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fMRI evidence for central auditory processing of speech in deaf infants under sedation

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Functional MRI (fMRI) performed in infants with congenital hearing loss provides evidence that auditory language stimulation produces activation of the central auditory system in the brain. Babies are normally sedated for clinical MRI scans. With IRB approval we have added a 10 minute fMRI scanning procedure to clinically indicated MRI scans in infants with severe to profound hearing impairment (n=18) or normal hearing (n=22). Sedation is performed according to clinical guidelines at our institution using either Propofol ((200-250 mcg/kg/min i.v.) or pentobarbital (5 mg/kg orally). fMRI scanning is performed using Echo-planar gradient echo acquisitions on a 3 Tesla clinical MRI system while a mothers voice reads stories to the babies at a sound level 10 dB above the measured hearing threshold. Brain activation is measured in primary auditory cortex and planum temporale speech recognition areas.
Results in the normal hearing group of infants demonstrates that the central auditory system is stimulated by speech in infants, although sedation does attenuate brain activation in a dose dependent manner. Central auditory and language activation is also detected in hearing impaired infants with levels of activation correlating to measured hearing thresholds.