Electron microscopic temporal bone histopathology in experimental pneumococcal meningitis.

Abstract:

Bacterial meningitis is one of the most common causes of acquired profound sensorineural deafness in children. Measurement of hearing and examination of the cochlea is limited in patients suffering from acute meningitis. A rabbit model of pneumococcal meningitis was developed to identify the temporal bone histopathologic changes that occur in meningogenic labyrinthitis caused by Streptococcus pneumoniae. Light microscopy was previously performed on temporal bones from acutely meningitic rabbits with profound hearing loss as determined electrophysiologically. Extensive inflammation of the cochlea with endolymphatic hydrops was observed. The organ of Corti, however, showed preserved architecture in the majority of these animals. In order to further investigate these findings, a protocol was used to create meningitic rabbits with hearing loss ranging from early high-frequency loss to profound deafness. The temporal bones from 7 rabbits were examined by transmission electron microscopy. In cases of mild hearing loss, partial degeneration of the inner row of outer hair cells, as well as edema of efferent cochlear nerve endings and marginal cells of the stria vascularis, was seen. With increasing degrees of hearing loss, the remainder of the organ of Corti and intermediate cells of the stria showed ultrastructural abnormalities. Spiral ganglion cells and basal cells of the stria vascularis remained intact in all subjects. This study provides unique information regarding the histology and pathophysiology of meningogenic deafness. The clinical implications of these findings are discussed, with an emphasis on potentially reversible changes and therapeutic intervention.