margin of the round window towards the tip of the cochlea and the other as the inner tangent of the basal turn of the cochlea. This drawing pattern was layed over the two following CT slices underneath the round window. If the drill stays now between the two parallel lines on the one to two slices underneath the round window, the scala tympani will be opened. On two temporal bones we tested this theses with our hexapod model which represents the most accurate method to drill a cochleostomy so far. In both cases the scala tympani was

opened.Conclusion: A trajectory can be planned before drilling to achieve the highest feasibility of hitting the scala tympani. Further evaluation of this hypothesis will be necessary. As navigation systems and radiologic data are getting more and more precise, we are able to develop corridors and define targets of high accuracy. Support: This study was supported by the Federal Ministry of Education and Research of Germany and the companies Cochlear GmbH und Richard Wolf GmbH, Germany.