

Spectrogram of Cochlear Microphonic Recording at Round Window of Chinchilla Without Fluid

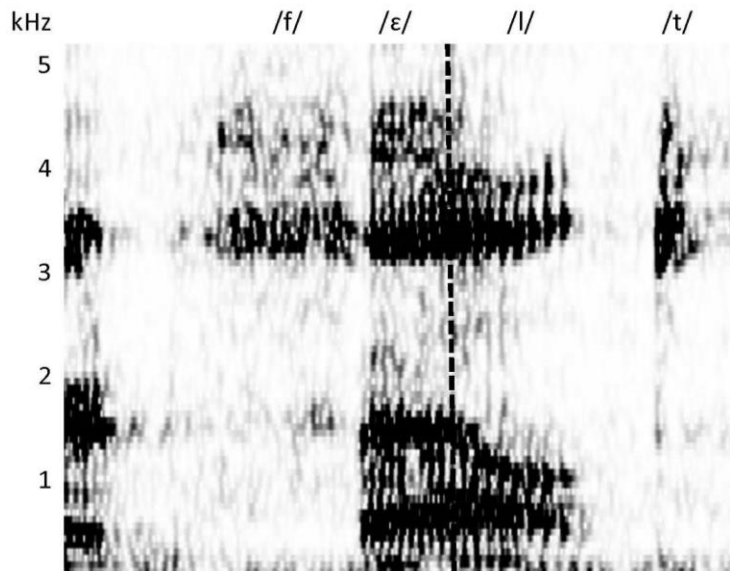


Figure 15-5A. Spectrogram of an electrode recording of the word “felt” at the round window of a chinchilla without fluid in the bulla.

Spectrogram of Cochlear Microphonic Recording at Round Window of Chinchilla With Fluid

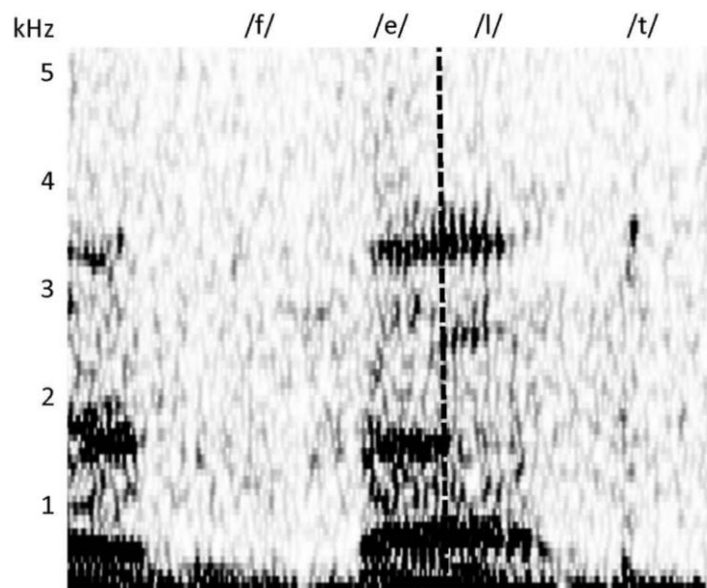


Figure 15-5B. Spectrogram of an electrode recording of the word “felt” at the round window of a chinchilla with fluid simulating OME in the bulla.

Unraveling the riddle of the relationship of OM to CAPD

Based on our current knowledge; how can early OM cause/contribute to CAPD? We have discussed that sound deprivation, faint and inaccurate speech can cause faulty imprinting and incomplete development of the auditory system. So, it is easy to see how this could cause the child to have poor Decoding of speech (not able to quickly and accurately identify speech). Decoding is one of the four Buffalo Model categories. How about the two factors of the Tolerance-Fading Memory (TFM) category? Indistinct information is harder to remember (thus, it is harder to increase memory span with age) and there are more challenges in deriving speech from background of noise. The third category is Organization, dealing with the ability to properly sequence auditory information. Long before we began to analyze the speech errors of those who had OM, we were aware that those who had conductive losses had a high incidence of reversals on the SSW test (Katz, 1978). Possibly temporal changes could lead to improper sequencing, especially if one ear/side is more affected than the other. The last category is Integration, primarily dealing with coordination of information in the two hemispheres. Temporal errors, restricted memory, poor decoding skills and/or organizational problems could adversely influence Integration. Integration is especially difficult when one ear/side is less efficient, usually for the non-dominant ear/hemisphere. Perhaps, when we depend too heavily on the better ear we may not exercise Integration skills just as children who have unilateral early recurrent OM have less efficient development on that side.

Infants are thought to have immunity from OM from their mothers for the first three months of life, especially if breast fed. However, many children that we see with CAPD have an early history of OM, sometimes as early as the first three months. Children who have bouts of OM early in life have a tendency for recurrent OM with longer bouts and perhaps with thicker fluid. If these problems produce anatomic alterations, the effects could be long-term or permanent. This is why it is important to consider what can be done, as soon as possible, to reduce and improve these problems. Preventing/reducing bouts of OM and improving auditory functions are discussed in the next section.

Newborn brains are extremely absorbent to the world around them. The experiences during the initial months and years greatly influence the way that brain continues to develop and then functions for many years thereafter. If ME fluid blocks some or much of the normal hearing experiences, as discussed in this chapter, this could cause lower intensity stimulation (less audible), distortion (significantly reduced high frequencies and altered speech sounds) and temporally reduced (delayed signal transmissions) information. These could cause a structurally altered CANS, for example in the auditory brainstem nuclei (Webster and Webster, 1979). This combination of factors could surely lead to delayed babbling by the young child and delayed or poor speech because of their weak auditory skills. How might CAP induced difficulties contribute to language problems? Receptive language is closely associated with the auditory cortex (involving Wernicke's area). This is closely associated with auditory decoding of speech as we have seen time and again (Luria, 1966, 1970). Expressive language (Broca's area) is associated with the inferior frontal lobe and, among other things, requires auditory memory (in the nearby hippocampus of the anterior temporal lobe).

Does the development of reading and spelling greatly benefit from auditory processing? For sure it does (Bennett et al., 2001; Silva et al., 1986). For a period of 10 years phonics was not taught in elementary schools because some people thought these auditory contributions were unnecessary to learn to read. Ten years later it was reinstated when they found reading scores had plummeted.

Children who have OM generally have the fluid in both ears. Unfortunately, the fluid builds up in the child's ears reducing the intensity of sound to the cochlea as well as producing delays and distortions of the acoustical signal. Speech is especially affected when the high frequencies are reduced. The fluid may remain for a month or perhaps more, during a child's young life, and may recur after a few weeks or months and then again later on. During these bouts not only are the sounds very weak and perhaps not clearly audible, but we also have good reason to believe that there is also added noise. This means that the foundations for speech understanding are significantly tainted from early life.