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# MANOMETRIC EVALUATION OF NASALITY IN CLEFT PALATE SPEECH

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The effects of organic deficiencies upon articulation vary considerably. A high palatal vault may influence voice, but seems to have little effect on articulation. Clefts create greater obstacles than other organic disorders because they have a profound influence on sounds dependent on substaigned pressure such as stop-plosives and fricative sounds. Some clinical and experimental observations state that complete isolation of the oral from the nasal cavity is not required for adequate articulation (Calnan, 1956, Bloomer, 1953, Kaltenborn, 1948, Milisen, 1966) but the more nearly it is achieved the less compensation will be necessary.

It is well known that the undesirable articulatory pattern in cleft palate speech develops on the basis of organic disorders. The cleft changes the pneumodynamics of oral and nasal cavity in such a direction that naso-pneumodynamics is superimposed on the oro-pneumodynamics (Mysak, 1966). This is conditioned by the too large an opening into the nasopharynx compared with the size of the opening into the oral cavity. The proper physiological conditions necessary to the good resonance relationship are inverse: The opening into the mouth between the tongue and velum must be wider than the velo-pharyngeal opening (Kaltenborn). Then the air pressure at the time of phonation will be greater in the oral than in nasal cavity.

For purposes of study the measurements of phonatory nasal pressure were performed with the aid of apparatus constructed upon principles of a manometer. The apparatus consisted of an olive joined to an elastic rubber drain connected to a metallic tube with a stop-valve. To this tube was joined a capillary tube of glass closed as a siphon. The capillary tube was fastened to the millimeter scale and filled before the measurements with a drop of alcohol solution of fuchsine. At the time of examination the olive was inserted to the nasal duct and the patient was bidden to utter isolated and syllabic phoneme sequences. The nasal air pressure during the vocalization caused the shift of stained fluid in the capillary tube. The oscillation was measured as the millimeter scale.

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On the basis of 85 manometric measurements of nasality during the articulation of vowels and consonants it was demonstrated that in cleft palate speech the nasality varies in volume of expired phonatory air through the nasal ducts. The results are shown in the diagram representing the extension of nasality for all fundamental speech sounds in three groups of patients: 1. before the operation, 2. after the operation, 3. after the reeducation of speech.

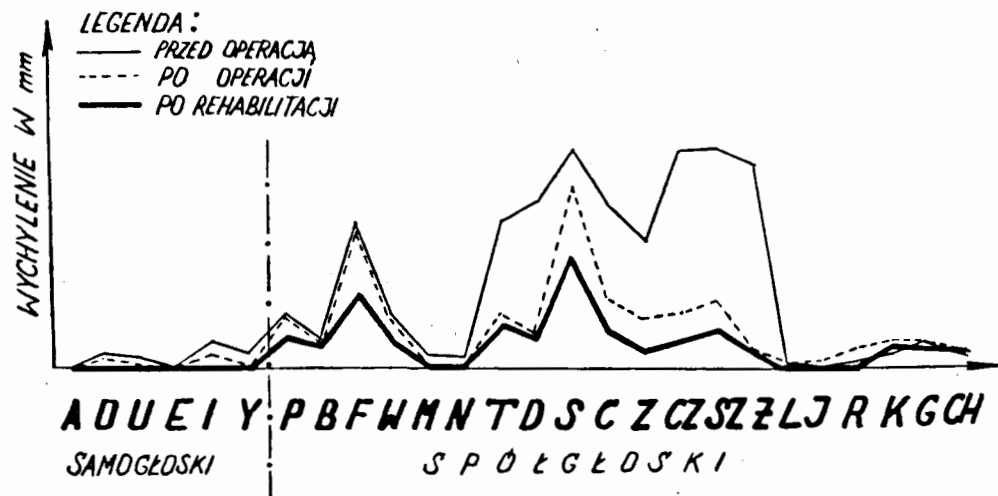


Fig. 1.

The first curve on the diagram relates to the 29 patients before the operation. The same patients were examined after the operation and the results are shown by the dotted line. Twenty seven of these patients were examined after the speech therapy and all the ratios of nasality are collected in the curve 3.

From this graphic presentation of the results is clearly seen the change of nasality in cleft speech sounds after the operation and after the speech therapy. The nasality of consonants was greatly diminished. After the reeducation if even there were slight traces of nasality in manometric measurements in general it was not heard in speech.

From our investigation some observations of phonatory value result. It was evident that in the majority of our measurements the greatest ratio of nasality was stated in the production of "F" and "S". It can be concluded that the greatest amount of oral breath pressure is needed in the production of these sounds of speech which require the most narrow passage of the air through the half-closed mouth. The velopharyngeal gap in cleft palate patients is too wide for the production of sufficiently great oral pressure. Thus it can be seen that in speech production always and in the articulation of all sounds of speech the same proportions between the openings of two resonance chambers i.e. nasal and oral cavity must be kept. Always the oral opening must be larger than the nasopharyngeal one.

Of great importance in voice rehabilitation in cleft palate patients is auditory monitoring. The comparison of two groups of patients: after the operation and after the speech therapy show that the degree of nasality did not change so much as did the intelligibility of speech, which greatly improved after the rehabilitation program.

However, our manometric measurements of nasality stress the significant role of the relationships between two resonatory chambers i.e. nasal and oral cavity and show that the efforts of surgery should aim to enlarge an oral port and to reduce the nasopharyngeal opening.

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#### DISCUSSION

*Vrtička:*

It is necessary to distinguish "nasality" as an acoustical parameter from "nasal escape" as an aerodynamic one. In many cases, these two values do not exactly correspond.