OBJECTIVE: The objective of this study was to assess the intracochlear position and the extent of trauma to cochlear structures using a new prototype electrode carrier (Flex EAS). Special emphasis was placed on the practicality for combined electric and acoustic stimulation of the auditory system. STUDY DESIGN: Human temporal bones were evaluated histologically after insertion of the electrodes, and insertion forces were measured in an acrylic model of the scala tympani. METHODS: 1) Insertion forces with the regular C40+ array and the new electrode prototype were measured in an acrylic model of the scala tympani. 2) Ten human temporal bones were implanted using the same surgical procedure as in vivo. All bones underwent fixation methylmethacrylate embedding to allow cutting of the undecalcified bone with the electrode in situ. In addition, radiography of the implanted devices was performed and correlated to histologic results. Electrode positions and trauma to cochlear structures were then evaluated histologically. RESULTS: All insertions of the new electrode array were performed in the scala tympani of the cochlea. All insertions were atraumatic and covered one cochlear turn. The only effect on cochlear structures that could be observed was a slight lifting of the basilar membrane in the middle turn limited to the tip of the electrode. In three bones, basal trauma, which resulted from the cochleostomy itself, could be observed as well. All neural
structures remained intact. CONCLUSIONS: The new electrode prototype provides very good mechanical properties for safe and atraumatic implantation. All criteria for the use in hearing-preservation cochlear implantation for electric and acoustic stimulation were fulfilled. Surgical measures to prevent basal trauma appear to be very important.