THE EFFECT OF INFLAMMATION ON BLOOD VESSEL AREA AS A CAUSE OF VARIATION IN GANGLION CELL DENSITY MEASUREMENTS IN THE CAT COCHLEA.

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The success of a cochlear implant depends on an adequate number of surviving spiral ganglion cells. Further loss of ganglion cells may arise from the biology of cochlear implantation itself. The quantitative analysis of ganglion cells is, therefore, an important consideration when assessing the biological safety of a cochlear implant.

Quantitative analysis of ganglion cells in a histological section is conventionally expressed as a cell density, with the number of cells within Rosenthal's canal being divided by its area. This method removes the variation observed in counts, which vary with the cross-sectional area of Rosenthal's canal. However, density measurements must address the problem of including or excluding the areas of other histological structures, principally blood vessels, present within Rosenthal's canal. If blood vessels proliferate in an inflammatory response associated with ganglion cell death, then excluding their area may result in an underestimate of ganglion cell loss. Consequently, a new cochlea implant parameter, e.g., an electrical stimulus programme, may be wrongly passed as safe.

To investigate this problem a retrospective study was performed. Nine cats, had been implanted in both cochleae and one side electrically stimulated. Ganglion cell densities and degree of inflammation had been measured within a 1 mm region of the site of the electrode pair.

An analysis of blood vessel area was made in the same 1 mm region using image analysis techniques. Consequently, the effect of degree of inflammation on blood vessel area and ganglion cell density measurements was investigated.

There was a highly significant ($p<.01$) increase in blood vessel area with degree of inflammation. However, there was no significant effect on ganglion cell density, measured by excluding blood vessel area over that including it, with increasing degree of inflammation (95% confidence intervals of regression coefficients overlap).

It was concluded that blood vessel area increased with degree of inflammation but this had no effect on ganglion cell densities calculated by excluding that area. Consequently, blood vessel area may be excluded in ganglion cell density measurements even in inflamed cochlea.
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