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SOME CASES OF BRODIE'S ABSCESS

BY

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Brodie's abscess or chronic bone abscess may develop, according to Brodie's own description, inside any bone whatsoever of the body, though occurring more frequently in the tibia than in any of the other bones. Brodie has himself given a short report on eight cases. All the patients except one were men between 13 and 34 years of age. The abscesses were in four cases situated in the upper third of the tibia and, in the remaining four cases, in the lower third. The case histories indicate that the duration of the disease had in individual cases ranged from 5 to 18 years.

As a rule, the onset of chronic bone abscess is insidious. The patients complain of recurring attacks of pain, gradually increasing to excruciating agony. The pain is often of boring or burning character, with a feeling as of tension within the bone, e.g. as inner pressure; periodically it becomes nearly unbearable and is frequently most severe at night. Some patients, however, report that the pain is most distressing in the day-time, viz. during work, being alleviated by the night's rest. Attacks of pain extending over 3 to 4 days alternate with painless intervals of some months' duration. During the most acute stages a red, distended, fluctuating swelling, hot to the touch and accompanied by oedema, will be found over the affected part of the extremity. The neighbouring joint is also often swollen without, however, loss of motility. In a few cases superficial cellulitis develops, and sometimes a definite thickening of the bone is observed. Conversely to osteomyelitis proper, no sinuses are formed.

Radiographically, the chronic bone abscess is seen in the diaphysis, viz. frequently in the vicinity of the epiphysial cartilage, appearing as discrete rarefaction extending from the epiphysial cartilage towards the medullary canal. Its outlines are not quite distinct; the lesion, however, is clearly visible, as the adjacent bone shows increased radiopacity. The lesion is often wedge-shaped and may, even as late as after a duration of 5 years, be narrower than 6 millimetres and extend 2.5 centimetres or more from the epiphysial border towards the marrow. The more acute the abscess, the greater the cavity, the less distinctly marked its walls, and the less conspicuous the layer of periosteal new bone. As the process continues, the walls become more sharply delineated and sclerosed.

In one-third of the cases, preceding septic foci can be demonstrated, whereas in others there is a history of tonsillitis, pneumonia or empyema. The duration is generally such a long one that the patient is apt to forget these circumstances. In most cases it is, therefore, impossible to estimate how long the abscess has been present.

Many authors state that measles, scarlet fever or other eruptive fevers have preceded Brodie's abscess, also that, in many cases, the chronic bone abscess developed subsequently to contagious diseases. In some instances typhoid has been established. In the majority of cases *staphylococcus aureus,* as in acute osteomyelitis, is found.

An abscess due to staphylococci will rarely pervade the epiphyseal cartilage. If this happens, as a rule tuberculosis is present. The joint, though periodically exhibiting irritation, is seldom actually infected; yet, after ossification of the epiphysial cartilage, the chronic bone abscess can involve the epiphysis and indeed infect the joint. Periosteal new bone formation is not an essential feature, even if the abscess has been present for several years. In cases, however, where the abscess extends over the greater part of the diaphysis, osseous deposits are generally observed. Sequestration does not occur, except possibly after surgery.

Much less frequently the bone abscess develops within the middle third of the diaphysis and subperiosteally.

Abscesses situated in the middle part of the diaphysis cause a broadening of the latter. In the middle of the bulge a discrete, round or oval cavity is found, surrounded by a thick wall of dense, compact bone apparently obliterating the medullary canal above and beneath the abscess.

If the lesion develops as a localized abscess near the periosteum, a local thickening of the bone will result, due to formation of new bone, in the thickest part of which a sharply-delineated abscess cavity can be seen.

The treatment as a rule is surgery. Expectant treatment may be adopted when dealing with an abscess of recent date, viz. fixation, for instance by encasing the limb for some time in plaster of Paris. The symptoms can then disappear, but in most cases they will return later. Surgical treatment consists in opening the bone and curetting the cavity. The latter usually contains granulations and thin liquid, but, as a rule, no free pus. Drainage of the cavity is sometimes instituted, this generally not being necessary, however. The prognosis is excellent, and healing usually takes place without complications. On the other hand, repeated skiagrams will disclose that the cavity within a bone in which a bone abscess had been evacuated may remain for a considerable time, viz. one, two or three years, indeed even longer. After effective surgical evacuation, the bone lesion can nevertheless disappear within a couple of months, this being so in most instances.

The site incidence of Brodie's abscess is illustrated by *Brailford's* (1938) tabulation of 62 cases.

The site most commonly affected is obviously the tibia, viz. in 38 of the 62 cases, i.e. more than 50 per cent. In but 8 cases, viz. scarcely 13 per cent., the abscess was situated in the femur. Similar figures have been reported by *Henderson* and *Simon*, who in 1924, having collected 200 cases from the literature available at that time, found the tibia being the site of the process in 139 instances.

However, as is known, the disorder is not a very frequent one. In the records of the X-ray Department of St. Göran's Hospital we have since 1930 found 16 cases (Table 2), in 14 of which the tibia was affected.

TABLE 1

Table summarizing the Main Features of 62 Cases of Chronic Abscesses of Bone (42 males; 20 females).

Years:	Age Period at which Abscess was found						
	1—5	6—10	11—15	16—20	21—30	31—40	40+
Number of cases	6	5	19	15	10	5	2
Duration of signs and symptoms at time radiographic evidence was obtained	1 wk to 6 mths	3 mths to 6 mths	3 mths to 5 yrs.	3 yrs. to 11 yrs.	1 yr. to 20 yrs.	1 mth to 30 yrs.	

Site of Primary Bone Focus

Tibia			Femur	Humerus	Ulna	Radius	Fibula
Lower end	Upper end	Mid. third					
29	9	2	8	7	4	2	1

Single focus in bone, 45 cases. Multiple bone foci, 17 cases.

TABLE 2

Cases of Chronic Bone Abscess (Brodie's Abscess) Diagonsed at the X-ray Department of St. Göran's Hospital from 1930 to 1945.

Upper third of tibia	5	
Middle „ „ „	2	
Lower „ „ „	6	
Tibia (situation not specified)	1	
		14
Femur	1	
Humerus	1	
Radius and ulna	0	
Fibula	0	
		2
In all		16 cases

At the Department of Orthopaedics of St. Göran's Hospital, no case of Brodie's abscess had been treated for a considerable period; during the past two years, however, we observed 5 cases, a description of which might be of interest.

Case 1. Man aged 35 (records K. O. 419/44, K. O. 53/45), since September, 1943, suffering from pain in the right leg, viz. in the dorsal part of the thigh immediately underneath the trochanter and radiating downward into the leg below the knee and the foot, both when walking and when at rest. The patient had not had fever nor suffered from contagious diseases.

On examination on December 5th, 1944, tenderness and swelling within

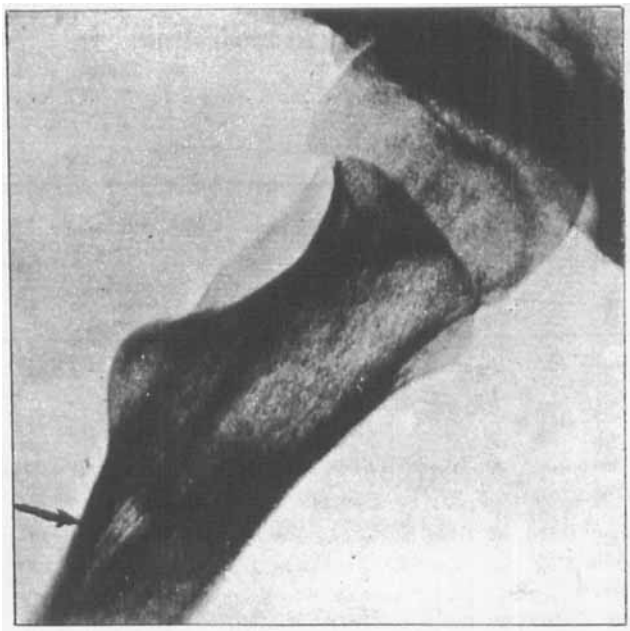

Fig. 1.
The layer of periosteal new bone is not very marked, but the pea-sized rarefaction (on left) is clearly visible.

an area immediately underneath the right greater trochanter were noticed on palpation. The motility of the hip joint was not impaired.

Skiagraphically, there was evidence of subperiosteal new bone formation immediately beneath the greater trochanter, the deposit being c. 1 cm. deep and 7-8 cm. long. In the bone cortex, corresponding to the middle part of the deposit, a round, more radiolucent patch about the size of a pea, with smooth walls, was visible (Fig. 1).

When the bone focus was exposed on December 29th, 1944, the surface of the bone underneath the periosteum was rough and reddened. By drilling multiple holes and cutting the intervening bone bridges with a

chisel, an aperture was made in the outer wall of the femur at the site of the new bone deposit. Thus an area of considerably thickened bone was entered showing, towards the marrow, a cavity about the size of a pea, with smooth walls and containing only a greyish, turbid liquid, a specimen of which was secured. The osseous covering was also forwarded for examination. The wound was closed primarily.

Broth cultures from the fluid showed sparsely-growing staphylococci. The osseous covering consisted of a piece of compact bone with normal lamellar structure, presenting no conspicuous signs of decalcification. In the marrow cavities either fat tissue or fibrous tissue with, in patches, slight chronic infiltration was seen.—The picture may possibly be interpreted as evidencing low grade osteitis, probably only representing the marginal zone of a supposed osteitic focus. No indications of specific inflammation or changes suggesting the formation of cortical osteoid are to be found.

Fig. 2.

In this skiagram the pea-sized focus traversed by the fracture is visible on the right-hand side of the nail. Laterally from the focus the periosteal new bone, now considerably decalcified, can be seen.

The post-operative cours was completely normal. The operation site remained free from irritation. The patient was discharged on January 8th, 1945, having been advised to refrain from athletic and similar exercise.

Afterwards he was repeatedly seen by me, the last time on February 12th, 1945, his condition then being entirely satisfactory.

Despite the warnings received, however, the patient went to the mountains for skiing and, on February 21st, 1945, incurred a fracture of the femur at the site of the operation. The fracture was treated by exposing the bone and inserting a nail into the marrow cavity. At this operation, neither greyish liquid nor pus were found, and the fracture united without complications (Fig. 2).

Case 2. Boy aged 12 (record K. T. 143/45) who, after having sprained his left ankle on July 11th, 1945, in the evening of the following day ran a temperature of 39° C., continuing for three days. At times excruciating pain, during other periods comfortable. Swelling round the ankle and tenderness on palpation, limited to a small area of the anterior aspect mesially and level with the epiphysis. Motility of the ankle joint normal. As the patient, in addition, was tuberculin-positive, there was a strong suggestion of tuberculosis.

The patient had, however, in the previous autumn been inoculated with Calmette-Guérin bacilli, and radiograms of the lungs did not disclose any tuberculous changes. The Gruber-Widal reaction in the blood was negative. The history points rather to septic infection than to tuberculosis. When the skiagrams of the foot were studied, the focus seemed to be situated within the epiphysis, but closer scrutiny of several films taken in another projection revealed the fact that the tibial focus was situated within the diaphysis proximal to the epiphysial border (Fig. 3). Again, tuberculosis, as stated above, usually originates from the epiphysis. The diagnosis therefore must be that of Brodie's abscess, this as a rule developing within the diaphysis and eventually, at a later stage,

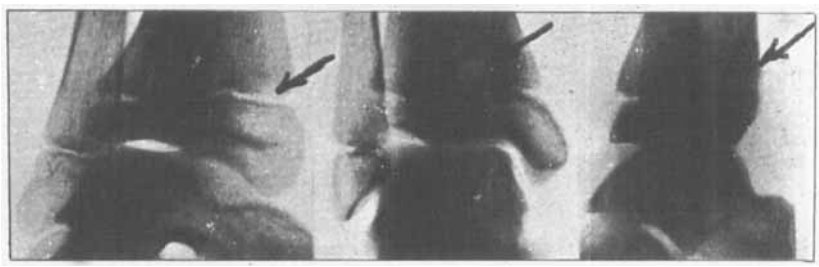

Fig. 3.

being able to pervade the epiphysial border and to spread within the epiphysis. This diagnosis was verified by operation performed on August 17th, 1945, as well as by the histological examination of granulations removed; on November 15th, i.e. about three months after the operation, the patient's father reported that the boy had since made a complete recovery.

Case 3. Boy aged 10 (records K. O. 409/44; K. O. 181/45; K. O. 464/45), seen at the Out-patient Department on November 11th, 1944.

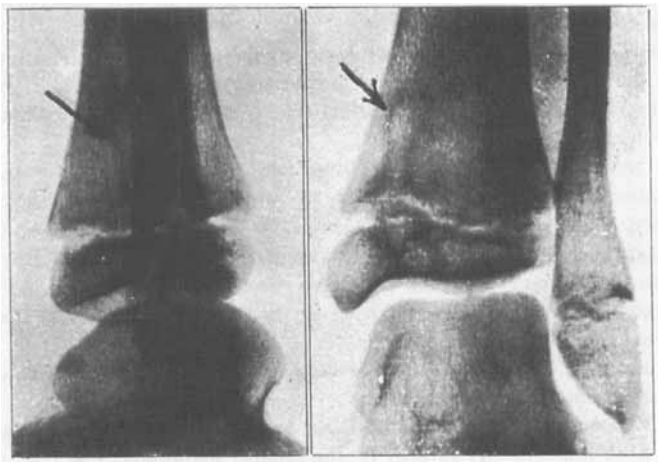

Fig. 4.

The patient had at that ime for more han a week experienced pain in the distal part of the right leg below the knee. The discomfort commenced when the boy jumped over a puddle. During the following night, pain and a swelling extending downward to the right ankle joint developed.— The patient is said to have suffered from so severe a pain in the right ankle joint in the summer of 1944 that he was scarcely able to put his weight on the foot.

Examination on November 30th revealed slight but appreciable swelling of the right ankle joint, the motility of which was not impaired. Moderate tenderness on palpation over the tibial epiphysis immediately above the anterior aspect of the ankle joint. In creased skin temperature round the ankle. Pirquet's reaction, negative.

Radiograms of the right ankle joint did not disclose any injury to the bone. Within the distal portion of the tibial diaphysis as well as in the epiphysis, a longitudinal, wedge-shaped rarefaction was visible, surrounded by slightly sclerotic bone (Fig. 4). Skiagraphically, the left lung showed a calcified primary complex.

As tuberculosis could not be ruled out, the patient was treated by fixation of the ankle joint in a plaster cast encasing the foot and the leg below the knee.

About the middle of December the patient was entirely free from pain. Intracutaneous tuberculin tests with doses of up to 1 mg. were twice negative. Discharged in the middle of February, 1945, wearing a plaster cast and using crutches.

In April, radiograms were made again. By then the previously more radiolucent parts of the bone had undergone sclerosis. All the bones of the foot as well as the lower portions of the tibia and fibula showed marked decalcification. The articular cartilages of the talocrural joint appeared somewhat flattened.

The patient was afterwards kept under observation. The swelling round the ankle joint remained, the patient feeling pain when walking. Motility of the joint somewhat impaired, considerable muscular atrophy of the leg below the knee.

On repeated radiography in November, 1945, it was found that the bone abscess, at least as regards its upper portion, was practically sclerosed. The height of the joint cavity was reduced. Closer scutiny of the skiagrams of the lungs proved the findings formerly considered to indicate a primary complex to have been misinterpreted, the lungs consequently having to be regarded as healthy. Gruber-Widal reaction, negative.

In order to establish a definite diagnosis, it was decided to perform a biopsy from the joint capsule.

On November 14th a curved incision was made on the anterior aspects of the tibia immediately lateral to the medial malleolus. The soft tissues were divided in such a way that the bone, stripped of periosteum, was to a large extent exposed. The bone surface appeared normal. When opened diaphysal to the epiphysial border, the bone did not present an abscess. On extension of the incision in a downward direction, crossing the joint, a defect situated in the medial portion of the epiphysis was noticed, and lateral to the latter, within the soft parts, brownish, discoloured granulation tissue occupying an area the size of a bean. This granulation tissue contained turbid liquid, a specimen of which was secured. The joint capsule was perforated in one place. A specimen was taken from the joint capsule. Primary suture. Fenestrated circular plaster cast.

The patho-anatomical findings were those of non-specific granulation tissue; on cultures from the liquid, growth only resulted in broth, gram-positive cocci being demonstrated.

Case 4. Finnish girl aged 9 (record K. O. 535/45), since the autumn of 1944 complaining of pain in the left leg. For two periods in 1945 the

girl had been hospitalized as diphtheria carrier at the Hospital of Contagious Diseases.

Walks with a slight limp. Conspicuous tenderness on palpation in the upper portion of the left thigh, inward rotation and flexion in the left hip joint slightly impaired.

Skiagrams disclosed a discrete rarefaction about the size of a pea in the left femur, situated near the base of the trochanter and surrounded by sclerotic bone, also, in addition, pronounced sclerosis of the entire intertrochanteric area (Fig. 5).

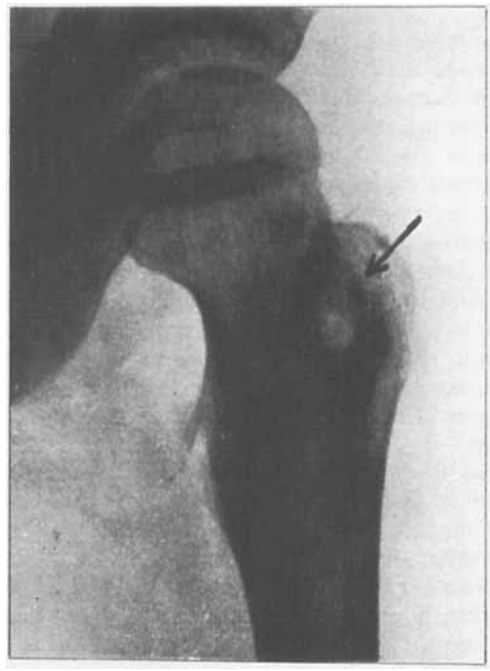

Fig. 5.

Gruber-Widal reactions for typhoid, paratyphoid and undulant fever (Bang), negative.

On operation on December 28th a layer of new bone, c. 3 cm. long and 1½ cm. wide, about 2 mm. in thickness, was found on the anterior surface of the femur immediately below the trochanter and extending towards the collum. When the bone was opened a small, pea-sized cavity surrounded by firm, sclerotic bone was exposed; it did not contain pus or turbid liquid, nor could a conspicuous capsular membrane be discerned.

Parts of the wall were forwarded for examination, and a piece was put into broth for culture, no growth ensuing however.

Histological examination of the removed tissue did not allow a precise diagnosis to be made. Low grade non-specific osteomyelitis had to be taken into account, but certain features of the picture prevented osteitis fibrosa being entirely ruled out.

The clinical course poins unequivocally to Brodie's abscess. After operation the pain subsided completely, and in due course the limp disappeared.

The patient was discharged without symptoms on March 23rd, 1946.

Case 5. Boy aged 1½ (recorded K. O. 78/1946). Healthy, breast-fed infant, apart from some trouble in feeding. At the age of 6-7 months inoculated with Calmette-Guérin bacilli. Whooping cough in September-October 1945. During the last week of November the patient's mother noticed spasms in the left leg near the knee. The child was screaming and did not permit the knee to be touched. After a little while the attack was over but re-occurred about once every week. The attack was over but re-occurred about once every week. The attacks were accompanied by high fever, viz. up to 39° C., abating within one day. In the intervals the child behaved normally, running about as usual.

The patient was admitted to a paediatric hospital, where no pathological changes in the left leg were observed. Motility of the knee joint, normal. X-ray examination disclosed a cavity within the left distal femur metaphysis. Tuberculin tests, negative. Referred to orthopaedist for examination.

On admission to St. Göran's Hospital on January 30th, 1946, there was no tenderness, and the motility of the left knee was unimpaired. No swelling of the soft tissues.

Radiographically, a fairly oblong, discrete rarefaction surrounded by markedly sclerotic bone was found within the distal end of the femur diaphysis. Dorsally a smallish erosion of the cortical bone was visible. On the dorsal surface, not very conspicuous formation of periosteal new bone.—The X-ray findings suggest an osteitic bone abscess within the distal part of the left femur diaphysis (Fig. 6).

When, on curetting the cavity on January 30th, 1946, the bone was stripped of periosteum, the thin, compact wall being opened, a delicate, cyst-like sac was detected. As this was incised, purulent liquid welled forth, and the curet entered a cavity about the size of a bean, containing pus and a small, pea-sized sequestrum, which was extracted. The pus was diluted with broth, and agar tubes inoculated with this mixture were were forwarded for bacteriological analysis. The sequestrum was sent to a pathologist for histological examination. The cavity was dusted with micro-crystalline sulfathiazole. Cramer's splint for thigh, leg and foot.

Gram-stained smears did not show bacteria; in cultures, however, growth of staphylococcus aureus ensued.

The post-operative course was made complicated by slight purulent discharge from the wound. The patient has now completely recovered.

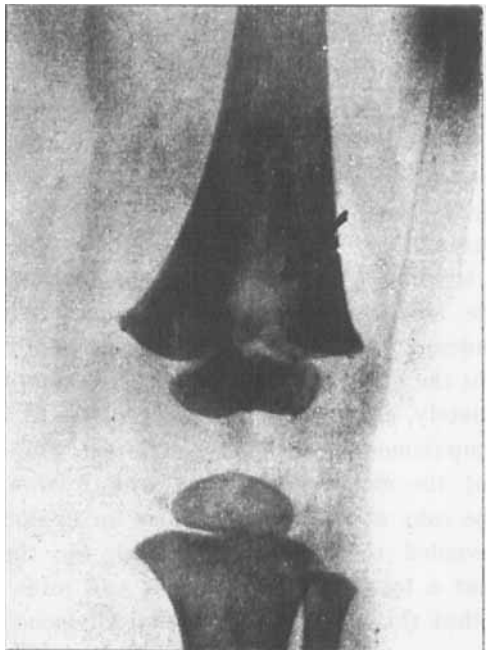

Fig. 6.

Of the five cases described the first is a typical instance of Brodie's abscess, evidencing the low grade virulence of the bacteria, as healing by first intention took place not only after the first, but also after the more injuring second operation for fracture.

The second case proves that a very careful study of the skiagrams is essential, especially as regards the situation of the focus relative to the epiphysial border; furthermore, that close attention must be paid to the influence of radiographic projection. In some of the films the focus may seem to be situated within the epiphysis; however, when radiograms are made in another projection, it will emerge that the actual site of the

lesion is he diaphysis. Such evidence can settle the diagnosis as well as the indication for treatment, and is highly material for the later course of the disease. In a case of Brodie's abscess, surgery will be adopted, resulting in a rapid cure and freedom from symptoms. On the other hand, when we are dealing with tuberculosis, the course of illness is generally more prolonged, especially if the joint is involved.

In the third case, the diagnosis was initially less clear, especially in view of the pulmonary findings, the tuberculin reaction and the skiagrams. The pulmonary findings and the radiographic appearance of the foot suggested tuberculosis, but the negative Mantoux test went against this conception. At first, conservative treatment seemed to induce healing of the bone focus. In the skiagrams, however, the articular cartillages showed a tendency towards flattening, this pointing to tuberculosis. As, on the other hand, the subjective symptoms did not subside completely, also the swelling round the ankle joint and a moderate impairment of motility remained, and furthermore, on account of the negative Mantoux test, it was deemed advisable for the sake of safety to perform an exploratory operation. This revealed that the abscess had, for the most part, healed but that a focus in the epiphysis and joint capsule still existed, and that this focus contained staphylococci.

Subsequent to operation the temperature was normal, the patient not complaining of pain .

It is quite obvious that cases of bone abscess in the vicinity of the ankle joint require very careful and critical examination, and that every possibility must be utilized to obtain a securely established diagnosis and to avoid delay in treatment. In order to gain full certainty as to the diagnosis, the presence of bacteria in the abscess must be demonstrated. If the diagnosis proves to be Brodie's abscess, the focus must be evacuated as soon as feasible. The prognosis is good.

The remaining cases are also of interest. Case 4 shows that the histological differential diagnosis as against osteitis fibrosa may sometimes be a rather difficult matter. The findings on operation and the clinical course of this case, however, pointed

quite definitely to Brodie's abscess. Case 5 is highly interesting as regards the history. Short attacks of severe pain continuing for one or two days, pain and impaired motility of the adjacent joint as well as long intervals of complete freedom from pain, are typical of Brodie's abscess.

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