FROM THE APELVIKEN COASTAL SANATORIUM,
APELVIKSSTRAND, VARBERG, SWEDEN

ON THE TREATMENT OF TUBERCULOSIS OF THE TALOCRURAL AND TALOCALCANEAL JOINTS

BY

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The communication which I propose to make records the treatment of all the cases of tuberculosis of the talocrural and talocalcaneal joints handled at the Apelviken Coastal Sanatorium from Jan. 1st, 1928, to Dec. 31st, 1934. The treatment of these patients, from the time the institution was founded, in 1904, and up till 1928, was exclusively on conservative lines. The roentgenograms from the time before January, 1928, when a modern roentgen equipment was installed, are mostly so poor that the material unfortunately cannot be used; and also the case-journals from before that time are so incomplete that a comparative investigation based on them would be of very little value.

The Apelviken Coastal Sanatorium is the largest special hospital in Sweden for the treatment of bone and joint, and severer cases of glandular, tuberculosis. The institution is situated on the west coast of Sweden, near the town of Varberg, eight miles south of Gothenburg. The number of beds is 445. The hospital is open to patients of all ages, from any part of Sweden.

The material forming the basis of the present survey consists of 110 cases in all. Of these, 53 were tuberculosis of the talocrural joint, 29 tuberculosis of the talocrural and talocalcaneal joints, 16 tuberculosis of the talocrural, talocalcaneal and talonavicular joints, 11 tuberculosis of the talocalcaneal joint, and 1 tuberculosis of the talocalcaneal and talonavicular joints. The distribution according to sex, and to the age at which the disease

first manifested itself, will be seen from the following table. During the period comprised by the present investigation, the total number of surgical tuberculosis cases dealt with was 3.055; the cases of tuberculosis in the above named joints thus constitute 3.6 per cent. of this total.

Age-group:	1—5		5—10		10—15		15—20		20 and over	
Sex (M = male, F = female)	M	F	M	F	M	F	M	F	M	F
Talocrural	3	2	7	4	5	2	12	7	6	5
Talocrural and talocalcaneal	3	3	5	3	—	2	1	3	3	6
Talocrural, talocalcaneal and talonavicular	1	1	2	—	1	—	3	1	5	2
Talocalcaneal	—	—	1	4	—	—	1	2	3	—
Talocalcaneal and talonavicular	—	—	—	—	—	—	—	—	—	1

All patients, on entering the hospital, undergo first a blood-sedimentation test by Fåhreus and Westergren's method, then a Pirquet's tuberculin test, and, if the latter proves negative, a Mantoux's intracutaneous test with TOA in doses from 0.1 to 3 milligrams. All suspicious bone- and joint symptoms are the subject of roentgenography. Even if the patient reacts positively to tuberculin, it must be remembered that the symptoms may possibly be due to some other agent than tubercle bacilli. The diagnosis is not absolute until the bacilli have been demonstrated from abscesses or fistulæ. In such complicated cases, a guinea-pig test and cultivation on Hohn and Loewenstein's medium are invariably undertaken. At all operations, specimens are taken and set aside for histological examination, and for guinea-pig tests and cultivation on the medium just named, unless those methods have already given a positive result.

In the early stages, the diagnosis of tuberculosis in the talocrural joint, or the talocrural and talocalcaneal joints, or in both these and the talonavicular joint, can be rather difficult to establish. Examination and palpation are very important. The patient will often state that he has twisted his foot, and will

sometimes tell how a swelling arose over the ankle joint immediately afterwards; or else that such a swelling appeared some weeks later, and that he then began to feel a pain when walking, and began to limp. In many cases such a limp, and a slight pain, together with some little swelling and tenderness over the joint, are, in the beginning, the only symptoms. Sometimes a tuberculous affection of the ankle joint can for many years cause the

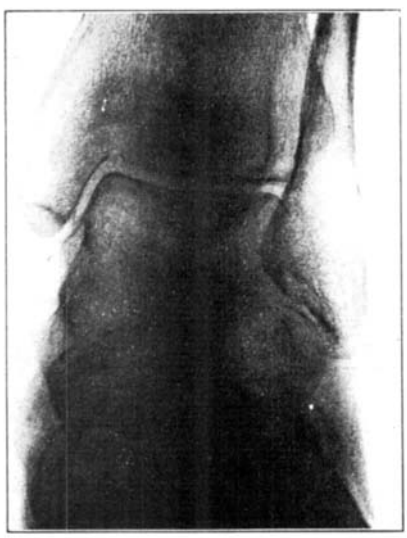

Fig. 1.

patient a certain amount of trouble, and yet it may be impossible to make a definite diagnosis, as the following case shows.

Journal no. 318/30.—B. H., male, aged 25. Born Sept. 30th, 1904. Admitted Aug. 30th, 1929. Discharged Oct. 1st, 1930.

Diagnosis: Tuberculosis of the right talocrural joint.

Anamnesis: At the age of 6, hip-disease. Since childhood trouble with his right foot. In 1928, it got worse, with swelling of the ankle-joint, which had since then been treated with plaster-of-Paris bandages.

On admission: General health good. Internal organs, no remark. Pirquet, negative.

Local symptoms, right foot: Diffuse swelling of ankle joint, with slight tenderness. Mobility greatly restricted.

Roentgen examination shows atrophy, narrowed interarticular space and, on March 17th, 1930, a focus in the distal epiphysis of the tibia, probably with sequestra (Fig. I).

Progression: Tendernes gradually disappearing. Some valgus position. Mobility diminished.

Operation, April 16th, 1930: Resection of talocrural joint. Extensive fungoid changes in the capsule. Osseous foci in the talus and in the tibial epiphysis. Caries in the lateral malleolus.

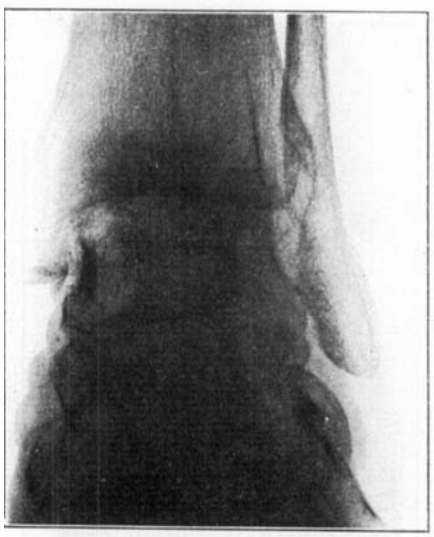

Fig. 2.

Roentgen examination, Aug. 11th, 1930, shows ankylosis in good position. (Figs. II and III).

Time in hospital: 13 months; five and a half of which after the operation.

Condition Aug. 1934: No pain or other trouble with the foot. Walk unimpeded. Has been working at stone-cutting and road-mending for two years past. Does not wear any bandage.

In many cases, roentgenological changes are not found until after several months, or even years.

The anamnesis is, of course, of great importance. If there is a previous history of either pleurisy, erythema nodosum or pulmonary, abdominal or glandular tuberculosis, one will, of

course, suspect, in the first instance, that also the affection under examination is of tuberculous origin. Likewise will a positive exhibition of tuberculosis suggest to the examiner the necessity of ascertaining whether the same disease is also responsible, or not, for the local symptoms engageing his attention.

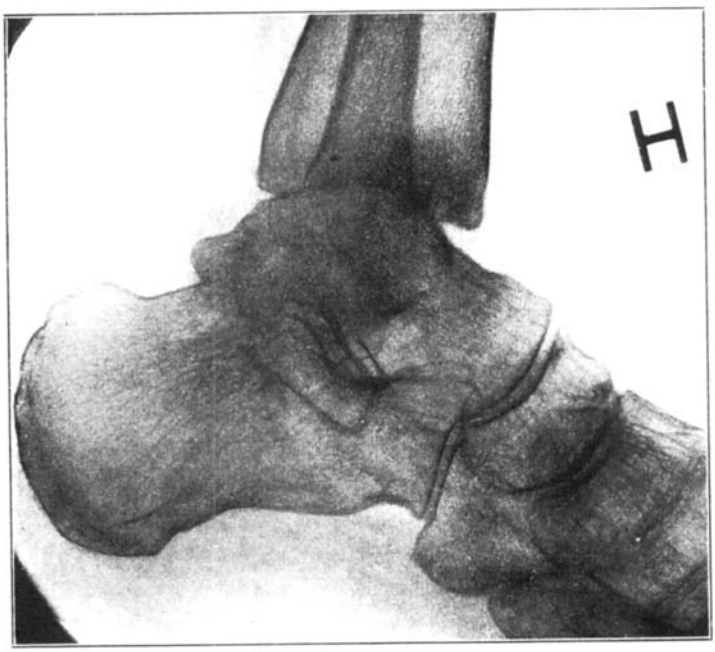

Fig. 3.

Tuberculous arthritis of the talocrural joint does not result in any thickening of the sole of the foot over the calcaneus, but, when the disease has reached a certain stage, in a filling-out of the grooves behind, and in front of, both malleoli. Flexion and extension are restricted or completely abolished, abduction and adduction likewise; rotation free. The same disease in the talocalcaneal joint results in thickening of the sole over the calcaneus and filling of the grooves back of both malleoli; abduction and adduction are restricted or abolished, rotation and

flexion free. In rather short time, the leg muscles on the affected side begin to get atrophied, and the temperature over the diseased joint begins to rise. Little by little, changes begin to appear also in the roentgenograms, in the form of atrophy of the bones, narrowing of the interarticular spaces, erosion of the joint-surfaces, and sequestra. In this connexion it is to be noted that in cases of tuberculosis in the posterior talocalcaneal joint, though operation may show the existence of extensive erosions of the bone close to the capsular attachments, the roentgenograms may sometimes not have given any indication of such destructions, because the best pictures of this joint are obtained in lateral projection, and erosions at the points indicated need not necessarily be visible in pictures thus taken. In a great many cases where such changes existed, the interarticular space had retained its normal height. These observations I have made in cases of tuberculosis of the talocrural joint in which I had not been sure whether the posterior talocalcaneal joint was free or not. On this joint being opened, I found in such cases distinct tuberculous caries in the neighborhood of the capsular attachments, which caused me to resect the joint. If, on the other hand, the roentgenograms show distinct tumefaction of the capsule, the existence of arthritis in the joint may be taken as demonstrated also roentgenologically. As the tuberculosis in the talocrural and talocalcaneal joints progresses, the diagnosis as a rule becomes easy. The swelling of the joints becomes more and more pronounced (tumeur blanche), and abscesses and fistulæ begin to form. As a rule, tuberculosis of the talocrural joint does not attack the sheaths of the peroneus muscles, though abscesses follow the tendons up along the leg. Nevertheless I have on operation, in two of my cases—both adults—found a fungoid, tuberculous tendovaginitis in the sheaths of the peronei. In both cases, pathoanatomical examination verified the diagnosis. I. E. and Dejerine *Sorrel* say in their work: »Tuberculose osseuse et ostéo-articulaire« (1932), to which I shall have to refer frequently in the following, that they have never seen a case of tuberculous tendovaginitis secondary to tuberculosis of the talocrural joint.

According to the same authors, tuberculosis of the talocrural joint is often followed by tuberculosis in the talocalcaneal joint; and when that is the case, the latter localisation becomes the most important. Tuberculosis isolated to the talocalcaneal joint alone should, according to them, be rare, and more benign than tuberculosis in the talocrural joint. They have only seen 12 such cases; one in a child 4 years old, the other eleven in children aged from 7 to 16 years. Since the chapter containing that statement was written, *Sorrel* has seen 9 more cases, but he has never found any case in an adult subject. In my material, the condition occurs in 11 patients: 5 in the age-group from 5 to 10 years, 3 from 15 to 20, and 3 over 20 years old. That this localisation of the disease is found chiefly in older children should be because it is the result of an existing tuberculous osteitis in the upper part of the calcaneus. In early childhood, when only the ossific nucleus for the calcaneus exists, the tuberculosis occurs in the latter; abscesses break through inwards or outwards, and propagation to the talocalcaneal joint should not take place. *Sorrel* says that all the cases of tuberculosis in the talocalcaneal joint that he has seen were apparently due to osteitis in the upper part of the calcaneus. That a central tuberculous osteitis in that bone can occur also in adults, and can give rise to tuberculosis in the the posterior talocalcaneal joint, is shown by one of my cases:

Journal no. 367/32.—G. V., male, aged 31. Born June 6th, 1900. Admitted Oct. 23rd, 1931. Discharged April 13th, 1932.

Diagnosis: Tuberculosis of left calcaneus and talocalcaneal joint, with fistula formation.

Anamnesis: In February, 1930, swelling and tenderness on lateral side of left heel. In April, same year, operated on in hospital, on which occasion a cavity, as large as a walnut, in the left calcaneous, was chiselled open. Two months later, fresh operation. In the fall of same year, healing complete; discharged. During the following winter, renewed symptoms and formation of fistula.

On admission: General condition, good. Internal organs, no remark. Pirquet, positive.

Roentgen (Fig. IV): In the middle of the posterior half of the calcaneus there is a defect in the bone, irregular of outline, the size of a cherry. The posterior articular surface of the talus opposed to the

calcaneus, and the articular surface of the latter placed against the talus, are destroyed.

Operation, Nov. 5th. 1931: The focus in the calcaneus chiselled open. The posterior articulation, between the talus and the calcaneus, resected.

Pathoanatomical diagnosis: Typical tubercles.

On discharge: Healing complete. Free mobility in talocrural joint. No trouble in walking.

Time in hospital: 6 months; about five of which after operation.

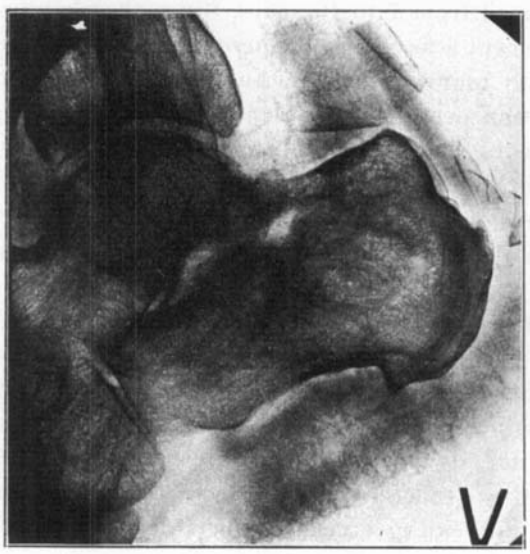

Fig. 4.

Condition Sept. 1932: No trouble with the foot. Walk unimpeded. Wears a bandage. Works as carpenter.

Condition Oct. 1934: Some pain when walking, especially on starting. Walk fairly unimpeded, but a certain amount of limping. At maximum of flexion the foot stands at right angles to the leg. Flexion and extension together, in the angle joint, about 45°. Wears bandage. Still working as a carpenter.

That it is also possible for the talocalcaneal joint to become infected from a focus in the inferior part of the talus without the talocrural joint becoming infected at the same time, is proved by the following case.

Journal no. 531/29.—K. F. V., male, aged 8. Born May 8th, 1921. Admitted Jan. 14th, 1929. Discharged July 19th, same year.

Diagnosis: Circumscribed tuberculous focus in right talus, leaving the talocrural joint free, but tuberculosis in the talocalcaneal joint.

Anamnesis: At Christmas time, 1927, he got an abscess on the lateral side of his right ankle-joint, pain in the foot, and could not walk. The abscess healed. Examination in a hospital showed: »a circumscribed

Fig. 5.

Fig. 6.

focus in the talus; the process of no magnitude«. Since then he had been taken care of at home.

On admission: General condition, good. Pirquet, positive.

Local symptoms, right foot: 110° pes equinus. The whole instep swollen, blueish red. Anteriorly and distally to the lateral malleolus, a fistula, in the cicatrix from an old incision. Below the medial malleolus, a slack fistula, about 1.5 cm. in diameter, full of granulations. Above and posteriorly to the malleolus, an abscess.

Roentgen, Jan. 16th, 1929 (Figs V. and VI): Sequestra in lateral part of talus. The talocrural joint apparently free. The posterior talocalcaneal joint involved; the surfaces facing it eroded.

Operation, Jan. 21st, 1929: Sequestrotomy.

Roentgen, May 14th, 1929 (Fig. VII): The defect in the talus sharply circumscribed. The bone-design good.

On discharge: Healing. Leather bandage. No subjective symptoms.

Time in hospital here: 6 months.

Condition Aug. 1934: No pain or discomfort from the foot. Walk unimpeded. Has worn no bandage since 1932.

It has been discussed whether the interosseous talocalcaneal ligament might possibly act as a barrier preventing the tuberculous infection from spreading from the posterior joint to the anterior, and *vice versa*. That the two joints are isolated from one another would seem to be indicated by my material,

Fig. 7.

of which in 36 cases the posterior talocalcaneal joint was affected, the anterior free. In cases where there was extensive osteitis in the inferior parts of the talus, there was in many instances propagation to both joints; in 3 instances even the talonavicular joint had become affected.

Also other diseases, such as septic and gonorrheal osteoarthritis, can produce pathological pictures resembling those observed in tuberculosis of the talocrural and talocalcaneal joints. Especially as regards tuberculosis of the talocrural joint must it be remembered that gonorrhea can sometimes give a similar picture. Luetic osteoarthritis can, clinically, resemble tuberculous osteoarthritis very closely. Lues should be suspected especially when there is considerable new periosteal bone forma-

tion without fistulation. Also luetic arthritis without osseous changes may occur. Wassermann's and other serum reactions, together with the effect—or non-effect—of antiluetic treatment, will settle the diagnosis. Also the osteoarthritis associated with tabes and other organic diseases of the nervous system should be borne in mind. Certain fractures, as, for instance, of the calcaneus, can result in secondary chronic changes in the talocalcaneal joint, which may be wrongly interpreted as tuberculosis. Also hemarthrosis in the talocrural joint may for a time simulate tuberculosis.

During the period from Jan. 1st, 1928, to Dec. 31st, 1934, there have been treated at the Apelviken Coastal Sanatorium 3 cases of septic arthritis of the talocrural joint, 1 ditto of the talocalcaneal joint, 1 case of luetic osteoarthritis of the talocrural joint, and 1 case of post-traumatic arthritis of the talocrural joint.

I have found that, as regards the prognosis and treatment, it is impossible in Sweden to follow the same schematic lines as the authors mentioned in the foregoing. Perhaps the course of osteoarthritis in these joints is different in Sweden from what has been observed in Berck. The greater part of the material in I. E. and Dejerine *Sorrel*'s work comes from Paris. In Sweden, the mortality- and morbidity rates for tuberculosis are very different in the various provinces. It is my impression that surgical tuberculosis is much more benign in some parts of the country than in others. This must be taken into consideration when it is the question of treatment. Benign cases can perhaps be cured completely by a conservative therapy; in more severe ones it is oftener necessary to operate.

The *Sorrel*'s rightly say, in the work already referred to, that in order to understand the localisation and development of tuberculous arthritis in the various parts of the foot it is necessary to know the mode of ossification which obtains in the different bones of the latter. They give a description of this, which I will briefly repeat here. The ossific centres for the dif-

ferent bones do not all appear equally early. The first to form is the central one for the calcaneus, which makes its appearance in the sixth month of fetal life. The last to appear is the centre for the navicular, at two to two and a half years of age, sometimes later; and the ossification of which is not terminated until about the ninth year. The development of the talus is different from that of all the others. Its ossific centre appears rather late toward gestation, and its ossification is terminated early. From the age of two it consists of bone covered with a thin layer of cartilage; which explains why osteitis of the talus practically never exists without spreading to the surrounding joints. In all the other bones of the foot, the ossification is not terminated until about the ninth year. Until then, the bone consists of an osseous centre surrounded by a thick layer of cartilage. This explains the cases of isolated osteitis before that age. The cartilage covering is supposed to prevent any existing tuberculosis from spreading to the joints. If, in some instance, it should nevertheless do so, the tendency to further propagation would be small, and the prospects of healing good. After the age of nine years or so, osteoarthritis should, according to *Sorrel,* be more common. In my material it is commonest after the age of fifteen; in 55 per cent. of the cases, the symptoms made their appearance after that age. As I have already said, I suppose that in Sweden the disease sets in at a later age than what is the case with *Sorrel*'s material, and that a large percentage of the Swedish population does not become infected with tuberculosis until after the age of fifteen.

According to *Sorrel,* immobilisation and general treatment alone should not, as a rule, suffice to cure osteoarthritis after the age of nine, but resection should be necessary in order to prevent the process from spreading. And this tendency to spreading should be all the greater, and should necessitate all the more deep-going surgical intervention, the older the patient. *Sorrel* says that with immobilisation and general treatment he has obtained good results only in patients under 10 years. After that age, conservative operative measures have, as a rule, given excellent results in adolescent and young adult subjects. In

older ones, the results get less good, and the cases in which amputation has to be resorted to more frequent. My material shows, though, that complete healing with ankylosis can be effected also in older subjects without any deep-going surgical intervention, especially where there is a fistula with secondary infection, as witness the following two cases.

Journal no. 105/32.—N. L., male, aged 16. Born March 13th, 1914. Admitted Nov. 21st, 1930. Discharged May 8th, 1932.

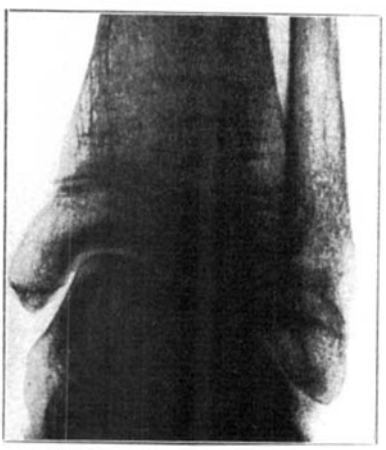

Fig. 8.

Diagnosis: Lupus vulgaris of nose and face. Tuberculous lymphadenitis of the neck. Tuberculous bronchial lymphoma. Tuberculous osteitis of the fibula, with fistula and tuberculous ulcer of the leg, and tuberculosis of the right talocrural joint.

Anamnesis: Since the spring of 1929, the patient has had an ulcer on the side of his right foot, just above the lateral malleolus.

On admission: General condition good. Internal organs, no remark. Pirquet, positive. Extensive lupus vulgaris of face and nose.

Local symptoms, right foot: Full mobility in talocrural joint. Above the lateral malleolus, the skin is ulcerated over an area as large as the hand of a child; the margin undermined. The appearance typically tuberculous.

Roentgen (*Fig. VIII*): The talocrural interarticular space narrowed. In the inferior part of the fibula, close to the epiphysis, a periosteal thickening, about 0.5 cm. broad. Inward from the latter, a rarefaction in the bone, the size of a bean.

Treatment: Local Finsen treatment for the facial lupus and on the tuberculous ulcer of the right leg. Excision for biopsy from the latter. Roentgenological diagnosis: »Typical tubercles in the corium.«—As no result was obtained from the treatment, it was decided to operate.

Operation, March 20th, 1931: The ulcer on right leg excised. From its centre, a fistula, almost the width of a pencil, led into a focus in the fibula, which was cleaned out. *April 1st: Transplantation ad modum*

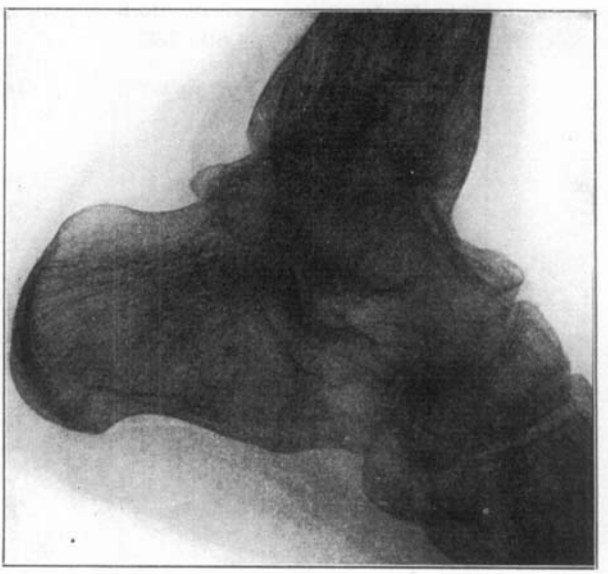

Fig. 9.

Thiersch.—After the operations there came signs of arthritis in the talocrural joint. The transplantation succeeded. The fistula healed.

Roentgen, March 30th, 1932 (Fig. IX): Complete osseous ankylosis of the talocrural joint.

May 8th, 1932. Patient discharged, wearing a bandage. Walk unimpeded.

Time in hospital here: 17½ months; 13½ of which after operation.

Condition Dec. 1934: No trouble from right foot since operation. Not the slightest limp. The patient uses his right foot precisely as the left one.

Journal no. 681/32.—A. S., female, aged 43. Born June 16th, 1889. Admitted Aug. 6th, 1932. Discharged April 7th, 1933.

Diagnosis: Tuberculosis of the talocrural and posterior talocalcaneal joints of left foot.

Anamnesis: Erythema nodosum ten years ago. A year ago she twisted her left foot, and after that time it constantly troubled her. Gradually it began to swell and become more and more painful. In 1932 she went into a hospital, where »incipient tuberculosis« was diagnosed, and she was remitted to the hospital of her home town, where she got roentgen

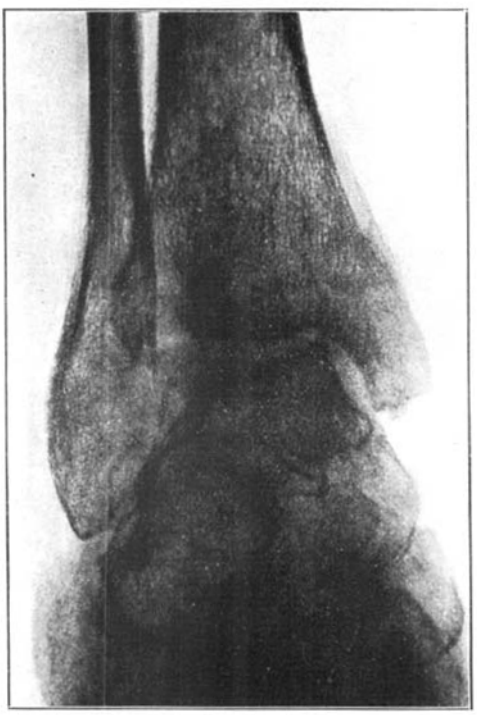

Fig. 10.

treatment, and the foot was put in plaster bandage. In March, a fistula developed over the lateral malleolus.

On admission here: General condition good. Pirquet, positive.

Local symptoms, left foot: Considerable swelling over the talocrural and posterior talocalcaneal joints. The foot fixed in slight equinus position. Attempt at movements cause pain. Over the lateral malleolus are the openings of some fistulæ, some of them healed, others suppurating.

Roentgen, Aug. 9th, 1932.—Antero-posterior view (*Fig. X*): The entire joint-surfaces of the tibial epiphysis and the trochlea tali eroded; rather deep destructions of the latter. On the medial side of the distal tibial metaphysis and epiphysis, a periosteal thickening of up to 3—4 millime-

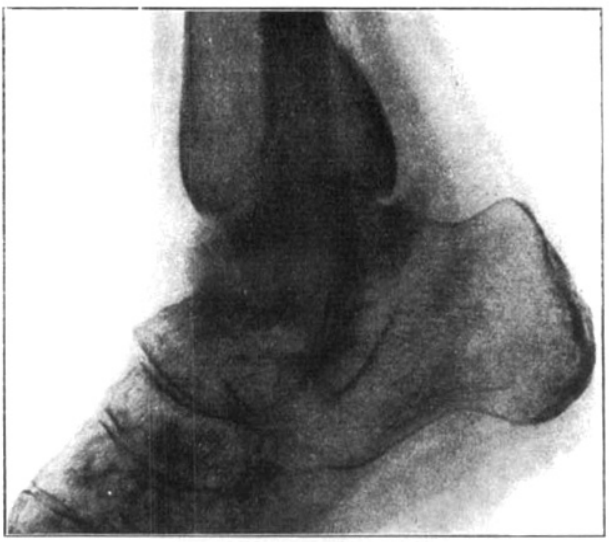

Fig. 11.

Fig. 12.

ters.—The *side view* (*Fig. XI*) shows, in addition to this, osteitis of the inferior posterior part of the talus and the upper part of the calcaneus, with probable osseus ankylosis.

Wassermann, negative. Sachs-Georgi's and Kahn's flocculation test, negative.

On discharge: Healing with ankylosis of both affected joints. Absolutely no pain in foot on walking.

Time in hospital here: 8 months.

Roentgen, Sept. 20th, 1933: see Fig. XII.

Condition July, 1934: No pain or trouble from the foot. Walk unhindered. Does domestic work. No bandage.

That there can be at least apparent complete healing also without secondary infection, seems to be proved by the following case:

Journal no. 492/28.—J. J., male, aged 20. Born May 15th, 1907. Admitted Dec. 2nd, 1927. Discharged Apr. 7th, 1928.

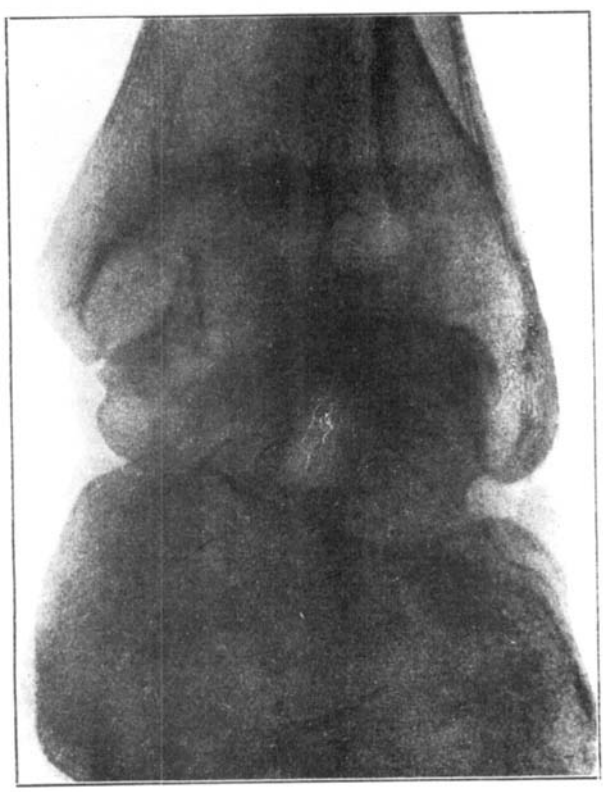

Fig. 13.

Diagnosis: Tuberculosis of the right talocrural joint.

Anamnesis: Symptoms for 3 years back, with incapacity for work.

On admission: General condition fairly good. Internal organs, no remark. Pirquet, positive.

Local symptoms, right foot: Considerable swelling around both malleoli, on the lateral side with fluctuation. Limp, and pain when walking.

Fig. 14.

Roentgen (Figs. XIII and XIV): Considerable destruction of the joint-surfaces of the trochlea tali and distal tibial epiphyses. Bone-design around the joint ill-defined.

On discharge (with bandage): Very little swelling. No tenderness. Normal position. Flexion to 20° from latter. Pronation and supination almost normal.

Roentgen, May 11th, 1928, (Fig. XV), shows better calcification. Osseous ankylosis?

Time in hospital: 4 months.

Condition Aug. 1934: No pain or other subjective symptoms from the foot. Walk unimpeded. Patient works as a farm-laborer, and has not worn a bandage since 1932.

In this last case, where no solid ankylosis was built up, there may still be a possibility of recurrence.

In children, tuberculosis of the talocrural and talocalcaneal joints usually begin with osteitis in the talus, and *Sorrel* there-

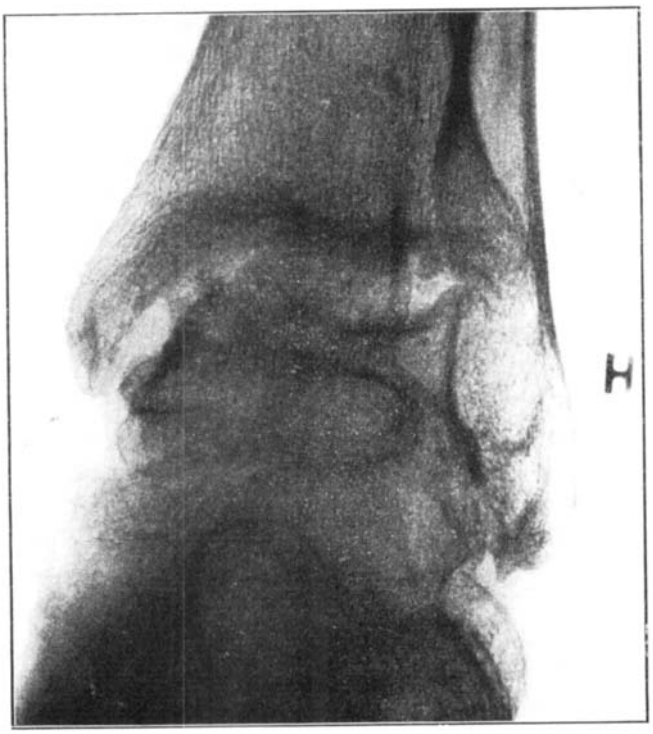

Fig. 15.

fore holds that astragalectomy should be undertaken. Among my material there is, however, one case, of a patient 9 years old, with tuberculosis of the talocrural joint, in which it is evident that the infection had arisen from foci in the distal tibial epiphysis and metaphysis. In that case, an early astragalectomy would probably not have prevented the tuberculosis from spreading to the talocrural joint. In adolescence, and in adults, foci in the epiphyses of the fibula and the tibia are of

more frequent occurrence. In my case,[1] I twice prevented invasion of the joint by eradicating foci in the lateral malleolus, and once by cleaning out a focus in the medial malleolus; but in most cases the joint had unfortunately been invaded before the patient came to the sanatorium.

Treatment.

In the early stages, while the subjective symptoms are yet the principal ones, and the objective symptoms doubtful, it is nevertheless best always to assume that the case is one of tuberculous osteoarthritis, and to treat it as such by immobilising the foot in plaster bandage, taking care of the patient's general condition, and watch the development of the disease. The general line of treatment followed has been immobilisation in plaster splint, sun- and fresh air therapy, strengthening diet, codliver oil with 40 per cent. calcium phosphate added; the latter medication alternately given and suspended for periods of two weeks at a time. The duration of the sun-baths given during the warm seasons is increased little by little, until the patient gets used to lie out of doors naked for a couple of hours at a time, sometimes twice a day. During the middle of the day, rest under complete silence in the wards. From September till May, the patients are also, every second day, given either arc- or quartz-light treatment.

The course of the pathological process has been followed by means of a monthly control of the patient's weight and the sedimentation reaction, and through study of the roentgenograms. With regard to the sedimentation reaction I would say that, of course, it possesses a certain value, but one should be careful not to let oneself become hypnotised by it. I have operated on a good many cases of tuberculous pyarthrosis, and have seen cases of surgical tuberculosis in patients whose general condition was quite good, where gravitation abscesses had to be evacuated every two or three days of as much as a whole liter of pus, and in which the blood-sedimentation rate was nevertheless perfectly normal. In a hospital like the Apelviken, one

will often meet with nosocomical infections that cause an increase in the sedimentation rate, without this necessarily meaning that the tuberculous process has taken a more unfavourable course.

With regard to a number of patients—27 in all—it was found, on their arrival at the sanatorium, that their general condition was poor, and that, in addition to the tuberculosis in the feet, they had tuberculosis in various other bones or joints. In 10 cases there was complication with pulmonary tuberculosis. The cases of osteoarthritis were in 62 instances complicated with abscess- or fistula formation.

During the first years of the period with which this report is dealing, the patient's lungs were roentgenographed in all cases where there was any reason to suspect a co-existing tuberculous affection of that organ. Only of late years we have taken pulmonary roentgenograms of nearly all patients. In most of the cases where clinical signs of pulmonary tuberculosis were absent, the roentgen examination showed marks, at least, after tuberculous affections of the lung that had run their course. In a number of cases in which the clinical examination had given a negative result, the roentgen examination showed the existence of active pulmonary tuberculosis.

In the case of children, the treatment has been in the highest possible degree conservative, with immobilisation of the foot in plaster bandage, puncture of abscesses, curettage of fistulæ, and sequestrotomies. In a number of cases, though, where it was found that these conservative measures alone did not give the desired result, resections and astragalectomies had to be done, in order to prevent advance of the process. Surgical intervention has not been resorted to until it had become reasonably certain that the body had overcome the general tuberculous infection, and had become strong enough to begin the work of reparation. A good result can be expected only after sufficient time has been allowed for a preparatory general treatment, and if the physician dealing with the case is able to judge when a suitable stage has been reached for undertaking the operation; if he is practiced in its perfomance, and knows how to conduct the after-

treatment. That surgical tuberculosis requires to be dealt with in special hospitals, is beginning to get recognised more and more in all countries.

In cases of tuberculosis of the knee-joint, there will very often be an increased growth, in length, of the diseased leg. In my study of tuberculosis in the talocrural joint I have found nothing similar to this. The reason probably is that growth of the leg in longitudinal direction takes place much less actively from the distal epiphysis and metaphysis than from the proximal. On the contrary, tuberculosis of the talocrural joint during childhood and adolescence often results in shortening of the leg, and in its becoming, on the whole, less developed than normal.

In contrast to other authors, and especially to the Sorrels, I have found that in the case of adult subjects, when alone the talocrural joint is affected, a better result is obtained by a well executed resection of the latter than by astragalectomy, which Sorrel recommends as the standard method. In a number of cases where I have followed my own ideas on that point, the functional result has been so good that it has been impossible for anyone who did not know the facts to tell, when the patient was walking, in which of the feet the disease had been. Nor have these patients themselves experienced any further discomfort or trouble from their disease. Most of them have been able, a few months after the operation, to go back to physical work of the most exacting kind, such as farmlabor and the like, and have never needed to wear any bandage since.

I have done this resection of the talocrural joint in 27 cases altogether; namely:

Age-group:	5—10	10—15	15—20	20 and over
No. of cases:	1	2	9	15

As example of the results I give the following case:

Journal no. 375/29.—V. G., female, aged 18. Born Feb. 19th, 1910. Admitted Oct. 1st. 1928. Discharged Dec. 18th, 1929.

Diagnosis: Tuberculosis of the right talocrural joint, with fistula.

Anamnesis: Since May, 1928, pain in the right ankle. In June, same

year, 5 days in hospital, where the foot was put in plaster bandage, which she wore until she was admitted here. In the beginning of September she had got a pain over the lateral malleolus, and had again been admitted to the same hospital as before, where an opening had been made in the plaster bandage, and an abscess had been incised. She had not been able to put her weight on the foot for pain.

On admission: General condition, no remark. Internal organs, no remark. Pirquet, negative. Mantoux (1 milligram), positive.

Fig. 16.

Local symptoms, right foot: The foot stands in 30° equinus position. No dorsal flexion from the latter. Very marked tenderness to pressure over the talocrural joint. On the lateral malleolus, an ulcer, about 1.5 cm. in diameter; its margin irregular and undermined.

Roentgen, Oct. 10th, 1928, (Fig. XVI): Interarticular space narrowed; outlines of articular surfaces of talocrural joint blurred. Rather pronounced atrophy in spots all through the skeleton of the foot.—Until Oct. 20th, 1928, extension treatment.

Operation, Sept. 6th, 1929: Resection of talocrural joint. The fistula with surrounding skin excised, including an abscess which extended into the joint. In the malleolus a couple of foci, the size of large peas. Extensive destructions of the cartilage.

Dec. 18th, 1929: Patient discharged with bandage. Walks well. Subjectively no trouble.

Time in hospital here: 14½ months; of which 3½ months after operation.

After-examination, Sept. 1st, 1932: Patient has no trouble or discomfort whatever from the foot operated on. The mobility is to a great extent preserved; she is able to walk long distances without feeling the slightest stiffness or pain. She dances freely; does not wear any bandage.

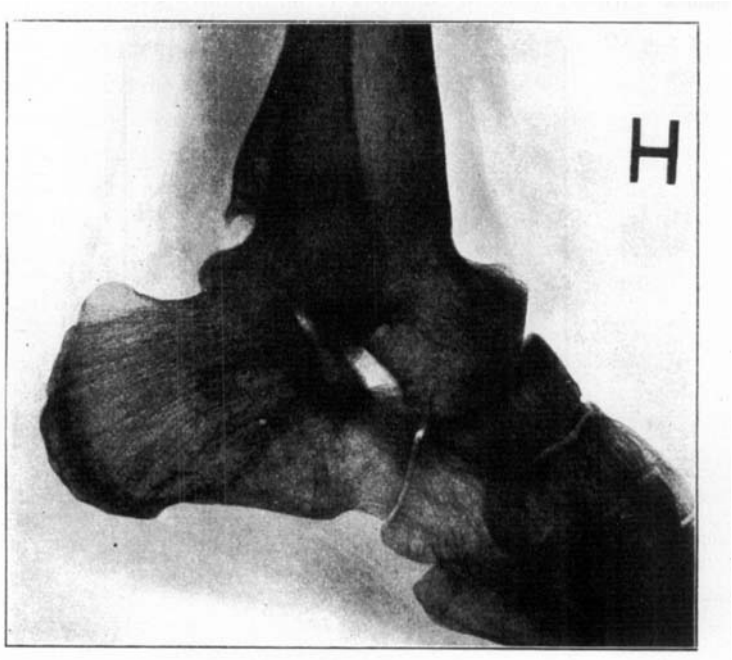

Fig. 17.

Roentgen, same date (Fig. XVII): Solid ankylosis of talocrural joint, in 10° flexion.

Condition Aug. 1934: No trouble from the foot. Walk unimpeded. Works as a seamstress.

Most of the patients have been after-examined, clinically and roentgenologically, either at the sanatorium here or at the hospital in their home town or the nearest orthopedic institution. Besides, question blanks have been sent to all patients treated. Answers have been received in regard to all the cases.

Only in one case has recurrence or advance of the tuberculous process been ascertained, and has made it necessary to amputate. As to any risk attaching to resection of the talocrural joint, the mortality from the operation has been = 0. One woman, eighteen years old, died from tuberculosis of the lung and kidneys 29 months after the operation, and another, forty years old, from acute pulmonary tuberculosis 3 months after the operation. In none of the others has there been any signs of recurrence, nor, as a rule, even the slightest trouble or discomfort. Of the total 27 operations, 19 were done more than four years ago.

In 6 cases where both the talocrural and the talocalcaneal joint were affected, I have resected both the talocrural and the posterior talocalcaneal joints, for the reason that there were destructions of the joint surfaces of them both. In 5 of these cases the result, after an observation period of up to six years, is still excellent. Operation mortality, 0. One woman, thirty-one years old, died from tuberculous spondylitis 3 years after the operation.

Like *Sorrel* and other authors, I have found that tuberculosis from the posterior talocalcaneal joint stops at the interosseous talocalcaneal ligament.

From all this it will be seen that not even in this sort of cases astragalectomy can be considered as *the only correct* operative treatment. On the other hand, it is probably the only conservative method of operation that will give a good result in the case of adult patients with extensive tuberculous osteitis of the talus, complicated by tuberculous osteoarthritis of the talocrural, talocalcaneal and talonavicular joints.

Technique.

My technique for resection of the talocrural joint has been as follows:

Esmarch's bandage. Ether anesthesia or, in some cases, lumbar anesthesia with stovaine or percaine *ad modum* Jones, with injection of 1 ampulla Merck's ephetonine one hour before

the spinal anesthesia. Incision *ad modum* Kocher-Lauenstein. The tendons of both peronei muscles are divided immediately behind the lateral malleolus, the ligament and joint-capsule sharply severed from their anterior and posterior attachments to the distal tibial epiphysis. The foot is then turned into strong adduction, so that the whole of the talocrural joint can be readily inspected. All tissue that seems tuberculous is carefully excised, and only as much of the joint-surfaces of the talus and the tibial epiphysis resected as is necessary in order to reach the part of the bone not yet invaded by the process. Also the distal tibio-fibular joint is carefully resected. In most cases, I have ablated the tip of the lateral fibular malleolus, in order that it should not project too far. When the joint-surfaces have been fitted to each other, the wound is closed completely, the peronei tendons resutured, and dressings applied. A circular plaster bandage—not Boehler's bandage—is laid, with the foot in 5 to 10° flexion; the angle being made somewhat larger in the case of women patients. In determining the angle, I usually take into consideration the height of the heels the patient is used to wearing. As regards the women, though, I do not consent to heels higher than 3 or 4 centimeters. On the tenth day after the operation, an opening is cut in the plaster, over the place where the incision was made, and the suture is removed. After three or four weeks a fresh circular plaster bandage, with heel, is applied, and the patient is allowed to get up, provided the course of the healing has been free from complications. This has been the case except in a few instances, where a slight necrosis of the skin occurred, which healed, however, in the course of a few weeks.

By resection of the talocrural joint my object has been to obtain healing in ankylosis. I believe that object to be furthered by letting the patient put weight on the foot as soon as possible. As I have already said, this can usually begin to be done after three or four weeks, by which time there will, as a rule, be no more pain. About six weeks after the operation, a plaster cast is taken for a rigid leather bandage of a model of my own construction. Instead of the old heavy foot-holsters with splints

on both sides coming together in an arch underneath the metal plate supporting the sole of the foot, my bandage (see Fig. XVIII) has only one splint of rustless steel, on the medial side of the leg, continuing in a metal plate resembling a flat-foot brace, underneath the foot. It has proved just as durable as the old one with two splints, and has the advantage of being both lighter

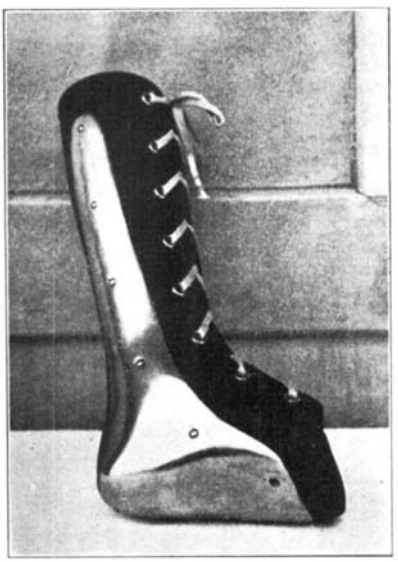

Fig. 18.

and less conspicuous, which is of great importance, especially for the female patients. The bandage is worn until ankylosis has set in; as a rule from six months to a year after the operation.

My technique for simultaneous resection of the talocrural and talocalcaneal joint has, as regards the former, been the same as described above. After the talocrural joint has been resected, the posterior talocalcaneal joint is laid open from the lateral side, the tuberculous granulation tissue and the capsule excised, and the diseased joint-surfaces resected. Then suture without tamponage, and plaster bandage in the same manner as already described.

In doing *astragalectomies,* I make a curved incision on the lateral side, and not only remove the talus, but am particularly careful to extirpate the capsule and any apparently tuberculous tissue; using the knife, and not confining myself to mere curettage. Of the surfaces of the tibia and calcaneus, which in many instances are only superficially eroded, I remove only such portions as appear to be diseased. After the astragalectomy has been performed, the distal surfaces of the tibia and fibula are brought in opposition to the anterior part of the dorsal surface of the calcaneus. Like several other authors, I have found this position to give a better result, functionally, than the posterior or intermediate ones. Of the lateral malleolus, I have in many instances resected a lamella from the inside, in order that it should not jut out too far from the calcaneus. Suture of soft tissues and skin; then circular plaster bandage, with wadding. In putting the foot in plaster it must be avoided to grip the foot by the toes, or, if a tricot sling is used, to take hold of the latter in front of the toes. If this is done, the whole foot will namely be lifted forward, and the fork of the leg bones come opposite the posterior part of the calcaneus,—a position which gives the very poorest result, functionally.

After about a month, the patient has then been given a fresh circular plaster bandage, and has been allowed to begin to put weight on the foot. After, on the average, two months, he has been given a laced boot with reinforced leather heel-cap, but without splints. The object with an astragalectomy is not that there should come osseous ankylosis between the leg and the calcaneus, but pseudarthrosis.

Though it is, of course, preferable that there should be no fistulæ or abscesses when it is a case of performing operations like the ones here described, I have not considered the existence of such as a contra-indication—for instance, if there was a fistula many months old—if operation was otherwise indicated. The fistulæ have in such cases been carefully excised, and the healing has taken place in almost the same short time as in the other cases. As a rule, the wound has been sutured without drainage, in spite of the fistulæ; in no case has it been left open.

Considering the results I have obtained with conservative radical operation, or with astragalectomy, I have not seen any reason to try the method of extra-articular fixation, for instance of the ankle-joint, which has been described by *Putti* and *Zanoli,* among others. They write, in their work: »Le artrodesi nella tuberculosi osteoarticulare«, that resection is the only method to be considered in cases of tuberculosis of the knee-joint, but describe 12 cases of tuberculosis in the talocrural joint where they have used extraarticular fixation, in 2 of them obtaining improvement. I do not see any reason to use the method in tuberculosis of the joints of the foot, when it is possible by resection or astragalectomy to get the focus of the disease eradicated and obtain a good result, functionally.

Amputation of the leg has been done in 7 cases. In all of these, conservative operation was out of the question owing to poor general condition, amyloid degeneration, pulmonary tuberculosis or some other more or less severe general disease, or else because the destructions in the foot itself were so extensive, and of such a charter, that there was absolutely no prospect of being able to restore it to any degree of functional capacity either by conservative radical operation or by astragalectomy. I would add here that I have found the prognosis to be particularly bad in fistulating cases with stalactite-forming periostitis of the tibia and fibula, and that in such cases amputation has been the best method.

I have not, in any of my cases, used tarsectomy, which some authors recommend, nor operation *ad modum* Symes, or other complicated methods. If the greater part of the foot has to be sacrificed, amputation is the surest way to secure healing. If the patient gets a well-fitting prosthesis, the functional result is very good. I have had patients on whom amputation on the leg had to be done, and who have been able, afterwards, to go back to farm-work and similar occupations.

In the case of children, I have waited as long as possible before deciding to amputate, and in hardly any case have I done so except on vital indication. In children one may, even in seemingly desperate cases, get a good result by lengthy conserva-

tive treatment combined with some minor operative measures, as shown by the following case:

Journal no. 2/31.—G. P., male, aged 6. Born May 14th, 1918. Admitted Feb. 22nd, 1924. Discharged April 17th, 1931.

Diagnosis: Tuberculosis of the left calcaneus, talocrural, talocalcaneal and talonavicular joints, and of the zygomatic bone.

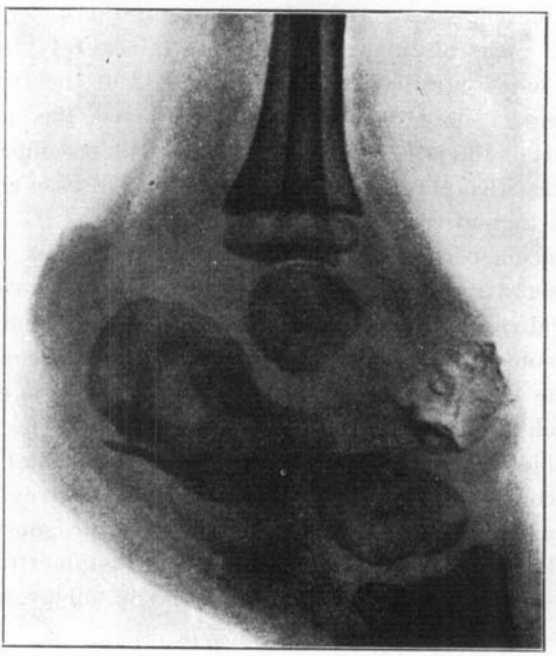

Fig. 19.

Anamnesis: The mother died from pulmonary tuberculosis. The patient has suffered for 3 years from pain in his left foot, and has had difficulty in walking.

On admission: The patient is small of stature, pale and thin. Pirquet, + +.

Local symptoms, left foot: Considerable swelling around the talocrural joint and talus; with fistulæ, full of enormous masses of granulations, both on the medial and the lateral side. Considerable equinus.

Roentgen, March 5th, 1924 (*Fig. XIX*), shows extensive osteitic changes in the calcaneus, with large sequestra in the centre. Extensive osteitis in the anterior part of the talus, and in the navicular.

Course: During 1924, incisions and curettage of fistulæ in the foot, and correction of the equinus. During 1925 and 1926, the swelling of the soft tissues grew less, and the structure of the talus and calcaneus began to change. During 1927, growing together of the head of the talus, the navicular and the anterior portions of the calcaneus and cuboid bones.

Operation, July 24th, 1928: The calcaneus chiselled open; the large hollow in its centre, containing numerous sequestra, scraped out.

Operation, Jan. 21st, 1930: Renewed curettage of the cavity in the calcaneus, with removal of cheesy granulations and of sequestra.

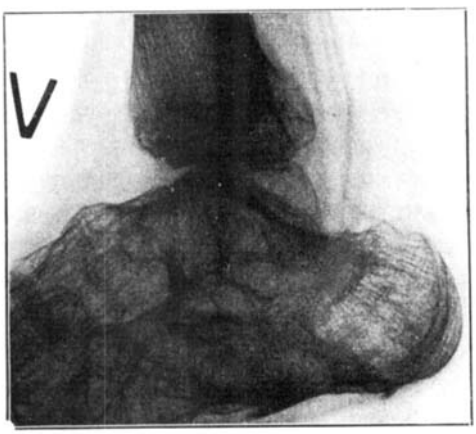

Fig. 20.

Roentgen, Jan. 10th, 1931, see Fig. XX.

On discharge, April 17th, 1931: Healing with the foot in good position. The patient walks excellently well. Mobility in the talocrural joint, about 20°.

Time in hospital here: 7 years and 2 months.

Condition Aug. 1934: No pain or discomfort from the foot. Walk unimpeded. Has been without bandage for 2 years. Farm-worker.

It is true that this patient was in hospital for over seven years, but of this time only 2 years and 8½ months were after his first operation. If any operative measures of a more radical kind should have been undertaken at an earlier stage, it would most probably have had to be the posterior tarsectomy used by French orthopedic surgeons. The result here shows that the mode of treatment chosen was the right one.

The operative treatment of tuberculosis in bones and joints is indicated not only on medical grounds, but also in a very great measure from considerations of a social and economical nature. Everyone whose work lies principally with a category of patients suffering from diseases that take so long to cure as surgical tuberculosis will know that the longer that treatment has taken, the more difficult is it to bring the patient back to the stage where he will resume an active life. Though at the Apelviken Sanatorium we have instituted a system of regular occupation both for the bed-patients and, still more, for those who are able to be up and about, in the form of various handicrafts, etc., I have found that if a patient has to remain in the place for a long time he ends by getting depressed, and often loses all desire to procure for himself, after he has begun to get well again, an occupation which will enable him to live and provide for himself. Therefore, the sooner it is possible to get him cured, and to get him back to his usual work—or to some new occupation better suited for him,—the easier will it be to get him to become self-supporting again. Both for the patient's own sake and for the sake of the social body at large we should, in trying to cure a local tuberculosis, employ as far as possible those methods of treatment which will bring about the cure *in the shortest possible time and with the best result, functionally.* I fully believe that the attainment of that object will in an ever increasing degree be the result af a general hygienic treatment combined with surgical orthopedics. One reason why I think that surgical treatment should in many instances be resorted to, is the great frequency with which a conservative therapy is followed by recurrences. In no less than 22 of the 41 cases where I resected after preliminary conservative treatment, such recurrence occurred. By letting the patient first have a sufficient long stay in a sanatorium, until the body has thrown off the general infection, and by then chosing a propitious time for removing all tuberculous bone- and articular tissue, definite healing is obtained, and there will be no risk of recurrence afterwards.

Nearly all our patients at Apelviken are people in modest

circumstances or actually poor. The cost of their treatment and maintainance in the sanatorium amounts to very considerable figures. But whether it is the patient himself or the state, or some other individual or authority, that defrays this cost, it is evidently of great importance, from the viewpoint of national economics, that his stay should be as short as possible, and, at the same time, the result of the treatment as lasting as possible. My over seven years' experience as chief surgeon of the Apelviken sanatorium has taught me that in the case of adult patients conservative radical operation done at the right time, both in tuberculosis of the knee- and ankle-joints and in several other tuberculous affections of bones and joints, gives a better result, functionally, than an exclusively conservative treatment; that it almost completely eliminates the risk of recurrence, and materially reduces the expense of caring for this category of cases as a whole. The very circumstance that place is not repeatedly needed for patients with recurrences makes it possible to care for a considerably greater number of cases with the same number of beds, and the requirements in the way of available accommodation will thus be notably less.

That my material contains no less than 36 cases in which exclusively conservative treatment was employed is partly because some of these patients are still under treatment, partly because I have found that in a number of instances, especially of children, it is possible to obtain a complete cure, and even *restitutio ad integrum,* in that way. The Sorrels have not seen a single case of cure, by conservative treatment, of an even moderately severe tuberculosis of the talocrural joint with abscesses and fistulæ. I have, beside the case of the adult patient already described, seen 3 such cases, all in children. One of them was the following:

Journal no. 750/32.—G. N., male, aged 4. Born March 3rd, 1928. Admitted June 1st, 1932. Discharged Nov. 11th, 1933.

Diagnosis: Tuberculosis of left talocrural joint, with fistulation.

Anamnesis: The father has pulmonary tuberculosis. The patient has had trouble with his left foot since December, 1931.

On admission: The boy is small and thin. Internal organs, no remark. Pirquet, positive.

Local symptoms, left leg and foot: Marked atrophy of the whole musculature of the left leg. The whole region of the left ankle-joint very much swollen. On the lateral side, the skin is ulcerated over an area larger than the patient's hand. In the bottom of this there are fungoid, suppurating granulations with elevated, undermined edges. On

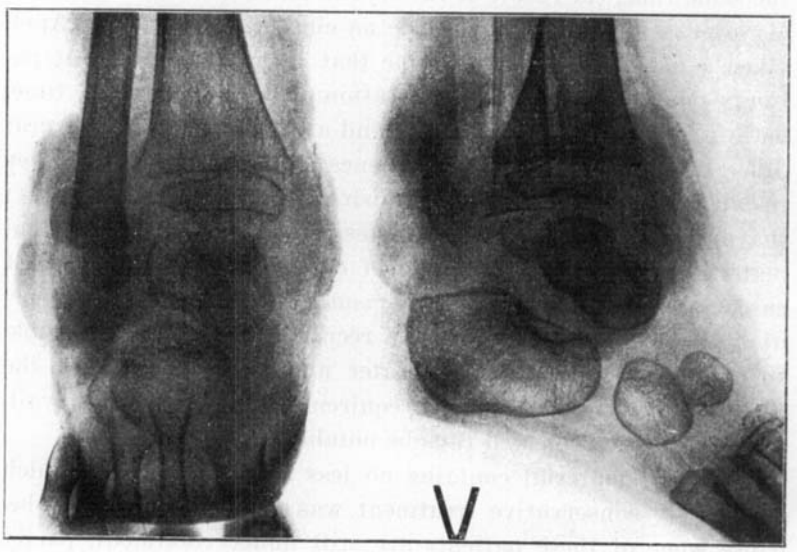

Fig. 21. *Fig. 22.*

the posterior and medial sides, around the achilles tendon, several ulcerations, from 1 to 3 cm. in diameter.

Roentgen, frontal view (Fig. XXI): Intense swelling of the soft tissues around the talus, the talocrural and talocalcaneal joints. The cartilage of the talocrural joint shows normal contours; the interarticular space is of normal height. Medially in the trochlea tali, close to the talocrural joint, there is a roundish, fairly well circumscribed rarefaction, the size of a large pea. Laterally in the distal tibial metaphysis is another, similar, rarefaction. The bone-design in the distal fibular metaphysis is irregular. Considerable periosteal growths on the distal part of the fibula.—*Side view (Fig. XXII):* The bone-design in the talus somewhat irregular. The contour of the collum ragged. Shape and bone-design of the calcaneus normal.

Clinical course: After immobilisation and repeated curettages for the removal of granulations, the foot was cured by June 1933.

Roentgen examination Nov. 3rd, 1933. (*Figs. XXIII and XXIV*): No longer any foci in the bones. The only visible change consists in some thickening of the capsule of the talocrural joint.

Patient discharged Nov. 11th, 1933, with bandage.

Condition July 1934: No pain. Walk unimpeded. No signs of any active process.

Fig. 23. *Fig. 24.*

In a couple of these cases, five years have elapsed since the foot was healed. If there should nevertheless eventually come recurrence in any of them, I shall probably have to agree with *Sorrel,* and adopt his system of doing astragalectomy in all cases of positive tuberculosis of the talocrural joint in children. That resection does not give as good results in the case of children as in the case of adults, is my absolute conviction. In a couple of cases in which I did resection of the talocrural joint in children, the result, as far as that joint is concerned, was healing with ankylosis; but the tuberculous process passed along, and attacked the talocalcaneal joint.

In the cases where the patient himself, or his parents, have refused to consent to a major operation, it has, of course, been

impossible to undertake any such. When recurrence has set in subsequent to conservative treatment, as has happened in 37 cases, I have usually succeeded in convincing the patient, or his relatives, that operation was the only way of getting definitively rid of the disease. It is evident that, even after a recurrence, a surgical operation such as resection or astragalectomy should not be undertaken until after sufficiently long general treat-

Fig. 25.

ment. Tuberculosis in childhood, of the talocrural or talocalcaneal joint, even if completely cured, may at a later age give rise, secondarily, to arthritis deformans of a more or less troublesome character, as the two following cases show.

Journal no. 685/28.—A. K.-J., female, aged 21. Born Oct. 12th, 1906. Admitted March 4th, 1927. Discharged Nov. 11th same year. Admitted a second time April 13th, 1928. Discharged July 13th, 1928.

Diagnosis: Tuberculosis of the left talocrural and talocalcaneal joints.

Anamnesis: Two sisters dead from pulmonary tuberculosis; a third sister has had the same disease for several years. The patient herself was operated on, in 1911, in a hospital, for pus formation in the ankle-joint. Was afterwards well until 1924, when the ankle again became painful and swollen. Under treatment in the sanatorium here from March 4th to Nov. 11th, 1927; discharged with bandage.

On admission, April 13th, 1928: General condition, good. Lungs, no remark. Pirquet, ++.

Local symptoms, left foot: Very little mobility in ankle-joint. Over the lateral malleolus, two long cicatrices; back of the same, swelling and tenderness on pressure.

Roentgen, April 24th, 1928 (*Figs. XXV—XXVI*): The interarticular space irregular, but of almost normal height. The lateral part of the tibial epiphysis only 2—3 cm. high. The trochlea tali flattened, its shape

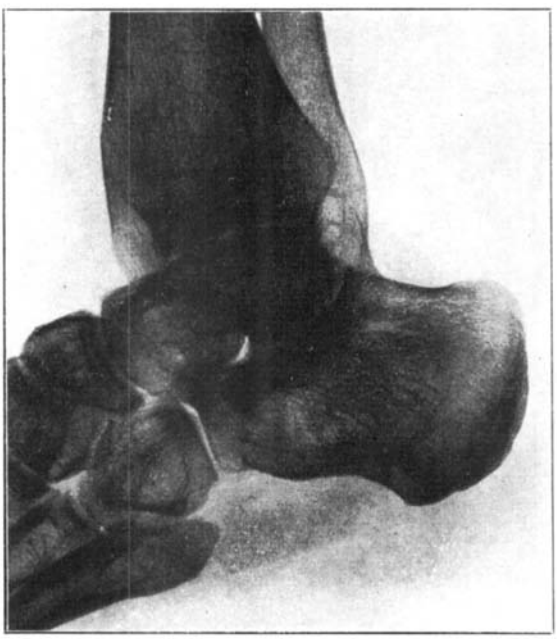

Fig. 26.

irregular. Also the joint-surfaces facing the posterior talocalcaneal joints irregular. No signs of any active process. Since 1927, the distal part of the tibia, the trochlea tali, and the calcaneus, immediately below the talocalcaneal joint, are become highly sclerosed.

Discharge, June 13th, 1928, with bandage.

Total time in hospital here: 11 months.

Condition Oct. 1934: No pain in the foot. Walk unimpeded. Does not wear any bandage.

Journal no. 852/32.—I. F., female, aged 16. Born Oct. 25th, 1916. Admitted July 22nd, 1932. Discharged March 3rd, 1933.

Diagnosis: Inveterate osteoarthritis of right elbow- and talocalcaneal joints.

Anamnesis: No hereditary disposition, nor at any time exposure, to tuberculosis. According to the patient's own statement, she had once, when she was a year old, fallen out of her baby-carriage, hurting her right elbow and foot; and had, as a result, got a pain in those joints, with fistula formation. She does not know how long this trouble lasted, nor whether she was in any way treated for it. She has since got a pain in the foot whenever she overtaxed it in any way.

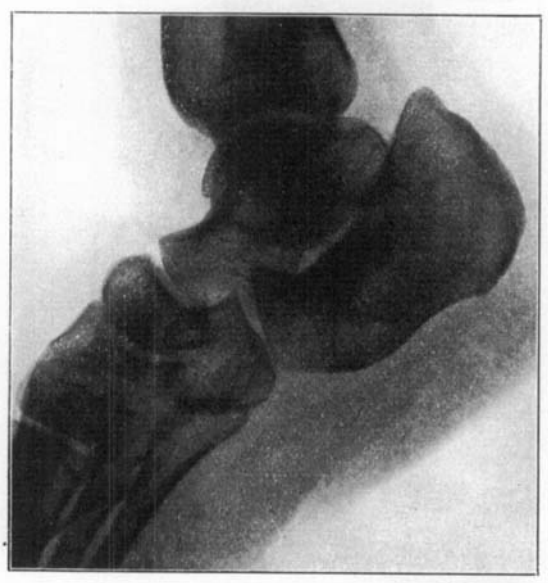

Fig. 27.

On admission: General condition, no remark. Internal organs, no remark. Pirquet, positive.

Local symptoms, right foot: No swelling or tenderness. Below the lateral malleolus, two pale, in-drawn cicatrices after fistulæ. The foot stands in pronounced valgus in the fork, and on the medial side a considerable pad has formed. Dorso-plantar flexion within normal limits. The foot can be brought from the abduction position into medial, but not over into adduction position. It can also actively be maintained in medial position, but soon returns into adduction, especially when the patient is walking.

Roentgen, Aug. 3rd, 1932, (Side view, Fig. XXVII): The whole shape of the calcaneus is different from what is usually the case at that age. Its middle and anterior portions are considerably longer than normal, giving it the form of a wooden shoe. Also the shape of the talus is unusual.

Its head is flattened, and its neck bent dorsally. No signs of any active process. The contours of the interarticular space between the talus and the calcaneus are sharp all through.

Operation, Sept. 9th, 1932: Subastragalar arthrodesis + shaving down of the soft tissues on the medial side. The fragments of bone chiselled off in the talocalcaneal joint were disposed in the form of a wedge, with its base toward the middle, in order to correct the valgus. A fibro-

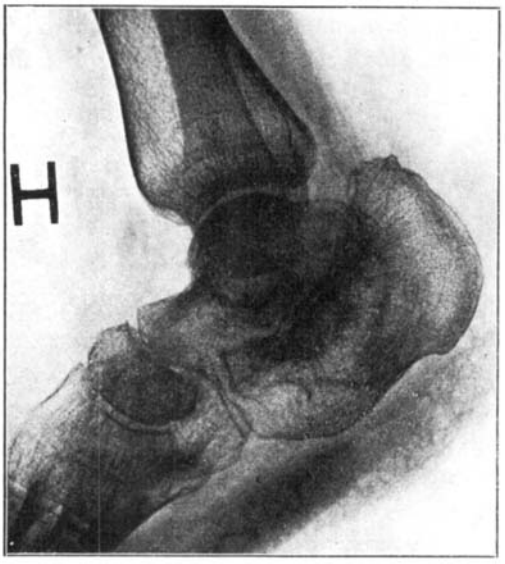

Fig. 28.

cartilaginous focus in the upper part of the calcaneus was removed. The bone around it was highly sclerotic.—*Nov. 3rd, resection + arthroplastics on right elbow-joint:* Typical tuberculous changes.

Roentgen, Feb. 22nd, 1933, (*Fig. XXVIII*): Bony ankylosis between the talus and the calcaneus.

March 3rd, 1933: Patient discharged, with inlay. No tenderness or pain.

Condition July 1934. No pain or discomfort from the foot. Walk unimpeded. No longer wears inlay in her shoe.

Among my material there are several cases of patients who have been treated for many years, in hospitals or sanatoria, by exclusively conservative methods, for tuberculosis of the ankle joints, without getting relieved of their trouble. It has been

for them an unnecessary waste of those many years. It is therefore my opinion that conservative treatment should not be continued with too long; especially as resection, or astragalectomy, nearly always gives an excellent, or at least a good, result, functionally. Besides, the time the patient has to stay in the hospital after one of those operations is relatively short; for the cases in my material the maximum was 1 year, the minimum 6 weeks, the mean average 19 weeks. And finally, the operation, as a rule, serves at the same time to rid the patient of his tuberculosis.

SUMMARY

The author reports upon the results obtained in the Apelviken Coastal Sanatorium, during the years 1928—34, in the treatment of altogether 110 cases of tuberculosis in joints of the foot, with localisation distributed as follows: talocrural joint, 53; talocrural and talocalcaneal, 29; talocrural, talocalcaneal and talonavicular, 16; talocalcaneal alone, 11; talocalcaneal and talonavicular, 1.

In regard to the anamnesis, he remarks that the patient in many cases states that the trouble arose after he had in some way or other twisted his foot; that it can therefore be difficult, at first, to establish the diagnosis; and that the patient can for many years have trouble in the form of pain, and sometimes swelling, before any positive clinical changes appear. The author then reviews the clinical symptoms of tuberculosis in the talocrural and taloalcaneal joints.

With regard to the roentgenological diagnosis, he points out that changes in the talocalcaneal joint due to tuberculosis are likely not to be seen in the roentgenograms, because the best views of that joint are obtained in lateral projection, and erosions in the neighborhood of the capsular attachments need not be apparent in pictures thus taken.

Tuberculosis of the posterior talocalcaneal joint often fol-

lows the appearance of the disease in the talocrural joint, which is its principal localisation. In the posterior talocalcaneal it is relatively benign, and some authors would maintain that it does not occur primarily there after the age of 15—16 years. Of the 11 cases with which the localisation is represented in the author's material, 3 belong, however, to the age-group of 15 to 20 years, and 3 to the group »20 and over«; while the remaining 5 belong to the group of 5 to 10 years. The author shows that in adult subjects tuberculosis isolated to the posterior talocalcaneal joint can develop not only as a result of osteitis in the upper part of the calcaneus, but also from a central tuberculous osteitis in that bone, or from a focus in the lower part of the corpus tali.

The interosseus talocalcaneal ligament seems to act as a barrier which prevents the tuberculous infection from spreading from the posterior talocrural joint to the anterior; which is shown by the fact that in 36 of the cases the former was affected, but the latter nevertheless went free.

With regard to the differential diagnosis, the author shows that septic and gonorrheal arthritis can give a clinical picture resembling that of talocrural and talocalcaneal tuberculosis. Luetic osteoarthritis can be very similar, clinically, to the tuberculous. Lues should be suspected when there are considerable periosteal growths without fistula formation. Wassermann and other serum reactions, together with the result of an antiluetic treatment, will settle the diagnosis. Also osteoarthritis due to tabes and other organic diseases of the nervous system should be borne in mind. Hemarthrosis of the talocrural joint may for a time simulate tuberculosis. Certain fractures, notably of the calcaneus, can give rise to secondary chronic changes in the talocalcaneal joint, similar to those produced by tuberculosis.

The author believes that surgical tuberculosis is much more benign in some parts of Sweden than in others; and this should be considered when it is a question of treatment. He shows by examples that a complete cure can be obtained by conservative treatment also in the case of patients above the age of 10,

especially when secondarily infected fistulæ are present; but gives examples also of such apparently complete cure in the case of adults, in whom no secondary infection existed. He points out that tuberculosis of the talocrural joint in children does not always begin in the talus, as claimed, for instance, by I. E. and Dejerine *Sorrel,* but can also begin with foci in the distal tibial epiphysis; in which case astragalectomy alone will not suffice to obtain a cure. The talocrural joint can become infected from isolated foci in the malleoli, and by thoroughly eradicating these before they break through, arthritis can be avoided.

The author describes the general treatment employed, the manner in which the course of the disease is controlled, etc. Surgical operations of any magnitude have not been undertaken until there were definite signs that the general tuberculous infection had been overcome. The talocrural tuberculosis has not in any of the children caused increased longitudinal growth of the diseased leg; in all cases has the growth been commensurate with the child's natural development otherwise.

Resection was done by the author in 27 cases of tuberculosis of the talocrural joint, in them all with excellent result. The patients were able to leave the hospital in as short time as two months after the operation. Two patients died; one, a woman 18 years old, two years and five months after, from tuberculosis of the kidneys and lung; the other, a woman of 40, three months after the operation, from pulmonary tuberculosis. In none of the other cases has there been any recurrence of the disease, though 19 of them were operated on more than four years ago. In the author's opinion, resection is apt, in the case of adult patients, to give a still better result than astragalectomy.

Simultaneous resection of the talocrural and talocalcaneal joints was done in 6 cases, in all of them with excellent result.

In the case of children, astragalectomy probably gives the best and surest result.

The author gives 4 cases to show that it is possible by conservative treatment to obtain a complete cure of tuberculosis, with fistulæ and abscesses, in the talocrural joint. As to whether the

results in these cases will eventually prove to be lasting, he does not wish to express any opinion.

Tuberculosis in childhood, of the talocrural or talocalcaneal joint, may, even if completely cured at the time, give rise, later, to secondary arthritis deformans in those joints, which may necessitate surgical intervention, for instance in the form of arthrodesis of the posterior talocalcaneal joint.

ZUSAMMENFASSUNG

Es wird berichtet über die Behandlung von insgesamt 110 Fällen von Fussgelenkstuberkulose, darunter 53 Fälle von Talocruralgelenkstuberkulose, 29 Fälle von Talocrural- und Talocalcanealgelenkstuberkulose, 16 Fälle von Talocrural-, Talocalcaneal- und Talonaviculargelenkstuberkulose, 11 Fälle von Talocalcanealgelenkstuberkulose sowie ein Fall von Talocalcaneal- und Talonaviculargelenkstuberkulose, die im Küstsanatorium Apelviken während der Zeit vom 1/1 1928 bis 31/12 1934 behandelt wurden.

Betreffend die Anamnese wird darauf hingewiesen, dass der Patient oft angibt, dass die Beschwerden unmittelbar nach einer Verstauchung aufgetreten seien, dass es darum im Anfange schwer sein kann, die Diagnose zu stellen, dass der Patient viele Jahre hindurch Beschwerden in Form von Schmerzen wie auch von Anschwellung hin und wieder haben kann, bis sichere klinische Veränderungen in Erscheinung treten. Die klinischen Anzeichen der Talocrural- und Talocalcanealgelenkstuberkulose werden durchgesprochen.

Betreffend die Röntgendiagnose wird darauf hingewiesen, dass man bei Tuberkulose im hinteren Talocalcanealgelenk möglicherweise keine Veränderungen auf dem Röntgenbilde findet, was darauf zurückzuführen ist, dass man die deutlichsten Bilder von diesem Gelenk durch Seitenprojektion erhält, und dass die Usuren an den Kapselbändern hierbei nicht hervorzutreten brauchen.

Eine Tuberkulose im hinterem Talocalcanealgelenk begleitet oft eine Talocruralgelenkstuberkulose, welch letztere die wichtigste Lokalisation ist. Die Tuberkulose im hinteren Talocalcanealgelenk ist relativ gutartig. Im Material des Verfassers (11 Patienten) kommt diese Lokalisation bei 3 Patienten im Alter von 15—20 Jahren vor, bei 3 im Alter von über 20 Jahren, bei den übrigen 5 im Alter von 5—10 Jahren. Einige Autoren sind der Meinung, dass das Leiden nach dem Alter von 15—16 Jahren nicht mehr vorkommt.

Die isolierte hintere Talocalcanealgelenkstuberkulose bei Erwachsenen kann, wie der Verfasser zeigt, nicht nur als Folge einer Osteitis im oberen Teil des Calcaneus entstehen, sondern auch infolge einer zentralen Tbc.-Osteitis im Calcaneus und nach einem Herd im unteren Teil des Corpus tali.

Das Ligamentum talocalcaneum interosseum scheint eine Barriere zu sein, die die Ausbreitung der tuberkulösen Infektion vom hinteren zum vorderen Talocalcanealgelenk verhindert, was daraus hervorgeht, dass in 36 Fällen das hintere Talocalcanealgelenk angegriffen war, das vordere jedoch nicht.

Differentialdiagnose: Septische und gonorrhoische Arthritisfälle können ähnliche klinische Bilder geben wie die Talocrural- und Talocalcanealgelenkstuberkulose. Die luetische Osteoarthritis kann der Tuberkulose sehr ähnlich sein. Man soll Verdacht auf Lues haben, wenn sich grosse periostale Auflagerungen ohne Fistelbildungen vorfinden. Wassermanns und andere Serumreaktionen sowie die Wirkung der antiluetischen Behandlung sichern die Diagnose.

Die Osteoarthritiden bei Tabes und anderen organischen Nervenkrankheiten dürfen gleichfalls nicht vergessen werden.

Ein Haemarthrosis im Talocruralgelenke kann für eine gewisse Zeit eine Tuberkulose vortäuschen. Gewisse Frakturen, besonders im Calcaneus, können zu sekundären chronischen Veränderungen im Talocalcanealgelenk Anlass geben, die denen bei Tuberkulose ähnlich sind.

Des Verfassers Meinung nach sind Knochen- und Gelenkstuberkulosen in gewissen Teilen von Schweden bedeutend gutartiger als in anderen. Bei der Frage der Behandlung muss hierauf Rücksicht genommen werden.

Der Verfasser weist nach, dass eine Ausheilung durch konservative Behandlung auch bei Patienten von über 10 Jahren gelingen kann und belegt dies mit Beispielen. So ist es besonders, wenn sekundärinfizierte Fisteln vorhanden waren. Es wird angeführt, dass eine scheinbare Ausheilung ohne Sekundärinfektion bei Erwachsenen vorkommen kann.

Es wird darauf hingewiesen, dass eine Talocruralgelenkstuberkulose bei Kindern nicht immer im Talus beginnt, wie z. B. Mr. et Madame Sorrel behaupten. Die kann ebensogut mit Herden in der unteren Tibiaepiphyse beginnen, in welchem Falle eine Astragalektomie allein keine Heilung herbeiführen kann. Das Talocruralgelenk kann von isolierten Herden in den Malleolien her infiziert werden, und wenn man diese vor dem Durchbruch ausräumt, kann eine Arthritis vermieden werden.

Es wird ein Bericht gegeben über die benutzte Allgemeinbehandlung, Kontrolle des Krankheitsverlaufs u. a. m. Grössere operative Eingriffe wurden nicht vorgenommen, ehe Zeichen dafür vorlagen, dass der Körper die tuberkulöse Allgemeininfektion überwunden hatte.

Bei Kindern hat die Talocruralgelenkstuberkulose in keinem Fall ein vermehrtes Längenwachstum des Unterbeines mit sich geführt, dagegen ist es aber oft in seiner Entwicklung zurückgeblieben.

Der Verfasser hat in 27 Fällen bei Talocruralgelenkstuberkulose eine Resektion ausgeführt und ausgezeichnete Resultate erhalten. Die Patienten haben das Krankenhaus in der kurzen Zeit von zwei Monaten nach dem Eingriff verlassen können. Zwei Patienten starben; eine 18jährige Frau, an Tbc. renis et pulmon., 2 Jahre 5 Monate nach der Operation, und eine 40jährige Frau, an akuter Lungentuberkulose, 3 Monate nach der Operation. Alle übrigen Patienten mit Talocruralgelenkstuberkulose sind rezidivfrei, darunter 19, die seit mehr als 4 Jahren operiert waren. Der Verfasser ist der Meinung, dass die Resektion eine Operationsmethode ist, die bei Erwachsenen noch bessere Resultate geben kann als die Astragalektomie.

In 6 Fällen wurden gleichzeitig das Talocrural- und das hintere Talocalcanealgelenk mit ausgezeichnetem Resultat reseziert.

Bei Kindern dürfte die Astragalektomie die besten und sichersten Resultate geben.

Durch den Hinweis auf 4 Fälle von Talocruralgelenkstuberkulose mit Fisteln und Abszessen, die mit konservativer Behandlung ausgeheilt wurden, wird die Möglichkeit eines solchen Ausganges nachgewiesen. Wieweit das Resultat dieser Fälle auch in der Zukunft verbleiben wird, darüber will der Verfasser sich nicht äussern.

Eine in den Kinderjahren ausgeheilte Tuberkulose im Talocrural- oder Talocalcanealgelenk kann Veranlassung zu einer sekundären Arthritis deformans in diesen Gelenken geben, welches Leiden eine chirurgische Behandlung erforderlich machen kann, z. B. eine Arthrodesis des hinteren Talocalcanealgelenks.

RÉSUMÉ

Compte rendu du traitement de 110 cas de tuberculose des articulations du pied, dont 53 cas de tuberculose de l'articulation tibio-astragalienne, 29 cas de tuberculose des articulations tibio-astragalienne et astragalo-calcanéenne, 16 cas de tuberculose des articulations tibio-astragalienne, astragalo-calcanéenne et astragalo-scaphoïdienne, 11 cas de tuberculose de l'articulation astragalo-calcanéenne et 1 cas de tuberculose des articulations astragalo-calcanéenne et astragalo-scaphoïdienne, soignés au Sanatorium d'Apelviken, durant la période allant du 1 janvier 1928 au 31 décembre 1934.

En ce qui concerne l'anamnèse, on signale que le malade indique souvent que l'apparition des troubles a suivi immédiatement une foulure; c'est pourquoi il peut être difficile de poser le diagnostic dans les débuts; d'autre part, le malade peut pendant de nombreuses années se trouver gêné par des douleurs, parfois de l'enflure, avant qu'il soit possible de constater des modifications cliniques certaines. Etude des symptômes cliniques de la tuberculose des articulations tibio-astragalienne et astragalo-calcanéenne.

En ce qui concerne le diagnostic radiologique, on signale que

lorsqu'il s'agit de l'artiuclation astragalo-calcanéenne postérieure, il n'est pas toujours possible de voir les modifications sur la radiographie, du fait que les meilleurs images sont obtenues par projection latérale et que l'usure des insertions capsulaires n'est pas forcément visible sur l'image prise de cette façon.

La tuberculose de l'articulation astragalo-calcanéenne est souvent accompagnée de tuberculose dans l'articulation tibio-astragalienne, cette dernière constituant la localisation la plus importante. La tuberculose de l'articulation astragalo-calcanéenne est relativement bénigne. Parmi les observations de l'auteur, on voit cette localisation chez 11 malades, dons 3 âgés de 15 à 20 ans, 3 de plus de 20 ans et 5 âgés de 5 à 10 ans. Un certain nombre d'auteurs estiment que cette affection ne se manifeste pas après l'âge de 15—16 ans.

Comme le démontre l'auteur, on peut rencontrer des cas de tuberculose de l'articulation astragalo-calcanéenne chez les adultes, non seulement à la suite d'une ostéite dans les parties supérieures du calcanéum, mais encore à la suite d'une ostéite tuberculeuse centrale dans le calcanéum ou lorsqu'il y a un foyer dans la partie inférieure de l'astragale.

Le ligament interosseux astragalo-calcanéen semble constituer une barrière qui empêche la propagation de l'infection tuberculeuse de la partie postérieure de l'articulation astragalo-calcanéenne à la partie antérieure, ce qui ressort du fait que dans 36 cas la partie postérieure de l'articulation astragalo-calcanéenne était attaquée, alors que la partie antérieure n'était pas atteinte.

Diagnostic différentiel: des arthrites septiques et gonorrhéiques peuvent provoquer des symptômes cliniques identiques à ceux de la tuberculose des articulations tibio-astragalienne et astragalo-calcanéenne. L'ostéoarthrite luétique peut ressembler beaucoup à la tuberculose. Il y a lieu de supposer qu'on se trouve en présence de la syphilis, car il y a de forts dépôts périostaux sans formation de fistules. Les réactions Wassermann ou les réactions à d'autres sérums, ainsi que l'effet du traitement antiluétique permettent d'établir le diagnostic.

Il faut également songer aux ostéo-arthritis provoquées par le tabes dorsalis ou d'autres maladies nerveuses organiques.

Un hémathome dans l'articulation astragalo-calcanéenne peut parfois simuler la tuberculose. Certaines fractures, notamment dans le calcanéum peuvent donner lieu à des modifications secondaires chroniques dans l'articulation astragalo-calcanéenne, ressemblant à la tuberculose.

D'après l'avis de l'auteur, dans certaines parties de la Suède, les cas de tuberculose des articulations de la jambe et du pied sont beaucoup plus bénins que dans d'autres parties du pays. Il y a lieu de tenir compte de ce phénomène dans la question du traitement.

L'auteur déclare qu'on peut obtenir la guérison par un traitement conservateur, même chez des malades âgés de plus de 10 ans et il le prouve par des exemples. C'est notamment le cas s'il y a une fistule provenant d'une infection secondaire. Il est allégué qu'une guérison apparente peut avoir lieu chez les adultes, même sans qu'il y ait eu d'infection secondaire.

Il est signalé que la tuberculose de l'articulation tibio-astragalienne chez les enfants n'apparaît pas forcément dans l'astragale, ainsi que Monsieur et Madame Sorrel le supposent. Elle peut parfaitement se manifester sous forme d'un foyer dans l'épiphyse du tibia inférieur; dans ce cas une simple astragalectomie ne saurait pas amener la guérison. L'infection de l'articulation tibio-astragalienne peut provenir de foyers isolés dans les malléoles et on peut éviter l'arthrite par leur évacuation avant qu'une perforation ait eu lieu.

Exposé du traitement ordinaire appliqué, de la surveillance du cours de la maladie, etc. Il n'a jamais été pratiqué d'intervention chirurgicale sérieuse avant que l'on ait constaté que l'organisme avait surmonté l'infection tuberculeuse générale.

La tuberculose de l'articulation tibio-astragalienne chez les enfants n'a en aucun cas entraîné une croissance exagérée de la jambe malade, au contraire le développement de cette jambe en a été retardé.

L'auteur a pratiqué une résection dans 27 cas de tuberculose de l'articulation tibio-astragalienne et obtenu d'excellents résul-

tats. Les malades ont pu quitter l'hôpital déjà deux mois environ après l'intervention. Deux malades sont décédés: une jeune femme de 18 ans, 2 ans et 5 mois après l'opération, de tub. renis et pulm. et une femme de 40 ans, 3 mois après l'opération, d'une tuberculose pulmonaire aiguë. Aucun cas de récidive n'a été observé chez les autres malades de la tuberculose de l'articulation tibio-astragalienne, parmi lesquels 19 sont opérés depuis plus de 4 ans. L'auteur estime que la résection est une méthode opérative qui peut donner des résultats encore meilleurs chez les adultes que l'astragalectomie.

Dans 6 cas où on fit la résection simultanément des articulations tibio-astragalienne et astragalo-calcanéenne postérieure, on obtint d'excellents résultats.

Chez les enfants, l'astragalectomie donne sans doute les résultats les meilleurs et les plus sûrs.

En se référant à 4 cas de tuberculose dans l'articulation tibio-astragalienne avec fistules et abcès, guéris par traitement conservateur, il est prouvé qu'il est également possible d'appliquer ce traitement. L'auteur ne peut cependant rien dire en ce qui concerne la constance des résultats obtenus jusqu'ici.

Une tuberculose des articulations tibio-astragalienne et astragalo-calcanéenne dans l'enfance peut provoquer une arthrite déformante secondaire dans ces articulations qui peut exiger une intervention chirurgicale comme par ex. l'arthrodes de l'articulation astragalo-calcanéenne postérieure.

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