

TUBERCULOSIS OF THE APPENDIX

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TUBERCULOSIS of the appendix is one of the more rare manifestations of tuberculosis in the human body. Since the recognition of the disease by Corbin¹ in 1873, it has only occasionally attracted the attention of the physician and surgeon. With the discovery of the tubercle bacillus by Koch in 1882, added zest was given to the study of tuberculous lesions in general, and in the last few years tuberculosis of the appendix has been accorded greater attention. However, the comparative rarity of the condition is indicated by the fact that the Index Catalogue of the Surgeon General's Library and the Index Medicus present but forty-four articles upon this subject, nine of which the physicians of the United States have contributed. This fact stands in marked contrast to the thousands of papers which have been written upon the general subject of appendicitis. The larger text-books on pathology and even the extensive systems of medicine and surgery accord only passing mention to the lesion or entirely neglect it.

While the opinions of different medical writers vary somewhat as to the frequency of the disease, all are agreed that it is relatively infrequent. Deaver, of Philadelphia, considers it among the greatest rarities, while Lockwood, of England, considers that two per cent. of all diseased appendices are tuberculous. In the Montreal General Hospital in a series of 1259 appendicectomies, there were found but three appendices showing tuberculous involvement, giving a percentage of but 0.16. In Allen's² series of 80 cases, tuberculosis was twice noted. In my series of 179 appendices studied histologically, only one case was discovered. The frequency of tuberculosis in appendices removed by operative procedure is much less than that in appendices removed at post-mortem examinations, as may be seen by a reference to Tables I and II.

TABLE I

FREQUENCY OF TUBERCULOSIS OF APPENDIX FOUND AT OPERATION

Operator	Year	Operations	Tuberculous	Per cent.
Fitz	1886	257	8	3.0
Robson	1902	300	5	1.7
Letulle	1905	300	2	0.7
Mayo	1905	1888	29	1.5
Surg. Lab., U. Penn.....	1909	310	6	2.0
Deaver	7610	16	...
Allen	1909	89	2	2.8
Author's series	1917	179	1	0.57

¹ Müller: Univ. Penn. Med. Bull., 1909-1910, xxii, 48-54.

² Allen: Brit. J. Child. Dis., 1909, vi, 1-7.

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TABLE II

FREQUENCY OF TUBERCULOSIS OF APPENDIX FOUND POST-MORTEM

Operator	Autopsies	Tuberculous	Per cent.
Fenwick and Dodwell.....	2000	17	0.8 *
Leseur	500	144	22.0
Kelly	3770	44	1.2
White (cases dying in Phipps Institute as probably tuberculous) ..	263	57	21.7
White (cases dying in Phipps Institute as probably tuberculous) ..	56	33	59.0 †

*Primary tuberculosis of the appendix

†Examined microscopically

The disease is more common in males than in females, the ratio being as three is to two. Most of the cases found in the literature have occurred in young adults. The following table from a paper by Müller shows the age incidence.

TABLE III

AGE INCIDENCE

Years	Cases
2 to 9	3 *
10 to 19	18
20 to 29	21
30 to 39	16
40 to 49	6 †

*The earliest recorded case occurred in a child of two years.

†The oldest recorded case occurred in a man of 47 years.

The disease occurs in two forms, primary and secondary. The primary form of the disease is very rare. The existence of the primary form has been denied by many writers, but Beck ³ reported a case where the removal of a tuberculous appendix was followed by death of the patient. An autopsy was performed and absolutely no evidence of tuberculosis was found elsewhere in the body, except in the lymphatic nodes of the ileocaecal angle, which were of a decidedly recent origin and were held to be secondary to the appendiceal lesion. The primary form of the disease may originate through (1) the deposition of the bacilli from the contents of the intestinal tract itself, (2) from the peritoneum, (3) from the lymphatic system, and (4) from the circulating blood. Deposition of bacilli from the faecal content of the intestinal canal itself seems to most observers to be the most rational conception of the etiology of the primary form, since it would be extremely rare for bacilli free in the peritoneal cavity or in the general lymphatic or blood circulation to elect the appendix alone as a seat of infection, while sparing other equally vulnerable organs. The dependant position of the appendix with its tendency toward faecal stasis affords the bacilli in the faeces a favorable opportunity for becoming implanted and developed, and hence favors the theory of an intestinal origin of the disease.

³ Beck: Volkmann's Vortrage, 1898, No. 221.

The secondary form of the disease is much more common. It may arise by the direct extension of the process from adjacent tuberculous structures. The most frequent point of extension is from an adjacent ileo-cæcal tuberculosis. Direct extension may also occur when the appendix becomes adherent to tuberculous adnexa in the female. By means of the blood stream, the appendix may become infected from a focus in a distant organ, especially from a pulmonary focus. It is even asserted that the appendix may be invaded thus by bacilli from a pulmonary focus, while the intestinal tract itself entirely escapes.

Tuberculosis of the appendix occurs in one of three types; miliary, ulcerative, and hyperplastic. In the miliary type, the disease is usually manifested in the form of miliary tubercles on the peritoneal covering of the appendix. The majority of such cases appear as a part of a generalized or localized peritoneal tuberculosis, and should not strictly be classed as appendiceal lesions. Of course, it is possible that bacilli might penetrate from the faecal content of the lumen, permeate the walls and develop nodules on the peritoneal surface, but in such cases there would be great likelihood of the development of the ulcerative form in the mucosa and submucosa.

The ulcerative type is the most common form. It may be primary, but usually is secondary to either ileo-cæcal involvement or tuberculous lesions of the lungs. Often it is not recognized before the microscopic examination of the excised organ is undertaken. The appendix is somewhat thicker than the normal organ. The serous coat is usually injected and frequently presents very fine adhesions. At times, however, one finds small grayish-white tubercles on the serosa. The mucosa is injected and presents small round or oval ulcers of varying extent. These ulcers may show minute tubercles in the floor, or the floor may be caseous. The ulcers are most often found near the tip of the organ, next in frequency at the base, while the intermediate portion most frequently escapes. These points of localization correspond to the points of greatest liability to faecal stasis. The ulcers extend through the mucosa into the submucosa. At times the floor of such an ulcer is formed by the muscular coat. Perforation of the appendix is rare, but occasionally a ruptured tubercle on the serosa becomes the point of origin for a peri-appendicular abscess. Microscopically, the characteristic lesions of this type are confined to the mucosa and the submucosa. Here endothelial leucocytes and giant cells occur, with greater or lesser caseous destruction of the mucosa. Simultaneously the meso-appendix may show miliary tubercles and the adjacent lymph-nodes may be involved.

The hyperplastic type is usually secondary, there being but two cases reported in which the disease was primary. The appendix is usually somewhat enlarged, the thickening of the walls being accompanied by the deposit of fibro-adipose tissue beneath the serosa. The thickening involves the entire circumference of the organ and merges gradually with the normal areas. At times cicatricial contractions and adhesions cause a narrowing or even a stenosis of the lumen. The serosa is unchanged, but through it

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one may see the discolored areas in which the subserous tissues have degenerated or become the seat of hemorrhage. Rarely miliary tubercles are found on the serosa. The mucosa is usually slightly involved, but may present a few tubercles or a few ulcers. The chief alteration occurs in the submucosa, which is greatly thickened and presents numerous tubercles in all stages of development and degeneration. There is a predominance of fibrous connective tissue and the process extends through the muscular layers in such a manner that often the separate tissue layers become indistinguishable. Microscopically, one sees a great increase in connective tissue, a blending of the layers, giant cells, fewer endothelial leucocytes, and less caseation than in the usual tubercle. By appropriate staining methods, tubercle bacilli may usually be demonstrated. The development of the hyperplastic form is considered to be due to the fact that the patient possessed a high index of resistance, whereby reparative or restrictive processes are developed around the tuberculous lesion, resulting in fibrosis. Likewise the absence of the high index of resistance results in little protective mechanism being developed, with the formation of the more rapidly destructive type of the disease.

The signs and symptoms of tuberculous involvement of the appendix show considerable variation in different patients. They fall into two groups; (1) Those referable to the tuberculous process as a pathological entity, and (2) those referable to the appendix itself. The general symptoms include the characteristic temperature of tuberculosis, usually rising two to three degrees during the afternoon, falling during the night to normal or nearly so in the morning. In some cases, there are no marked temperature changes, except during the exacerbations of the disease. In the majority of cases the pulse is somewhat accelerated. As in tuberculosis in other parts of the body, so in tuberculous appendicitis we usually find slight but progressive loss of weight. Nocturnal sweating occurs, but less frequently than in pulmonary involvement. The appendiceal disease is characterized by its extreme chronicity, which may frequently be interrupted by acute exacerbations. The appendiceal symptoms in the intervals between exacerbations present a vague sense of discomfort in the iliac fossa with slight tenderness. During the acute attacks, nausea and vomiting may occur. There may be marked muscular rigidity in the right lower quadrant. There may be slight meteorism. The characteristic point in tuberculous appendicitis is a history of recurrent attacks of appendiceal colic in which the distress of the patient is much less than is ordinarily found in acute appendicitis. Occasionally in individuals possessing rather thin abdominal walls, the appendix may be palpated as a thickened fibrous cord, at other times an irregular hardened mass is found in the region of the ileocaecal junction. In cases where the appendix is secondarily involved, the symptoms due to the primary focus will also be evident.

The clinical diagnosis of the disease is difficult, and most diagnoses have been made during operation, at autopsy, or on the microscopical examination of the organ after its removal. The presence of a history of "chronic

appendicitis," associated with a slowly progressive loss of weight, afternoon temperature and nocturnal sweating should suggest the possibility of this condition. Blood examinations during the acute attacks are of relatively slight value, as there may be either a leucocytosis or a leucopænia. If there is mixed infection superimposed, there may be leucocytosis. In uncomplicated tuberculosis there may be leucopænia. Bloodgood has remarked that in chronic cases without the active formation of pus, the leucocyte count generally lies below normal. This has been disputed by other observers, but the general opinion is that the white count is never very high in uncomplicated tuberculous appendicitis. The use of tuberculins has proven of no assistance in reaching a diagnosis. The finding of tubercle bacilli in the fæces would be of some assistance, provided one could exclude the possibility of swallowing tuberculous sputum and the presence of intestinal tuberculosis.

Clinically the question of a differential diagnosis rarely arises, since tuberculosis of the appendix seldom enters the mind of the physician at this time. In chronic cases, tuberculosis would be separated from chronic non-tuberculous involvement by the greater chronicity, the presence of an afternoon rise in temperature, loss of weight, and lesser degrees of prostration. It is recognized from suppurative appendicitis by the mildness of the attacks, absence of leucocytosis, absence of sustained hyperpyrexia, and by the lesser degree of fixation of abdominal muscles. At operation, it is differentiated from neoplasm by the fact that the tuberculous enlargement of the organ merges gradually with the neighboring healthy tissue, while a neoplasm is more localized and the transition from the pathological to the normal tissue is abrupt and demonstrable to the eye and finger.

The disease may be complicated by a peri-appendicular abscess, caused by the proliferation of the colon bacillus through the appendiceal walls. The rupture or the perforation of the ulcerative type may result in a peri-appendicular abscess of the form known as "cold abscess." A more common complication is the finding of a generalized tuberculous peritonitis, in which case care must be exercised to determine whether the appendiceal lesion is secondary to the peritonitis. Ileocæcal tuberculosis is often found in connection with this disease. It is usually secondary to the appendiceal lesion, rather less frequently the appendiceal lesion is secondary to the ileocæcal process. In advanced cases the mesenteric and ileocæcal glands may be involved.

The prognosis in tuberculous appendicitis varies according to the variety of the disease and the complications that are present. The operative mortality is very small, although the final results are not entirely favorable. In 66 cases collected by Müller, one death resulted directly from the operation, while 15 others died within a few months following operations. In fact, but 8 cases are definitely reported in the literature as cured. A cure should not be assumed until two or three years have passed following the operation. If the disease is primary in the appendix and if the operation is done before secondary involvement occurs, the operation should offer

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strong hope of complete cure. Secondary tuberculosis of the appendix offers a very dismal prognosis. When the process is secondary to pulmonary involvement, especially with coincident intestinal lesions, the prognosis is grave. The prognosis is somewhat more favorable in the hyperplastic type of the disease.

The treatment falls into two subdivisions, medical and surgical. Medical treatment is permissible only in secondary type of the disease, and then only in cases where the general disease is active and progressive. If the general disease is quiescent, operative measures should always be undertaken. The condition of the lungs should be made the criterion by which the advisability of the operation is decided. Advanced pulmonary tuberculosis is an indication for medical and hygienic treatment, and should absolutely preclude operative measures. The medical treatment includes open-air life, and a liberal, easily digested diet. Tonics should be administered, iron, arsenic, cod liver oil, and malt.

The surgical removal of the appendix is always indicated in the primary cases of the disease, also in cases where the systemic lesions are latent and inactive. The arguments against operation are: (1) That usually the appendix is not the only tuberculous portion of the intestinal tract, (2) the irritation of the anæsthetic is liable to cause a violent recrudescence of quiescent pulmonary areas. Still further the fear of fæcal fistula from poor reparative power deters many men from operating. However, with careful technic, fæcal fistula rarely occurs. Gas-oxygen anæsthesia reduces the pulmonary irritation to a minimum, and spinal analgesia absolutely removes it. Convalescence is established within a week, thus the hygienic treatment is but little disturbed.

CONCLUSIONS

1. Tuberculous appendicitis occurs more frequently than is generally recognized. About 0.5 per cent. of all appendices removed surgically are tuberculous.

2. There are three forms of the disease, miliary, ulcerative, and hyperplastic. The lesion may be primary or secondary to tuberculosis elsewhere in the body. The primary form is extremely rare.

3. The diagnosis rests upon the demonstration of an afternoon temperature, progressive weight loss, evening sweats and pain and tenderness in the right lower quadrant.

4. The prognosis is unfavorable except in the very rare primary forms of the disease. It is best in the hyperplastic form.

5. The treatment is operative whenever possible. Active pulmonary lesions contra-indicate operation. There is no medical treatment of the lesion in the appendix itself. Hygienic treatment is indicated in active pulmonary conditions associated with tuberculous appendicitis.