II. Basic Study

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INTRACOCHLEAR FACTORS AFFECT THE AUDITORY BRAINSTEM RESPONSE TO INTRACOCHLEAR ELECTRICAL STIMULATION IN CAT

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Cochlear implants are one treatment for children who are born deaf or become deaf before acquiring language. It is hypothesized that several factors within the cochlea may influence the performance of an implantee. Such factors could include the number and distribution of surviving spiral ganglion cells and the presence of fibrous tissue and/or new bone growth. Using an animal model, we have studied the response of the auditory brainstem to implantation, and the effect of intracochlear factors on this response. Neonatally, pharmacologically deafened cats were implanted with a 4-electrode array in the left cochlea at ages from 100 to over 180 days. Eight were chronically stimulated (1000 hours if possible) with charge-balanced biphasic current pulses; three were unstimulated controls. Electrically evoked auditory brainstem responses (EABRs) were regularly recorded during the chronic stimulation program. After terminal 2-deoxyglucose (2DG) experiments, the cochleas of these animals were decalcified, embedded, sectioned and examined for surviving spiral ganglion cells and fibrous tissue. Using 3-dimensional computer-aided reconstruction of the cochleas, the data was plotted at each 1 mm segment along the Organ of Corti from the round window. Spiral ganglion cell survival is decreased within the 1 mm around the stimulated pair of electrodes in comparison with the corresponding position on the control sides. Mean spiral ganglion survival of the stimulated side is positively correlated with the final EABR threshold; however, the comparison of the cell survival around the electrode-pair with the EABR threshold shows no correlation. Moreover, the fraction of the IC with significant 2DG label is not correlated with intracochlear factors except the total length of the Organ of Corti and the length of the basal turn. There is no significant difference between stimulated group of animals and the unstimulated one as regards total spiral ganglion cell survival, EABR threshold, and 2DG fraction.
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