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TUBERCULAR TUMORS OF THE WINDPIPE. TUBERCULOSIS OF THE LARYNGEAL MUSCLES. A CONTRIBUTION TO THE PATHOLOGICAL HISTOLOGY OF LARYNGO-TRACHEAL PHTHISIS.

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TUBERCULAR TUMORS OF THE WINDPIPE. TUBERCULOSIS OF THE LARYNGEAL MUSCLES. A CONTRIBUTION TO THE PATHOLOGICAL HISTOLOGY OF LARYNGO-TRACHEAL PHTHISIS.

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I.—TUBERCULAR TUMORS OF THE WINDPIPE.

THE larynx of the consumptive is the seat of various forms of neoplasm which are pathologically separable into three distinct groups.

1. *Granular hyperplasiæ.*—This is the most common variety of outgrowth, and consists of an aggregation of small grayish or pinkish granulations, which fringe the edges or deck the base of tubercular ulceration. They are rarely, if ever, met with as the result of the simple catarrhal or diphtheritic [1] changes which are found in phthisis of the windpipe, and are therefore of considerable value in differential macroscopic diagnosis. They occur in all portions of the larynx, their seat depending on the location of the ulcerative process, and are sometimes so abundant as to cause stenosis and necessitate tracheotomy. Anatomically allied to granulation tissue, they may be regarded as the representatives of a conservative process—*as a natural step*

[1] On diphtheritic ulceration, see papers by the author in the *Monatsschrift für Ohrenheilkunde*, No. 9, Berlin, 1881, and the "Transactions of the Med.-Chir. Faculty of Maryland," 1882.

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toward cicatrization. If sections be made through a tubercular ulcer of the larynx or trachea, and its surrounding granulations, a more or less clearly defined zone of hyperplastic inflammation of the connective tissue will be discovered, which isolates the degenerate tubercle from the healthy tissues in its immediate vicinity. The vegetations under discussion are the result of this protective inflammatory process, and consist, histologically, of a mass of newly formed connective-tissue cells and nuclei, in which enlarged, tortuous capillary vessels are sometimes developed.

2. *Papillomatous excrescences.*—Of less common occurrence than the preceding, the members of the second group are closely allied to simple laryngeal papillomata, and, like them, owe their origin to chronic vascular congestion of the mucous membrane. Their occasional presence, however, in the midst of pronounced pallor of the larynx, would lead to the belief that they sometimes result from the irritation of an opposite pathological condition, viz.: the peculiar anæmia of the laryngeal membrane, which is so often the herald of the tubercular process. Warty, acuminate, or leaf-like in form, and varying in color from a pale grayish to a pronounced reddish hue, they spring, as a rule, from the posterior laryngeal wall, and in this situation sometimes attain to a considerable size, and are readily mistaken for true laryngeal papillomata. They occur also on the epiglottis and below the anterior commissure of the vocal cords. In structure they are the histological analogues of the laryngeal papilloma, and occur, as a rule, independently of well-marked tubercular lesions. These growths often ulcerate and assume an apparently malignant form, but I am unaware of any microscopical evidence of their conversion into tubercular products. Stoerk,[1] who has carefully studied the development of these neoplasms, maintains

[1] *Klinik d. Krankheiten des Kehlkopfes*, etc., Stuttgart, 1880, S. 282.

that their presence in the interarytenoid fold is an infallible sign of incipient tuberculosis, and, following Rokitansky, regards them as the result of the indurative proliferation of the connective tissue, which occurs in the course of chronic tubercular disease of the mucous membrane in the neighborhood of the arytenoid cartilages.

3. *Tubercular tumors.*—The two above-described varieties of neoplasm contain no histological elements by which they may be differentiated from simple granulation or papillary vegetations. The third group, on the other hand, includes solitary tumors of the windpipe, which are composed, histologically, of a mass of closely aggregated miliary tubercular nodules, and which occur independently of infiltration and ulceration of the mucous membrane. I desire to call especial attention to these growths, as they are not described in works on laryngeal pathology, and I am unaware of a single recorded case of laryngeal neoplasm whose tubercular nature has been demonstrated by the microscope.[1] The two following, which came accidentally under my observation in the Rudolph Hospital in Vienna, are therefore worthy of publication. The *post-mortem* examinations were made by Dr. Hans Chiari, to whom I am indebted for the specimens, and the organs handed to me for microscopic investigation.

1. *Tubercular tumor of the trachea.*—This was taken from the body of a man who had died in the hospital from carcinoma of the stomach. Secondary cancerous deposits were present in the liver, kidneys, spleen, and other organs. The lungs, however, contained tubercular cavities. The pharynx, larynx, and trachea were free from inflammation and ulceration. The bronchial and retro-tracheal glands

[1] It is obvious that neoplasms of various kinds may be found in the air-passages of phthisical persons, which have no connection whatsoever with the tubercular process. The cases recorded by Andral *Clinique médicale*, t. ii, p. 195, (and *Spillan's Transl.*, Lond., 1836, p. 489), Trousseau "Laryngeal Phthisis," Phila., 1839, p. 31, and others, evidently belong to this category.

were enlarged, tumefied, and caseous. In the membranous posterior wall, at its junction with the cartilaginous framework of the trachea, about 1½ cm. above the bifurcation, was a well-defined circumscribed tumor about the size of a small bean, its long axis parallel with that of the trachea, and of a uniformly even, smooth appearance. It was covered by the mucous membrane of the trachea, and was dense in consistence, giving to the touch the sensation of a hard cancerous nodule, for which, indeed, it was mistaken. A similar growth was found in the pericardium.

The microscope revealed a picture for which I was not prepared. It showed, namely, that the tumor, which seemed to have its origin in the submucous connective tissue, consisted, in the main, of an aggregation of distinct tubercular nodules set in a more or less well-marked vascular net-work of hypertrophied connective tissue. The majority of the tubercles lay in the deeper portions of the mucous membrane and in the submucous tissue; a few were more superficial, lying under the epithelium. They exhibited all grades of degenerative change; in some caseation was so far advanced that nothing remained but the cellular wall. Between the individual nodules the connective tissue was hypertrophied and the seat of a moderate amount of round-cell infiltration which had invaded the glandular follicles in its vicinity. The tissues of the trachea in the immediate neighborhood of the growth presented no remarkable change. *The nodule in the pericardium showed the same histological structure that was found in the tracheal neoplasm.* All the other diseased organs were shown by the microscope to be cancerous.

2. *Tubercular growth of the vestibulum laryngis.*—The subject from whom this specimen was taken died outside of the hospital, of pulmonary phthisis. The whole upper compartment of the larynx, including the epiglottis, ary-

epiglottic folds and ventricular bands, presented a remarkable mammillary or granular appearance, due to the presence of small, uniformly smooth, dense, moderately hard nodular growths, which lay beneath the mucous membrane. The nodules were about the size of a split pea, each merging into its neighbors, so as to form one continuous growth. This process ceased abruptly on either side, at the free border of the ventricular band. There was no trace of ulceration in pharynx, larynx, or trachea.

Microscopical examination of numerous sections of the growth showed it to be of the same nature as the above-described neoplasm in the trachea. Like it, it seemed to have invaded principally the submucous tissue, and, like it, consisted of a mass of closely aggregated miliary tubercles in all stages of degeneration. The nodules in the deeper portions were further advanced in caseation than those which were more superficial. The growth was less dense in consistence than the one observed in the trachea, and the connective tissue between the nodules had undergone a less degree of hypertrophic change. The tubercles lay in close proximity to the blood-vessels, one or two of which were compressed by the new formation. The remaining portions of the larynx were healthy. The lungs contained tubercular cavities. There were tubercular ulcers in the intestine, and the basilar surface of the brain was covered with miliary granulations.

As intimated above, these cases are probably unique. Such tumors doubtless have a similar origin to the so-called "metastases" in the laryngeal mucous membrane which take their departure from old tubercular disease of other organs, as the kidney (Köhnhorn[1]) and bronchial glands (Lennox Browne[2]).

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[1] *Berliner klin. Woch.*, 1876, Nos. 3 and 4.

[2] *Med. Times & Gaz.*, 1876, i, p. 456. (Eppinger: "Pathologische Anatomie des Larynx u. der Trachea." Berlin, 1880, S. 155.)

II.—TUBERCULOSIS OF THE LARYNGEAL MUSCLES.

The hoarseness without palpable *intra-vitam* or *post-mortem* changes in the larynx, so often met with in phthisical patients, led Fraenkel,[1] in 1877, to examine the laryngeal muscles as a possible seat of degenerative processes which might explain the alterations in the voice. In twelve larynges, some apparently healthy, others presenting ulceration, he found constant anatomical changes, which consisted essentially in an atrophy of the striated muscles. The connective tissue between the primitive bundles was markedly infiltrated with cells, and the nuclei of the muscles so increased as to destroy apparently the muscular fibres by pressure of the new-formed cells.

Several years later, Posadsky,[2] of St. Petersburg, confirmed the observations of Fraenkel, and showed that the same degenerative changes took place also in the muscles of the upper and lower extremities, the intercostals, and the diaphragm. The muscles were pale and friable, and the microscope showed granular degeneration of the muscular fibres. In many cases there was disappearance of the transverse striation, and the fibres were notably narrowed, and some empty sarcolemma sheaths were seen. The interstitial connective-tissue changes described by Fraenkel were not discovered by Posadsky.

Heinze,[3] who has carefully studied the pathological anatomy of laryngeal phthisis, is unable to confirm the results arrived at by Fraenkel, and thinks that tubercular infiltration of the tissues is sufficient to explain the anomaly in the voice. This observer has furthermore discovered tubercle in the muscular tissue of the deeper laryngeal structures, an occurrence, according to him, of extreme rarity. Out of

[1] "Ueber die patholog. Veränderungen d. Kehlkopfmusculatur bei Phthisikern." *Virchow's Archiv*, lxxi, 3, 1877.

[2] *Vide*, *London Lancet*, 1881, vol. i, p. 149.

[3] "Die Kehlkopfschwindsucht," Leipzig, 1879, S. 69.

fifty carefully examined cases, tubercle of the muscles, unconnected with general tubercular infiltration of the larynx, was found only twice.

The apparent rarity, therefore, of miliary tubercular deposit in the muscular tissue of the larynx induces me to record the microscopical appearances observed in a case which I have recently had the opportunity to examine.

The specimen was taken from the body of a man who had died in an advanced stage of pulmonary phthisis. Cavities were present in both lungs. The epiglottis was the seat of several small ulcerated spots, and there was a large ulcer involving the whole of the left ventricular band, the anterior portion of the corresponding ventricle and vocal cord. The microscopical examination of the ulcer and the portions of the larynx immediately adjoining, presented the usual appearances of tubercular infiltration and ulceration.

In order to determine the changes in the muscular tissue, sections were made through the arytenoid cartilage and the muscles attached to its base. The histological changes consisted (1) in the deposit of distinct miliary tubercles in the substance of and between the muscular fibres, and (2) in alterations in the fibres themselves.

1. In the deeper portions, near the insertion of the muscular fibres into the arytenoid cartilages, were found several large, well-marked, distinctly circumscribed tubercles embedded in the muscular tissue, and wholly unconnected with the tubercular infiltration of the mucous membrane which clothed that portion of the larynx. They lay in the centre of the muscle, between the individual fasciculi, by which they were completely surrounded and which they had forced apart, so that at the situation of the tubercle the muscular bundle presented under the microscope an ampulliform dilatation. The outer fasciculi surrounded the tubercle completely, whilst the central ones passed appar-

ently through its substance, or ended abruptly at its margin in a mass of small round cells. The individual fasciculi were in some places torn completely asunder; in one place, absorbed by the pressure of an outlying tubercle. The tubercles themselves presented the typical appearance of these neoplasms, each containing several giant cells. In one, caseation had produced almost complete destruction of its central portion. In the immediate neighborhood and between the individual fasciculi, in some instances forcing them apart, was an abundant, high-grade round-cell infiltration. The cells were observed, on cross-section, to completely surround the separate fasciculi; at some points they had so invaded the muscular tissue as to leave little of its original structure visible.

2. The most noticeable change in the primitive bundles themselves was an increase in the number and size of the muscle cells. Those bodies were generally enlarged, sometimes irregular in outline, and filled with a granular matter; in others the nuclei were plainly visible. At some situations the muscular tissue showed no well-defined pathological change, beyond, perhaps, a slight increase in number of the nuclei; whilst at others, and especially was this the case in the vicinity of the tubercles, the striation was indistinct, the fibres were broken across, so that the sarcolemma sheath became visible, and in some spots the muscular tissue itself was converted into a granular detritus.

These appearances add little to what has already been observed by Heinze; but as corroborative evidence of the accuracy of his observation, they may prove of some interest to those whose studies have led them into this field of pathological research. As to the import of the granulo-fatty degenerative changes in the muscular fibres, I am inclined to regard them as the result of disturbances of nutrition induced by chronic inflammation, rather than as an integral part of the tubercular process.