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TUBERCLE OF THE TESTIS.[1]

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The present paper is intended as a contribution to our knowledge of tuberculosis of the genito-urinary organs. Though much has been written upon surgical tuberculosis in this country, and though much good work in an operative way has been done in the field of genito-urinary tuberculosis, nothing of importance has been published as to the histology of these affections as seen in the light of modern research, clinical and microscopical. Indeed, there is a distinct void in English and American medical literature as regards these affections. To fill this in a measure, I have availed myself of the able assistance of Dr. Ira Van Gieson, one of the curators of Charity Hospital and here present the macroscopic and microscopic appearances found in four testes removed from two patients who are under my care. It fortunately happens that in these testes the course of the disease can be very clearly studied step by step. In these two cases, the interesting and not very unusual clinical fact is presented of the tuberculous process beginning spontaneously in the epididymis and involving the testis proper, and in marked contrast with what is so frequently the case, namely, the development of tuberculosis in an epididymis or testis the seat of previous traumatic or gonorrhœal inflammation.

Case I.—J. R., aged forty-two, American, bachelor, was admitted to Charity Hospital, Dec. 28, 1886. The family history on his father's side is excellent, but that of his mother is bad, since she, together with three brothers and three sisters, died of phthisis prior to the fortieth year. The patient says that he had pains in his chest and shoulder-blades, together with much expectoration, fifteen years ago; that six years ago he had a hemorrhage, and that four years ago he was told by a physician that he had phthisis. He has never suffered from any venereal disease.

In September, 1886, he fell from a high elevation, but experienced no injury to his testes known to him. Shortly after this his left testis began to be very painful and to swell. The enlargement went steadily on, accompanied by pain. The right testis became swollen and painful about Christmas, 1886, and on admission it was found to be larger than the left. Three weeks later an abscess was found in the left testis, which was by my direction opened by my house surgeon Dr. Bosch. About a fortnight later an abscess opened spontaneously in the right testis. The very weak and anæmic condition of the man, though the discharge of pus from the testis was great, led me to defer operation until he had been built up by extra diet and tonics. On the 23d of

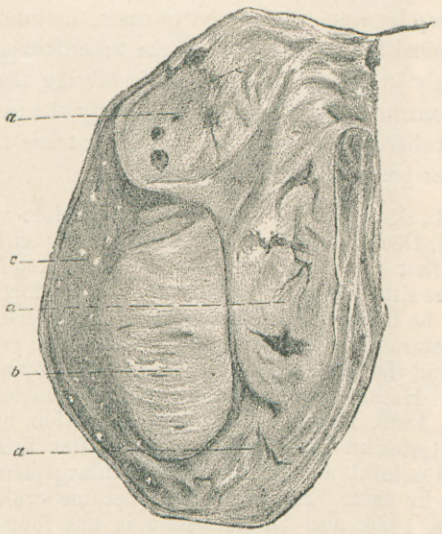
1 Read before the American Association of Genito-Urinary Surgeons, at the first annual meeting, at Lakewood, N. J., 1887.

February, I removed both testes under strict antisepsis, using a bone drainage tube. Healing was perfect at the end of a week. Before the operation the patient expectorated a great deal, but since, he has gradually improved in this respect, his general health is much better and he has gained considerably in weight. In the sputum of this patient the tubercle bacillus was found.

Gross appearances. 1. *Left organ.* The epididymis is enlarged, its average diameter 1½ cm., the testicle and epididymis together measure 6½ by 4½ cm. in diameter. The epididymis is honeycombed with larger and smaller yellowish semi-fluid areas. The outer surface of the albuginea is smooth. The mediastinum testis is thickened, sending out several short yellowish radiating streaks into the testis. Scattered over the cut surface of the testis—from four to six to a square centimetre—are small white opaque nodules, varying in size from a pin's point to a pin's head.

The right organ is slightly larger than the left, the epididymis is about the same size and similar in appearance, The testis contains an ellipsoidal cheesy mass, 2 by 3 cm. in diameter involving the mediastinum and adjacent testicle tissue (Fig. 1), so that there is left uninvolved a narrow crescentic area of the testis, containing small white nodules of the same character and distribution as in the other testis.

FIG. 1.



Right testicle of Case I. *a*. Swollen, purulent, and tubercular epididymis. *b*. Cheesy tubercular mass, involving the corpus Highmori and adjacent testicle tissue. *c*. Crescentic area of testicle tissue containing larger and smaller whitish opaque spots.

Microscopical examination. 1. *Left organ.* In the *epididymis* there are: 1, circumscribed collections of pus cells; 2, extensive areas of vascular small round-celled tissue resembling granulation tissue, with extravasations of blood; 3, diffuse tubercle tissue, not morphologically distinct from the tissue resembling granulation tissue, but identified as

tubercular by the presence of tubercle bacilli; 4, a very few well-defined tubercle granula, composed of one or more central giant cells with a surrounding zone of small round cells; these tubercles are isolated and scattered about in the interstitial tissue and in the tissue resembling granulation tissue; 5, groups of normal seminal tubules; 6, seminal tubules in various stages of degeneration.

In some of these degenerated tubules, the wall is infiltrated with small round cells, its outline is indistinct, and it merges into the surrounding tissue. The lumen frequently contains one or more multinuclear masses, apparently derived from the preëxisting epithelium, and in addition it sometimes contains small round cells and pus cells. The lumen is occasionally crowded with pus cells alone. The walls of other tubules and the small round cells infiltrating them have degenerated, so that the multinuclear mass in the lumen is surrounded by a granular zone containing few and fragmentary nuclei. In this way some of the degenerated tubules in section, resemble some forms of tubercle granula so closely that it is difficult to decide morphologically whether the appearances are due to a simple degeneration of the tubules or to tubercle granula. Portions of these degenerated tubules, which in section look like tubercle granula, may be termed pseudo-tubercle granula, for intermediate stages are present between the normal tubules and these degenerated tubules which simulate tubercle granula.

In the *testicle* there are: 1, tubercle granula; 2, an increased amount of interstitial tissue; 3, changes in the walls of the tubules and in the parenchyma; 4, grayish-white globular bodies of varying structure from one to two millimetres in diameter.

FIG. 2.

Chronic diffuse orchitis, associated with tuberculosis of the testicle. *a*. Seminal tubules with thickened walls and granular nucleated masses in the lumina. *b*. Cluster of small round cells infiltrating the interstitial tissue. *c*. New interstitial tissue between the tubules.

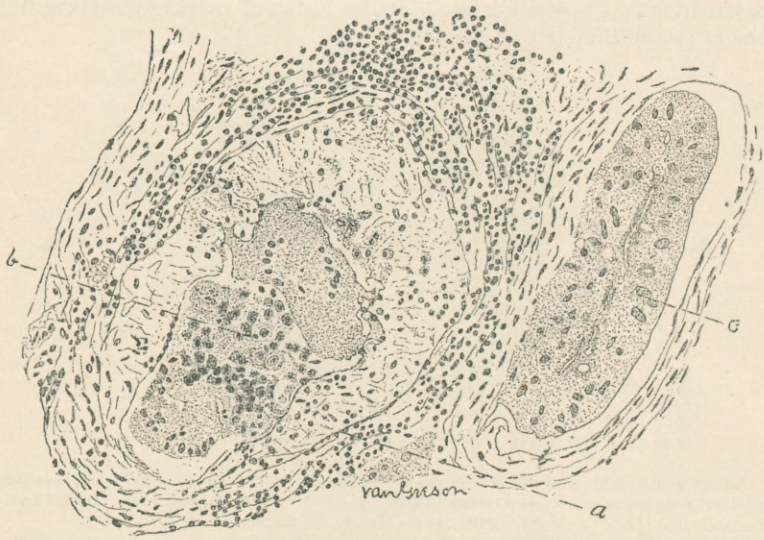
1. The tubercle granula are very few in number and are composed of one or more central giant cells surrounded by a zone of small round cells. A cheesy zone often lies between the giant cell and the small round-celled zone. Some are situated within the tubules, others in the interstitial tissue.

2. The interstitial tissue is loose in texture and composed of a finely reticulated basement substance containing fusiform and branching cells

and groups of large rounded cells with granular bodies. There are numerous clusters of small round cells scattered throughout the interstitial tissue (Fig. 2). Some of these clusters may possibly be commencing tubercle granula: others are perhaps phases in the development of the new interstitial tissue.

3. The walls of the tubules are thickened and their nuclei increased in number. The membrana propria is frequently separated from the remaining layers and the intervening space occupied by a transparent homogeneous mass, so that the wall frequently presents two zones, an inner structureless, and an outer nucleated lamellated zone. The membrana propria is often thrown into folds. The lumen of the tubules is occupied by a granular mass containing many nuclei, apparently formed by the desquamation and confluence of the cells lining the tubules (Figs. 2 and 3, *c*). This granular mass extends for some distance along the tubule and fills up the lumen as a plug. There is a space between this intratubular mass and the wall, and in the mass are a number of larger and smaller irregular cavities. These cavities at the central part of the mass are frequently larger and take the shape of long cracks and radiating fissures (Fig. 2). These spaces and cavities are perhaps due to the shrinking effect of the hardening agent. The majority of the intratubular masses have a peripheral

FIG. 3.



Showing the formation of a pseudo-tubercle granulum in chronic diffuse orchitis, associated with tubercular orchitis. *a*. Wall of seminal tubules, with an outer zone infiltrated with small round cells, and an inner granular zone. *b*. Contents of the lumen, consisting of a giant cell, granular detritus, free cells and nuclei. *c*. Adjacent tubule, with its thickened wall and intra-tubular granular mass of desquamated epithelium.

distribution of their nuclei, and transverse sections of many of them look like giant cells. Some of the tubules are filled with red blood cells. The diameter of some of the tubules is increased, due partly to

a thickening of the wall, and partly to a dilatation of the lumen. The outer zone of the wall is thickly infiltrated with small round cells (Fig. 3); the inner zone is coarsely granular and contains a few scattered nuclei. The lumen contains usually one or more large multinuclear masses resembling giant cells, also granular detritus, free cells and nuclei. The contents of the lumen seem to be formed by the disintegration of the intratubular mass, which in the majority of the other tubules fills up the lumen as a solid plug. Many of the dilated tubules with the small round-celled infiltration of the wall, and the fragmentary contents of the lumen, resemble very closely some forms of tubercle granula, but as these changes in the tubule seem to be dependent on simple inflammatory and degenerative processes, the nodules which these tubules present on section may be called pseudo-tubercle granula. These pseudo-tubercle granula in the testis are produced by the chronic diffuse orchitis (Fig. 3). They are generally isolated.

4. Some of the grayish white globular bodies are composed of amorphous material in which the outlines of one or more seminal tubules may be faintly seen. Others have a still less distinctive outline and it is difficult to decide how they originate.

The smallest of the minute white spots, noted in the description of the gross appearances, were occasioned by tubercle granula, or by the larger clusters of small round cells infiltrating the interstitial tissue, or by pseudo-tubercle granula. The larger spots were due to the grayish-white globular bodies. The walls of some of the bloodvessels were thickened. The vas deferens was normal.

2. *Right organ.* The microscopic appearances did not differ materially from those in the left organ. The large cheesy mass (Fig. 1) was composed of confluent miliary tubercles and cheesy areas.

Case II.—An American, merchant, married, aged thirty-three and one-half years, a thin, pale cadaverous-looking man, was brought to me in the latter part of August by his brother, a prominent practitioner of New York. His family history showed that a brother died when eighteen months old of tubercular meningitis, and that two paternal aunts at the age of eighteen and fifty-five, and a maternal grandfather at the age of forty-seven, died of phthisis. The patient has never enjoyed good health, having suffered more or less from nasal catarrh, functional disease of the heart, and indigestion. He is a man of correct habits, and has never been exposed to venereal disease, never having had intercourse with any woman except his wife. When he was two and one-half months old he had tubercular meningitis, which lasted two months. He has, since a child, suffered from left inguinal hernia.

In the early part of November, 1885, the patient noticed a slight swelling on the left side on the head of the epididymis, which he thought was a part of his hernia. This swelling was accompanied by a slight watery discharge from the urethra. Though various external and internal remedies were used, the swelling increased until it involved the whole testis, which in February, 1886, was twice its normal size and accompanied by a large hydrocele. In April, an opening formed near the tail of the epididymis, discharging considerable pus. A large abscess also formed over the right biceps muscle. About August, the right testicle began to swell, and in November, an abscess seated on it opened spontaneously.

In October, 1886, the patient consulted me, and I advised the prompt removal of both testes. This was emphatically declined by the patient. From the date of the October, 1886, consultation until the spring of 1887, I heard at intervals, through the brother of the patient, that he was in wretched health, that the testes were larger and still discharging profusely, but that he obstinately refused to undergo an operation. Early in April, however, he realized the fact that he was steadily growing worse, and that the lesions of the testes were progressively becoming worse, and he gave his consent to the operation.

On the 7th of April, with the assistance of Dr. C. W. Cutler, Dr. R. H. Greene, Dr. J. A. Bosch, and Dr. W. C. Gilley, my hospital assistants, I removed both testes under full antisepsis, as in Case No. 1. The healing of the wound was rather slow, but unattended by pus formation. Some weeks before a large abscess had formed in the hypogastric region, and after much persuasion was opened, giving vent to a large quantity of pus. The healing of this pus-secreting cavity was much retarded by the obstinate refusal of the patient to allow it to be properly treated by drainage, irrigation, etc.

No bacilli were found in the sputum of this patient.

Gross Appearances. 1. *Left Organ.*—The epididymis is enlarged, its average diameter 1 cm. The testicle and epididymis together measure 6 by 4½ cm. in diameter. The epididymis is cheesy, and has at its summit a small elongated cyst containing clear fluid. The mediastinum is thickened, and its upper part contains a nodule the size of a pea, with a cheesy centre. A few minute white spots are scattered over he cut surface of the testicle.

2. *Right Organ.*—The epididymis is enlarged, its average diameter 1½ cm. The testicle and epididymis together measure 6½ by 5½ cm. in diameter. The epididymis is soft and cheesy. A mass of confluent nodules occupies the mediastinum and about one-third of the testicle. The remainder of the testis contains larger and smaller nodules with intervening testicle tissue. The surface of the albuginea is nodular.

Microscopical Examination. 1. *Left Organ.*—The *epididymis* contains tissue resembling granulation tissue and cheesy areas. In the *testicle* there are diffuse changes in the stroma and parenchyma similar to those in the testicle of the preceding case, but less marked. The interstitial tissue is moderately increased, the walls of the tubules are but slightly thickened and the outlines of the desquamated cells in the lumen are often still distinct. In the sections pseudo-tubercle granula are absent. Tubercle granula seem to be present only at the mediastinum. The vas deferens has a cheesy centre.

2. *Right Organ.*—The *epididymis* is similar in structure to the left epididymis. In the *testicle* there are larger and smaller tubercles generally associated with fibrous tissue and cheesy degeneration. The changes in the interstitial tissue, in the tube walls and in the parenchyma are more extensive than in the preceding testicles. The interstitial tissue is voluminous and approaches the character of dense fibrillar connective tissue (Fig. 4). The walls of the tubules are greatly thickened, frequently showing two zones. A shrunken, coarsely granular mass with few nuclei occupies the lumen. In places the lumen is nearly obliterated by the thickened walls. The vas deferens has a cheesy centre.

Tubercular orchitis may occur in connection with acute general miliary tuberculosis, or with chronic miliary tuberculosis in other organs. It may also occur in conjunction with tuberculosis of the genito-urinary tract, or it may be localized in the testis or epididymis.

FIG. 4.

Chronic diffuse orchitis, associated with tubercular orchitis. *a*. Thickened walls of the seminal tubules, showing two zones—one of the tubules contains a shrunken granular nucleated mass in the lumen. *b*. New fibrillar connective tissue between and around the tubules.

Tubercular orchitis and epididymitis are frequently so intimately associated with different inflammatory and degenerative changes, that it is often difficult in parts of the organ to interpret the appearances. Thus in both of the organs in Case I., in addition to the tubercular process and the acute suppurative inflammation in the epididymis, there was a diffuse orchitis and a degeneration of the tubules in the epididymis—each accompanied with the production of pseudo-tubercle granula—which were much more prominent features than the tubercular process. These cases illustrate three phases of diffuse orchitis; the left testicle in Case II. an earlier, both testicles in Case I. a later, and the right testicle in Case II. a still later stage. Arnold describes pseudo-tubercular bodies occurring in the liver and kidney in conjunction with tuberculosis of these organs. In tuberculosis of the liver pseudo-tubercular bodies may be formed by changes in the walls of the gall-ducts, accompanied by a desquamation and confluence of their lining epithelium. Sections of the masses of confluent epithelial cells of such gall-ducts resemble giant cells. In tubercular nephritis pseudo-tubercular bodies may be produced by similar changes in the epithelium and walls of the uriniferous tubules.

The causal relations between the diffuse orchitis and the tubercular process do not seem to be definitely ascertained.

Gaule[1] applied the terms spermataphoritis to the changes in the parenchyma, and perispermataphoritis to the changes in the tube walls and stroma of the testis, and believed that both of these lesions were due to the extension of an inflammatory process along the tubules from the epididymis to the testis.

Waldstein[2] observed changes in the parenchyma of the testis with an unappreciable lesion of the interstitial tissue; and marked interstitial changes with slight parenchymatous alterations, and believed that the lesion in the parenchyma was not dependent on the interstitial changes, but due to alterations in the tubuli recti, caused by new growths of connective tissue in the corpus Highmori. This hypothesis would explain the not infrequent regional involvement of the testis by the diffuse orchitis. In the cases of tubercular orchitis examined by Gaule and Waldstein, the diffuse orchitis was present in the majority.

Reclus[3] describes cases of tubercular orchitis in which suppurative inflammation is a prominent lesion.

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1 Anat. Untersuchungen über Hodentuberculose (Phthisis testis), Virchow's Archiv, vol. lxix. pages 64 and 213.

2 Zur Kenntniss der tuberculösen Erkrankungen des Hodens. Ibid., vol. lxxxv.

3 Du Tubercle des Testicule et de l'orchite tuberculeuse. Paris, 1876.