

of fibrous tissue, and thus with more final use of the lung. It ought also in such cases to lessen the danger of amyloid degeneration of important organs from prolonged suppuration. It ought to be tried faithfully in bronchiectasis confined to one lung, in the hope of lessening the amount of fibrous tissue produced by the disease and so making the havoc to the lung and general system less.

THE NATURE AND HISTO-PATHOLOGY OF THE EPIPHARYNGEAL TONSIL.

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The body which is known as the third, pharyngeal, or better, epipharyngeal tonsil, and when hyperplastic, as adenoids, is situated at the superior part of the posterior wall of the epipharyngeal space, and constitutes the upper portion of Waldeyer's ring, the median and lower portions of which are completed respectively by the faucial and lingual tonsils, the whole being connected by a system of delicate lymphatic vessels and nodes.

While the honor of first disclosing the local and re-

solitary follicles and Peyer's patches in the intestinal walls. Henle called it conglobular; Koelliker, cytogenous; His, lymphoid tissue. Woake's idea as to adenoids being of a papillomatous nature has long since been proven erroneous. Indeed, this adenoid tissue is widely distributed throughout the body. It is abundant in the pharynx; in the esophagus it is almost absent, and in the stomach inconstant; but it abounds in the intestinal canal, especially in the ileo-cecal region, while in the rectum and about the anus it again becomes scant or altogether absent. It is found in the conjunctiva, in the tear ducts and in the mucosa of the female genitals. The trachea is rather free from the adenoid structure; but in the larynx it is constant, and is most frequently abundant in the ventricles and the interarytenoid region, on the free edge of the epiglottis, on the petiolus, in the aryepiglottic folds and in the sinus pyriformis.

Knowledge of the distribution of adenoid tissue in the postnasal space and adjacent structures is of practical

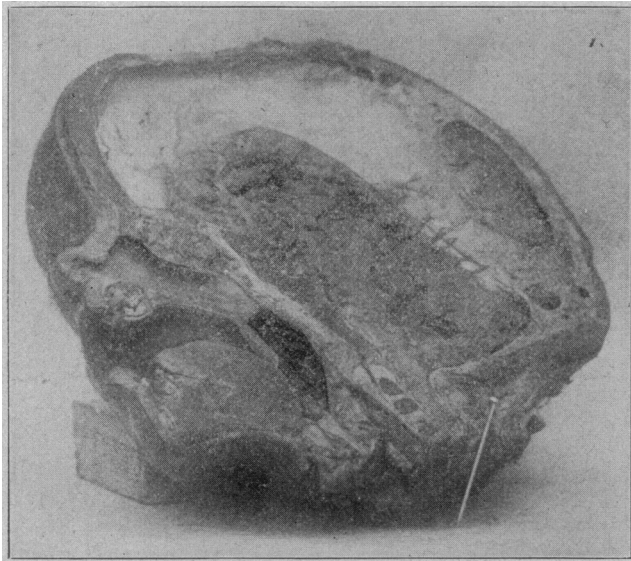


Figure 1.

Showing size and position of a normal epipharyngeal tonsil.

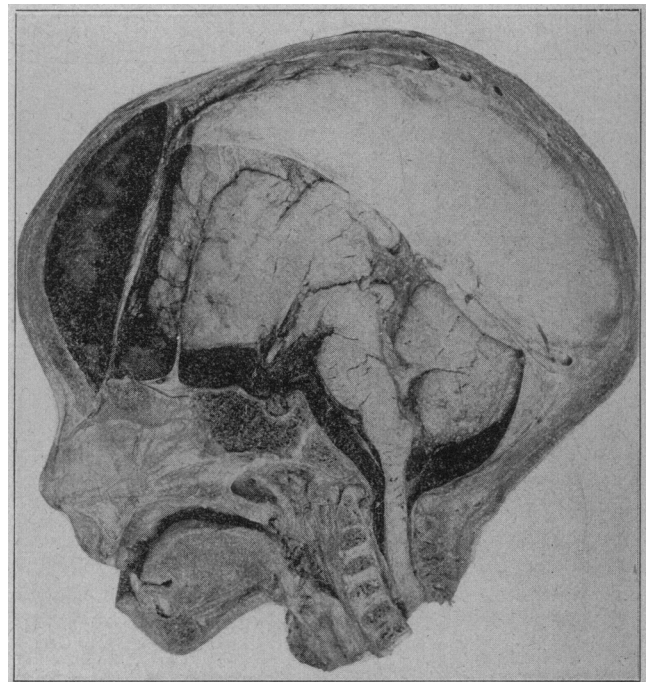


Figure 2.

Showing adenoid tissue embracing Rosenmüller's Groove.

mote significance of adenoids belongs to Wilhelm Meyer, first in 1868, then in 1873, their existence can hardly be said to have been altogether unknown to the ancient writers. Although he was ignorant of the real cause, Hippocrates, in the 7th Book of Epidemics, gives the clinical picture of adenoids with the concomitant ear discharge, headache, irregularity of the teeth, V-shaped palate, etc. We may gather from Celsus that the effects of adenoids were not unknown to him. Pliny mentions them. Semon draws attention to a picture of a Prince of Spain painted in 1524, in which the artist has portrayed the facies peculiar to those affected with mouth breathing. Schneider (1655), Santorini (1724), Haller (1764), Lacauchie (1853), and Luschka (1868) more or less perfectly described the morphology of the epipharyngeal body, and it was the latter investigator who first conferred on it the name, since generally accepted, the tonsilla pharyngea. Henle, Koelliker and His were the first to examine its histological structure, and to show the histological similarity existing between this and other remote lymphoid structures, namely, the spleen, the thymus, lymph glands,

import, inasmuch as the whole or any part of it is liable to undergo hyperplastic change.

The normal pharyngeal tonsil may be said to occupy the space reaching laterally from one Eustachian cushion to the other, and from the superior margin of the choanae above, to the arcus atlantis below. It is flat and traversed by three to five or more vertical grooves, which tend to converge at its lower end; several fissures are usually found running from side to side, intersecting the former. It measures from 4 to 6 mm. in thickness. From here the adenoid tissue reaches over the soft palate into the middle meatus of the nose and along the floor, where it may be often detected by anterior rhinoscopy as a linear projection of pale pink color (Shäffer, Winckler, Hellman). The accumulation is so great on the median walls of the postnasal space and at the ostium of the Eustachian tube that Teutleben suggests that it be called the tubal tonsil. It enters the walls of the tube itself as far as its upper third. Trautman contended that adenoid vegetations never have their origin in Rosenmueller's groove in the im-

mediate neighborhood of the tubal ostium, while B. Fränkel, Schäffer and others have contended that such origin is frequently found. Reference to Fig. 2 shows growth growing directly from the aforesaid region.

Embryologically the pharyngeal contents are associated by means of Landzert's canal with the pituitary body and pineal gland. But as far as I have been able to ascertain the exact relationship of the tonsilla with the hypophysis is not known. According to Stohr the metamorphosis of leucocytes into the fibrillar structure of adenoid tissue begins in the third month of fetal life. In the sixth month the pharyngeal tonsil is formed. At birth, however, a pharyngeal tonsil is very rudimentary, scarcely visible to the naked eye in most cases. Only exceptionally do we find its hyperplastic enlargement beginning before the end of the first year. In the majority of children from the 5th year to puberty the accretion is at its height. From this time on, its tendency is toward involution. In individual instances we have the most varied exceptions to the rule. Thus we may have large masses of adenoids remaining after puberty and into adult life, or we may see voluminous masses undergoing rapid spontaneous disappearance at any age

widely distributed through the animal kingdom by Schmidt, Killian and Holl. It is constant in mammalia, with the exception of rodents, where it is very scant or altogether absent. In swine lymphatic tissue in the pharynx is especially abundant. A lymphatic body analogous to the faucial tonsil as it occurs in man is to be found in birds and in certain reptiles and amphibians.

As to the function of the pharyngeal tonsil little or nothing is known, as little as is known of the part played by the faucial tonsil. Numerous hypotheses have been advanced regarding both, but as yet none of them have been proven. Harrison Allen, reasoning from their embryological connection with the hypophysis cerebri, believed that adenoid vegetations were intimately connected with the metabolic processes of the economy; he says: "I remain of the opinion that adenoid growths, while, as a rule acting mechanically, will occasionally manifest the symptoms of a veritable disease which is allied to other affections of the blood vessels, glands and lymph systems, and which should be regarded as having a dominating influence on metabolic processes. It is thus placed in alliance with acromegaly and

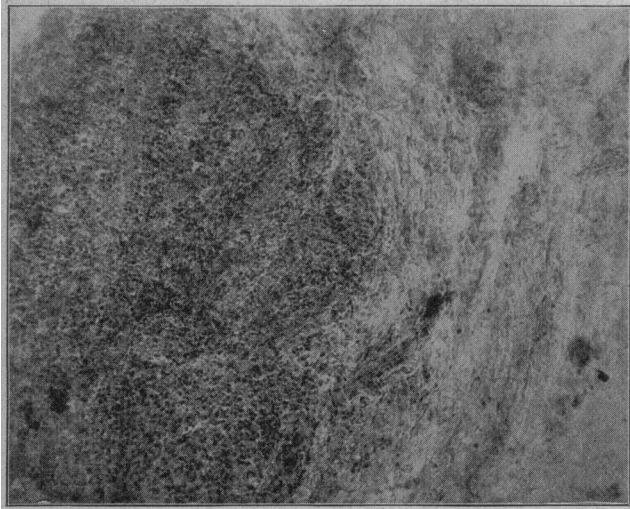


Figure 3.

Showing ripening of embryonal into adult connective tissue in an epipharyngeal tonsil removed from a lad at puberty.

before puberty. We must remember, however, that it does not require large masses of adenoid tissue in infants to greatly interfere with nasal respiration.

The size, shape, color, and consistency of the hyperplastic pharyngeal tonsil vary greatly. Its size may cause it to completely or incompletely fill the postnasal space. Meyer divided them as to shape into folioid, conical, pectinate and lemelliform varieties. The archtypal form is that with a broad base, sharply defined, of rather hard consistency, hemispherical in shape and with more or less deep sagittal and transverse furrows crossing its surface. The other varieties may be regarded as the result of modification in corrugation due to anomalies in the normal sagittal and transverse furrows. The color may be pale pink, red or purple. Density varies according to the relative amount of lymphoid and connective tissue a growth may contain, and to a certain extent with its vascularity. The surface may be coarsely granular or smooth. There is little doubt but that they possess a certain degree of erectility.

This peculiar arrangement of the pharyngeal lymphatic system is not limited to man. It has been found



Figure 4.

Blood vessels at the base of a hyperplastic epipharyngeal tonsil, showing their radial arrangement. At *a* and *b* are shown how the fibrous tissue prevents the collapse of the blood vessels.

myxedema." The pharyngeal adenoid ring has been identified with the digestive or absorbent process on account of its histological resemblance to the adenoid structures in the intestinal walls. But the position of the epipharyngeal tonsil would seem to preclude its participation in such a process. On account of its resemblance to the structures which in fetal life are actively employed in the production of hematogenous elements, namely the spleen, thymus, liver, certain observers have endeavored to connect it with the hematopoietic process. Analogy is not born out when we remember that after birth when these organs have ceased their hematopoietic functions, the adenoid structures of the pharynx in the large majority of cases just begin to appear. Again, their great variability would militate against their participation in such an important process. Against the theory that they protect the organisms against infection we have only to recall the frequency with which they serve as portals of entry for diphtheria, scarlet fever, rheumatism, etc.

Hyperplasia of the pharyngeal tonsil has been ascribed to various pathological processes by numerous writers.

Michael Dansac divides them into those of tubercular, syphilitic and scrofulous origin, and bases his deductions on a histological study of 32 cases of adenoids occurring in the clinic of Gougenheim at Lariboisieri Hospital.

The relationship of tuberculosis to adenoids has furnished a theme for discussion by many writers during the last few years, and we are now in position to say that although the epipharyngeal tonsil may not infrequently be infected by the specific germ, its hyperplasia is far more often due to other causes and may be seen by the following table:

	100 cases found	0 cases of tuberculosis;
Broca in	33	4
Gottstein in	33	2
Lemoyez in	32	8
Brundel in	64	5
Plundar in	32	2
Luzzatti in	50	5
Breeger in	78	7
Wex in	210	
Total . . . .	599	33

Pillet found giant cells in three cases out of ten specimens examined, but we know that giant cells alone

adenoids, anemia, aprosexia, etc., are in all cases due solely to their mechanical presence is scarcely probable. The recent experiments of Massini and Genta seem to prove that adenoid tissue occurring in the postnasal space possesses a secretion which when injected into rabbits causes a slowing of the pulse rate and a rise in the vascular pressure, thus placing by analogy adenoids among the glands having an internal secretion, such as the thyroid, adrenal bodies, pituitary gland, etc.

Their coincident appearance in many cases of scrofulosis is admitted. But we are all aware that in certain cases in which the general condition can scarcely be differentiated from true scrofulosis, immediately on removal of the growth in the postnasal space the vital capacity of the individual improves and the patient in a short time is restored to full health. This condition has been called by Moritz Schmidt, pseudo-scrofulosis.

HISTOLOGY.

Bickel proposes to confer the name of tonsil on only those masses of adenoid tissue which meet the following specifications: 1, a sharply-defined base; 2, diffused



Figure 5.

Lymph follicles with their more deeply stained peripheries.

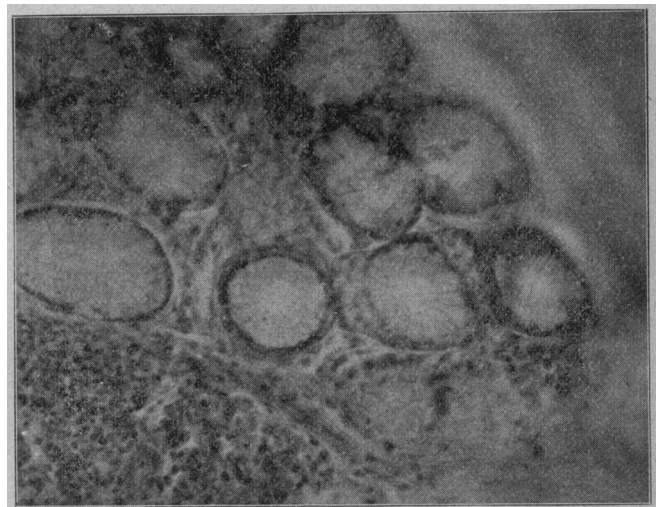


Figure 6.

Acinous glands from the deeper portions of an epipharyngeal tonsil.

found under conditions such as those present in his cases are not evidence of tuberculosis. The reaction of adenoids to the tuberculin test has been negative in the large majority of cases.

In one of G. Gottstein's cases, from which the adenoids were removed, evidences of tuberculosis were found. At the time of removal the patient was 12 years old. Six years afterwards she was again examined. Only the slightest remnant of adenoid tissue remained, which had a perfectly normal appearance and the patient herself was in possession of perfect health.

That we often find adenoids in strong healthy children, must disprove the hypothesis that they are always of tubercular, scrofulous or syphilitic origin. Causes of hyperplasia occurring in the pharyngeal tonsil are various. Among the most frequent stand the acute infectious diseases of childhood; especially provocative are scarlet fever, diphtheria, measles and whooping cough, and next to these come recurrent attacks of acute catarrhal inflammation and acute lacunar inflammation. The frequency with which these attacks occur in the epipharyngeal tonsil has been scarcely appreciated, as pointed out by Gradle.

Whether the systemic disturbances which accompany

infiltrations of leucocytes around lymph follicles; 3, crypts and sinuses; 4, the lymphatic tissue must approach close to the surface and contain acinous glands.

The epipharyngeal tonsil possesses all of these characteristics. It is covered with epithelium, the character of which varies with the age and size of the growth; in the normal young tonsil it is rather constantly cylindrical and possessed of cilia. In the older growths, however, this cylindrical epithelium assumes more often a pavement-shaped variety and the cilia are lost. The epithelium is arranged in rows of two in the young tonsil; in the older tonsil they may increase to three or five. Immediately beneath is the limiting membrane, which as a rule is very delicate. Below this comes the substantia propria consisting of the lymph follicles, leucocytes, blood vessels and lymphatics, the whole being held together by a reticulum of connective tissue. In a number of sections stained with the fer-hematoxylin method I was unable to find a nervous structure. The size and number of the follicles in any growth vary greatly. The follicles may be so large as to be visible to the unaided eye in the stained section; there may be two to five layers from the surface to base. Nearly always the periphery of the follicles stain more intensely

than the central portion. Deep within the tissues are found the acinous glands. The arrangement of the blood vessels is somewhat fan-shaped. J. Hynitzsch has observed villous elevations within the crypts which show a great similarity to the papillomatous proliferation seen in mammary and ovarian cysto-adenoma. The same author has made a study of the cysts occurring in the hyperplastic pharyngeal tonsil and divides them into two varieties corresponding to the two types of epithelium lining the crypts, namely, the columnar and squamous cysts. These columnar epithelial cysts vary in size from a microscopic body to that of a bean, occur frequently and contain a clear ropy mucus, often rich in leucocytes and occasionally red blood corpuscles. In two cases the cysts contained multinuclear elements or giant cells. Their nuclei vary in number, are of irregular arrangement and never situated along the line of the cell, thus essentially differentiating them from giant cells found in tuberculosis. Squamous epithelial cysts are much rarer. These cysts frequently contain horny lamellæ concentrically arranged, the center composed of amorphous granular masses, fat globules and cholesterol crystals. They may be regarded in all instances as due to retention of secretion by closure of the mouths of crypts. The process of involution may be explained as follows: Maturing of the embryonal tissue takes place first in the oldest portion of the growth, which is probably at the base of the tonsil. This process, together with the peculiar fan-shaped arrangement of the blood vessels may be seen in Figure 4, and here, too, we may gain a hint as to the cause of hyperplasia in certain growths. The firm connective tissue in which the blood vessels of the base are embedded prevents diminution of their caliber and this interferes with the normal decrease in the nourishment of other portions of the growth. We thus have a relatively increased blood supply to that portion of the growth supplied by the blood vessels affected. The change of embryonal into adult connective tissue takes place in the interfollicular tissue. Each follicle is enclosed in a bag, as it were, of maturing connective tissue; this gradually contracting tends to cause the follicles to disappear by pressure atrophy.

#### CONCLUSIONS.

1. The tissue composing adenoids has a wide distribution throughout the body.
2. The epipharyngeal tonsil is an organ normally present in all individuals.
3. The function of the epipharyngeal tonsil is at present unknown. Whether it is simply an evolutionary vestige or has to do with metabolic or other processes is equally uncertain.
4. Its wide distribution among the various members of the animal kingdom, its embryological connections, and its identity with lymphoid structures elsewhere in the body, would suggest that the epipharyngeal tonsil has a function.
5. The histology and the experiments of Massini and Genta would tend to place it in the class of glands having an internal secretion.
6. The relation of tuberculosis, syphilis or scrofulosis to adenoids is not etiologic. Adenoids may be affected with tuberculosis, etc., but only as any other organ may be similarly affected.

**Important Scientific Post for a Woman.**—Since Nencki's death, his assistant for many years, Miss Sieber-Schumord, has been appointed director of the Institute of Experimental Medicine at St. Petersburg, in his place.

## THE ROENTGEN RAYS

IN DIFFERENTIATING BETWEEN OSTEOMYELITIS, OSSEOUS CYST, OSTEOSARCOMA AND OTHER OSSEOUS LESIONS, WITH SKIAGRAPHIC DEMONSTRATIONS.

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In periostitis, as well as in osteomyelitis, the skiagraphic signs are well marked. Abscesses can not only be localized, but their extent is so well outlined that the technical steps of the operation can be definitely traced in advance. The feeling of security the surgeon has while proceeding under the mentorship of the skiagraph gives a satisfaction unknown in former years, when often the whole femur had to be exposed simply in order to ascertain whether all foci were detected. If the Roentgen

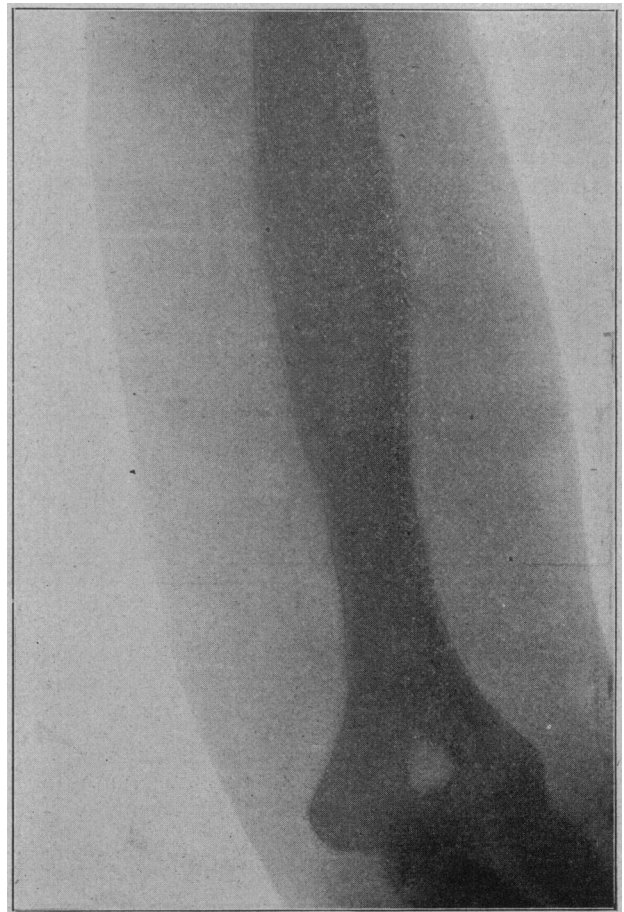


Fig. 1.—Osteomyelitic focus in the middle of the humerus.

rays show but one focus, no other regions of the bone need be attacked.

In such cases a preceding trauma often opens the avenue of infection. The pain, the edema, the fever, and general debility may be sometimes so little marked that differentiation becomes difficult. The skiagraph not only clears this difficulty of diagnosing this disease, the true etiology of which is still so obscure, but it also furnishes a trustworthy guide for the operative technic at the same time.

Osteomyelitis is of a decidedly infectious character, generally due to the invasion of the staphylococcus aureus, which fortunately has a tendency of forming circumscribed foci in the vascular tissues of the bone, viz., the medulla, and sometimes the periosteum. The predilection of osteomyelitis is for the long bones of young