as a result of which a small lumen was formed in the center of the tumor through which the barium emulsion passed. Figure 4 shows the new canal at A.

CONCLUSIONS

Both the method itself and the two cases reported are too recent to indicate the final results of this method of radium therapy in cancer. The efficiency of the method, however, is evidenced by the results obtained in these two cases, as well as in several others which will be reported later. The patients make an uneventful recovery, and there is no rise in temperature, and no peritoneal irritation or subsequent sloughing of tissue.

In a word, the insertion of radium emanation does not add in the least to the hazard of the operation. At the same time, the tumors diminish in size considerably. This shrinkage takes place gradually in the course of from six to eight weeks after the operation.

Inoperable carcinoma of the gastro-intestinal tract presents the most hopeless type of cancer. Surface applications of radium alone is ineffectual in the majority of cases. Deep high voltage roentgen-ray therapy does not influence this class of cases, and is followed frequently in my experience, as well as in that of other investigators, by severe cachexia.

Thus the method of intratumoral insertion of radium emanation produces no general deleterious effect on the organism, and at the same time in every instance causes a shrinkage of the tumor mass. The method seems, therefore, to be of great promise, and should be tested by all surgeons and radiotherapeutists who are in a position to obtain the capillary tubes of radium emanation. 119 West Seventy-First Street.

Medical Teaching in Mexico.—For nearly three centuries, medical teaching in Mexico was in charge of the royal proto-physicians. These, in addition to supervising public health and the practice of medicine, taught the subjects at the university and examined applicants. This practice lasted until Mexico proclaimed its independence from Spain, when the so-called papal university was closed. In 1823 and 1825 bills providing for the organization of a medical school were passed but no action was taken until a physician, Dr. V. Gómez Fariás, became president of the republic and ordered in a decree, dated Oct. 23, 1833, the foundation of the school. This was done on Dec. 4, 1833. Its first head was Dr. Casimiro Licéaga, assisted by a group of twelve professors. The school at first was lodged in convents, but in 1854 the government bought the old building of the Inquisition, which the school still occupies.

TUBERCULOSIS OF THE TESTIS IN A CHILD*

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Whether or not tuberculosis may be primary in the body of the testis has aroused much argument. Hektoen¹ states that "tuberculosis of the testis and epididymis is common, and it may be primary in either organ in the sense that the testis or epididymis may be the first organ in the genito-urinary tract to be affected." It is in this sense that I wish to present briefly the history and pathologic report of a case of tuberculosis of the testis in a child, aged 3 years.

The left testis was almost entirely involved in the tuberculous process, while careful examination of the epididymis failed to reveal any lesion.

Tuberculosis of the testis in children presents apparently a somewhat different pathologic condition and pathogenesis from that affecting the adult male.

REPORT OF CASE

History.—M. M., aged 3 years, was brought to the service of Dr. L. E. Schmidt in the Sarah Morris Hospital, Aug. 31, 1920. The mother said that the child suffered from pain and swelling of the scrotum, especially on the left side. The first symptoms occurred one day before entrance to the hospital. The mother said that while bathing the child she observed swelling of the scrotum, and that the child complained so of pain that she was prevented from cleansing the parts. The mother had not been in the

habit of bathing the child herself, and, therefore, could not state the exact date of the first appearance of the swelling. However, the child had not complained of pain until the day before he was brought to the hospital.

The child had been delivered normally and was breast fed. His appetite had been poor usually. There had been no painful urination, and the child usually slept well. There was no history of previous illness. The family history was negative, except for the fact that the child's father had been suffering with a chronic cough for the last two years.

Physical Examination.—No positive findings were revealed except swelling of the left half of the scrotum. The skin was slightly erythematous, and the left testis was enlarged to about three and one-half times its normal size. The testis was very sensitive to palpation, and the epididymis was apparently also enlarged.

* Read before the Chicago Urological Society, May 18, 1922.

* From the Department of Genito-Urinary Surgery and the Nelson Morris Memorial Institute for Medical Research of the Michael Reese Hospital.

1. Hektoen, Ludvig, and Riesman, David: An American Textbook of Pathology, Philadelphia, 1901.

Fig. 4 (Case 2).—Tumor of transverse colon after radium treatment: A, new canal formed between the two ends of the colon.

Laboratory Findings: The white blood corpuscles numbered 13,750; red blood corpuscles, 4,900,000. All other findings in the urine and blood were negative. The roentgen-ray examination of the chest was negative for any evidence of pulmonary or bronchial gland tuberculosis.

Operation.—In view of the findings, it was determined to operate. A high castration of the left testis with the epididymis and as much of the vas as could be reached was performed. There was a small amount of clear hydrocele fluid present. The wound healed by primary union, and the temperature at no time reached above 100.2 F., taken rectally. So far as we can determine, the child has not suffered any extension of the process.

Report of the Pathologist.—Dr. O. T. Schultz, director of the Nelson Morris Memorial Institute for Medical Research, made the following report:

Gross: The specimen is a rounded mass, 3.3 by 2 by 2 cm., with a piece of spermatic cord, 2 cm. long, attached. The surface is smooth and pale. Near the lower pole of the mass is a firm nodular area, and near the upper pole another similar area. The epididymis cannot be distinguished from the body of the testis, externally. On section, the body is uniformly dense, pale and firm, and has lost the appearance of testicular tissue. The epididymis is compressed along one side of the body. In places, it appears somewhat denser than normal, but it is apparently involved to a much slighter degree than the testis.

Microscopic: The tubules of the testis are almost completely replaced by avascular cellular inflammatory tissue composed of fibroblasts and lymphocytes. In this tissue are numerous endothelioid tubercles with large giant cells. In areas, the tubercles are so closely placed that they have fused, forming conglomerate tubercles which are centrally necrotic. In the peripheral portion of the testis, a few groups of tubules can still be recognized. Spermatogenesis is absent. In some of the tubules, the epithelium is separated from the wall. The epididymis is quite sharply demarcated from the testis by a layer of fibrous tissue, which, next to the testis, is infiltrated by lymphocytes. The tubules of the epididymis are normal. The outer layer of the walls of some of them is slightly infiltrated by lymphocytes. The intertubular stroma is somewhat edematous; about some of the vessels is a slight degree of lymphocytic infiltration. The epididymis, in sections from various levels, is entirely free of tubercles, and is not even involved by direct continuity from the markedly involved testis. In sections through the cord, the vas is normal. Moderate edema and slight perivascular lymphoid infiltration are present in the loose tissue about the vas, but tubercles are entirely absent. The tuberculous process is very clearly limited to the testis. Such slight inflammatory reaction as is present in the epididymis and vas is not tuberculous in character, and is apparently wholly secondary to the involvement of the testis.

Pathologic Diagnosis: Diffuse productive tuberculosis of the testis.

COMMENT

According to Kocher,² in primary tuberculosis of the testis, the entire organ is involved. It appears as

a hard body with a relative homogeneous surface in which the normal characteristics of testicular substance are no longer to be seen. Adami³ says that in adults with tuberculosis of the testis the process begins in the epididymis and involves the testis secondarily, while in children before puberty the reverse is the case. Felizet⁴ states that acute tuberculosis of the testis may assume the form of acute hydrocele or acute orchitis.

A further careful search of the literature reveals many cases reported as tuberculosis of the testis which were actually tuberculosis of the epididymis, while the testis was free from lesions.

There has been considerable discussion as to the manner in which the testis is involved by the tubercle bacillus. Kocher said that there were three possibilities: First, that involvement occurred by way of the blood stream; second, that it occurred by way of the mucous surfaces through the urethra; third, that bacilli

are present at birth and develop after local trauma. Rokitsky⁵ considered the infection to be an ascending one, beginning in the testis. Simmonds,⁶ however, states that the spread of the infection is always toward the testis (testipetal), against the current of the secretory stream. Baumgarten⁷ differs wholly from Simmonds, saying that the dissemination of tuberculosis in the male genital tract is always in the direction of the physiologic current. In agreement with him also are such authorities as Virchow,⁸ Corning,⁸ Ranvier,⁸ Dufour,⁸ Jullien,⁹ Weigert,¹⁰ Hueter¹¹ and Ziegler.⁸ In opposition to this view, however, are ranged Cohnheim,⁸ Steinthal,⁸ Tuffier⁸ and Terillon.⁸ In view of this diversity of opinion, certain fundamen-

tal principles and the results of research on this subject merit discussion.

Clinicians and pathologists of experience will agree that in discussing human pathology the words "always" and "never" should give way to the terms "usually" and "seldom." With this point of view in mind, it appears from careful histopathologic research that either or both processes mentioned may operate in a given case or in a series of cases.

Fig. 1.—Section, showing, in the left upper portion, normal tubules of the epididymis; central portion, inflammatory changes in tunica, no evidence of tuberculous lesions; right lower portion, remnant of testicular tissue, and at periphery, productive tuberculous involvement; slightly reduced from a photomicrograph $\times 60$.

3. Adami, J. G., and McCrae, Thomas: Textbook of Pathology, Philadelphia, Lea & Febiger, 1912.

4. Felizet: Tuberculose testiculaire chez les enfants, Progrès méd., 1899.

5. Quoted by Kocher (Footnote 2).

6. Simmonds: Virchows Arch. f. path. Anat., 1906, p. 183; *ibid.* 1914, p. 216.

7. Baumgarten: Experimentelle Untersuchungen über die Histologie der Hodentuberculose, Verhandl. d. deutsch. path. Gesellsch., 1901, p. 91. Baumgarten and Kroner: Experimentelle Studien über Histogenese und Ausbreitung der Urogenital-Tuberculose, Tübingen 5, 1906.

8. Quoted by Sussig: Deutsch. Ztschr. f. Chir. 165: 101 (July) 1921.

9. Jullien: De la tuberculose testiculaire Arch. gén. de méd., April, 1890.

10. Weigert: Virchows Arch. f. path. Anat. 88: 307, 1882.

11. Hueter: Ausbreitung der Tuberculose in männlichen urogenital System, Beitr. z. path. Anat. u. Physiol. 35, 1904.

2. Kocher, Theodor: Die Krankheiten der männlichen Geschlechtsorgane, Stuttgart, F. Enke 48, 1887.

Until 1921 all reports in the literature, as far as I have been able to determine, have dealt with well advanced clinical cases or cases coming to necropsy. In this connection, Strümpell¹² remarks, "In cases coming to necropsy the tuberculous lesions are usually so widespread that the location of the very beginning of the process cannot be definitely determined." The work of Sussig, who laboriously examined between 150,000 and 180,000 serial sections of the male genital tracts of thirty patients dying of acute tuberculosis, none of whom showed gross lesions of the seminal tract, deserves especial attention. Twenty of the thirty cases examined were entirely negative microscopically, as far as lesions in the genital tract were concerned. His findings of microscopic lesions in the ten positive cases demonstrate conclusively that early hematogenous tuberculosis of the genital tract possesses a marked tendency to attack blood vessels first. In 60 per cent. of the early cases definite vascular involvement occurs. Sussig's work also definitely demonstrates that no single organ in the male genital tract is solely the site of predilection for the primary focus of tuberculosis in the tract, but rather that tuberculosis can and does attack every organ in the genital tract and can produce any possible combination of organs involved. This, as I shall try to show later, is extremely important from the prognostic as well as the therapeutic point of view.

The ten positive cases show the following organs involved: Case 1, epididymis; Case 2, testis and seminal vesicle; Case 3, left spermatic vein; Case 6, seminal vesicle; Case 7, testicle, seminal vesicle, epididymis and spermatic plexus; Case 9, testis, seminal vesicle and prostate; Case 11, epididymis, seminal vesicle, prostate and vas deferens; Case 12, epididymis, seminal vesicle; Case 13, prostate, and Case 14, prostate.

Thus it will be noted that the primary microscopic lesions in the genito-urinary tract were multiple in most of the cases. In four of the cases it was single. Twice the solitary focus was in the prostate, once each in the left spermatic vein and in the seminal vesicle. In 70 per cent. of the cases a primary microscopic focus was present in the seminal vesicle, in 50 per cent. in the epididymis, and in 30 per cent. in the testis.

Usually the testis is involved secondarily from the epididymis, but not invariably. This fact has been denied chiefly in the American literature on the subject. The case reported is evidence of this fact, as is also Sussig's case in an 11-weeks old infant in whom the testis was involved, whereas in serial section of the epididymis, no tubercles were found. The tubercles

in the testis were all in the interstitial tissue and invariably about a blood vessel. A tubercle which was followed in serial section could be seen attacking first the wall of the blood vessel and eventually breaking into the lumen of a tubule. Hutinel and Deschamps¹⁴ have reported examinations of tuberculous testes in children in whom they saw the lesions begin along the blood vessels, and they believe that it is possible for bacilli coming from without, by the respiratory or digestive route, to reach the testicle by way of the blood stream without coming from a primary focus existing in the body. This opinion as a whole has not, of course, been substantiated, and I believe that in most cases a primary focus exists outside the genito-urinary tract. Lecène¹⁵ reports a case of an isolated tuberculous focus in the epididymis in which the lesions were confined to the outer walls of the tubules and in no instance involved the mucosa, thus confirming the observations of Sussig and Deschamps and Hutinel.

Reclus⁵ reported three cases of tuberculosis of the testis in which the epididymides were not involved. Collinet,⁵ out of forty-one cases, reported nine in which the epididymides were not involved. Kocher² said that after carefully examining material obtained at necropsy he believed there are cases in which tuberculosis of the testis remains the only tuberculous change until death. Koenig¹⁶ said that tuberculosis of the testis may remain in loco, but that it need not do so. Shaw¹⁷ reports the case of a man, aged 26, with a large caseating nodule in the right testis, centrally situated, in whom the epididymis, cord and tunica were normal. The left testis was normal. However, the left epididymis was the

Fig. 2.—Productive tuberculosis involving practically the entire testis; characteristic giant cell in center of endothelioid tubercles; slightly reduced from a photomicrograph $\times 230$.

site of advanced tuberculous changes. These findings speak very strongly for a hematogenous infection and against dissemination by the mucous surfaces. Barling¹⁸ reports the case of a patient, aged 31, similar to the one reported herein, in which there was bilateral acute tuberculosis of the testes, and the epididymides were free from lesions. Trauma preceded the swelling of the testes.

Legueu¹⁹ states that the epididymis is always involved first, and that the testis is secondarily infected by extension along the mucous surfaces. This point of view is contradicted by Lecène,¹⁵ who remarks that all of Legueu's conclusions are open to attack. MacFarland Walker²⁰ says that in all his cases the earliest signs were demonstrable in the lower pole of

14. Hutinel and Deschamps: Arch. gén. de méd. 1891.

15. Lecène: Bull. Soc. anat. de Paris 81: 479, 1906.

16. Koenig René: Beitrag zum Studium der Hodentuberculose, Deutsch. Ztschr. f. Chir. 18, 1898.

17. Shaw, J. B.: Tuberculous Testes Following an Attack of Measles, Brit. M. J. 1: 1586, 1898.

18. Barling, G.: Double Acute Tuberculosis of the Testis, Lancet, 1892, p. 864; *ibid.*, 1892, p. 809.

19. Legueu: Traité chirurgicale d'urologie, 1910.

20. Walker, MacFarland: Lancet 1: 435 (Feb. 15) 1913.

12. Strümpell, Adolf: Lehrbuch der speciellen Pathologie und Therapie der inneren Krankheiten, Ed. 16, Leipzig, F. C. W. Vogel, 1907.
13. Sussig: Deutsch. Ztschr. f. Chir. 165: 101 (July) 1921.

the epididymis and explained this by stating that the fact "that the lower pole of the epididymis should be the commonest site is only to be expected if the tuberculous infection is a descending one." This view may be discarded in the light of more recent observations and histopathologic research.

Keyes²¹ states that testicular tuberculosis is never an isolated lesion. In a recent article, Young²² says, "These statistics show conclusively the absence of isolated testicular tuberculosis and the rarity of testicular involvement when the epididymides are extensively involved." Further in the article he states that "it is probably erroneous to suppose that primary tuberculosis of the epididymis often occurs. It probably seldom occurs through blood stream infections, as is so often asserted. The seminal vesicles are not only the primary focus from which the epididymides are involved, but from which also the prostate, bladder and the kidneys in many cases are involved." He is undoubtedly correct in many of the conclusions expressed in his article, especially in showing that tuberculosis of the adult testis or epididymis is often but a part of the pathologic change present. In the statement that blood stream infection is rare, I cannot concur; nor can I in the view that the testis and epididymis seldom represent the primary focus of the disease. It is undoubtedly true that the seminal vesicles present the most frequent site of primary foci in the seminal tract; but when it is borne in mind that the earliest microscopic evidence discloses the primary focus to be multicentric in 60 per cent. of the cases and that the frequency of earliest foci in the seminal vesicles, epididymides and testes are represented by the figures seven, five and three, respectively, it is apparent that the testis and epididymis together are more frequently the site of the primary focus than the seminal vesicle.

CONCLUSIONS

1. Tuberculosis of the testis may be primary and even solitary as far as the genito-urinary tract is involved.
2. The infection when primary in the testis is hematogenic and first involves the blood vessel walls, later breaking into the lumen of the tubules.
3. Infection via the mucous surfaces is possible in the chronic type of the disease but not the only method of dissemination.
4. Acute hematogenous tuberculosis of the testis involves the entire gland, owing probably to the rich anastomoses of the peculiar blood supply of the organ.
5. Tuberculosis of the male genital tract is more often primarily multicentric than single.
6. Tuberculosis may affect the testis on one side and the epididymis or seminal vesicle on the opposite side.
7. Tuberculosis of the testis is usually, in the adult, secondarily involved by extension from the epididymis. In children the reverse is true.
8. Surgical removal of a tuberculous testis is indicated in acute infections of the gland if there is no evidence of other tuberculous foci. The disease may be localized there.
9. Unilateral radical removal of the seminal tract is not indicated because involvement of contralateral organs is not infrequent in the disease, while corresponding organs may be free.

10. General hygienic care and upbuilding of the patient, as advised by Thompson Walker²³ in the treatment of chronic cases, is rational.

11. The roentgen ray offers the hope for cure in many cases of the chronic type, as recent reports indicate.

A SCARLET FEVER EPIDEMIC IN AN AGRICULTURAL SCHOOL*

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AND

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In February, March and April of 1922, fifty-nine of the 840 students of the agricultural school of the University of Minnesota contracted scarlet fever. At this university, the powers and the responsibilities of health officer and of practitioner of medicine are vested in one organization—the Students' Health Service. This dual interest makes possible careful studies by one institution both of epidemiologic conditions and of clinical cases. Such studies, made of the scarlet fever epidemic, are epitomized in this article.

ENVIRONMENTAL CONDITIONS

The school of agriculture admits as regular students boys and girls who have completed eighth grade work or its equivalent; and as special students, men and women of mature years. Exclusive of the 262 ex-service men who were here receiving vocational training, most of the students came from rural communities, 59 per cent. of them living in places of less than 100 population. This gave a group of boys and girls most of whom were between 16 and 25 years of age, with presumably very little immunity to the usual contagious diseases of childhood. At the school, 36 per cent. of these students lived in dormitories, and 40 per cent. took their meals in a common dining hall. Most of the others rented rooms near the campus, and took their meals at restaurants or boarding houses. The conditions here closely paralleled those in certain of our national Army camps, where the more common contagious diseases took a high toll both in morbidity and mortality. A review of the history of the university shows that in this school, as in no other part of the institution, have frequent and extensive epidemics of contagious diseases occurred.

THE OUTBREAK AND COURSE OF THE EPIDEMIC

During the winter of 1921-1922, there were many cases of scarlet fever in the Twin Cities, and, in November and December, three university students were sent to the hospital with this disease. It was not, however, until January 25 that scarlet fever made its first appearance in the school of agriculture. A girl, aged 18, was the first victim. She knew of no exposure to scarlet fever; but she had spent the week-end, before being taken sick, at her home, returning to school one day before the development of her first symptoms. As to the source of her infection, one can only speculate; but, as there were no other patients at the school and except for her trip home she had remained on the campus, it seems probable that she was exposed during her trip. This girl was isolated immediately on her

21. Keyes, E. L., Jr.: *Ann. Surg.* 45:918, 1907.

22. Young, H. H.: *The Radical Cure of Tuberculosis of the Seminal Tract*, *Arch. Surg.* 4:334 (March) 1922.

23. Walker, Thompson: *Surgical Diseases and Injuries of the Genito-Urinary Organs*, London, Cassell & Co., 1914.

* From the Students' Health Service, University of Minnesota.