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TUBERCULOUS OSTEOMYELITIS OF THE GREATER TROCHANTER

By

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Teale appears to have been the first to describe tuberculous osteomyelitis of the greater trochanter (1870). Since then, a number of reports on the subject have been published, including a comprehensive study by the Scandinavian investigator, *Ivar Alvik*. Among a large number of tuberculous bone diseases the incidence of this condition seems to be roughly 2 per cent.

During the period from 1937 to 1949, 17 patients were treated for this disease in Juelsminde Hospital for Surgical Treatment of Tuberculosis, which is run by the Danish National Association for the Fight against Tuberculosis.

The ages of the patients ranged from 4 to 47 years; four were under 20, five between 20 and 29, six between 30 and 39, and two were over 40 years of age. According to the literature the age group between 20 and 30 years seems to have the highest incidence. In the present series, which consisted of 12 men and 5 women, either side was equally frequently involved, eight cases being localized on the right and nine on the left side.

The most frequent symptoms are obviously pain, tenderness and swelling of the affected region, and limping. Owing to the tenderness, limitation of active movements of the hip joints is often encountered, whereas the range of passive motion is normal. Later in the course an abscess develops, possibly followed by sinus formation. Moderate muscular atrophy is often observed, and a transitory rise of the temperature is not uncommon.

In 13 of the 17 patients, pain and tenderness were the initial symptoms, accompanied by swelling in 10 cases and by moderately elevated temperature in 10 cases. Only four patients had had a limp.

In all the patients an abscess developed, in 16 cases followed by sinus formation. In two patients muscular atrophy measured 5 cm, in seven 1–2 cm, and in seven patients no muscular wasting was present.

The etiology seemed unquestionable in 15 of the 17 cases; in 14 patients tubercle bacilli from the focus were demonstrated, and in one patient tuberculous granulation tissue was revealed by histologic examination. The remaining two cases were patients with other

Fig. 1.
40-year-old man, hazelnut-sized, cystic area of rarefaction downwards in the trochanter before the operation. In the negative film the lateral demarcation of the cyst was distinctly seen. After the operation only a a superficial defect persisted.

tuberculous manifestations. The Mantoux reaction was positive in all cases. Whenever possible, discharge should invariably be examined for tubercle bacilli and pathologic tissue be subjected to a histologic examination in order to establish whether or not a suspected affection is of a tuberculous nature. In the series under consideration, samples of discharge were examined in 15 cases, and in 12 of these tubercle bacilli were demonstrated. In 9 cases biopsy was performed; in eight of these tuberculosis was revealed. Finally, in five cases out of six, the presence of tubercle bacilli was revealed in cultures from granulation tissue.

Histologic and bacteriologic examinations supplement each other. Thus, it may be mentioned that in one case in which the presence of tubercle bacilli could not be demonstrated in cultures from discharge or granulation tissue, the histologic examination revealed typical granulation tissue, and in another case in which tuberculosis could not be demonstrated histologically, tubercle bacilli were revealed

Fig. 2. *Fig. 3.* *Fig. 4.*

Fig. 2.—31-year-old woman, superficial defect of the trochanter with slight sclerosis and small erosions. The patient had repeatedly been subjected to osteotomy.

Fig. 3.—Same patient as in fig. 2, fistulography before the resection.

Fig. 4.—Same patient as in fig. 2, the tip of the trochanter resected. A pea-sized zone of rarefaction in the middle of the trochanter and proximal to it a pea-sized calcification are seen.

in cultures from granulation tissue. In a third case, tubercle bacilli were found in cultures from granulation tissue but not from discharge.

The type of the tubercle bacilli was determined in 12 cases; in 10 cases human and in 2 cases bovine strains were found.

Hans Thomsen and his pupils have in numerous papers and lectures emphasized that any patient with extrapulmonary tuberculosis should be subjected to routine roentgen examination of (1) the cervical region, (2) the chest, and (3) the abdomen, with a view to disclosure of calcifications in the *lymph node component of the primary complex.*

Usually, there are only three ways of entrance to the body for the tubercle bacillus, viz., the lymphoid tissue of the tonsils, bronchioles, and the intestine, and in the regional lymph nodes of these three entrances the primary tuberculous infection very often deposits calcifications, which follow the individual throughout life and may easily be found by the aforementioned routine roentgen examination and thus reveal where the bacilli first gained entry to the body.

Entry through the conjunctiva or other mucous membranes is extremely rare; in this hospital we have found only one patient who had been infected through the conjunctiva.

The table presented here shows the results of the roentgen examination of the 17 patients with a special view to the disclosure of the route of entrance.

Roentgen examination of					
Chest (16 cases)		Abdomen (11 cases)		Cervical region (9 cases)	
	No. of cases		No. of cases		No. of cases
Calcifications in the hilus	7				
Calcifications in the apex	1				
Pulmonary tuberculosis	2	Nothing abnormal	10	Nothing abnormal	8
Previous pulmonary tuberculosis	1				
Pleurisy	1				
Dense hilar shadows	2				
Old primary complex	1			Calcifications	1
Nothing abnormal	1	Calcifications	1		
No roentgen examination	1	No roentgen examination	6	No roentgen examination	8
Total	17	Total	17	Total	17

It is seen that in 9 cases remnants of the primary complex in the lungs were demonstrated, while 4 cases showed more or less active tuberculous processes in the pulmonary tissue, which makes it likely that in the latter cases also the tubercle bacilli had gained entry through the lungs. Calcifications in the abdomen and the cervical region were found in one case each. The only patient with calcified cervical lymph nodes also revealed remnants of a primary complex in the lungs, which shows that there may be several routes of entrance; this assumption is also supported by the facts that the only patient with calcified abdominal lymph nodes gave a history of cervical adenitis, and that tuberculosis of the tonsils was disclosed in another patient with calcified hilar lymph nodes.

As it is only during recent years that we have subjected the patients to a systematic roentgen examination with a view to the disclosure of the route of entrance, this examination has not been carried out in all cases. So, in one patient none of the three examinations had been made; among the remaining 16 patients there were only two cases in which the route of entrance could not be disclosed.

Spread of tuberculosis to the trochanter may occur either through the blood stream or by propagation from (1) tuberculous abscesses of the hip joint, the sacro-iliac joint, the sacrum, and the lumbosacral or lumbar segments of the spine, or from (2) tuberculous bursitis.

Comments on (1): In none of the cases presented here did the

trochanteric tuberculosis originate from infection from such abscesses, and only a few cases of this nature have been reported in the literature. It should be expected that trochanteric tuberculosis may often arise through infection from abscesses of the hip joint, but neither in this case material nor among *Alvik*'s 36 patients were any such cases encountered. However, *Melton* reported 5 cases and *Sassen* one case with this pathogenesis. (Spread in the reverse order, from the

Fig. 5.
Same patient as in fig. 2, after sequestrectomy. The surface is more regular. A distinct zone of rarefaction in the centre of the trochanter; the calcification upwards in the soft parts more distinct.

trochanter to the hip joint, is even more uncommon; yet, *Alvik* reported 3 cases of this type).

Trochanteric tuberculosis originating from infection from gravitation abscesses of the spine is of somewhat more common occurrence; thus, *Alvik* had 7 cases among his patients. In these cases, particularly piriformis abscesses are of importance because the piriformis muscle is inserted into the greater trochanter, whereas psoas abscesses play a minor role since this muscle is inserted into the lesser trochanter, in which tuberculosis is of uncommon occurrence, although one such case was reported by *Melton*.

Comments on (2): Several bursae are found in the trochanteric region. Tuberculosis of one of these bursae will usually spread to the trochanter, and vice versa. There is considerable diversity of opinion as to whether the affection begins in the trochanter or the bursa, but most writers, including *Melton, Sassen* and others, agree that this is primarily of academic interest, as generally both the bone and the bursa ultimately become involved, and as both should be treated in

the same way. *Alvik* reports 3 cases with bone affection without involvement of bursae, but he expresses the view that most cases of tuberculosis of the greater trochanter occur through infection from a tuberculous bursitis. Also *McMurray* believes that most cases of tuberculosis of the greater trochanter arise by infection from the overlying bursa. *Marique* and *Stracker* claim that the disease most frequently initiates in the bone.

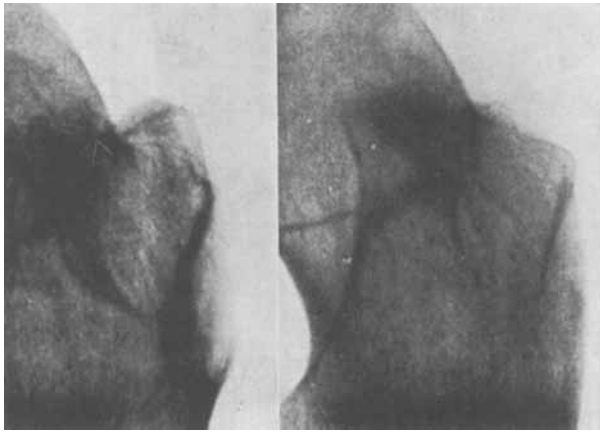

Fig. 6. *Fig. 7.*

Fig. 6.—17-year-old man, irregular surface of the trochanter with sequestra above it. The patient had repeatedly been treated with incision and curettage of bony tissue in another hospital.

Fig. 7.—Same patient as in fig. 6, after excision of the bursa, osteotomy and sequestrectomy 6 years previously and renewed sequestrectomy 3 years previously. The surface is now only slightly irregular.

In my opinion, tuberculosis of the trochanteric region most frequently originates in the greater trochanter, from which it may then spread to the bursa. The many cases of encysted foci beneath the surface of the bone reported in the literature and observed in my own series are in favor of this assumption (vide infra).

The number of cases in my series which started in the bursa cannot be decided. In 6 cases the first roentgenograms did not reveal any abnormalities, but this may be due to the limitations with which a roentgen examination is beset. Thus, in three of these cases operation revealed involvement of the bone as well as a well-demarcated abscess in a bursa. *Meyerding* reported two cases in which a bone affection found at operation had not been disclosed in the roentgenograms.

In order to estimate the length of the time interval between the

primary infection and the occurrence of tuberculosis of the greater trochanter, the patients were questioned and examined with a view to pleurisy, adenitis and erythema nodosum, as these affections usually occur in close relation to the primary infection.

In three cases the patients had pleurisy 1, 1, and 3 years, respectively, before the onset of trochanteric tuberculosis, and in one case pleurisy developed 1 year after.

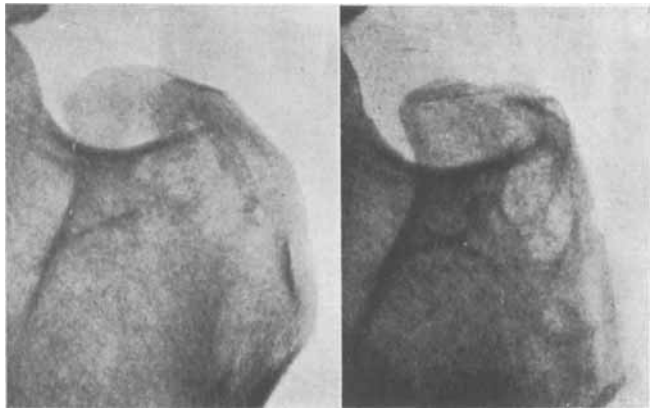

Fig. 8. *Fig. 9.*

Fig. 8.—30-year-old man, the bony pattern is irregular with osteoporosis and small rarified areas, before resection. The disease had started 2 months previously.

Fig. 9.—Same patient as in fig. 8, after resection. Several hazelnut-sized, fairly well-defined defects are seen.

Only one patient had had erythema nodosum; it developed 4 years before the onset of trochanteric tuberculosis; it was the same patient who had pleurisy 3 years before the development of trochanteric tuberculosis.

Three patients had cervical adenitis 14, 13, and 4 years, respectively, before the onset of trochanteric tuberculosis.

Although limited in number, these cases show that a time interval ranging from less than one to several years may elapse between the primary infection and the involvement of the trochanter.

In cases with a long interval between the primary infection and the trochanteric tuberculosis it cannot, with certainty, be said at which time the spread to the trochanter occurs, but it may be either (I) early or (II) late.

I. *Early spread:* The tuberculous bacillemia demonstrated in association with the primary infection may give rise to a latent trochan-

teric focus, which may subsequently be activated in case of reduced resistance (poor nutrition, other infections, etc.) or by trauma. Concerning these problems the reader is referred to *Hans Thomsen,* "Knogle-ledtuberkulose og traume", in which it is concluded:–

(1) There is no real evidence, either in the literature or in the limited Danish material, in support of the very prevalent opinion that blunt traumas should favor the localization of tuberculosis in the bone and joint system.

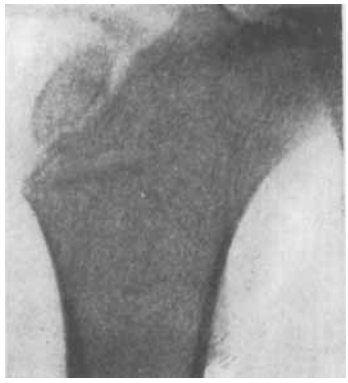

Fig. 10.
4-year-old girl, nothing abnormal;
8 months after onset of symptoms and after puncture.

(2) The old tenet of the production by the trauma of a *locus minoris resistentiae* is a purely speculative, theoretical product and has never been substantiated by any facts.

(3) It has never been proved that latent bone foci may exist for any prolonged time; at most, they can only be presumed to be of extremely rare occurrence.

(4) The general course of bone or joint tuberculosis usually remains unaffected after a blunt trauma; when the reaction (which the trauma would also cause in a previously unaffected extremity) has subsided, the curve of disease reverts to the form which the majority of these affections "spontaneously" assume.

II. *Late spread* should occur from a more or less active, secondary focus in one of the two ways described above. According to what has already been said, late spread must be considered more likely, since any failure to demonstrate other tuberculous foci may be due to shortcomings of the ordinary methods of examination.

Most investigators attach greater or smaller importance to *a trauma* in the development of trochanteric tuberculosis. Thus, *Alvik* reported

that seven of his 36 patients gave a history of trauma; *Melton* found a trauma in 23 per cent of his cases, and also *Pacini* attributed importance to a trauma in the past history. However, the trochanteric region is very liable to injury, and hence it is only natural that most patients give a history of trauma, and in their consciousness it may easily become aggravated, especially because the importance of a trauma in the development of tuberculosis of bones and joints is still partially recognized in a claim for compensation.–Five of the patients in the present series gave a history of trauma, in one case sustained to the middle of the thigh 5 years previously, in the remaining cases sustained to the trochanter 5 years, 6 months, 3 months, and 2 months before the onset of the trochanteric tuberculosis.

Other tuberculous foci: In patients with tuberculosis several organs will often become involved. Thus, in tuberculosis of the greater trochanter, many foci, which have developed before, after, and simultaneously with the trochanteric tuberculosis, will be found in addition to the primary complex.

In *Alvik*'s series, 23 of his 36 patients had other tuberculous foci (eight of them in the spine); *McMurray* found 42 per cent, *Melton* 50 per cent, *Pacini* 50 per cent, and *Meyerding* 21 per cent with other forms of tuberculosis of bone and 10 per cent with tuberculosis of the urinary tract.

In the present series other foci were distributed with regard to time and site as follows:–

	Before	After	Co-existent
Hips			1
Spine	3	2	
Sacro-iliac joint		1	1
Feet	1	1	
Pelvis		1	
Upper extremities	2		
Ribs		1	
Parietal bone		1	
Tonsils		1	
Urogenital system	2	2	
Pulmonary tuberculosis	2	1	
Pleurisy	3	1	

The figures in the table indicate the number of patients with a focus at the site stated. In 4 patients only a secondary focus in the trochanter could be demonstrated, whereas 4 patients had one additional focus and 9 patients several foci.

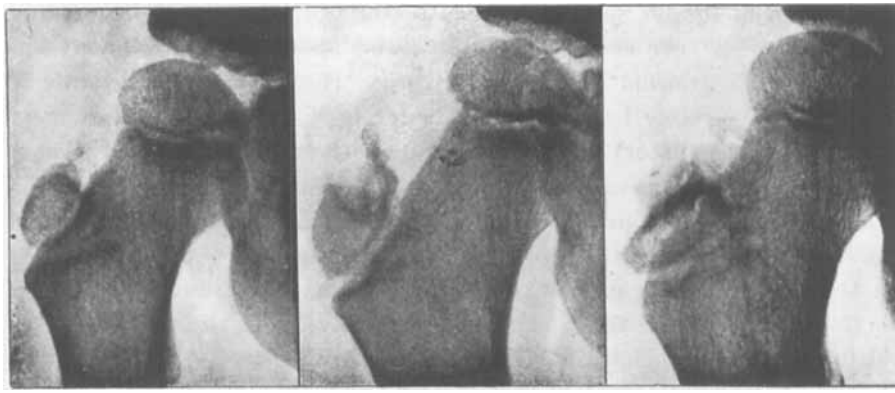

Fig. 11. *Fig. 12.* *Fig. 13.*

Fig. 11.—Same patient as in fig. 10, 6 months later.
The upper surface of the trochanter irregular-no further treatment had been given.
Fig. 12.—Same patient as in fig. 11, 12 months later; just before osteotomy.
Hazelnut-sized superficial destruction at the tip of the trochanter.
Fig. 13.—Same patient as in fig. 12, 18 months after osteotomy.
Irregular new bone formation at the trochanter.

Concerning the *patho-anatomical* picture the reader is referred to *Stracker*'s paper, but it must be emphasized that the reason why the function of the affected extremity is not impaired after the passing-off of the acute attack is that the trochanteric abscesses are circumscribed, so that they do not essentially affect the insertions of the tendons; this applies notably to the gluteus medius muscle, which is inserted into the greater trochanter and is of great importance for the stabilization of the body.

Roentgen examination revealed pea to hazelnut-sized, well-defined areas of rarefaction in the trochanter in 9 patients (see figs. 1, 12, 14, and 15). In 5 cases the outer margin was irregular, and nothing abnormal was found in 3 cases, although two of them showed calcifications in the soft parts.

The negative radiological findings in these 3 cases do not rule out the possibility of trochanteric tuberculosis, because the failure to demonstrate positive findings may, as *Melton* pointed out, be due either to the relatively coarse roentgen technique as compared with the fine changes or to inadequate technique, e.g., the failure to employ several planes, tomography, and stereoscopic examination. Thus, *Meyerding* found changes at operation in two cases in which the roentgenograms had been negative. In the 3 cases of the present series with negative radiological findings operation did not reveal anything abnormal

either, but the intervention consisted only of puncture in two cases and of puncture and incision in the third.

Of other writers, *Alvik* found periosteal ossification as the initial radiological sign. *Meyerding* found radiological changes in 15 of his 19 cases, viz., an area of destruction along the outer margin of the trochanter. *McMurray* found superficial erosion in 5 cases, a cyst in the marrow in 1 case and nothing abnormal in 5 cases.

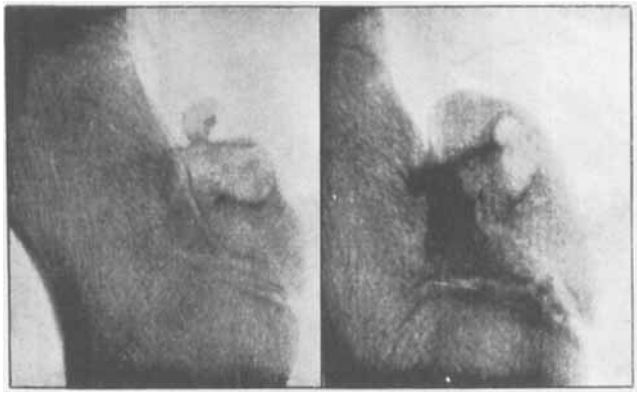

Fig. 14. *Fig. 15.*

Fig. 14.—11-year-old boy, hazelnut-sized, superficial rarefaction upwards in the trochanter; roentgenogram taken 3 months after the onset of symptoms and 1 month after incision, at which no denuded bone was found.

Fig. 15.—Same patient as in fig. 14, large rarefaction in the tip of the trochanter; no further treatment given; by now symptom-free for 12 months.

Examples of typical changes disclosed in the present series are shown in the illustrations.

In *the radiological differential diagnosis* the following conditions must be considered:

(I) Chronic or subacute unspecific osteomyelitis, including post-typhoid conditions.

(II) Osteochondrosis.

(III) Benign tumors, such as osteoma, chondroma and osteitis fibrosa cystica.

(IV) Malignant tumors, such as osteogenic sarcoma, Ewing's sarcoma and carcinoma metastases.

(V) More uncommon conditions, such as echinococcus cysts, gumma, myositis and xanthomatosis.

Comments on differential diagnosis: (I) In unspecific osteomyelitis the pathologic process will rarely be isolated to the trochanter but it

may be involved in the process. As contrasted with trochanteric tuberculosis, this disease gives rise to marked formation of new bone, notably a marked periosteal reaction and formation of large, elongated sequestra. In this hospital we have seen one patient with a hazelnut-sized cystic area of lessened density in the femur at the level of the trochanter; histologic examination showed chronic unspecific inflammation.

Fig. 16.
10-year-old girl with necrosis of the apophysis; a defect, the size of half a pea, is seen upwards in the trochanter.

(II) Osteochondrosis (aseptic necrosis or apophysitis) is very rarely localized to this region. However, we have had one patient with this localization; however, the roentgenogram revealed structural changes in the entire trochanteric apophysis, see fig. 16.

(III) Osteoma or exostosis has one of its sites of predilection in the upper end of the femur. It may be mistaken for the form of trochanteric tuberculosis in which extraperiosteal formation of new bone is predominant, but the bone structure is normal in osteoma, although there may be a superficial defect in case of an osteochondroma. Moreover, an osteoma has a broad-based attachment to the bone.

Osteitis fibrosa cystica localisata, which likewise has one of its sites of predilection in the upper end of the femur, may present pictures resembling the cystic areas of rarefaction seen in trochanteric tuberculosis; this applies notably to the extremely rare form with multiple cysts, but osteitis fibrosa will usually be situated in the femur itself and may then involve the trochanter; it is also characterized by an irregular trabecular structure with thinning of the cortex, often accompanied by spontaneous fracture, and by the absence of periosteal

reaction. We have had one patient with a walnut-sized area of rarefaction in the trochanter; histologically, the condition proved to be osteodystrophia fibrosa. *Bloodgood* reported two cases and *Johannesen* one of osteitis fibrosa of the trochanter which resembled tuberculosis (cited by *Melton*).

Chondroma or enchondroma is of rare occurrence in this region, but if present, it may be mistaken for the encysted form of trochanteric tuberculosis. If such a mistake is suspected, the hands and feet of the patient must be examined roentgenologically for chondromatous changes.

(IV) Osteogenic sarcoma is most frequently located to the knee joint, but may also be found in the upper end of the femur. Both in the osteolytic and osteoplastic forms the changes are considerably more pronounced than is usually the case in tuberculosis, and typical spicules may be present. At the Surgical Department of the County Hospital, Rønne, I saw a patient with so pronounced changes of the trochanter that a diagnosis of sarcoma was made, but a histologic examination showed tuberculosis. *Keith* reported a similar case.

Ewing's sarcoma is very frequently situated in the upper end of the femur. The changes are very pronounced and abundant new periosteal formation is present. For diagnostic purposes, advantage may be taken of the radiosensitivity of Ewing's sarcoma.

Finally, here as in other bones, metastases from a carcinoma should be considered, notably from cancer of the breast or the prostate, hypernephroma, or struma maligna.

(V) Echinococcus cysts, which are extremely rare in this country, may resemble the encysted form of trochanteric tuberculosis.

Gumma will very rarely show this localization and, usually, multiple changes are present.

Myositis occificans may resemble the cases of trochanteric tuberculosis in which formation of new bone occurs in the vicinity of the trochanter, but its clinical course differs essentially from that of tuberculosis.

Gaucher's disease may also present cystic areas of rarefaction, but the more widespread localization to the entire femur and the absence of formation of new bone will rule out tuberculosis.

Symptomatically, the following conditions may also give rise to differential diagnostic considerations: Coxitis, muscular necrosis, myositis, tuberculosis of muscles, actinomycosis, sinuses due to the presence of foreign bodies, injection necrosis, lymphatic sinuses, and paranephritic abscess.

Particularly, tuberculous coxitis requires differentiation. However,

in trochanteric tuberculosis good passive mobility and, in many cases, also good active mobility are present, and a roentgenogram will reveal the localization.

In the other conditions mentioned, roentgen examination and cultures of discharge from sinuses, if any, will in most cases lead to the proper diagnosis.

Operative treatment was employed in all 17 cases.

In 5 cases puncture was the only surgical intervention. These patients (all adults) did not differ from the remainder. In one of them, a discharging sinus has persisted for about 20 years; in 1938 this patient was hospitalized here for a couple of days for examination, but since that time he has not been seen. The remaining 4 patients are symptom-free. In these patients, a sinus had persisted for 4 years, 12 months, 6 months, and 5 months, respectively. In all cases, the sinus had developed in relation to the first puncture and persisted for several months after the last puncture. In one patient a new sinus developed 15 years after the procedure.

In 4 cases incision was done; two of these had first been punctured and one was punctured after the incision. In all four, sinuses formed; they persisted for 1 month, 6 months plus periodically for 4 years, 18 months plus periodically for 12 months, and 2 years, respectively. All the sinuses developed in relation to the first intervention, and in three of the cases they persisted for several months after the last intervention. All these patients are symptom-free.

In 5 cases resection or osteotomy was performed. Two of them had previously been incised and two punctured. Four of these patients were subjected to radical operation only once, whereas the fifth had undergone four resections (in other hospitals), followed by sequestrectomy performed in this hospital 5 years later. After the last operation an almost constantly discharging sinus, which had persisted for 11 years, healed. The remaining patients had had sinuses for 12 months, 4 months, and two for 2 years. The sinuses formed in relation to the first puncture and persisted in three of the patients up to the radical operation, while the fourth patient had serous discharge for 6 months after the operation.

In 3 cases the principal operation was excision of the trochanteric bursa. In two of these patients, incision had been carried out repeatedly before the excision, and one patient had been punctured 32 years previously. Four years later one of these patients underwent sequestrectomy.–One of these patients had no sinus, whereas the two others had had a sinus for 2 and 6 years, respectively; in both cases it healed about two months after the last operation.

Alvik performed resection of the trochanter in 24 cases and excision of the focus without radical resection in 12 cases. *Melton* stated that conservative therapy may lead to recovery but advocated operative treatment as the surest and most rapid road to recovery. *Pacini* recommended conservative measures in children and operative treatment in adults.

From the cases reported here the following conclusions may be drawn with regard to treatment: –

In all cases, in adults as well as in children, operative treatment should be employed, and the extent of the intervention should be independent of the age of the patient. Freedom from symptoms may in many cases be achieved by one or more punctures or incisions, but the surest and most rapid road to recovery is radical operation with removal of all affected tissue, so that sinus formation and the attendant mixed infection are avoided.

Antibiotic therapy was used only in a few cases, since most of the patients were treated before the introduction of antibiotics and chemotherapy. The series is therefore too small for conclusions concerning the importance of chemotherapy, but the methods of treatment must be similar to those used in other forms of extrapulmonary tuberculosis, viz.: –

(1) If a tuberculous etiology is unquestionable and streptomycin is indicated, this therapy should be instituted at once. After the termination of the treatment material containing tubercle bacilli should be submitted for determination of the resistance to streptomycin.

(2) In case of mixed infection the resistance of the bacterial strains to various chemotherapeutic agents and antibiotics should first be examined, and the method of treatment be adapted according to the result.

(3) In most cases antibiotics must be considered only a supplement to the principal treatment, i.e., surgical removal of the focus.

Thirteen patients were examined for mixed infection, which was found to be present in 11 cases.

The time interval between *the onset of symptoms and the institution of treatment* was usually one to two months; however, in four cases 2 years and in one case 15 years had elapsed, but these five cases represented relapses after spontaneous healing following the onset of symptoms.

The duration of the disease ranged from 9 months to 33 years. In two patients with durations of 33 and 15 years, respectively, freedom from symptoms had been experienced in the meantime. In the afore-

mentioned patient who was admitted to this hospital for a few days for examination in 1938, a sinus has been present for 20 years. In two cases the disease persisted intermittently for 9 and 16 years, respectively, while symptoms had been present for periods ranging from 9 months to 4 years in the remaining cases.

Follow-up examination: The patients were either seen personally or contacted by letter. All the patients are alive.

The patient who still has serous discharge has been referred to hospital treatment by his physician because of partial incapacity.

The patient who also suffered from coxitis has an ankylotic hip. He has been granted a disability pension, which he supplements by plaiting door-mats.

The remaining 15 patients have returned to regular work. Of these, one (a fisherman) cannot stand hard work, and another (a farmer) cannot walk on uneven ground.

Two patients have slight discharge from a sinus in the trochanteric region, the remaining 14 have well-healed scars.

Three patients have periodical, slight pain in the trochanteric region; the others are completely free of pain.

The length of the observation period varies from 12 to 5 years in 3 cases, from 5 to 2 years in 7 cases, and from 2 to 1 year in 7 cases.

CONCLUSIONS

1. The disease may occur at any period of life, at least down to 4 years of age.

2. An abscess will develop in all cases, most commonly followed by sinus formation.

3. In order to prove or disprove the tuberculous nature of a suspected trochanteric affection, tissue or discharge should be submitted for bacteriologic and histologic examinations.

4. Roentgenograms of the lungs, the cervical region, and the abdomen will in most cases reveal remnants of the primary complex.

5. Spread of tuberculosis to the trochanteric region may occur either through the blood stream or by infection from a gravitation abscess from neighboring foci, notably of the hip joint, the sacro-iliac joint and the lumbar spine, of which particularly piriformis abscesses are important. A tuberculous coxitis will rarely spread to the trochanter, and infection in the reverse order is still more uncommon.

6. Several years may elapse between the passing-off of the primary tuberculous infection and the onset of the trochanteric tuberculosis.

7. No importance can be attached to traumas in the development of trochanteric tuberculosis.

8. It is believed that spread of tubercle bacilli to the trochanter occurs in close relation to the onset of symptoms.

9. Trochanteric tuberculosis will usually involve one of the adjacent bursae, and vice versa. Hence, it is without importance in which of these two sites the tuberculosis starts, but it is believed that in most cases the trochanter is the primary site of infection. This assumption is also supported by the fact that cystic areas of rarefaction in the trochanter were found in 9 cases of the present series. Moreover, affection of the bone cannot be ruled out by a negative roentgen finding, since this method of examination is beset with certain limitations.

10. Trochanteric abscesses are well-demarcated, so that they are without importance for the subsequent function of the extremity.

11. Trochanteric tuberculosis may be mistaken for a variety of other lesions, among which particularly malignant tumors should be considered.

12. The treatment of choice is surgical, and the surgeon must carefully remove all affected tissue to avoid the tendency to sinus formation. Accordingly, radical operation provides the safest and most rapid road to recovery, also in children. The introduction of streptomycin may possibly cause more conservative methods of treatment to be employed, but this cannot be decided on the basis of the present limited series.

13. Normally, the patient may be restored to full working capacity within less than 12 months.

SUMMARY

Seventeen cases of tuberculosis of the greater trochanter are reported. The ages of the patients ranged from 4 to 47 years. The symptoms were pain, tenderness, swelling, elevated temperature, limping, abscess and, most frequently, sinus formation. In 15 cases the etiology was unquestionable. In 14 cases remnants of the primary complex were demonstrated. The principal features of the pathogenesis are considered. In all instances the disease had arisen by spread through the blood stream to the trochanteric region. In 14 cases radiological changes of the trochanter and in two other cases exostotic projections from the trochanter were found. The roentgenologic and symptomatic differential diagnosis is considered. All the patients were subjected to surgical measures, 5 punctures, 4 incisions, 5 osteotomies, and 3 excisions of the bursa being performed. All the patients are alive. One

of the patients has an ankylotic hip due to a concurrent coxitis, one is still under treatment, two have slight discomfort, whereas the remaining 13 patients have been restored to full working capacity.

RÉSUMÉ

Dix-sept cas de tuberculose du grand trochanter sont rapportés.

Les malades étaient âgés de 4 à 47 ans. Symptômes: douleurs, sensibilité à la palpation, élévation de la température, léger boîtement, abcès et, le plus souvent, formation de sinus. Dans 15 cas l'étiologie était incontestable. Dans 14 cas on a pu retrouver la trace d'un complexe primaire. Les principaux faits afférents à la pathogénèse sont examinés.

Dans tous les cas la maladie s'est propagée jusqu'à la région trochantérienne par la voie sanguine. Dans 14 cas il y avait des modifications radiologiques du trochanter et dans deux autres exostose du trochanter. Les diagnostics radiographique et symptomatique différential sont examinés. Tous les malades ont subi une intervention chirurgicale: 5 ponctions, 4 incisions, 5 ostéotomies et 3 excisions de la bourse ont été pratiquées. Ils sont tous en vie. L'un d'entre eux a la hanche ankylosée par suite de coxite simultanée, un autre est toujours en traitement, deux éprouvent de légers ennuis, alors que les 13 derniers malades ont tous recouvré leur entière capacité de travail.

ZUSAMMENFASSUNG

Es wird über 17 Fälle von Tuberkulose des Trochanter major berichtet.

Das Alter der Patienten war 4 bis 47 Jahre. Die Symptome waren Schmerzen, Druckempfindlichkeit, Schwellung, erhöhte Temperatur, Hinken, Abszesse und besonders häufig Fisterbildung. Die Äthiologie war in 15 Fällen vollkommen sicher. In 14 Fällen konnten Reste des Primärkomplexes nachgewiesen werden. Die wesentlichen Züge der Pathogenese werden erwogen. In allen Fällen war die Krankheit durch Streuung zur Trochanterregion auf dem Blutwege entstanden. In 14 Fällen fand man röntgenologische Veränderungen des Trochanters und in 2 anderen Fällen Exostosenbildung am Trochanter. Die röntgenologische und symptomatische Differentialdiagnose wird erwogen. An allen Patienten wurden chirurgische Eingriffe vorgenommen. 5 Punktionen, 4 Inzisionen, 5 Osteotomien und 3 Exzisionen der Bursa

wurden ausgeführt. Alle Patienten leben. Einer der Patienten hat eine ankylotische Hüfte auf Grund einer gleichzeitigen Coxitis, einer steht noch unter Behandlung, zwei haben leichte Beschwerden, während die übrigen die volle Arbeitsfähigkeit erlangt haben.

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