The Cochlear Difference Tone

P.D.

Six

Bussum

Author's address: Dr. P. D. Six, Koningslaan 44, Bussum (Holland)

When an ear is stimulated with multiple pure tones, extra tones arise in the system. These extra tones can be traced by the use of cochlear microphonics (Wever and Bray effect). According to the pure place theory, such an extra tone is perceived on the place in the cochlea corresponding to its frequency, i.e. low tones at the apical and high tones at the basal end of the cochlea.

By measuring the cochlear potentials we investigated to what extent the place theory holds for these extra tones, especially the primary difference tone.

The maximum amplitude of the difference tone component in the cochlear response was determined, provided that the middle ear distortion was negligible. The experiments showed that the use of the primary tones of about 5000—and a difference frequency of 500 to 800—yielded the most advantageous experimental conditions. The difference tone production was found to be maximal for these values of the difference frequency. This seemed to indicate that the distortion was of cochlear origin rather than arising in the middle ear. The latter transmits sound with fair fidelity, so that a frequency maximum is not to be expected.

In the experiments electrodes were placed in holes, drilled into both the apical as well as the basal turn of the cochlea. The amplitudes of the primary tones as well as the difference tone, produced in the cochlea, were measured. The values from the two electrodes were compared. This comparison helped in the explanation of the corresponding vibration patterns.

In the graphs the ratio of the amplitudes of the difference tone at the apical and at the basal turn is shown in comparison to the corresponding ratio for a pure tone.

The values obtained were significantly smaller than unity, the latter being a value, which should be found when the places of origin of a pure tone and a difference tone were similar. This

Six, The Cochlear Difference Tone
287

result was subject to the restriction that the primary tones were of moderate intensity in the microphonic potentials.

It is already known that distortion products originate mainly from the middle ear when the intensity of the primary tones is high, i.e. up to a value where the sound source begins to distort. Summary.

The potentials of the combination tones originate at the place in the cochlea where the stimulation by the primary tones gives the maximum electrical effect, at least for moderate intensities.

The electrical distribution of the combination tones in the cochlea does not correspond to the distribution to be expected according to their subjective pitch and is not in accordance to the place theory.

Kuילman, J.: Pract. oto-rhino-laryng. 18, 287–293, 1956

Nystagmus vestibulaire et contre-rotation des yeux enregistrés simultanément.

Par J. KUILMAN.

Une méthode nystagmographique n'est exacte qu'à condition qu'elle enregistre simultanément non seulement le nombre de secousses, la durée d'une série et la vitesse des phases lentes et rapides, mais aussi tous les détails d'un mouvement oculaire, telles que son amplitude, sa direction horizontale, verticale, rotatoire ou ses combinaisons, et la position de l'œil.

Au cours de ces dernières années la méthode galvanique a été développée et pratiquée avec succès et une certaine perfection. Cependant il faut remarquer qu'un enregistrement d'oscillations