

explain the extended survival of part of the animals than to presume the presence of minute amounts of accessory tissue; because rats kept on cortical extract show a quick sensitivity either to the presence or absence of that hormone.

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A New Roentgenologic Technic in the Study of Phonetics.

LEON J. MENVILLE AND J. N. ANÉ.

From the Department of Medicine, Tulane University, New Orleans.

Numerous theories have been advanced and investigations made to account for differences in voice quality based upon a study of speech sound after it leaves the mouth. Such studies have been in many instances unreliable because formerly it was almost impossible to make an accurate study of the intra-oral, pharyngeal, and laryngeal mechanisms, which are among the important structures used to produce speech and singing.

About 20 years ago it was appreciated that the X-ray, by outlining the forms and sizes of speech and singing cavities, could be the means of uncovering many of the hidden secrets of phonation. Myers¹ demonstrated a certain technic by which these structures were visualized on an X-ray plate. Later, Stephen Jones² devised the chain technic, which consisted of the passing of a small chain through the nostril of a subject who was instructed to swallow the loose end. An X-ray plate was then made to show the position of the chain in relation to the soft tissues. Russell³ used a fine thread which apparently was impregnated with some substance opaque to the X-ray. The subject was made to swallow the loose end of the thread, which was supposed to remain by capillary attraction on the middle portion of the tongue. We are unable to find mention by any of the numerous investigators that the palate was satisfactorily outlined by any marker except the normal bone as shown on the X-ray film.

It must be appreciated that a mechanical means employed in outlining the forms and sizes of speech and singing cavities, such as the chain technic, gold foil, or the thread technic, could interfere

¹ Russell, G. Oscar, *Speech and Voice*, The Macmillan Co., New York, 1931, 7.

² Russell, G. Oscar, *Speech and Voice*, The Macmillan Co., New York, 1931, 7.

³ Russell, G. Oscar, *Speech and Voice*, The Macmillan Co., New York, 1931, 10.

with the normal functioning of the anatomic structures which produce speech. In addition, it is difficult for a small thread to remain in constant alignment on the middle of the tongue, and also on the middle of the hard and soft palate.

In the course of Andrade's⁴ experimental investigation on the articulation of certain sounds in the speech of Mayan Indians, we were privileged to conduct the roentgenologic phase of these experiments, making use of what we believe is a new roentgenographic technic. It was suggested by one of us that, instead of using such mechanical markers as were employed by earlier investigators, a mixture of gum acacia and barium sulphate be painted with a camel's hair brush on the midportion of the tongue from base to tip, also that the soft and hard palate be bisected with a coating of the same mixture. While this demonstrated roentgenologically the midsection of the tongue and palate, after a while the saliva caused the mixture to spread. It was then suggested that a preparation of glucose and bismuth subcarbonate be used. This proved to be an ideal marker, as it cast a dense shadow when roentgenographed and the movements of the tongue and the saliva did not efface the preparation.

Some of the more representative X-ray films in which this technic was used are here demonstrated. The midportion of the tongue is clearly shown and its relation to the palate, which is also marked, is demonstrated. The relation of the tongue to the hard palate is considered of great importance in the study of the articulation of all vowels.

In our roentgenographic examination, we used a soft-tissue technic which makes possible the visualization of the epiglottis, the larynx with its vocal cords, and the position of the epiglottis in relation to the base of the tongue, which is considered of importance in phonologic studies.

⁴ Andrade, Manuel J., of the Carnegie Institution of Washington. The Chichen-Itza Project. Middle American Archaeological Research. Verbal communication, 1931.