

VICARIOUS ACTION OF THE BOWELS FOR THE KIDNEYS IN TUBERCULOSIS.¹

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It has long since been recognized that in certain cases of tuberculosis there is a looseness of the bowels which is not due to ulceration. This looseness has been termed in the textbooks an irritative diarrhea and has been ascribed to errors in diet. When it has occurred in cases which have come to autopsy the bowels have been found free from ulceration and apparently in a healthy condition.

A careful study of a number of cases which have been under observation for a long time clinically and which have come to autopsy has led us to believe that in these cases the looseness of the bowels is due to a vicarious action of the bowels for the kidneys and that nature is really trying to protect the system by this vicarious action.

Though the diagnosis "enteritis" from the clinical symptom diarrhea is frequently allowed to stand even when the autopsy findings are negative, it is to be remembered that the more we study pathology the fewer clinical symptoms do we attribute to apparently healthy organs. We can understand how a diarrhea of a few days' standing produced by an acute enteritis might be undiscoverable at autopsy, but we do not believe a diarrhea of weeks', months' and even years' duration can properly be attributed to what at autopsy seems to be a normal intestine.

We have 11 cases to report. In all of them there was severe diarrhea, usually over a protracted time. In all,

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the intestines were found normal and the kidneys were found to have undergone acute alterations.

Two of the cases were private patients and nine were patients of the Phipps Institute. In one of the private cases the autopsy was made by C. Y. White and in the other by Joseph Walsh. The autopsies on the cases in the Phipps Institute were made by R. C. Rosenberger. The microscopic study in one case was made by C. Y. White and in the other 10 by Joseph Walsh. The study of the kidneys was macroscopic and microscopic. The kidneys in 9 cases out of the 11 were cut into 140 to 150 small pieces and each piece was examined macroscopically. A varying number of pieces were then blocked and microscopic sections made. From 12 to 60 microscopic specimens were studied in each case.

We wish to thank Mr. Karl W. Smith whose assistance made this detailed study of the kidneys possible.

The cases were as follows:

CASE I. (Private patient; Flick).—Female, single, school teacher, aged 31. She came under treatment first on June 23, 1901. Her history of exposure to tuberculosis dated back 12 years. She gave a history of having had severe colds for several years. She weighed 113 pounds, and was in an acute stage of the disease. She had tubercle bacilli in the sputum and had signs of involvement of both lungs. She improved rapidly under treatment, and in about 11 months was able to go back to teaching. She weighed 150 pounds at the end of the first year's treatment, and her pulse and temperature were normal. While teaching she again lost weight, dropping down to 145 pounds. She regained her weight during the summer vacation and went back to teaching in the fall. During the early winter months she lost weight, but remained pretty well. She again regained her weight, and by spring weighed 150 pounds. During the spring months she again lost slightly, and at the end of her second year's treatment she weighed 143 pounds, and was in a pretty fair condition of health, in spite of the fact that she had taught a year. She went to the mountains for her summer holiday and returned in October in rather bad condition. She had lost 11 pounds and showed congestion of considerable of the left lung and the upper part of the right lung. She now had a pulse of 120, and had to go to bed for awhile. She again gained in weight and improved in every way, so that by December she weighed 139½ pounds. She was very short of breath, however, upon exertion, and suffered alternately from constipation and diarrhea. From this time on she had alternate periods of diarrhea and constipation, although occasionally her bowels were in good condition. In April, 1904, a cavity formed in the upper part of the left lung, after which she again improved in many ways, although she did not gain in weight. She weighed at this time 136 pounds. Her pulse became more rapid and her dyspnea increased. In June her pulse ran as high as 130. In August she weighed 130 pounds, and her pulse was 124, although she felt pretty well. In the latter part of August she was taken quite ill, with great looseness of bowels and extreme weakness. The physician who was called, diagnosed her case

as severe diarrhea, and treated her for it with bismuth and opium. She unexpectedly died on the third day of her illness. There is no record of an examination of the urine in this case, although nephritis was suspected for some time, and our recollection is that an examination of urine was made, but found negative. Our recollection also is that there was edema of the legs.

Autopsy (Walsh).—August 24, 1904, 8.30 p.m.; autopsy done in private house.

Pathologic Diagnosis.—Bilateral chronic adhesive pleurisy; healed tuberculosis of the right lung; partially healed tuberculosis of the left lung, with cavity formation; emphysema and edema of both lungs; tuberculosis of the bronchial glands; acute diffuse nephritis; a few scattered tubercles in the kidneys.

External Appearances.—Well-nourished female; no decomposition; postmortem rigidity quite well marked; no post-mortem lividity; no jaundice; edema of both feet; subcutaneous fat well developed and preserved, three-fourths of an inch over the thorax, an inch over the abdomen, and about a half inch in the omentum; abdominal and thoracic muscles apparently normal; position of abdominal, pelvic and thoracic viscera normal; peritoneum, normal.

Pleura.—Left: Dense adhesion over the upper lobe and especially over the apex. In breaking up these adhesions in the apex a cavity in the lung was opened; scattered and easily broken adhesions over the lower lobe. Right: Dense adhesions over the upper lobe, though not so dense as on the left side. There was practically no exudate.

Lungs.—Left: Large, emphysematous and edematous; pale in color. The apex of the upper lobe presented a cavity, 2 in. by 3 in. in diameter. The cavity had smooth walls and was empty. There was slight infiltration about it. Except for the edema and emphysema, the rest of the lung was normal. Right: The lung was generally emphysematous and edematous. There were several scars evident over the apex; no infiltration.

Pericardium.—Normal; no adhesions and a normal amount of fluid.

Bronchial Glands.—Enlarged, but not caseous.

Heart.—Completely covered by emphysematous lungs; normal in size, color and consistency; subepicardial adipose tissue marked.

Valves.—Normal.

Aorta.—Normal.

Spleen.—Slightly enlarged and congested; shape and consistency normal.

Liver.—Size, consistency and color normal.

Gallbladder.—Normal.

Suprarenal.—Left: Apparently normal. Right: Not examined.

Appendix.—Normal; no tuberculous ulceration apparent.

Stomach.—Normal in position; mucous membrane of pink tint.

Small and Large Intestines and Rectum.—Normal; no blood; no appearance of inflammation; no ulcers.

Ovaries and Uterus.—Apparently normal.

Mesenteric Glands.—Normal; not enlarged.

Kidneys.—Left: Enlarged one and a half to twice normal size; shape, normal; capsule slightly adherent; consistency

softer than normal; surface of section cloudy, dull; cortex markedly thickened, pale in color; pyramids normal in size, but congested. Several small yellowish, millet-seed to split-pea size areas on external surface and surface of section. Right: Exactly similar to left. Both kidneys cut into 140 small pieces.

Microscopically (Walsh).—Forty specimens examined; kidney investment normal; malpighian bodies normal distance from kidney surface; glomeruli enlarged; hyaline degeneration apparent in the epithelial cells of the loops; quite marked thickening of the connective tissue of Bowman's capsule; widespread marked necrosis of the epithelium of the convoluted tubules and of the secreting tubules of the medullary rays; numerous hyaline casts; thickening of the interstitial tissue between the tubules; infiltration of small round cells between tubules, and sometimes about glomeruli; several areas of destroyed tubules replaced by infiltration of small round cells, which look like young tubercles; bloodvessel walls thickened; several typical tubercles with caseation and giant-cells.

Diagnosis.—Acute diffuse nephritis; scattered tubercles.

CASE II. (Private patient; Flick).—Male, aged 18, 6 feet 2 inches in height, student. He was exposed to tuberculosis for a considerable period of time when aged 6. He was again exposed for a considerable period when aged 13. He was a fairly healthy child, but was always thin. The highest weight that he had ever reached was 145 pounds, about a year before death. He broke down in health after a very severe year of study and overwork in college, a year before death. In spite of rest the disease remained active during the year. He first came under observation (Flick) two months before death, when he was extremely weak, unable to move about, and ran a pulse of 122 at rest. He had had loose bowels for four months at this time. Physical examination revealed a cavity in the upper lobe of the right lung, with more or less infiltration of the entire lung and extensive involvement of the upper half of the left lung. He had considerable tenderness over the abdomen and gave some evidence of appendicitis. In spite of all that could be done, the disease ran to a fatal termination in two months.

Autopsy and pathologic report were made by C. Y. White.

Pathologic Diagnosis.—Chronic tuberculosis of the lungs with cavity formation; miliary tuberculosis of the lungs, liver, spleen, and kidneys; subacute parenchymatous nephritis; chronic fibroid pleurisy; acute splenitis.

External Appearances.—The body of an emaciated young man, aged about 20. The subcutaneous tissue contains a small amount of fat. The external lymphatic glands are not enlarged. Postmortem rigidity is marked; postmortem lividity in the dependent parts of the body. The body had been injected with preserving fluid before the autopsy.

Abdomen.—The peritoneal cavity contains about one liter of bloody fluid, part of which is injection fluid. There is one small puncture wound in the epigastrium, presumably from the injection instrument. The organs are all discolored, varying from a bleached pale pink to a deep red.

Intestines.—The intestinal coils are moderately distended with gas. The walls are irregularly congested. Section over

these areas does not show ulceration. The large intestine is similar to the small, but not so deeply congested.

Appendix.—The appendix is bound down with firm adhesions. The walls are moderately thickened and congested. Section shows the walls thickened and the lumen small. Microscopic examination shows the walls congested and the muscular coats infiltrated with round cells; subacute appendicitis.

Liver.—The liver is moderately enlarged, firm, and of a yellow color. The surface is mottled and bleached from the injection fluid. Section shows the cells pale and the organ congested. Throughout the section surface and on the surface of the organ there are numerous small 2 mm. yellowish tubercles. Microscopic examination of the organ shows the liver cells cloudy and the organ congested. Numerous early and some moderately advanced miliary tubercles are to be seen throughout the section.

Spleen.—The spleen is enlarged, soft, and of a deep red color. The lower surface and edge of the organ are bleached from the action of the injection fluid. Section of the organ shows the organ congested and the trabeculas not increased. No distinct miliary tubercles are to be seen on the section surface. Microscopically, the organ is congested and the section shows a few small miliary tubercles. These tubercles show a slight caseous center and a few giant-cells.

Kidneys.—The kidneys are both enlarged, soft, and of a pale color, the capsule strips easily showing a pale, somewhat yellowish cortex. Section of the organs shows the cortex greatly thickened and yellowish-pink in color. The medulla is deep red. The surface and section surface of the organs show a few scattered miliary tubercles. Microscopic examination shows the sections of the kidneys to be moderately congested. The epithelium of the tubules of the cortex is swollen and cloudy and in some places distinctly granular. The lumen of the tubules is in places partly filled with granular debris. The cells in places are slightly necrotic. The cross section of the tubules of the medulla shows in places the lumen to contain granular material.

Heart.—The heart is somewhat dilated and filled with currant jelly clots. The muscle is yellowish-red, and somewhat soft. The valves are apparently normal.

Lungs.—Both pleural cavities are filled with bloody fluid. There are a few firm adhesions in both cavities. Right lung: The upper and part of the middle lobes contain a large cavity, which is situated along the anterior surface of the lungs and varies from 1 cm. to 2 cm. below the surface. The greater part of this cavity is within the upper lobe. Almost all of the remaining upper lobe is consolidated. This consolidation varies in color from a deep red to a caseous yellow. The greater part is caseous, *i. e.*, small caseous areas separated by deeply congested and infiltrated lung tissue. The lower lobe contains numerous 1 mm. to 2 mm. yellowish tubercles and a moderate amount of edema. Left lung: The upper part of the left upper lobe is consolidated, and contains a small cavity measuring about 2 cm. to 3 cm. in diameter. The cavity is situated in the posterior lateral part of the lobe. The lower part of the lobe and the whole of the lower lobe contain numerous small 2 mm. to 3 mm. caseous tubercles, a moderate amount of congestion, and a slight amount of edema.

CASE III.—Phipps Institute case. (Hatfield, Brinton, and Walsh.) Abstract.

No. 236, Vol. ii. Male, aged 32; occupation, laborer; entered hospital April 21, 1903. He was discharged from hospital April 21, 1904. He reentered September 1, 1904; died October 1, 1904.

Duration of illness, eight years. First symptom, pneumonia; no edema.

Sputum.—Tubercle bacilli positive.

Bowels.—From April 21, 1903, to February 1, 1904, according to temperature chart, generally constipated; patient's statement, April 22, 1903, constipated; April 24, 1903, constipated; May 1, 1903, constipated; May 5, 1903, constipated; May 8, 1903, constipated; October 3, 1903, constipated; February 5, 1904, constipated; August 23, 1904, diarrhea; from September 1, 1904, to October 1, 1904, bowels somewhat loose, as follows: 6, 5, 2, 2, 2, 1, 1, 2, 1, 2, 0, 2, 2, 1, 2, 2, 2, 2, 2, 1, 2, 2, 2, 2, 6, 4, 4, 3, death.

Urine.—July 14, 1903, trace of albumin, no sugar, many pus cells, no casts; July 18, 1903, no albumin; October 28, 1903, urethral discharge like gleet; April 22, 1904, albumin present, no sugar, granular casts; June 1, 1904, no sugar, albumin and blood present, much debris; March 8, 1904, acid, 1,032, albumin present, no sugar, no diazo; September 3, 1904, cloudy white precipitate, no sugar, hyaline and granular casts, pus in great quantities, epithelial cells, debris; tubercle bacilli positive; September 15, 1904, pain in bladder and incontinence; June 18, 1903, considerable pain in right lumbar region; July 31, 1903, pain in left lumbar region extending down to left groin. Three or four months previous to death the diagnosis of tuberculosis of the left kidney (that is, surgical kidney) was made.

Heart.—April 22, 1904, accentuated second sound.

Pulse.—During first year in hospital, pulse was between 90 and 100; respiration between 25 and 30; temperature between 98° and 100°. During last two weeks of illness, pulse, temperature and respiration gradually became elevated.

Autopsy (Rosenberger).—Abstract.

Pathologic Diagnosis.—Fibroid tuberculosis of right lung; ulcerative tuberculosis of both lungs; chronic parenchymatous nephritis right kidney; ulcerative tuberculosis of left kidney; cystitis; amyloid spleen; congestion of liver and calcified tubercle.

Heart.—Normal.

Aorta.—Beginning atheroma.

Spleen.—Amyloid.

Liver.—No amyloid reaction obtained; one calcified tubercle, otherwise normal.

Bladder.—Tuberculous ulceration.

Suprarenal.—Tuberculosis of left suprarenal.

Intestines.—Normal.

Appendix.—Small, no ulcers.

Mesenteric Glands.—Not enlarged.

Kidneys.—Left: 7 oz.; enlarged and swollen; shows three large ulcerated areas averaging 3 cm. in diameter, each surrounded with fibrous tissue. Right: Enlarged, swollen, pale. Nothing further found except a very small cyst.

Microscopically (Walsh).—Right cut into 70 small sections. Thirty-eight sections studied. Glomeruli swollen, sometimes fibroid; epithelium sometimes shows a vacuolated condition (hyaline vacuoles); Bowman's capsule thickened. Convolute tubules: Widespread degeneration and necrosis of the epithelium; innumerable hyaline casts; many cellular and granular

casts; round-cell infiltration between tubules; tubules sometimes contain red blood cells, again white blood cells; secreting tubules of medullary rays swollen and necrotic; interstitial connective tissue thickened; general congestion, especially of pyramids; no amyloid to gentian violet; no tubercles found.

Diagnosis.—Right: Marked diffuse nephritis. Left: Advanced tuberculosis.

CASE IV.—Phipps Institute case. (Hatfield.) Abstract.

No. 1,032, Vol. xii. Male, aged 27, single; occupation, copper-smith; entered hospital June 30, 1903; duration of illness, one year; edema present, but history does not say where.

Heart.—June 30, 1903, dullness increased up and to right; second pulmonic accentuated.

Pulse.—100 to 120; respirations, 26 to 32; temperature 97° to 100°. He left hospital of his own accord, August 12, 1903; he reentered without being seen in the meantime, August 9, 1904, and died September 10, 1904.

Clinical Diagnosis.—Tuberculosis of the lungs and pleura; tuberculosis of the intestines.

Principal symptoms during second stay in hospital, cough, expectoration and looseness of bowels.

Bowels.—June 30, 1903, fairly regular; while in house from June 30, 1903 to August 12, 1903, bowels were alternately constipated and slightly loose. On entering hospital, August 9, 1904, he complained of diarrhea. From the time of entrance to hospital, August 9, 1904, till death, his stools averaged about four a day, though once, 12.

Urine.—July 10, 1903, no albumin, no sugar, no casts.

Autopsy (Rosenberger).—Abstract.

Pathologic Diagnosis.—Ulcerative tuberculosis of both lungs with emphysema, tuberculous pleurisy, fatty kidneys, amyloid spleen, congested liver.

Heart.—Weight, 7½ oz.; normal.

Spleen.—7 oz.; enlarged; consistency diminished; dark red; reacted to the iodine stain.

Liver.—2 lb., 6 oz.; small, congested; mottled in appearance.

Intestines.—Normal.

Appendix.—Tubercles.

Mesenteric glands.—Not enlarged.

Kidneys.—Left: 6 oz.; slightly larger than normal; pale; tubercles evident. Right: 5 oz.; same as left.

Microscopically (Walsh).—Both kidneys cut into 140 to 150 sections. Left showed two small tubercles. Twenty-four specimens studied; widespread degeneration and necrosis of epithelium of convoluted tubules; occasional slight round-cell infiltration between tubules, between the epithelial cells in convoluted tubules and into the tubules; connective tissue of Bowman's capsule thickened; a few hyaline casts; no amyloid to gentian violet; typical tubercles with caseation and giant cells.

Diagnosis.—Parenchymatous nephritis; scattered tubercles.

CASE V.—Phipps Institute case. (Stanton.) Abstract.

No. 1,157, Vol. xiii. Female, aged 34, widow; occupation, domestic; entered hospital July 29, 1903; died June 3, 1904.

Diagnosis.—Tuberculosis of the lungs, larynx, and glands of neck and axilla; duration of illness, six months; no edema.

Sputum.—Tubercle bacilli positive.

Heart.—Normal.

Pulse.—80 to 90; respirations, 20 to 30; temperature, 98° to 100°; toward the end all three elevated.

Bowels.—July 29, 1903, patient said bowels were regular; during August, 1903, average 1 to 2; during September, 1903, average 2; during October, 1903, varied from 0 to 3; during November, 1903, average 1; during January, 1904, 1 or 0; in other words, a little tendency to constipation alternating occasionally with looseness; March 6, 1904, diarrhea; March 11, 1904, diarrhea severe; March 16, 1904, diarrhea better; March 25, 1904, diarrhea; blood in stools; in other words, from February 1 to March 6, 1904, pretty regular, generally only 1, once 2, again 3; March 6, 9 stools; March 6 to March 11, 9, 4, 5, 4, 5, 4; then regular, 1 or at most 2 a day till April 1. April 1, 1904, 3; April 2, 1904, 4; April 18, 1904, 3; and after that 3 and 4 a day till death.

Urine.—July 29, 1903, acid, 1,010, no albumin, no sugar. Microscopically.—Leukocytes.

Autopsy (Rosenberger).—Abstract.

Pathologic Diagnosis.—Miliary tuberculosis of both lungs, with cavity in both; emphysema; congestion; kidney infarct; catarrhal appendicitis; red atrophy of liver; extreme emaciation.

Heart.—8½ oz.; right ventricle shows fatty infiltration, the ventricle wall is thin, about 3 mm.; muscle flabby, otherwise normal.

Spleen.—3½ oz.; small and firm.

Liver.—2 lb., 14 oz.; dark red, presents the appearance of red atrophy.

Intestines.—Normal.

Appendix.—Normal.

Mesenteric Glands.—Enlarged, not caseous.

Kidneys.—Left: 4½ oz.; recent congestion; old infarct; pale.

Right: 4½ oz.; same as left, except infarct.

Microscopically (Walsh).—Ten sections studied microscopically. Glomeruli swollen, epithelium vacuolated; no congestion. Convoluted tubules: Epithelium swollen, degenerated, and occasionally necrotic; same is true of the secreting epithelium of the medullary rays; slight thickening of interstitial tissue; no congestion; no appearance of amyloid; not stained for amyloid; infarct not studied; typical tubercles, with caseation and giant-cells and tubercle bacilli.

Diagnosis.—Toxic nephritis; scattered tubercles.

CASE VI.—Phipps Institute case. (Landis.) Abstract.

No. 2,180, Vol. xvi. Female, aged 42, married; first visit March 11, 1904; entered hospital March 31, 1904; discharged May 12, 1904; readmitted July 16, 1904; died October 27, 1904; duration of illness, two years; no edema.

Sputum.—Tubercle bacilli present.

Heart.—Sounds poor in quality, systolic murmur at pulmonary area; July 27, 1904, second pulmonic accentuated, systolic murmur at pulmonic area, also at apex; mitral murmur probably hemic; dyspnea extreme.

Pulse.—During first stay in hospital, 90 to 110; respirations, 30; temperature, 98° to 100°; after readmission to hospital, pulse, 110; respirations, 32; temperature, 98° to 102°. During September, respirations oftentimes went up to between 40 and 50.

Bowels.—March 11, 1904, regular; on admission, March 31, 1904, she said regular; July 19, 1904, very loose; July 27, 1904, condition of bowels much improved; from April 1, 1904, to April 30, 1904, during stay in hospital, bowels quite regular, usually 1; once, 0; 10 times, 2; from time of readmission, July 16, 1904, till death, there were frequent spells of looseness; July 22, 5; July 28, 7; August 3, 7; August 4, 5; August

10, 5; August 14, 5; August 21, 5; September 19, 5; September 27, 6; September 28, 6; September 29, 6; September 30, 5; October 9, 5; October 10, 6; October 11, 4; October 12, 5; October 14, 10; from this time till death, 4, 4, 5, 4, 7, 5, 5, 6, 4, 3, 6, 4, 8. In addition, during July, August, and October, there were practically never less than 3 or 4 a day.

Urine.—March 20, 1904, amber, acid, 1,024, trace of albumin, no sugar; no casts; July 19, 1904, acid, yellow, albumin positive, no sugar, diazo positive.

Autopsy (Rosenberger).

Pathologic Diagnosis.—Pleurisy of both sides; tuberculosis of both lungs; caseous pneumonia of right lung; congestion of liver; mitral valvulitis; parenchymatous nephritis; atheroma of the aorta and splenic artery; capsulitis of spleen and liver; appendicitis.

Heart.—Displaced to left; mitral valve markedly thickened; fenestration of the middle aorta leaflet; chordæ tendinæ of mitral valve also thickened; weight, 8 oz.

Spleen.—6 oz.; slightly enlarged; rather firm; area of capsulitis posteriorly; pin-point areas, resembling tubercles; splenic artery atheromatous.

Liver.—Slightly enlarged; 2 lb., 14 oz.; veins slightly dilated; more or less mottled on section.

Intestines.—Ileum much congested; no ulcers present; rest of intestines normal.

Appendix.—6 cm. in length; swollen near tip; connects with another mass on left; upon opening this mass purulent material was found and perforation near the tip.

Mesenteric Glands.—Enlarged; some calcified.

Kidneys.—Left: 5 oz.; slightly enlarged; shows slight congestion; two small areas apparently tubercles. Right: 4 oz.; paler than left; firm in consistency; evident macroscopic tubercles.

Microscopically (Walsh).—Both kidneys cut into 140 to 150 sections; three small tubercles found. Thirteen specimens studied; glomeruli sometimes swollen; rare fibroid glomerulus; connective tissue of Bowman's capsule thickened; necrosis of epithelium of convoluted tubules; lumina frequently filled with debris; no round-cell infiltration; few hyaline casts; some general congestion; no amyloid to gentian violet; typic tubercles with caseation and giant-cells.

Diagnosis.—Parenchymatous nephritis; scattered tubercles.

CASE VII.—Phipps Institute case. (Brinton, Stanton.) Abstract.

No. 2,238, Vol. xvii. Male, aged 25, single; occupation, waiter; first visit to dispensary March 29, 1904; entered hospital April 29, 1904; died May 15, 1904.

Diagnosis.—Pulmonary tuberculosis with pneumothorax. Pneumothorax developed suddenly while in hospital; duration of illness, 6 years.

Sputum.—Tubercle bacilli present.

Heart.—Normal, second pulmonic sound slightly loud.

Pulse.—100 to 120; respirations, 28; temperature, 98° to 103°.

Bowels.—March 29, 1904, inclined to diarrhea; April 29, 1904, patient said he had slight diarrhea and had had several attacks. From time of entrance to hospital till death, 15 days, he showed once three, and once four, and three times two stools.

Notes.—April 5, 1904, bowels loose; April 12, 1904, regular; April 19, 1904, regular.

Urine.—May 1, 1904, no albumin; May 12, 1904, no albumin, sugar present, diazo present, excess of phosphates.

Autopsy (Rosenberger).

Pathologic Diagnosis.—Pneumothorax, right side; ulcerative tuberculosis of both lungs with widespread cavity formation; adhesive pleurisy, fatty infiltration of liver; miliary tubercles in appendix; tuberculous pneumonia.

Heart.—7 oz.; normal.

Spleen.—5 oz.; normal.

Liver.—3 lb., 14 oz.; large, dark and firm.

Intestines.—Normal.

Appendix.—Contains a few small yellowish areas resembling tubercles.

Mesenteric Glands.—Very slightly enlarged.

Kidneys.—Left: 5½ oz. Right: 6 oz.; both organs pale, and in some areas congestion is present.

Microscopically (Walsh).—Thirty-three specimens studied; glomeruli: Marked hyaline vacuolization of epithelium; Bowman's capsule connective tissue thickened; epithelium of convoluted tubules swollen and necrotic; lumen obliterated; epithelium of secreting tubules of medullary rays swollen and necrotic; intertubular tissue thickened; congestion here and there; no infiltration; no amyloid to gentian violet.

Diagnosis.—Mild diffuse nephritis.

CASE VIII.—Phipps Institute case. (McCarthy.) Abstract. No. 2,262, Vol. xvii.—Male, aged 57, married; occupation, cook; entered hospital, April 5, 1904; died June 13, 1904; duration of illness, since 1889; no edema.

Sputum.—Tubercle bacilli present.

Heart.—Normal; distinct accentuation of pulmonic second sound.

Pulse.—100 to 120; respirations, 24 to 30; temperature, 98° to 103°.

Bowels.—Loose; painful movements; from 1 to 4 daily till death; most frequently 2; frequently 3; occasionally 4.

Urine.—1,028; albumin in slight quantities; no sugar.

Autopsy (Rosenberger).

Pathologic Diagnosis.—Ulcerative tuberculosis of both lungs; miliary tuberculosis of both lungs; pleurisy, most marked on left side; parenchymatous nephritis; fatty liver, with possible red atrophy; tuberculosis of the mesenteric glands; bed sores.

Heart.—4½ oz.; small, pale, normal in shape and size.

Spleen.—Normal, 6 oz.

Liver.—2 lb., 6 oz.; firm, pale; apparent dilation of veins.

Gallbladder.—Small; walls thickened.

Intestines.—Normal.

Appendix.—Normal.

Mesenteric Glands.—Much enlarged and somewhat caseous.

Kidneys.—Left: 5 oz.; slightly enlarged; pale. Right: Smaller; cortex thickened; medulla purplish; stellate veins prominent; surface smooth; 5½ oz.

Microscopically (Walsh).—Both kidneys cut into 140 to 150 pieces. One small cyst found and a few small, yellowish areas looking like tubercles. Twenty-four specimens studied; glomeruli swollen, sometimes shriveled, again fibroid; connective tissue of Bowman's capsule thickened; convoluted tubules dilated, sometimes cystic dilated; epithelium atrophic; sometimes desquamation of epithelium into tubules; few hyaline casts; thickening of interstitial connective tissue; no amy-

loid to gentian violet; several areas (1 mm. in diameter) of round-cell infiltration, possibly young tubercles; several typical tubercles with caseation and giant-cells.

Diagnosis.—Chronic interstitial nephritis; scattered tubercles.

CASE IX.—Phipps Institute case. (Brown and Norris.) Abstract.

No. 2,344, Vol. xvii. Female, aged 35; occupation, housework; first visit to dispensary May 4, 1904; entered hospital May 12, 1904; died August 10, 1904.

Diagnosis.—Tuberculosis of both lungs; tuberculous enteritis; duration of illness one year; no edema.

Sputum.—Tubercle bacilli present.

Heart.—Normal.

Pulse.—100 to 110; respirations 32; temperature 98° to 101°; all three elevated toward the end.

Bowels.—May 3, 1904, regular; May 12, 1904, regular. These two represent the patient's own statement on the history sheet. May 15, 1904, constipated; June 20, 1904, diarrhea; June 22, 1904, two stools daily; June 25, 1904, five to six daily; June 28, 1904, no better as regards diarrhea; June 29, 1904, more comfortable; July 11, 1904, diarrhea continues; from May 18 to June 1 bowels usually 1 daily; from June 1 to June 21, usually 2, frequently 3, twice 4, and twice 5; from June 24 to July 28, usually 3, once 4, and once 6; from July 28 till death, 5, 4, 4, 7, 7, 7, 7, 6, 7, 4, 2, 4, 5.

Urine.—1,020, clear, acid, trace of albumin.

Autopsy (Rosenberger).

Pathologic Diagnosis.—Ulcerative tuberculosis of both lungs; bilateral pleurisy; fatty kidneys; congested liver; enlarged mesenteric glands; congestion of ileum.

Heart.—8 oz.; somewhat enlarged and flabby.

Spleen.—7 oz.; slightly enlarged; no amyloid to iodine.

Liver.—3 lb., 1 oz.; dark, mottled veins prominent.

Intestines.—Ileum congested.

Appendix.—Normal.

Mesenteric Glands.—Enlarged.

Kidneys.—Left: 4 oz.; no tubercles visible. Right: 5 oz.; no tubercles visible; small, pale.

Microscopically (Walsh).—Kidneys cut into 140 to 150 small pieces; numerous small cysts filled with brown gelatinous material found. Thirty-three specimens studied; glomeruli swollen and hyaline, sometimes appearance of amyloid degeneration (hematoxylin and eosin), again of pure hyaline degeneration; no amyloid in specimens stained with gentian violet, though specimens so stained were poor and amyloid remains questionable; Bowman's capsule connective tissue thickened; convoluted tubules dilated; epithelium atrophic; numerous hyaline casts; many convoluted tubules filled with debris; several areas of round-cell infiltration looking like young tubercles; one area of dense connective tissue looking like healed tubercle; occasional localized infiltration between tubules; several small cysts; interstitial tissue generally thickened; no congestion.

Diagnosis.—Interstitial nephritis; possible amyloid; probable scattered tubercles.

CASE X.—Phipps Institute case. (McCarthy.) Abstract.

No. 2,815, Vol. xxi. Male, aged 28, married; entered hos-

pital October 8, 1904; died November 9, 1904; duration of illness, nine months; some swelling of feet.

Sputum.—Tubercle bacilli present.

Heart.—Normal; accentuated pulmonic and aortic second.

Pulse.—120 to 150; respirations, 50 to 60; temperature, 99° to 102°.

Bowels.—Loose from time of entrance to hospital till death; for 22 days preceding death, bowel movements daily, 2, 0, 3, 4, 3, 3, 3, 3, 4, 3, 4, 3, 3, 2, 3, 4, 4, 5, 2, 2.

Urine.—No analysis.

Autopsy (Rosenberger).

Pathologic Diagnosis.—Ulcerative tuberculosis of both lungs; coalesced tubercles in both lungs; caseous pneumonia and emphysema of right lung; pleurisy; red atrophy of liver; dilation of right side of heart; enlarged mesenteric and bronchial glands.

Heart.—Slight displacement to right; right side dilated and shows chicken-fat clot; enlarged; 8 oz.

Spleen.—7 oz.; slightly enlarged; soft; darker than normal; no amyloid.

Liver.—4½ lb.; enlarged; extends nearly to umbilicus; dark.

Intestines.—Normal; rectum and ischio-rectal region not examined.

Appendix.—7 cm. in length; no ulcers present.

Mesenteric glands.—Enlarged.

Kidneys.—Left: Movable; enlarged; dark red, and presents slight striation of cortex; 6 oz. Right: 6 oz.; resembles left; enlarged; no tubercles present in either.

Microscopically (Walsh).—Both kidneys cut into 150 pieces. Thirteen specimens studied. Glomeruli: Hyaline vacuolization of epithelium; some congestion; Bowman's capsule connective tissue thickened; convoluted tubules: Epithelium swollen, degenerated and necrotic; occasionally round-cell infiltration between tubules, also between the cells of the convoluted tubules; epithelium of secreting tubules of medullary rays necrotic; rare hyaline casts; rare fibroid glomerulus; no amyloid to gentian violet; typical tubercles with caseation and giant-cells.

Diagnosis.—Parenchymatous nephritis; scattered tubercles.

CASE XI.—Phipps Institute case. (Ravenel.) Abstract.

No. 2,926, Vol. xxi. Female, aged 19, single; entered hospital November 26, 1904; died December 22, 1904; duration of illness, 3 years; no edema.

Sputum.—Tubercle bacilli positive.

Heart.—Reduplicated first sound.

Pulse.—110 to 140; respirations, 35 to 45; temperature, 97° to 100°.

Bowels.—Loose; November 29, diarrhea; December 6, diarrhea quite bad and painful; from November 27, 4, 1, 6, 1, 1, 2, 4, 5, 3, 4, 2, 3, 4, 5, 2, 5, 3, 4, 3, 3, 2, 2, 0, 2, 0, 0.

Urine.—1,024, pus, albumin, no sugar, diazo slight.

Autopsy (White).

Pathologic Diagnosis.—Tuberculosis of both lungs with cavity formation; tuberculosis of the bronchial and mesenteric glands and of the appendix; dilated right and left ventricles; parenchymatous nephritis.

Heart.—Right ventricle walls thin and cavity twice normal size; left ventricle walls thin and cavity one and a half times normal size.

Spleen.—Normal.

Intestines.—Normal.

Appendix.—Contains considerable hardened feces and showed five small ulcers $\frac{1}{2}$ in. in diameter. Mesenteric glands: Slightly enlarged.

Kidneys.—Left: Normal in size; pale in color; normal consistency; capsule reasonably adherent. Right: Normal in size; pale in color; normal consistency; capsule reasonably adherent.

Microscopically (Walsh).—Both kidneys cut into 140 to 150 small pieces. One cyst $\frac{1}{2}$ in. by $1\frac{1}{2}$ in. in cortex filled with gelatinous caseated material; no tubercles found; Twenty-six specimens studied; glomeruli swollen, congested; epithelium shows hyaline vacuoles; Bowman's capsule connective tissue thickened; occasional glomeruli fibroid; small hemorrhagic infarct about 5 mm. by 6 mm.; various small areas of infiltration, especially under capsule; in localized areas convoluted tubules show epithelium necrotic; interstitial tissue thickened; no amyloid to gentian violet: no distinct tubercles found.

Diagnosis.—Diffuse nephritis.

Of the 11 cases, nine showed some abnormality of the liver. Some diseases of the liver may give rise to diarrhea, but in them other symptoms are prominent which did not exist in these cases. Six cases showed inflammation of the appendix. Appendicitis may give rise to diarrhea, but usually causes constipation. In seven cases there were enlarged mesenteric glands. Diseased mesenteric glands are credited with producing diarrhea, but even here there is some doubt, as there usually is associated with them ulceration of the bowels. In seven there was abnormality of the heart. Heart disease can only produce diarrhea by setting up hyperemia in the abdominal organs. In one case the liver, appendix, mesenteric glands, and heart all were normal, and yet the diarrhea and nephritis were marked.

In two of the cases an abnormal condition of the thyroid gland was found by Dr. William B. Stanton. One showed tubercles and the other simple enlargement. Enlargement of the thyroid is sometimes accompanied by diarrhea.

In only three cases was edema recorded as being present. It probably was present in some others, but was overlooked or not recorded. In six cases, however, there was a record of no edema. It may at least be inferred that edema is not a marked symptom. The absence of edema is most remarkable in Case XI, in which the autopsy revealed a dilation of both sides of the heart.

In five cases there was albumin in the urine. In three there was none. One of the remarkable features of nephritis in tuberculosis is the nonelimination of

albumin. Even when the kidneys are extensively diseased there is very little albumin in the urine, and sometimes there is none. In one case there were hyaline and granular casts in the urine; in one case there were no casts; in nine cases no record was made upon the subject of casts. The probabilities are that hyaline or granular casts would have been found in all if careful search had been made for them. Hyaline or granular casts seem to occur in all cases of nephritis associated with tuberculosis.

The specific gravity of the urine was 1,020 and over in four cases, and below 1,020 in one case. In six cases no record was made of the specific gravity. In tuberculous nephritis the specific gravity of the urine usually is very high. In cases in which loose bowels exist this high specific gravity may be due to the amount of fluid carried off by the bowels.

In seven of the cases the pulse was above 120, and in four it was below 120. For most of the cases the pulse record was a bed record. High pulse in tuberculosis is always suggestive of nephritis. The character of the pulse has not been recorded. Usually it is thready.

Nephritis occurs very frequently in tuberculosis. It is caused by the growth of the tubercle bacilli in the tissues of the kidney, and by the toxin excreted through the kidneys from lesions elsewhere. It also may be caused, perhaps, by the dead tubercle bacillus in the process of elimination. That the tubercle bacillus escapes from the body by way of the kidney can no longer be doubted. Whether it escapes only with broken-down tubercles in the kidneys, or also by elimination is unsettled. In a study of the urine in tuberculosis, made two years ago,¹ we reported the finding of tubercle bacilli in the urine in 44 out of 60 cases.

Grancher and Martin² reported a series of experiments upon dogs for the establishment of immunity with gradually increasing doses of avian tubercle bacilli in which the ultimate outcome frequently was nephritis, either bacillary or toxic. The longer the animal lived and the more resistant it became the greater were the chances of nephritis.


Clinically, nephritis is one of the complications in tuberculosis most to be dreaded. This is the more so because it is a complication which comes on with the

¹ Proceedings of Philadelphia Pathological Society, 1903.

² Revue de la Tuberculose, 1893.

very process which leads to recovery, namely, immunization. When established it becomes a menace to life. Many patients with tuberculosis die by way of nephritis as the real cause of death. The symptom-complex by which nephritis in tuberculosis may be recognized is a pasty skin, unusual fatigue upon slight exertion, shortness of breath, rapid thready pulse, high specific gravity of urine, hyaline and granular casts at times, tubercle bacilli in the urine at times, and slight amount of albumin at times. Edema may be present, but is not as a rule. Frequently there is looseness of bowels alternating with constipation and sometimes there is continuous diarrhea. Albumin and casts are more apt to be found when something has occurred to congest the kidneys.

We have found magnesium sulfate and nitroglycerin of greatest use in the treatment of this complication. When the bowels are very loose, .78 gm. (12 gr.) doses of magnesium sulfate every hour will lessen the number of stools. When the bowels are costive the magnesia will greatly improve the general condition. Sometimes patients begin to gain in weight under the use of magnesium sulfate who have done badly before. Opiates should never be used in these cases.



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