

INSTRUMENT FLIGHT TO THE INNER EAR

Problem – Challenge

To embed an electronic cochlear implant device into the ear of a deaf patient, the surgeon has to create a precise access from behind the ear, through the skull bone all the way into the inner ear. The implant electrode that bridges the damaged part of the inner ear to allow the patient to hear again is then carefully inserted into the cochlea through the access in the bone. Currently this procedure is carried out manually and the ear, nose and throat surgeon directly views the access into the cochlea through the opening in the skull bone.

Solution

A team of surgeons and engineers of Inselspital, Bern University Hospital, and the ARTORG Center for Biomedical Engineering Research, University of Bern (Switzerland), has developed a high-precision surgical robot for cochlear implantation successfully applied to several patients in a clinical trial. In the same way that avionics allow a pilot to fly a plane by instrument solely based on read-outs from the cockpit, the surgical robot developed by the researchers has the capabilities to perform surgery that a surgeon cannot carry out manually without a robot.

The critical developments that have led to the breakthrough first procedure on a patient are the reliable, computer-controlled safety mechanisms applied to the actions of the robot when drilling the tunnel into the side of the patient's head. The minimally-invasive keyhole tunnel runs at a safe distance between the facial nerve and the chorda tympani nerve into the cochlea so that the electrode wire of the implant can be inserted through this opening into the cochlea at the preplanned angle. Safe navigation and drilling inside the human ear that avoids damage to these nerves and the microscopic structures of the inner ear is accomplished through a combination of three interlocking safety components that act as the eyes, ears and touch of the surgeon.

