CHRONIC FIBROUS OSTEOMYELITIS

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Chronic fibrous osteomyelitis is a term that may be applied to any long-standing pyogenic infection of the bone in which the reaction on the part of the fibroblasts in contrast with the infiltrative cells becomes the outstanding feature of the lesion. As is well known, it may come as the end stage of acute pyogenic osteomyelitis in which there has been suppuration, necrosis, absorption, and cavity formation. As repair takes place the cavity may be filled with fibroblastic tissue showing varying degrees of maturation. Brodie's abscess not infrequently becomes quiescent or heals in this way. Such an area of chronic fibrous osteomyelitis may remain symptomless for an indefinite period or it may produce mild disturbances or be the seat of acute exacerbations. There is usually more or less osteosclerosis with the formation of a bony shell about it. Gradual replacement by hæmopoietic and fatty marrow may ultimately come about.

Fig. 1.—Chronic fibrous osteomyelitis of acromion process.

In contrast with this condition we may see a form of osteomyelitis pursuing a chronic course from the onset in which a circumscribed area of bone is broken down by fibroblastic activity and the space filled up with soft tissue. This lesion deserves special consideration since by the time that it has come to operation it is devoid of the usual microscopic changes of pyogenic infection and bears much resemblance to benign giant-cell tumor and osteitis fibrosa cystica with which it is sometimes confused. I have studied eleven cases belonging to this group particularly from the pathological standpoint. The findings vary greatly according to the age of the lesion. In those cases operated on during the first few months, while the disease is progressive, the

cavity has been found to be filled with a soft tissue that is grayish to brown in color. Microscopically it consists of fibroblasts, capillaries, polyblasts, giant cells, old hæmorrhage, and blood pigment. There is usually more or less necrosis throughout the tissue. Cholesterol slits are sometimes seen. There is lacunar absorption about the walls of the cavity and the adjacent haversian canals are dilated as a result of absorption by newly-formed fibrous tissue. There is practically no leucocytic or lymphocytic infiltration to be seen. The response on the part of the surrounding bone is extremely variable. In some instances little or no bone is laid down, while in others, there is marked new bone formation.

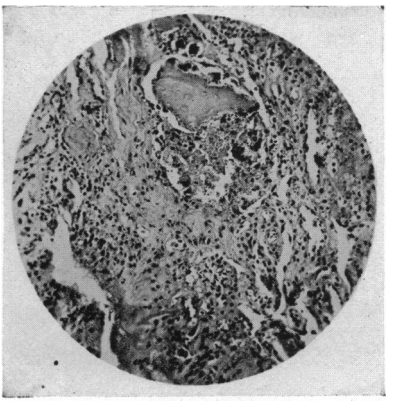

FIG. 2.—Tissue removed from lesion shown in Fig. 1.

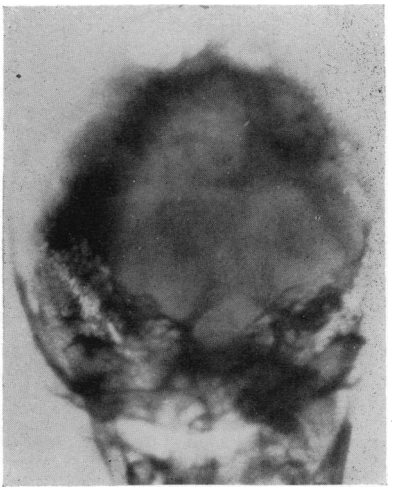

FIG. 3.—Destructive lesion (A) of parietal bone.

The following case is one in which there was bone destruction with practically no surrounding new bone formation: Female, thirty years of age. Six months before admission she began to have pains in the region of the acromion process of the right scapula. They gradually increased in severity and she developed moderate limitation of motion in shoulder. No general symptoms. Examination was essentially negative aside from the region of the right acromio-clavicular joint which was painful on motion and tender on pressure. There was no swelling. A röntgenogram (Fig. 1) revealed destruction of the mesial half of the acromion bordering on the acromio-clavicular joint. No new bone formation. Wassermann negative. At operation the acromion process for approximately one centimetre about the acromio-clavicular joint was missing and the space was filled with soft granulation tissue which bled freely. It was curetted away and the adjacent bone was removed with rongeur forceps. The wound healed *per primum* and six months later the disease appeared to be healed on physical and X-ray examinations. Microscopic examination showed the excised tissue to be composed very largely of fibroblasts with many capillaries, a few giant cells, and honocytes. (Fig. 2.) There were areas of

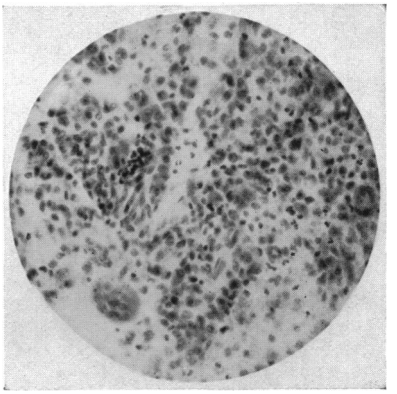

FIG. 4.—Photomicrograph of tissue removed from lesion shown in Fig. 3.

necrosis and occasional polymorphonuclear leucocytes. There were a few small trabeculæ of bone undergoing lacunar absorption. Cultures of the material on aërobic blood agar showed no growth. Those on meat broth and milk showed staphylococcus aureus. The fact that the histological picture was that of a fibroblastic reaction and that infiltrative cells were present in such small numbers raises the question of whether or not the staphylococcus found in the cultures was a contamination. Guinea-pig inoculations were negative for tuberculosis.

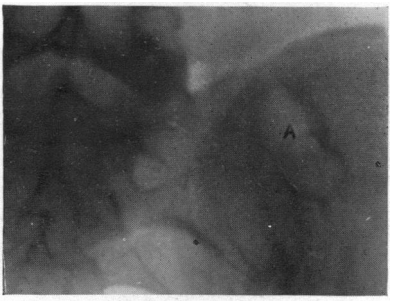

FIG. 5.—Showing a cavity in posterior part of ilium with thin, sclerosed walls.

A similar lesion in a girl, twelve years of age (Bone Sarcoma Registry No. 854), was studied pathologically. She had had slight pain and a swelling in the occipital region for two months. A röntgenogram (Fig. 3) revealed a punched out area of bone destruction about one inch in diameter without accompanying new bone formation. A grayish-brown tissue was curetted from the cavity by Dr. J. C. Clarke and the lesion healed promptly and has remained so for two years. Microscopic examination showed it to be made up mainly of young fibroblasts. Throughout were scattered numerous mono- and multinuclear giant cells and blood pigment. (Fig. 4.) There were very few lymphocytes and polymorphonuclear leucocytes. This is the earliest lesion of the group. No bacteriological examination was made.

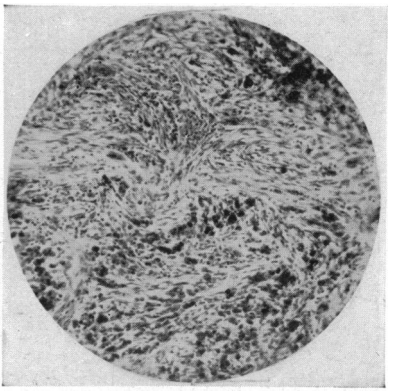

FIG. 6.—Photomicrograph of brown tissue from cavity shown in Fig. 5. It consists of fibroblasts, immature connective tissue, giant cells and blood pigment.

In other cases a shell of bone is gradually laid down about the cavity which becomes stationary in size, although the disease may remain active and continue to produce symptoms. The following case is an example of this type. Female, nineteen years of age, gave a history of pain in the left posterior iliac region of nine months' duration. It came on while there was an open wound of the right shin and had varied in intensity at intervals. No general symptoms. She had been treated elsewhere for sacro-iliac strain. Examination was negative aside from slight tenderness over the upper part of the ilium bordering on the left sacro-iliac joint. A röntgenogram (Fig. 5) revealed an area of reduced density in the ilium near the sacro-iliac joint with a sclerosed cortex about it. At operation the cavity was found to be filled by fibrous tissue which was grayish in some regions and a mottled brown in others, giving it the gross appearance of the "brown tumor" of the Germans. There was a shell of cortical bone about it. Microscopic examination of the brownish tissue (Figs. 6 and 7) showed that it was made up largely of fibroblasts. There were many large and small giant cells and a large amount of old blood and blood pigment. Few infiltrative cells

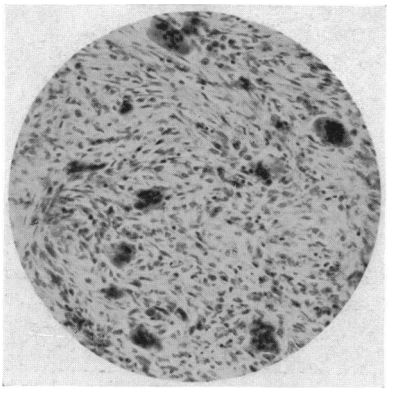

FIG. 7.—High power of tissue shown in Fig. 6.

were present. The grayish areas were composed of wavy connective tissue in varying stages of organization. (Fig. 8.) No bacteriological examination was made. The lesion healed and the patient was well four years after operation.

When the lesion is situated along the course of the shaft of a long bone whether centrally or peripherally, there may be very extensive new bone formed about the cavity. The cavity may continue to enlarge slowly and the new bone increase in amount over a considerable period of time. In the following case, the lesion began subperiosteally. Male, fifty years of age, two years before admission began to have dull pain in the mesial side of the upper third of the right tibia. It grew steadily worse and after four months a small tender swelling was noticed. The swelling, pain, and tenderness slowly increased despite the fact that he had four months of antisyphilitic treatment preceding admission. Examination was negative aside from a slightly tender oval swelling extending on the mesial surface of the right tibia five inches below the knee. A röntgenogram (Fig. 9) revealed a dense oval shadow along two inches of the surface of the shaft with a small oval area of reduced density in the cortex, at the centre of the swelling. He furnished X-rays taken ten and seventeen months after the onset showing the gradual increase in amount of periosteal new bone and enlargement of the cavity. Wassermann negative. The entire lesion was excised at operation and the cavity was found to be filled with a grayish-brown soft tissue. Aërobic and anaërobic cultures made on blood agar plates gave no growth. Microscopic examination of the tissue removed from the cavity (Fig. 10) showed it to be made up largely of fibroblasts. There were also many small and a few large giant cells and polyblasts. Extremely few leucocytes were seen. There were scattered areas of blood pigment and extravasated red blood cells. Very fine trabeculæ of new bone were seen in the peripheral portion of the tissue. The surrounding new and old bone possessed large cancellous spaces which were filled with fibrous marrow and there was evidence of bone absorption along the wall of the cavity.

This lesion was still in the progressive stage and at the time of operation was producing more marked symptoms than at any time previously. Despite these facts there was almost complete absence of leucocytic infiltration such as would be expected in a pyogenic infection. The patient

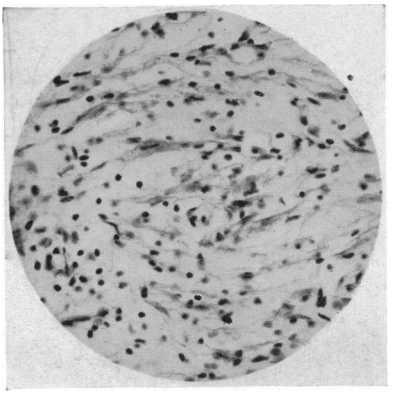

FIG. 8.—Photomicrograph of gray tissue from cavity shown in Fig. 5.

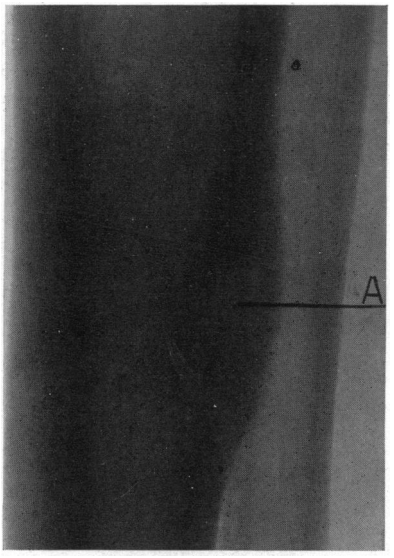

FIG. 9.—Peripheral lesion with central cavity (A) and marked osteosclerosis about it.

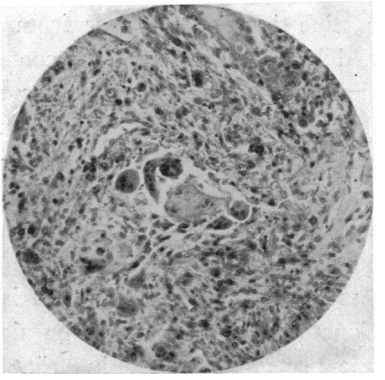

FIG. 10.—Contents of cavity in Fig. 9.

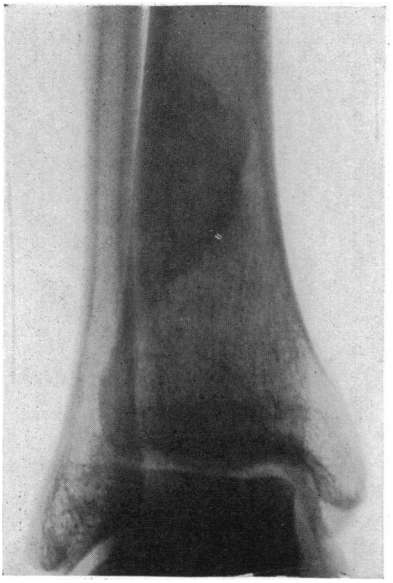

FIG. 11.—Shadow of dense bone about fibrous area, in medullary cavity.

was completely relieved by the operation and was well one year later.

An example of marked sclerosis in lesion situated in the medullary canal is that of a female, twenty-three years of age, who had pain in the lower end of the shaft of the right tibia for three months without any general disturbance. Examination was negative aside from tenderness along the shaft of the tibia just above the epiphysis. A röntgenogram (Fig. 11) revealed a large, oval, dense shadow extending into the medullary cavity from the lateral cortex of the lower two inches of the diaphysis. In the lateral view (Fig. 12) an area of reduced density is seen at the centre of the shadow. The sclerosed area was excised by Dr. John Hodgen. The specimen consisted of lateral cortex of the tibia and an oval mass of densely trabeculated bone attached to its inner surface. There was a central cavity one by two centimetres in diameter (Fig. 13) which was filled with a grayish soft tissue. On microscopic examination it was found to be loose connective tissue containing wavy fibres and almost free from giant cells and blood pigment. (Fig. 14.) There were no leucocytes. The contents of the cavity appeared to be in a quiescent stage. These two cases might perhaps as well be classed as sclerosing osteomyelitis but the fibrous nature of the reaction at the point of onset of the lesion is the pathological feature of greatest importance.

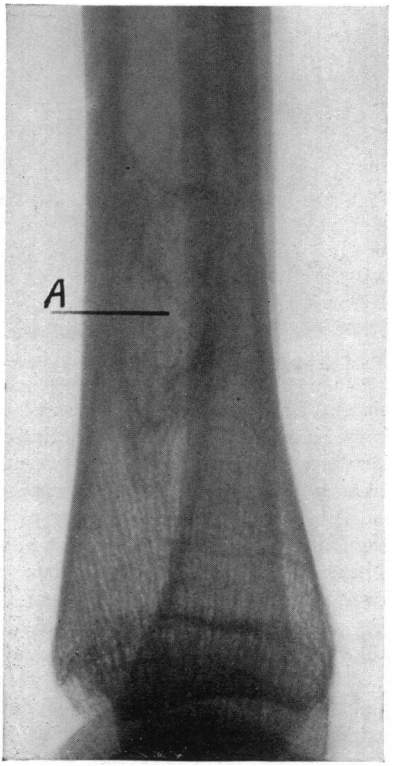

FIG. 12.—Lateral view of lesion in Fig. 11, showing reduced density at seat of cavity in central portion (A).

After a progressive period which may extend over a number of months or years, the disease may come to a standstill or healing take place, in which event a cortex is laid down about the lesion and the cavity becomes filled with a mature connective tissue that is free from giant cells and blood pigment. This connective tissue may remain unossified or there may be fine bony trabeculæ laid down throughout it, particularly in the peripheral regions. Some of these lesions produce very few or even no symptoms at the onset and all are apt to become symptomless as the reparative stage is reached. Consequently they may be detected as unexpected findings in röntgenograms made because of trivial complaints.

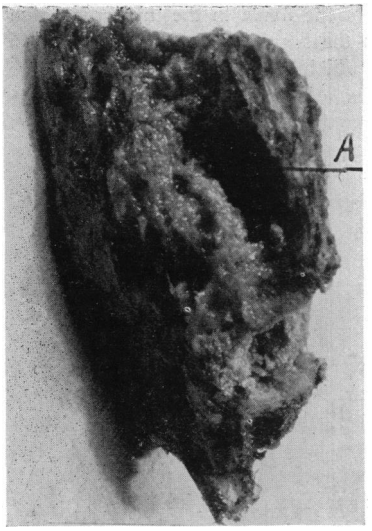

FIG. 13.—Excised lesion shown in Figs. 11 and 12 with central cavity (A).

The following two cases were detected as a result of X-ray examination because of symptoms suggestive of mild arthritis of the knee. A ten-year-old girl had had slight pains in the right knee

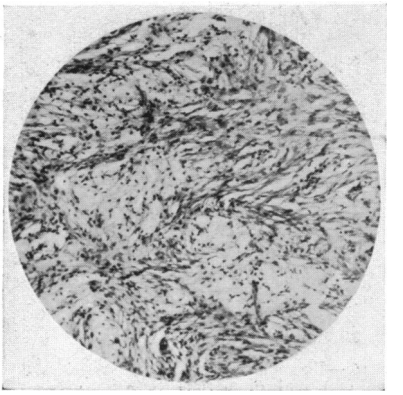

FIG. 14.—Photomicrograph of tissue from cavity shown in Fig. 13.

at intervals, for two months. Physical examination was negative. A röntgenogram (Fig. 15) showed an oval area of reduced density in the lateral portion of the femur three inches above the knee. Pathological examination of the excised lesion revealed a dense bony shell and mature white fibrous connective tissue filling out the cavity. (Fig. 16.) There were no areas of necrosis or hæmorrhage and practically no signs of phagocytic activity indicative of active inflammation. A similar case was that of a thirteen-year-old girl who for one year had had mildly intermittent pains in both knee-joints. There had been no general symptoms. Physical examination revealed slight tenderness on the mesial side of the right knee. The joint appeared otherwise normal. A röntgenogram (Fig. 17) unexpectedly disclosed an oblong area of reduced density (a) in the shaft of the right fibula near its upper end. There was a dense narrow shadow

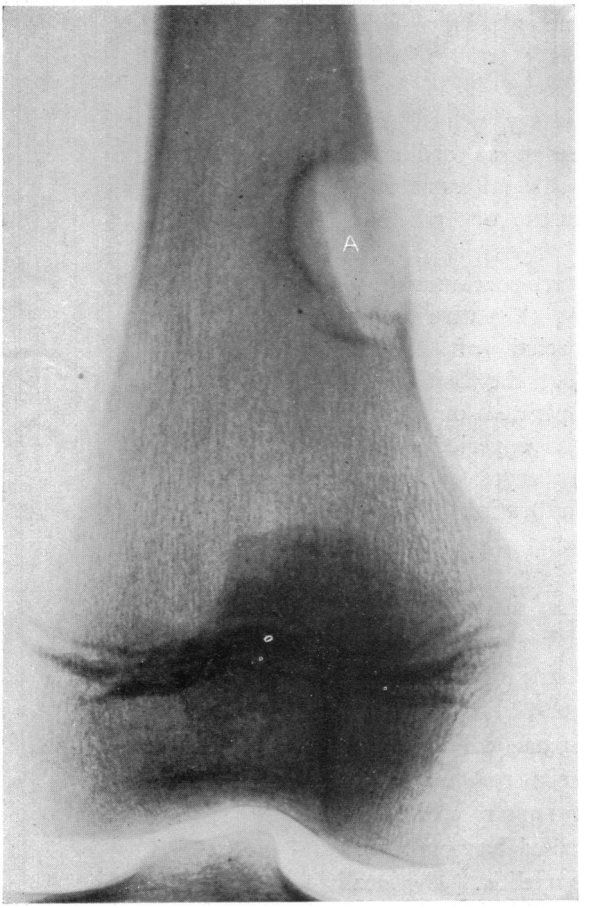

FIG. 15.—Cavity filled with fibrous tissue and surrounded by sclerosed wall.

about it indicative of bony encapsulation. The shaft of the fibula in the involved region was resected subperiosteally. On longitudinal section the segment was found to contain an oblong area filled with grayish-white soft tissue which was surrounded by a dense narrow cortex of bone. (Fig. 18). Mircoscopic examination showed the cavity to be filled with loose white fibrous connective tissue. There was a small amount of blood pigment to be seen but no giant cells or infiltrative cells. Along the bony wall there was an occasional osteoclast producing bone absorption, but in other places newly-formed bony trabeculæ were seen in the fibrous tissue. (Fig. 19.) It is impossible to state when this lesion had developed, but it was apparently in a quiescent state and had it been left alone, would probably have produced no disturbance in the future. Cultures of the soft tissue were made on aërobic and anaërobic blood agar plates, Rosenow's media, deep shake agar tubes and plain broth. They remained sterile.

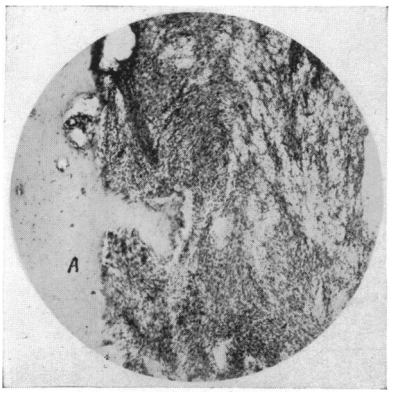

FIG. 16.—Photomicrograph of sclerosed bony wall (A) and of fibrous contents of cavity shown in Fig. 15.

Since we do not know the pathology of the very early stages of these lesions it is impossible to say whether they began as ordinary pyogenic inflammatory processes or whether the changes here observed were continuous throughout the entire progressive period of the lesion. But the fact that those operated on during the active period showed no leucocytic or lymphocytic infiltration favors the latter view. The tissue filling the cavity during the active stage bears some resemblance to that lining the cavity of a bone cyst, and its brown areas containing giant cells resemble giant-cell tumor which Barrie called hæmorrhagic osteomyelitis. The localizing tendency and the sur-

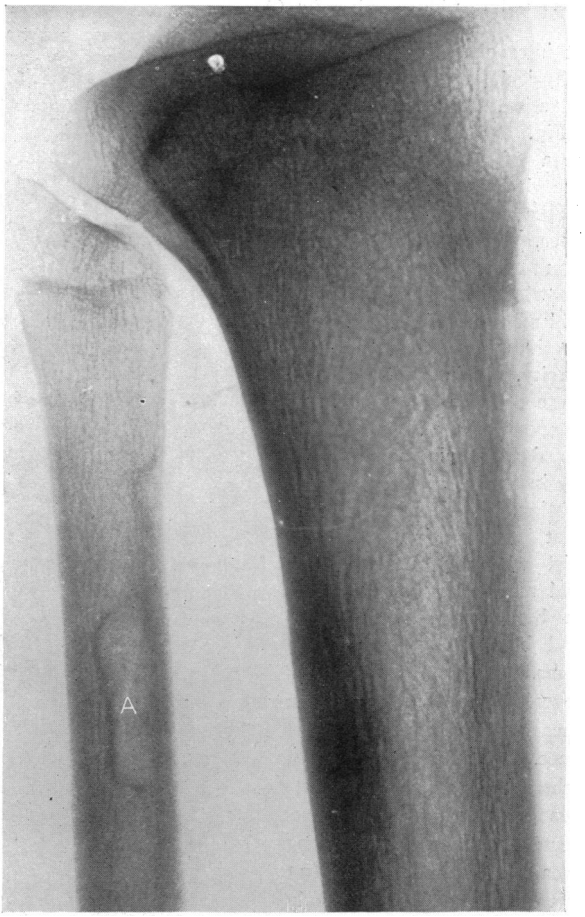

FIG. 17.—Cavity (a) with sclerosed wall in medullary canal of fibula.

rounding osteosclerosis are much less consistent with bone cyst and giant-cell tumor, than with pyogenic osteomyelitis. Osteitis fibrosa cystica may heal by filling out of the cavity with fibrous tissue and subsequent incomplete ossification very similar to the end stage seen in some of these lesions.

The etiology of the eleven cases that have been observed has been very imperfectly investigated. There appeared to be nothing in the histories that had any bearing on the cause except the infected open wound on the leg in the case of involvement of the ilium, which may have been the portal of entry of the microörganism. In four cases no bacteriological examination was made. In two cases staphylococcus aureus grew in the cultures. In the remaining five cases the cultures remained sterile, but in only two were both aërobic and anaërobic cultures made that might have permitted the growth of any form of pyogenic organism. Konjetzny (*Archiv fur Klinische Chirurgie,* vol. cxxi, p. 567, 1922) and Losser (*Deutsche Zeitschr. f. Chir.,* vol. clxxxv, p. 113, 1924) regard so-called brown tumors as the result of hæmorrhage that sets up an active absorptive process within the bone. However, the absence of a history of traumatism and the nature and duration of the changes are entirely inconsistent with an explanation on a purely traumatic basis. Axhausen (*Archiv. f. Klin. Chir.,* vol. cli, p. 72, 1928) has described anæmic infarcts of bone. He believes that in the process of organization of such areas there may be connective tissue invasion of the necrotic field with absorption, hæmorrhage, and cyst formation or fibrous tissue replacement with the establishment of connective tissue islands similar to those observed in some of the cases here described. It is possible that embolism and infarction play a rôle in the production of some of the lesions in this group as the last three described, but bacterial infection must also be present as the clinical manifestations in some cases and pathological changes could not be accounted for on the basis of aseptic necrosis alone.

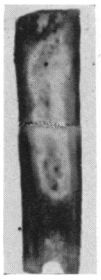

FIG. 18.—Photograph of section of fibula of Fig. 17, showing cavity filled with grayish fibrous tissue and surrounded by a bony cortex.

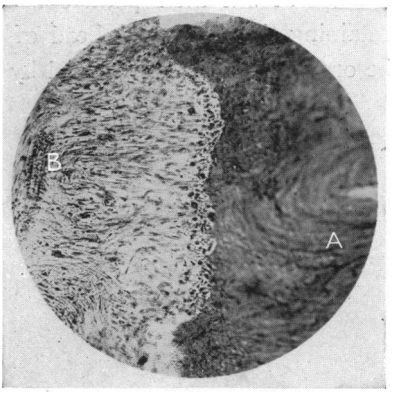

FIG. 19.—Photomicrograph of bony wall (a) and of fibrous contents of cavity (b) shown in Fig. 1.

The most probable explanation of these lesions appears to be that they are produced by organisms of low virulence belonging to the pyogenic group but not setting up the *usual* cytological reaction of pyogenic inflammation. This is rendered more plausible by the fact that streptococcus viridans has

grown in cultures of bone cysts and osteitis deformans and it has been cultivated from inflammatory changes in rheumatism, such as the Aschoff bodies of the heart and the nodules in the skin in which fibroblasts, giant cells, and polyblasts may predominate over leucocytic cells. They constitute a borderline group of lesions which require further investigation from an etiological standpoint but their pathological and clinical characteristics warrant us in retaining them as a sub-head of chronic osteomyelitis. Some of them may be organized infarcts infected by microörganisms of low virulence.