THE ORO-PHARYNX AS A PORTAL OF ENTRY FOR INFECTION.*

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In discussing the mouth and pharynx before the laryngological section, a medical man's function is obviously to confine himself to those general diseases which obtain access to the body through diseases in these cavities, but in a consideration of the lymph nodes of the oro-pharynx as a portal of infection a brief resumé of the anatomy is necessary. The tonsil, to take the best-known of the pharyngeal lymph-nodes as an example, has as its unit the lymph follicle covered with mucous membrane, and subdivided by infoldings of this membrane, the lining-epithelium of which is in many places deficient. Otherwise the structure is in all respects that of an ordinary lymph-node except as regards its lymph channels. Efferent vessels are present, but afferent are absent. Their place is, however, to some extent taken by the deficiencies in the lining mucous membrane of the crypts which are thus in direct communication with the inter-follicular lymph-channels.

The distribution of the lymphoid tissue in the pharynx is peculiar. We find the combined opening of the digestive and respiratory tubes almost completely surrounded by lymph-tissue, the so-called "Ring of Waldeyer," composed of pharyngeal, faucial and lingual tonsils and a lateral pharyngeal chain on each side. Thus at a point where ciliated epithelium is not yet present to protect by sweeping out invading micro-organisms and the protective action of the saliva in inhibiting bacterial growths (Albert and Mills¹) is no longer present, we have this curious formation of lymph tissue encircling the whole entrance to both digestive and respiratory tracts. This brings us at once to that mooted point, the function of the tonsillar-pharyngeal lymph tissue which may be approached from several sides. That it is not a vestigial remnant the work of Retterer² seems to prove. It is not existent in reptiles until the crocodile stage is reached and attains great complexity only in the higher mammals. Presumably a recently acquired organ has some function. The natural supposition is that it shares the function of lymph glands in general in the formation of lymphocytes and in protecting the body against the invasion of bacteria. Wood³ and

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Ravenal have tested the bacteriolytic action of an emulsion of tonsil with negative results. They attribute their failure to find such properties to a removal of antibodies by repeated absorption into the blood and lymph streams. The question as to how the tonsil may act as a portal of infection may perhaps be answered as follows:

First, through the blood stream, a local affection of the tonsillar mucous membrane such as diphtheria or follicular tonsillitis, produces in a few hours marked constitutional disturbance. This is most readily to be explained by the assumption of a speedy absorption of toxins through the vascular walls directly into the bloodstream and is well exemplified by the difference in constitutional disturbance of pure laryngeal and pharyngeal diphtheria. In the first case the constitutional disturbance is comparatively late, in the latter case early. In this connection, however, it must be remembered that Adami and his pupils believe that bacteremia is much more common in local disease than has ordinarily been supposed.

Second, infection through the lymph stream. This is probably a somewhat more uncommon method though some infection takes place in the majority of cases of tonsillitis as evidenced by the enlargement of the gland at the angle of the jaw and sometimes of the deep cervical chain. Goodale,⁴ Hodenpyl,⁵ Hendelsohn,⁶ Wood⁷ and others have worked upon this subject and prove that foreign material, carmine, ink, etc., can be absorbed from the tonsillar mucous membrane and crypts and found in the tonsils and lymph glands within a short time after injection. Wood, in particular, has made careful injections and dissections and finds a gland constantly situated just below the anterior border of the sternomastoid where it is crossed by the posterior belly of the digastric muscle. The superficial glands are not involved and the further connection is with the anterior chain of deep cervical glands, the lymph and foreign matter being finally emptied into the jugular lymph trunk and so into the junction of the jugular and subclavian veins.

Obviously, bacteria can much more readily follow the lymph channels than such gross materials as carmine, ink, etc., and often pass through the mucous membrane and faucial lymph tissue without local lesion to find resistance farther down in the lymph glands. This point has been well proven in studies on the analogous infections of the bronchial and mesenteric lymph nodes without antecedent disease of lung or intestine. It seems equally reasonable to attribute disease of the cervical glands to infection through the various drainage-areas of the glands involved.

The diseases which gain access to the body through the oropharynx may be divided in two main types. First, those local infections which cause constitutional disturbance by toxin absorption, of which diphtheria is the best example and which needs in this connection no further explanation. Second, those diseases caused by an invasion of the body by bacteria. Of these, the most common are tuberculosis and the various forms of septic invasion of the body by pyogenic organisms. Rheumatism may perhaps be caused either by toxin or bacterial entry. We have no definite proof of either but strong evidence of the existence of one of these etiological factors.

The status of the tonsil and the pharyngeal lymph tissue in its relationship to tuberculosis is one of great interest and has been approached both from the side of local tonsillar disease in pulmonary tuberculosis and in the etiological relationship of the faucial lymph tissue to cervical gland tuberculosis and even of apical pulmonary tuberculosis.

As would be expected in the case of organs with deep recesses constantly bathed with tuberculous sputum, the condition obtaining in the tonsil in the presence of advanced pulmonary tuberculosis, a large percentage of the cases show tuberculous tonsils. Strassman⁸ finds the tonsils tuberculous in thirteen out of fifteen autopsies on tuberculous subjects, Domockowski⁹ in every one of fifteen cases, Wood in a report from the Phipps Institute in twenty-nine out of thirty-seven cases.

The evidence of cervical gland-infection through faucial invasion but without local lesion is less direct but inferentially scarcely less clear. Animal experimentation shows that after inoculation at any point in the periphery with tuberculous material either a local lesion may result or the nearest lymph glands become tuberculous. Feeding experiments by Baumgarten¹⁰ and Fessler¹¹ prove that after ingestion of the tubercle bacilli with an intact mucous membrane the lymph follicles of the gut are first affected and later the mesenteric glands. Only with the ingestion of large amounts of virulent bacilli are local lesions produced. Primary bronchial lymph-node tuberculosis is likewise produced by inhalation of dried tuberculous sputum. We thus see the possibility of the passage of the tubercle bacillus through the intact mucous membrane. In children, gland tuberculosis plays a very important rôle. Wohlgemuth finds that in children under ten, sixty per cent suffer from tuberculous glands. In an analysis of 430 cases, the same author finds that in ninety-three per cent of these the cervical glands were af-

fect. Following our rule in case of infections of a lymph gland to regard its drainage area as the portal of entry, we inevitably reach the conclusion that the oro-pharynx and particularly its lymph tissue is the site of invasion. Recent work by Grobe,¹³ Beitzke¹⁴ and Wood,³ shows the occasional presence of a supra-clavicular gland-lesion connection with the cervical chain and hence an indirect possibility of apical involvement from the tonsil. This, however, must be a rare occurrence as the connection is not a regular one.

Septic invasion of the body has been reported in many cases by different authors. Stengel,¹⁵ Woodcock,¹⁶ Adler,¹⁷ Otten¹⁸ have all reported septicemias, some fatal, which have originated in tonsillar infections. In their cases in all probability, the infection is due to a direct passage of bacteria into the blood-stream.

Endocarditis, nephritis, pneumonia, pleurisy, meningitis, phlebitis, and eye lesions have all been reported many times as having an etiological relationship to tonsillar infection. Forchheimer¹⁹ even reports appendicitis and five cases of an infectious jaundice resembling Weil's disease following tonsillitis. The infecting organism varied; streptococci, yellow and white staphylococci were present.

Rheumatic fever has long been associated in the clinical mind with tonsillar infections. With the work done to establish a definite bacterial etiology for rheumatism the tonsil has come in for its share of investigation. Fritz Meyer isolated from twenty-five cases of rheumatic tonsillitis a diplococcus which produced an arthritis in rabbits. Frissell²¹ isolated from a rheumatic throat a coccus which regularly produced in animals a polyarthritis. The clinical association between the two conditions has long been noted by very many different authors.

The direct proof of cause and effect is lacking in a disease where a definite specific organism has not yet been isolated. The clinical connection, however, is so strong that we must consider the pharynx and tonsil as an ordinary portal of infection. Whether the disease is local and the absorption of toxins is responsible for the articular symptoms, or as Poynton and Payne believe, the organism circulates in the blood and lodges in the joints, one must assume either a special susceptibility of serous membranes for rheumatic toxin or a predilection on the part of the organism at fault for these same membranes.

Gurich,²² in an interesting monograph claims to be able, particularly in chronic cases to differentiate articular disease of ton-

sillar origin from other forms, by tonsillar therapy which consists in surgically opening all existing crypts and emptying the pockets of pus. This is followed by an arthritic exacerbation which the author claims is proof of the interrelationship of the two conditions. The reaction occurs on the third or fourth day and is followed by remission or cure of symptoms. Treatment is continued until all crypts have been opened and kept open. His results follow, 140 cases of rheumatism of which twenty-three failed to react and were thrown out as not of tonsillar origin. Of the remaining, 102 cases followed which showed reaction, ninety-eight were completely cured. Many cases were of long standing.

There remain for discussion the exanthemata in which throat-symptoms form so important a part that it seems reasonable to postulate a throat infection. Of these, scarlet fever and measles stand out prominently. As we are ignorant of their etiology, further discussion of the mode of invasion is profitless.

Finally there are that group of cases which many believe to be secondary to long-standing sources of irritation in the mouth or pharynx. Thus gastritis, and pernicious anemia (Hunter) may be in some instances due to slight but constant absorption of pus-organisms from small local foci such as may exist around the roots of teeth or deep in the tonsillar crypts without evidence of local trouble unless unusual care is taken in the examination.

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