

Inter-electrode place-pitch perception by cochlear implantees

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Multiple-electrode cochlear implants, including the 22-electrode device developed by Cochlear Pty Limited and the University of Melbourne, are designed to take advantage of neural tonotopicity. A number of psychophysical studies have confirmed that the pitch perceived when a single electrode is activated at a constant stimulation rate is related to that electrode's position in the cochlea. In general, as the site of stimulation is moved towards more-apical locations, lower pitches are perceived. Recently, the perceptual effects of concurrent activation of two adjacent or nearby electrodes were studied. Stimuli were constructed using two pulses delivered in quick succession each repetition period to the two component electrodes. The pitches of these stimuli were compared with those of single-electrode stimuli presented at equal loudness in a two-alternative forced choice procedure. The results showed that pitches ranked between the pitches of the single-electrode stimuli could be obtained in most implantees by appropriate choice of the currents on the two component electrodes. Variations of the component currents produced an orderly change in the pitch of the two-electrode stimulation. This phenomenon may provide some explanation for the improved performance of speech processors, such as the SMSP, which are designed to deliver stimulus pulses in quick succession to groups of nearby electrodes. It is possible that an increase in place-pitch resolution achieved in this way may provide implantees with more detailed information concerning, for example, the vowel formant frequencies and their transitions.



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