

Roentgen Evaluation of Velopharyngeal Closure

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Roentgen methods are available for the evaluation of the pharyngeal structures and particularly for the evaluation of velopharyngeal closure. Velopharyngeal closure may be estimated by indirect methods; for example, the nasal emission of air and, of course, the study of the patient's speech. In addition, the palate and uvula may be examined directly. There are, however, large gaps in our current knowledge of the physiology of the pharyngeal structures, in the growth and development of the pharynx, and in the relationship of function to altered oral, nasal or pharyngeal anatomy. Pruzansky (3) has compared the development and growth of knowledge of anomalies of the face to knowledge of anomalies of the heart. In his opinion, the surgeon, orthodontist, and speech therapist are denied pathological specimens and are denied precise knowledge of the normal and of the abnormal. From the roentgen standpoint, the difference has to do with the appreciation of anatomic alterations as reflections of functional alterations and vice versa.

Roentgen techniques have proven valuable in the study of the pharyngeal structures, even though there are significant limitations. Direct examination of the pharynx as one structure is difficult or impossible to obtain without distortion of anatomy. Direct examination, of course, of any one of the pharyngeal structures is possible. The oral cavity and pharynx, because of their anatomy, are ideally suited to roentgen examination. Any structure is visible radiographically because of its physical properties and in the pharynx the radiographic contrast afforded by bone, soft tissues, and air allows for visualization of the structures composed of soft tissue and surrounded by air as well as those composed of bone. Thus, the soft palate and uvula may readily be visualized and their relationship to the posterior pharyngeal wall be studied.

The application of any radiographic technique must be tempered by the knowledge that ionizing radiation is being utilized and appropriate steps, from the standpoint of protection of the patient and the physician, must be taken. Such steps include appropriate cones, proper filtration

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of the x-ray unit, and gonadal protection. Any x-ray examination should be properly planned and must be indicated from the medical or dental standpoint.

The inherent nature of an x ray is such that there is superimposition of many structures and this may be particularly confusing in the head and neck. This limitation has been resolved in great measure by the use of cinefluorographic or cineradiographic apparatus, since with movement, one can separate those structures that are superimposed. A more general limitation of the x-ray examination has to do with the fact that abnormalities of the oral and pharyngeal structures and speech, from the anatomic and physiologic standpoint, have not been clearly defined so that separation of significant information presents a real problem.

Radiographic Methods for Evaluation of Velopharyngeal Closure

LATERAL RADIOGRAPHY OF THE PHARYNX. This examination may be performed without special apparatus or preparation of the patient. As described by Randall, O'Hara, and Frank (5), a distance of six feet between the x-ray tube and the x-ray film is desirable and minimizes distortion. Film studies are exposed when the palate is in the resting position and during the enunciation of sustained test sounds. Films of this type show the length of the palate, the thickness of the palate, the relative depth of the pharynx, and the amount of adenoid tissue. The motion of the palate can be ascertained as well as the position of the tongue during enunciation. The examination is limited if the patient is not cooperative, for the exposure may be made when the patient is not phonating and, of course, there is a question as to whether phonation of a sustained sound can be related to 'normal' speech.

CEPHALOMETRIC EXAMINATION. In this examination the x-ray tube is at a specific distance from the x-ray film and the patient's head is held by a stabilization device. This standardized method affords the most accurate measurements of the pharynx and its structures and because the technique is standardized, one examination can be compared with another and when examinations of the patient are made over a period of time, measurements would be available relative to growth of the pharynx and the pharyngeal structures. A method has been perfected for use in infants (4).

LAMINOGRAPHY. This radiographic method may be combined with cephalometric studies for accurate measurement of the pharynx. The very nature of laminographic studies permits visualization of a plane of tissue of the pharynx with blurring of the structures on either side of it. Thus, by varying the depth of the plane, specific structures may be visualized.

CONTRAST STUDIES. Usually it is not necessary to define the palate and the tongue with contrast material. The air in the mouth and the pharynx is usually sufficient for adequate demonstration of the soft tissues. A barium-water mixture, however, is indicated when the swal-

lowing mechanism is to be evaluated and contrast material must be utilized if one is to evaluate passage of swallowed material into the nasopharynx behind the palate when velopharyngeal closure is inadequate.

FLUOROSCOPY. Fluoroscopic examination does afford a method for the observation of motion. However, the usual fluoroscopic device does not permit a recording of this motion as a permanent record.

CINEFLUOROGRAPHIC OR CINERADIOGRAPHIC STUDIES. These techniques represent a method whereby one can record function and promise for the future and the ability to define anatomic changes that are the result of altered function (2, 6). Detail is satisfactory and measurements can be made from the film records as demonstrated by the speakers on this symposium.

Conclusions

Roentgen examination occupies an important place in the diagnostic evaluation of the pharynx, particularly velopharyngeal closure. The roentgen methods, as discussed, are complementary; none will supplant the other. There are those methods which define anatomy and in a way that permits standardization of the technique. There are those methods which define anatomy and function, such as cinefluorography and cineradiography. Calnan (1) has stated, however, that palatal-pharyngeal radiography will provide knowledge; it will not and cannot provide wisdom. Thus, the roentgen methods are important in diagnosis and research, but do not stand alone because of defects in our knowledge and their ultimate value is directly related to the degree with which information so obtained is correlated with all of the information that has been gathered about the patient and his specific problem.

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