PERCEPTUAL AND ACOUSTIC CORRELATION IN CONSONANT IDENTIFICATION AFTER PARTIAL LARYNGECTOMY

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Introduction: The purpose of this study was to determine the correlation between perceptual and acoustic characteristics of French consonants produced by patients after supracricoïd partial laryngectomy (SCPL). In SCPL patients' speech, voice is produced by a neoglottis located at approximately 3 cm above the removed vocal folds, thus shortening the vocal-tract length. We first evaluated the voicing distinction, as their vibrator is profoundly modified, and second, manner and place of articulation features as their vocal tract is shortened by about 3 cm.
Methods: Ten male patients were recorded 18 months after SCPL. Audio recordings of the 16 French consonants in a syllabic context [CV] produced by each talker with three repetitions were presented to three expert listeners. The agreement between listeners, measured with kappa, ranged between 0.87 (se = 0.018) and 0.83 (se = 0.016). The listeners transcribed the perceived consonant using an open-response paradigm. Listeners' pooled responses were converted to confusion matrices and analyzed for voicing, manner and place of articulation. The acoustic evaluation, for spectro-temporal correlation, consisted in analyzing the transition slope, frequency and temporal parameters, intensity and place of burst, and Voice Onset Time (VOT).
Results : a) perception test: voiced consonants were perceived as voiceless consonants (24%), predominantly for stop consonants. Labial (12%) and velar (15%) consonants were identified as alveolar. [m] was confused with [n] in 7%. Manner features were not significantly altered. Glides were well identified.
b) acoustic analysis: the absence of voicing murmur, the weakness of the burst and the short duration of the consonant seems to be responsible for perceived voiceless consonants for our patient's voiced consonants.
Conclusion: Consonant articulation appears to impose certain constraints on voicing ability of SCPL patients, since voiced consonants are predominantly perceived as voiceless consonants. Presumably, this poor voicing ability is the direct consequence of the mechanical properties of the neoglottis that are far different from those of the vocal folds. Consonant identification is directly related to acoustic properties of the modified vocal tract. Acoustic and perceptual features can be defined to characterize consonant production behavior after partial laryngectomy. Moreover, assessing consonant identification and intelligibility should help to improve voice therapy and efficiency of speech.

Key words: supracricoïd partial laryngectomy, acoustics, perception, consonant identification, voicing, place, manner features

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