



Increased Intracranial Pressure Decreases Overall Neural Responsivity and Spontaneous Activity of the Auditory Cortex

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Introduction

The consequences of increased intracranial pressure (ICP) on neurologic function at a cellular level are largely unknown. There are examples (idiopathic intracranial hypertension) in which relatively normal neurologic function is maintained with elevated ICP; thus, it is unclear whether neurologic dysfunction in the context of increased ICP is due to the effect of ICP or other factors. We hypothesized that increasing ICP would result in changes in the response properties of cortical neurons on a cellular level which are not seen with less sensitive measures such as scalp-recorded sound-evoked responses.

Methods

Adult rabbits were anesthetized and a fiber optic intracranial pressure monitor was inserted into the brain parenchyma. An intraventricular catheter was placed and used to infuse saline to manipulate ICP. A tungsten microelectrode was inserted into the primary auditory cortex and used to record neuronal action potentials while sounds were presented to the contralateral ear. Normal neurologic function was determined by defining frequency vs intensity response area curves (RAC) and discharge rate vs intensity functions (RIF) for each

Results

Auditory cortical neural firing rates in response to auditory stimuli as well as spontaneous activity of the auditory cortex was recorded. We found that increasing ICP resulted in a statistically significant decrease in neural firing rates in response to sound as well as spontaneous activity (p=0.001).

Learning Objectives

This project describes the neural response on a cellular level to increasing intracranial pressure.

[DEFAULT POSTER]

Conclusions

Increasing ICP decreases the overall neural response rate of the auditory cortex on a cellular level. Compared with studies using less sensitive measures, like scalp-recorded sound evoked responses, dysfunction was seen at lower ICP thresholds. While the auditory system continues to function at ICPs elevated above baseline, overall responses to individual sounds were significantly diminished, indicating the possibility of a dose-response curve of neurologic function to increasing intracranial pressure.

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