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TUBERCULOSIS OF THE BONES AND JOINTS OF THE FOOT, INCLUDING AN ANALYSIS OF THE MATERIAL OF THE DANISH DISABLEMENT PENSION BOARD OF THE YEARS 1921—1940

BY

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The material of the Disablement Pension Board comprising tuberculosis of the bones and joints of the foot in the course of the years 1921-1940 includes a total of 234 pts. with this disorder. Cases are not included in which, later on, the disorder proved to be of non-tuberculous nature or in which the diagnosis was doubtful.

The material of the Disablement Pension Board will especially afford information of the course of the disorder, its duration and sequelae. The social importance of the disease will thus become especially conspicuous.

Tuberculosis of bones and joints is found to be localized to the foot in 5.7 to 11 per cent. *Nissen Meyer Ruegg* thus state 6.50 per cent., *Clairmont* 7.50 per cent., *G. A. Duncan* 6 per cent., *M. Cleveland* 6.6 per cent., *Chievitz* 10 per cent., *Schiller & Altschul* 10 to 11 per cent.

On going through a material of more than 13.000 pts. with tuberculosis of bones and joints of the "New York Orthop. Dispensary and Hospital" *Farrell & George* find the disorder to be localized to the foot in 5.7 per cent.

Otherwise tuberculosis of the bones occurs with the following localization and frequency according to *Kremer & Wiese*, tuberculosis of the talocrural joint being No. 4:—

Vertebral column	27.1	per cent.
Hip-joint	15.2	„ „
Knee-joint	13.4	„ „
Talocrural joint	5.8	„ „
Tarsus	4.3	„ „
Elbow	3.8	„ „
Finger bones	3.2	„ „

The disorder arises by metastasis from a latent or active focus in the organism. There are no reliable communications about transmission from tuberculous tendosynovitis or other tuberculous affections of the soft parts outside the joints.

The great importance of the hematogenous infection of the bones has been emphasized especially by *Hüebschmann* and *Kremer & Wiese*. Statistical examinations into the frequency of transmission of tuberculous disorders of the joints to the bones are insufficient, the material only reaching the pathologist when the question of such transmission can no longer be settled.

According to *Randerath* the hematogenous infection of the bones is at any rate more frequent than the occurrence of tuberculosis of some bone after preceding isolated tuberculosis of an adjacent joint.

The place of predilection for the development of a tuberculous affection is found in spongy parts rich in marrow, i.e. the bones forming blood cells or the myeloid parts of the long bones. The reason hereof is stated by *Randerath* to be a greater sensivity of the myeloid tissue to a tuberculous infection. This also explains the comparatively frequent occurrence of the disease in the short bones constituting the skeleton of the foot.

According to examinations by *Oehlecher* we only rarely have to do with bovine types of tubercle bacilli. In patients with surgical tuberculosis *K. A. Jensen* finds that 68 out of 73 cases are due to the human type. *Kremer & Wiese* state the typus bovinus in 2.4 per cent.

In the writer's material the typus bovinus was found in 3 cases of 21 whose types were determined, or 14.3 per cent.

Otherwise the statements of the ratio between the frequency of the two types vary in the different countries and districts.

Owing to the anatomical conditions of the foot (the comparatively small bones in connection with a great number of joints) osseous foci will frequently perforate to the joints at an early stage, and particularly in the case of the foot it will be difficult to distinguish between a primary tuberculosis of the bones and one of the joints.

On the basis of a very great number of cases of tuberculosis of the foot *Hahn* reckons with primary foci of the bones in 57 per cent.

Lange & *Becker* believe that the disorder may occur in association with tuberculosis of the synovial membrane, but most frequently it originates from a focus of the bones.

Only in comparatively few cases will the disorder develop as an isolated tuberculosis of some tarsal bone. *Lange* & *Becker* find such isolated tuberculosis in 15 per cent. of their cases, and in adult patients only as far as the calcaneus is concerned. *Contargyris* believes it to be almost a rule that tuberculosis of the calcaneus occurs as an isolated disorder.

Finotti finds foci especially in the anterior lateral part of the calcaneus.

Konschegg emphasizes the occurrence of central (caseous) foci with sequestrum formation, which for a long time do not penetrate to the joints and which lead to a tumorous transformation of the bone through ossifying periostitis and sclerosis of the surroundings.

Among 147 cases of tuberculosis of the foot *Miltner* & *Fang* find an isolated tuberculosis of the bones in 53 cases, or 36 per cent. The calcaneus was affected in 23 of these cases, then follow the first metatarsal bone, the astragalus and the cuboid.

In *Schiller* & *Altschul*'s material of 83 patients an isolated tuberculosis of the calcaneus occurred in 8 cases.

According to *Pouzet* the calcaneal tuberculosis is found in the two age classes in which the bone is osteogenetically active: during infancy when the nucleus of ossification in the corpus is developing and after the age of 10 when the posterior epiphyseal line ossifies.

Isolated persisting forms of tuberculosis of the scaphoid bone

have been described by *Pouzet, Massabuau & Marchand. Kremer & Wiese* find a more frequent occurrence of isolated forms during childhood.

In the material of the Disablement Pension Board an isolated tuberculosis of the bones is found in 35 cases, or 14.7 per cent. Here, too, the calcaneus is most frequently affected, then follow the first metatarsal bone, the scaphoid and the astragalus. The distribution is detailed in Table I.

In by far most cases the tuberculosis will, however, invade one or more joints and pass on to other bones. In the case of the tarsus, where the joints often communicate, greater or smaller parts of the foot will thus be liable to affection.

Of all the joints of the foot the talocrural joint is most frequently affected, more than half the number of all cases of tuberculosis of the foot being localized here. *Lange & Becker* state 40 per cent., *Kremer & Wiese* 57 per cent., *Farrel & George* right up to 82 per cent.

According to *Sorrel* the especially frequent occurrence of tuberculosis of the talocrural joint during infancy is due to a comparatively rapid development of the nucleus of ossification of the astragalus. This ossification comes to an end already at the age of about 2 years, when the other bones for a long time to come still consist of cartilage protecting against a further spread of the disease. Consequently an ostitis of the astragalus will most frequently be accompanied by a process in the adjacent joints, as a rule in the artic. talo-cruralis. On the other hand the infection of the talocrural joint from juxta-articular foci in the epiphysis of the tibia is rare.

In extensive ostitis of the astragalus the artic. talocalcanea post. is also frequently affected. *Hanson* thus finds both joints affected in 45 out of 98 cases of talocrural tuberculosis. In 16 of these cases there was a co-existent process in the joint between the astragalus and the scaphoid bone.

In *Lange & Becker*'s cases of tuberculosis of the talocrural joint the artic. talocalcanea post. is seen to be involved in 10 per cent. On the other hand an isolated occurrence of tuberculosis of the artic. talocalcanea post. is rare (*Sorrel*), accord-

ing to *Hanson* it is, however, seen in 10 per cent. *Sorrel* has not observed this localization in adults. In *Hanson*'s 11 cases of this nature there are 3 patients of more than 20 years. In *Hanson*'s opinion the disorder, which is especially frequent among older children, is due to transmission to the joint of processes in the upper part of the calcaneus. In early childhood, when there is only one nucleus of ossification, the disorder begins there and does not pass on to the joint.

Among 27 cases of calcaneal tuberculosis *Pouzet* thus only finds the talocalcaneal joint affected in 2 cases. In adults *Chiovitz* finds the talocalcaneal joint to be fairly frequently affected.

According to *Konschegg* tuberculosis of the other joints of the foot also frequently occur from foci in the astragalus, calcaneus, the scaphoid, cuboid, and cuneiform bones. The disorder may be isolated to a single joint, as for instance the artic. calcaneo-cuboidea which does not communicate with the other joints.

The tarsometatarsal joints may be affected from the tarsal bones, but according to Konschegg there are also independent processes from foci in the metatarsal bones.

In the case of the tarsus *Miltner* & *Fang* moreover describe an especially infiltrating form beginning in the synovial membrane or surrounding soft parts and spreading through direct propagation throughout the joints.

Altogether the bones of the foot are found to be affected in the following sequence in isolated and more extensive forms of tuberculosis: The calcaneus, the astragalus, metatarsal bones, the scaphoid bone (*Miltner* & *Fang*). In *Johansson*'s cases, too, the calcaneus is the bone most frequently affected.

In *Hahn*'s collective statistics comprising 1231 cases the sequence is: The calcaneus, the astragalus, the cuboid, the scaphoid, and metatarsal bones.

Several authors, however, find the astragalus to be most frequently affected (*Lange* & *Becker et al.*).

According to *Hahn* the frequency decreases with the amount of the substantia spongiosa of the individual bones.

In the 234 patients of the Disablement Pension Board the following localization of the disorder was found, the disease being bilateral in 4 cases, so that a total of 238 cases of tuberculosis of the foot resulted:

In 121 cases, or in 50.8 per cent., the talocrural joint was affected, either alone or together with one or more adjacent joints with the following distribution:

	Number of cases
artic talocruralis	94
„ „ + talonavic.	3
„ „ + talocalc.	18
„ „ + „ + talonavic.	2
„ „ + „ + „ + calc. cuboid	4
Total	121 cases

It will be seen that most frequently the talocalcaneal joint is involved, namely in 19.9 per cent.

In this group the disorder was bilateral in one case.

In 76 cases, or in 64 per cent., the right foot was found to be affected, the left foot in 43 cases, or in 36 per cent. thus a considerable but not statistically safe preponderance of the right side.

Schiller & *Altschul* find similar conditions, 65 per cent. of their cases being right-sided.

This unequal distribution must presumably be considered a casual displacement, as more authors would otherwise have drawn attention to it.

In 117 cases the disorder proved to be localized to the tarsus or metatarsus without involving the talocrural joint. In 3 out of these cases the disorder was bilateral. The right and the left foot were affected with almost the same frequency in this group.

In 17 cases there was diffuse tarsal tuberculosis with affection of most of the tarsal bones and joints.

In the remaining 100 cases the localization of the process was possible after several roentgenograms had been taken, in some cases supplemented with information from operations or post-mortem examinations.

The isolated tuberculosis of bones was thus found to occur in 35 cases. The percentage distribution of the individual bones will appear from Table I.

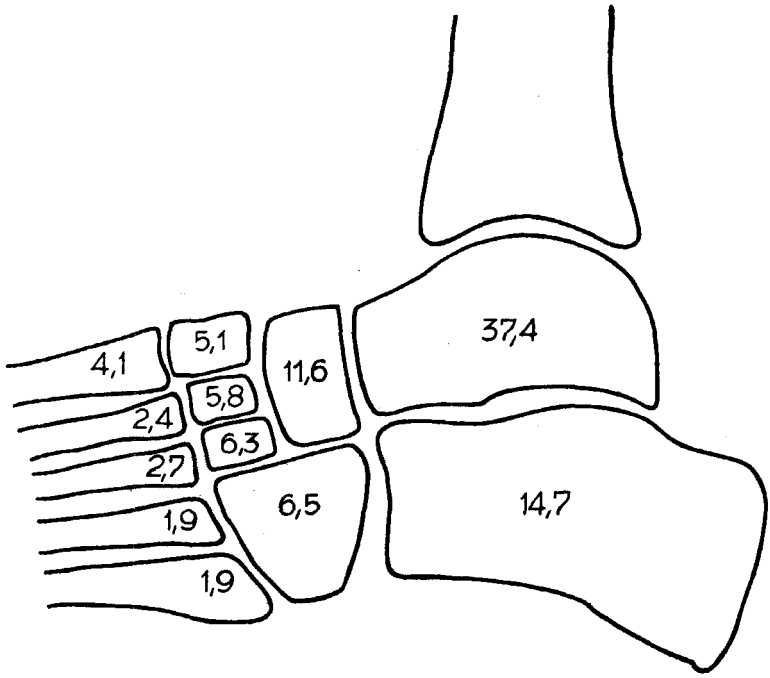
In 65 cases more diffuse forms were found with processes in one or more joints and with the following localization:

Chopart's joint		21 cases
of these:		
the whole of Chopart's joint	4 cases	
the talonavic. joint	10 „	
of these the ossa cuneiformia were also affected in 3 cases,		
in 2 cases the os cuboideum.		
the artic. calc.-cuboidea	7 „	
in 2 of these cases also the basis of metatars. III-V.		
In one case also the scaphoid bone		
The artic. talocalc. post		13 „
in one of these cases the artic. calc. cuboidea was involved, and in 1 case the artic. talonavic.		
the art. cuneonavicularis		15 „
in 4 of these cases the basis of one or more metatarsal bones was affected. In 1 case also the cuboid bone.		
the artic. tarsometatarseae (Lisfranci)		9 „
of these the artic. tarsometatars. I alone in 2 cases the artic.		
metatarsophal. I		6 „
process between the os cuneif. III and the cuboid		1 „

Chopart's joint will thus be seen to be most frequently affected, then follows the joint between the scaphoid and the cuneiform bones. As far as the latter joint is concerned the disorder has a tendency, via the articulation between the cuneiform bones, to pass on to the central part of Lisfranc's joint.

Altogether there are here 121 cases of tuberculosis of the talocrural joint and 100 cases where the disorder is localized to the tarsus and metatarsus, the individual bones being affected in the following sequence: The astragalus, the calcaneus, the scaphoid bone, the cuboid bone.

The percentage distribution will appear from Table I and is also shown in the diagram of the foot reproduced overleaf.



The figures state the frequency in per cent. of the involvement of the individual tarsal and metatarsal bones in 221 cases of tuberculosis of the foot.

TABLE I.

The frequency of Tuberculosis of the Individual tarsal and metatarsal Bones.

Bones affected	Isol. process		Multiple Processes		Isol. + Multiple	
	Frequency	%	Frequency	%	Frequency	%
astragalus	3	8.6	150	39.6	153	37.4
calcaneus	10	28.6	51	13.5	61	14.7
scaphoid	5	14.3	43	11.3	48	11.6
cuboideum	2	5.7	25	6.6	27	6.5
cuneif. III	1	2.9	25	6.6	26	6.3
„ II	0	0.0	24	6.3	24	5.8
„ I	0	0.0	21	5.5	21	5.1
metatars. I	9	25.7	8	2.1	11	4.1
„ III	1	2.9	10	2.6	11	2.7
„ II	2	5.7	8	2.1	10	2.4
„ IV	1	2.9	7	1.8	8	1.9
„ V	1	2.9	7	1.8	8	1.9
Total	35 cases		186 cases		221 cases	

It is often difficult to establish the diagnosis of tuberculosis pedis, especially in the milder cases where a prolonged period of observation is not infrequently required.

Cases of ostitis and arthritis of another etiology may give a picture similar to that of tuberculosis. This is also seen in luetic and gonorrheal affections of joints, especially of the talocrural joint. In the case of considerable periosteal neo-plasms without fistula formation lues should be especially considered (*Hanson*).

To this must be added post-traumatic alterations of the talocrural joint and moreover certain fractures of the calcaneus (*Sorrel*).

Meurer and *Erler* have reported cases of osteochondroma tali which roentgenologically and clinically resembled tuberculosis completely. A case reported by *Michel* was one of myeloplastic tumour.

Thus the X-ray findings are not pathognomonic of tuberculosis either. The most characteristic feature is a, most frequently diffuse, calcareous atrophy.

It will often be difficult to make out the different parts of the joints of the foot in the roentgenogram, especially in the case of affection of the artic. talocalcanea post. In examination of this joint *Anthonsen* recommends a special oblique projection, which has been described previously by *Husfeldt* and *Niels Hansen*. The foot is placed in dorsal flexion, its lateral aspect facing the film. The central ray is directed to a point immediately below the medial malleolus with an inclination of 25 degrees in the craniodistal direction and 30 degrees in the dorsoventral direction. The focal distance is reduced to 25 or 35 cm.

In some cases of isolated tuberculosis of the scaphoid bone the roentgen findings may be completely like those seen in *Köhler*'s disease. In the literature 11 cases of this nature have been reported hitherto. *Aimes & Estor, Massabuau & Marchand, Faulkner, Contargyris, Strée, Nové-Josserand,* and *Radulesco* report 1 case each, *Greenwood* and *Herzog* 2 cases each.

Till 1923 it was contested that tuberculosis could represent such a picture of density of the scaphoid bone instead of one of rarefaction of the bone.

Biopsy of regional lymphatic glands was employed by *Ottolenghi* and *Vals* from 1933, and from 1936 by *Seddon*. The biopsy gave positive results in a great number of cases. *Seddon* had a positive finding in 1 case of tuberculosis of the ankle.

In a case of tuberculosis of the artic. tarsometatars. I *Agerholm-Christensen* found tuberculosis both on bacteriologic and histologic examinations of tissue from the joint and lymphatic glands in the groin.

In unpublished examinations at the Institute of Pathological Anatomy of the University in Graz *Konschegg* reports that tuberculosis only in rare cases was demonstrated in the regional lymphatic glands, and inoculation in guinea pigs also failed. *Konschegg* believes that in *Ottolenghi*'s cases the tuberculous processes were more advanced and that the patients have only come under treatment at a comparatively late stage of the disease.

Normally, an involvement of the regional lymphatic glands is not reckoned with either in chronic, isolated tuberculosis of the organs.

On closer analysis 142 cases of the original 380 cases of tub. pedis of the Disablement Pension Board had to be excluded.

30 of these cases were disorders of a non-tuberculous nature:—

Chronic purulent osteomyelitis or arthroitis	18 cases
polyarthroitis	5 „
arthroitis deformans	2 „
pes planus	4 „
cyst of the cuboid bone	1 case

The other cases not included were left out for the following reasons:—

Doubtful diagnosis	31 cases
insufficient information	37 „
old cases subsided long ago	25 „
amputated before 1921	10 „
tuberculosis of soft parts only	7 „
isolated process in the malleoli	2 „

In 56 cases out of the 238 cases used for analysis the diagnosis was established histologically or bacteriologically.

Bacteriologically	in 15	cases
histologically	„ 34	„
histol. + bacteriol.	„ 7	„

As fistulae or abscesses were found at some time in nearly half the number of cases it would have been easy to arrive at a bacteriological diagnosis. Trial excision has only been employed in a few cases of this material.

In about ¾ of the cases the diagnosis was thus established on the basis of the clinical course compared with characteristical roentgenologic findings. The diagnosis is moreover supported by the frequent presence of tuberculosis of other organs.

As might be expected the morbidity in the different parts of the country is found to vary also in the case of tuberculosis of the foot.

If a classification is made according to counties the following figures are found for the 234 patients, a distinction being also made between rural and urban inhabitants.

County	Country number of pts.	Town or City number of pts.	Entire County number of pts.	
Hjørring	9	4	13	
Thisted	5	2	7	
Aalborg	12	5	17	
Viborg	17	1	18	
Ringkøbing	12	5	17	
Randers	7	2	9	
Skanderborg	8	9	17	
Vejle	7	4	11	
Ribe	9	5	14	
Haderslev	3	0	3	
Tønder	3	1	4	
Aabenraa-Sdbg.	2	0	2	(132)
Odense	7	8	15	
Svendborg	7	6	13	(28)
Holbæk	2	2	4	
Frederiksborg	3	2	5	

County	Country number of pts.	Town or City number of pts.	Entire County number of pts.	
Copenhagen	3	39	42	
Roskilde	0	3	3	
Sorø	4	1	5	
Præstø	4	0	4	
Maribo	4	4	8	
Bornholm	3	0	3	(74)
	131	103	234	

On going through the material of cases of active tuberculous spondylitis of the Disablement Pension Board *Hans Thomsen* finds that 381 out of 575 pts. are resident in counties of Jutland, 55 being from counties of Funen, and 139 from those of Sealand. Both absolutely and relatively the disorder is most frequently found in the counties of Hjörring, Thisted, Viborg, and Ringköbing. In proportion to the number of Insurance-Act patients in the different counties tuberculosis of the foot is most frequent in the counties of Tönder, Viborg, Ringköbing, Hjörring, and Thisted.

C. Dalsgaard has drawn the attention to the frequent occurrence of extrapulmonal tuberculosis in the county of Viborg. An especially great number of cases of tuberculosis in the lower extremities is found there in women engaged in agriculture.

Tuberculosis of the bones and joints occurs especially in the 2nd and 3rd decennium. In the material of the Disablement Pension Board 57 per cent. of the cases are found in these age classes; *Miltner* & *Fang* even state 77 per cent.

In 110 cases of tuberculosis of the talocrural joint *Hanson* finds 27 per cent. of the cases at the ages from 15 to 20 years.

Schiller & *Altschul,* in 83 adult pts., 65 per cent. of the cases at the ages from 16-30 years.

In *Sorrel*'s 108 cases of tuberculosis of the talocrural joint during childhood the disorder began in the course of the first 5 years of life in more than half the number of cases. A similar distribution is reported by *Sv. Johansson* in 26 children.

In the material of the Disablement Pension Board the following age-incidences are found:

Age at Onset of Disease	Number of Cases	%
0- 5	13	5.5
5-10	24	10.1
10-15	25	10.5
15-20	54	22.7
20-25	35	14.7
25-30	25	10.5
30-35	17	7.1
35-40	13	5.5
40-50	21	8.8
50-60	11	4.6
	Total 238 Cases	

Tuberculosis of the foot is generally stated to be of more frequent occurrence in men than in women—from the literature with the following collective statistics comprising both children and adults:

	Males	Females	Total
Syring	115	107	222
Cicconardi	78	67	145
Johansson	16	10	26
Schiller & Altschul	64	19	83
Hanson	62	48	110
Miltner & Fang	90	57	147
Hahn	414	245	659
	839 = 60.3 %	553 = 39.7 %	1392

As opposed to this the material of the Disablement Pension Board shows a slight, statistically doubtful, preponderance of the female sex, namely 121 females and 113 males.

In the case of 103 male patients the following occupations were represented:—

	Number of pts.
Engaged in agriculture	43
„ „ handicraft	25
„ „ trade	6
skilled workers	6
other occupations	17
unemployed	6

51 patients were found to have suffered from tuberculosis of other organs before the foot became affected.

Localization and frequency of affection of the individual organs will appear from Table II.

Exudative pleurisy was of especially frequent occurrence, being found in 33 cases, or in 14 per cent., then follow tuberculosis of the bones of other localization and tuberculous glands.

The patients will frequently state a trauma as the cause of the occurrence of the disorder.

In *Hahn*'s great material trauma is stated in 13 per cent.

In the French army almost all cases of tuberculosis of the foot were once stated to be determined by traumata (*Guder*).

On going through the cases of tuberculosis determined by traumata and submitted to the Directorate for Compulsory Accident Insurance *Hans Thomsen* finds affection of the talocrural joint and the tarsus to be the comparatively most frequent localization.

In the material of the Disablement Pension Board trauma was stated in the case of the talocrural joint in 38 cases, or in 31.4 per cent., in the case of the tarsus in 13 cases, or in 11.1 per cent., in the case of the whole foot in 21.4 per cent.

Most of the traumata were slight ones, in a number of cases the pt. only "twisted" his foot; "spraining and distorsions" are also stated. In a small number of cases only there were direct, more serious traumata, all of them without any fracture.

As to the question of tuberculosis and trauma *Hans Thomsen* otherwise finds nothing in support of the so-called tuberculosis of traumatic determination; the sensation of a trauma perceived by the patient will frequently be the first symptom of an insufficiency of the joint.

Tuberculosis of the foot will as a rule be characterized by a chronic course. If, for any length of time, the disorder remains isolated to one bone there will be few and vague symptoms to begin with, the pts. especially complaining of pain nad tenderness, later on swelling appears over the affected part.

On invasion of the joints, which is generally taking place when the patient seeks medical advice, the symptoms are ac-

centuated. In the case of the greater joints impairment of movement now also occurs.

When the talocrural joint is affected a more or less marked swelling of the joint develops, especially around the malleoli—a cushion-shaped swelling of the anterior aspect of the joint is also seen. Flexion-extension ceases wholly or in part.

When the posterior talocalcaneal joint is affected the grooves on either side of the Achilles tendon disappear completely downwards and according to *Hanson* a swelling of the planta covering the calcaneus is also seen. The rotation movements of the foot are impaired or stopped.

Miltner & Fang mention a more acute form for tuberculosis of the foot beginning in the synovial membrane and spreading through direct propagation throughout several joints.

When the disease has lasted a short time a distinct atrophy of the crus, in many cases of the femur, too, develops.

The further course of the disease often leads to abcess or fistula formation. *Miltner & Fang* state fistulae in 83 per cent. of the cases, being developed especially during the first 8 months of the disease. In *Hanson*'s 110 cases abscess or fistula occurred in 62 cases, or in 63.3 per cent., *Schiller & Altschul* state 39.8 per cent.

Hahn points out that in calcaneal tuberculosis fistulae appear especially corresponding to the external aspect of the bones.

As a rule swelling, abscess or fistula formation will correspond fairly well to the localization of the disorder to the different parts of the foot.

Not only from the calcaneus but also from most other tarsal bones, even from the astragalus, fistulae may arise without the adjacent joints being necessarily involved.

In the material of the Disablement Pension Board abscesses or fistulae developed in 54 per cent. of the cases.

In the case of tuberculosis of the talocrural joint a transmission to the tendon sheaths is said to be rare and has not been observed by *Sorrel*. *Hanson* has seen 2 cases of that nature.

Konschegg states that in the case of tuberculosis of the foot

the tendon sheaths of the mm. peronei, the m. tibialis post., the m. flexor dig. long., and the m. hall. long. are especially affected.

In 555 pts. with articular tuberculosis of varying localization *Duncan* found no signs of tuberculosis of other organs in 43 per cent. of the cases, and *Miltner & Fang* demonstrated active tuberculosis elsewhere in the organism in 65 per cent.; the lungs in 51 per cent., other bones in 22.2 per cent., glands in 17.8 per cent., intestines, the skin and other organs in 11.1 per cent.

Such results will naturally depend on how systematical the examination of the patients has been (roentgenogram of the lungs, examination of the stomach sluicings and the urine etc.). *Duncan* thus states that by means of systematical examination of the urine of patients with tuberculosis of bones and joints an accompanying renal tuberculosis could be ascertained in 13.8 per cent., and on systematical tonsillectomies the same author found the tonsils to be tuberculous in 24 per cent. *Snyder* states tuberculosis of the tonsils in 5 per cent. of tuberculosis of bones and joints.

In 136 cases out of the 234 patients of the Disablement Pension Board tuberculosis could be ascertained in other organs, either as an active or inactive process or as subsequent complication. Active tuberculosis was thus found in 69 cases, or in 29 per cent.

Pulmonal tuberculosis alone was found in 35 cases, or in 15 per cent.

Tuberculosis of bones and joints outside the foot in 30 cases, or in 12.8 per cent., compare Table II.

On the whole the treatment of tuberculosis of the foot has followed the lines that have been prevailing in the treatment of tuberculosis of bones and joints in general. Especially owing to the frequent localization of the disorder to other organs particular attention is also paid to the general treatment in the case of tuberculosis of the foot—not only in the conservative therapy but also as preparatory and after-treatment in the case of surgical interference.

The conservative treatment reached its climax at *Rollier*'s

TABLE II.

Localisation and Frequency of the tuberculous Processes outside the Foot in 136 pts.

Localization	Inactive tub.	Active tub.	Tub. as subsequent complic.
pleuritis exudat.	33	3	1
tub. pulm.	12	35	7
tub. of bones and joints	25	30	27
tub. glands	19	7	3
renal tub.		10	4
tub. of other organs	10	17	2
	(51 pts.)	(69 pts.)	(33 pts.)

sanatorium at Leysin; since 1903 he has advised sun-baths in cases of extrapulmonal tuberculosis.

In tuberculosis of the foot he states recovery with this treatment in 78.5 per cent. of the cases and improvement in 14.2 per cent. 66.6 per cent recovered with normal articular function. Tub. artic. talocruralis was especially favourably influenced by the light therapy.

The results reported comprise both children and adults so that for this reason, too, it is difficult to judge the results. It seems as if no after-examination of the patients has taken place.

Rollier rejects treatment in closed plaster-of-Paris bandages and uses a special extension treatment.

Lo-Grasso, too, stresses the conservative treatment, even if results that can touch the figures of Leysin have not been attained at Perrysburg through treatment with artificial light. 69 per cent. of 42 pts. with tuberculosis of the ankle joint were discharged as apparently recovered.

If trial excision has not been made, the diagnosis will be subject to no slight uncertainty in a number of these cases that have been treated conservatively.

Prognosis and treatment of tuberculosis of the foot will depend on the patient's age, the form, localization, and duration of the disorder.

Most authors agree to conservative treatment during childhood.

In 1910 *Sever,* from "The Children Hosp." in Boston, reported the results of treatment of tuberculosis of the talocrural joint and the tarsus and concluded that the conservative treatment in children is superior to the surgical one.

Fitzsimmons reported the results from the same hospital during the years that followed and arrived at a similar view.

Immobilization treatment is best carried out in circular plaster-of-Paris bandages which may later on be replaced by plaster splints. In the case of capsular fungus (arthritis fungosa) this method protects the articular surfaces by keeping them at rest, thus preventing stiffness of the joint (*Vulpius*). In case of destruction of the articular surfaces the ankylosis is furthered, which must also be aimed at in such cases. By means of fenestrae in the circular plaster local treatment of fistulae is possible.

Kochs, too, believes that fixation by means of plaster bandages is an easier and safer method than extension treatment.

On the whole there are few communications about extension treatment in tuberculosis of the talocrural joint, among others by *Franz Bier* and *Simon* who report 20 cases treated in that manner. Many of these cases healed up with good functional results. The authors advise extension treatment in all cases of tuberculosis of the talocrural joint and reject surgical interference and methods aiming at ankylosis.

Schiller & *Altschul* mention roentgen treatment that has been used in 83 cases with 2 areas with a dorsal and a volar area for the anterior part of the foot and a medial and lateral area for the posterior part of the foot and the talocrural joint. 150-200 r on each area.

Besides roentgen treatment, light therapy, orthopedic treatment and diet were employed.

By means of this treatment 58 pts. obtained a temporary recovery or became able to work.

In roentgen therapy *Kremer* & *Wiese* point out special contraindications in the more acute, inflammatory forms, in case

of highly destroyed joints, and in marked, caseous forms. Severe mixed infection is also a contraindication.

Only after preceding general treatment and immobilization and after repeated roentgen examinations have shown that the disorder has come to a standstill, the question of surgical interference of different nature may arise, according to the localization and form of the disease.

Many authors point out that the conservative treatment fails in patients over 16 years. The prognosis is stated to be unfavourable especially after the 40th year (*Lange* & *Becker*).

In the case of isolated foci of the bones simple evacuation of the focus is made.

According to *Mahler* foci near the joints occur especially in the lower part of the tibia and in the calcaneus.

The tendency to spreading in the direction of the joint is of great importance to the prognosis in these cases. Besides the danger of an articular infection there is also, in the case of young bones, a possibility of destruction of the epiphysis. Even conservative treatment of long duration will often fail.

Radical removal of foci near the joints is stated to be the best treatment. Even if the process has advanced so far as immediately below the articular cartilage, it is possible to operate without opening the joint (*Mahler*). *Erlacher,* too, goes in for early evacuation of these foci even at the risk of rupture into the joint. The author reports 9 cases, 8 of which recovered.

Pouzet operated 24 cases of calcaneal tuberculosis in children.

Nase also emphasized superiority of surgical treatment in the case of foci near the joints but only operates on the calcaeus where conservative treatment fails and in the case of sequestration.

Sorrel, who by the way states that infection of the talocrural joint from the tibial epiphysis is rare, has also in some of these cases performed a radical operation with removal of foci which would have penetrated into the joint if left alone.

Hanson evacuated foci of the malleoli in 2 cases and thus avoided spreading of the process to the joint.

In case of a more extensive process of some tarsal bone with

secondary invasion of the joint it will be advisable to remove the entire bone with the adjacent synovial membrane (*Erlacher*).

In the case of tuberculosis of the astragalus, which at an early stage will affect the talocrural joint, *Sorrel* especially goes in for astragalectomy. Already in 1906 *Menard* treated with astragalectomy but with poor results, as in these cases the disorder had spread too far (*Sorrel*).

In marked cases in children, too, *Sorrel* uses astragalectomy. The author points out that, as far as possible, the operation should take place before the occurrence of fistulae, at any rate before a possible mixed infection. *Sorrel* gives a detailed description of the technique and obtains excellent results in suitable cases. Other French authors, e. g. *Dubau & Bolot*, only advise astragalectomy in cases where the astragalus is highly destroyed or sequestrated.

The object of astragalectomy is not ankylosis but nearthrosis (*Hanson*). In fistulous cases, too, *Hanson* sutures without drainage. Plaster bandage is applied for 3 months.

In cases where only the talocrural joint is attacked *Hanson*, unlike *Sorrel*, obtains better results with a well performed resection of the joint than in astragalectomy. So much is resected of the tibia and the astragalus that healthy bony tissue is found. On the 10th day after the operation the bandage is opened and the sutures are removed, after 3 or 4 weeks a new bandage is applied and the pt. is allowed to get up, if there have been no complications. The object of this operation is ankylosis. 6 weeks after the operation the pt. gets a leather capsule.

If the artic. talocalcanea post. is also affected this joint is resected simultaneously.

In isolated processes in the artic. talocalcanea post., too, isolated resection of this joint gives excellent results (*Chievitz*).

Since 1923 *Hibbs*, too, has treated tuberculosis of the talocrural joint with resection and in the course of 6 months operated 18 cases without recidivation.

In the case of tuberculosis of the tarsus many authors, especially Americans, dissuade a simple evacuation of the focus,

as the whole of the diseased tissue cannot be removed in this manner and healthy parts of the bone are opened to tuberculous infection at the same time (*Miltner & Fang*).

McGavin makes an exception by recommending curettage in the case of localized processes of the smaller tarsal bones, such as the cuboid and the scaphoid.

After *Miltner & Fang* in 43 cases had tried curettage of the focus with poor results radical surgical treatment was resorted to with excision of soft parts and bones, endeavouring to remove the diseased tissue completely. When the excision was complete no recidivation was seen.

In cases with affection of the tarsal and metatarsal bones a complete removal of the whole part was thus necessary, and up to ¼ or ½ of the soft parts and bones of the foot was excised.

The metatarsal bones were removed in case of isolated affection. In single, localized processes of the smaller tarsal bones excision is especially applicable. In more extensive processes anterior tarsectomy is recommended according to *Ollier*.

Clavelin and *Sarroste* have made transversal tarsectomy in 6 cases with excellent results and together with their own 6 cases they have collected 30 cases from the litterature (12 cases of *Soulagne*'s, 8 cases of *Sorrel*'s, 3 cases of *Mériel*'s, 1 case of *Rocher & Roudil*'s) with 21 good results.

After the operation the pts. have been at rest for 3 months and have then been allowed to get up with a plaster bandage, care being taken to model the arch of the foot. The bandage has been removed after 2 or 3 months.

1 or 2 years after the interference the foot was fully capable of function. It must be pointed out that already from 1894 *Sinding-Larsen* operated according to radical principles and carried out astragalectomies, resections and tarsectomies with removal of all tuberculous tissue so that only an orthopedic problem remained.

In tuberculosis of the talocrural joint extra-articular arthrodesis has also been used. By this treatment ankylosis of the joint is aimed at (*Baumann*).

Zanoli has reported 12 cases.

Meurer, too, believes it to be justifiable to try the extra-articular arthrodesis in suitable cases and especially in localized processes, a firm ankylosis being obtained here in a position that is statically and functionally favourable; besides the after-treatment is simpler.

Tuberculosis of the foot has, however, a tendency to attack the soft parts diffusely as well as several joints, the method thus becoming less applicable, for which reason *C. K. Petter* maintains that all joints that have to carry a weight should be ankylosed. An operation that is properly performed, and at the right time, will thus give better and more lasting results than conservative treatment.

As a special treatment *van Haeff* mentions perivascular sympathectomy (*Leriche*), which is believed by several surgeons to be of a beneficial effect on tuberculosis of the bones.

A number of these cases must, however, be supposed to have been cases of post-traumatic dystrophy of the extremities.

Amputation of the crus is confined to the most advanced cases in which the disease has spread extensively to the tarsal or metatarsal bones and the surrounding soft parts.

Hanson states the prognosis to be especially bad in fistulating cases with stalactite-like periosteal coating of the tibia, in which case amputation is the best method. He has not used tarsectomy or operation a. m. Syme.

7 out of *Hanson's* 110 pts., or 6.4 per cent. were amputated.

Sinding-Larsen has performed 9 amputations in 83 pts., or in 11 per cent., Cleveland 6 amputations in 22 pts., or in 27.3 per cent.

In the case of the patients of the material of the Disablement Pension Board the treatment was mostly conservative: Immobilization of long duration in plaster bandages, light therapy, in connection with minor surgical interference.

Of greater surgical interference 17 talocrural resections and 21 astragalectomies in all were made. Moreover amputation of the crus was made in 22 cases, or in 9.2 per cent.

In 3 cases Pirogoff's operation and in 1 case Syme's operation.

As far as the talocrural joint is concerned excochleation and excision was moreover made in 28 cases.

In disorders of the tarsus 19 excochleations, 5 extirpations of bones, and 8 resections of bones and joints were made.

In disorders with so chronic a course as tuberculosis of bones and joints a very long period of observation is required to give us an idea of the course and duration of the disease.

In the 238 cases of tuberculosis of the foot of the Disablement Pension Board an average of 12 years has passed from the onset of the disease till the patients were in connection with the Board for the last time.

In 33 cases the disorder was complicated by the occurrence of tuberculosis in other organs previously not affected. As will appear from Table II such complications were chiefly affections of bones and joints.

7 pts. died whilst the disorder of the foot was active, 19 pts. died later on.

The cause of death in these 26 cases was found to be:

Tub. pulm.	11	cases
spondylitis tub.	4	„
tub. of other organs	4	„
non-tuberculous disorders	2	„
unknown	4	„

Besides 1 pt. died of embolia art. pulmonalis after surgical interference (amputatio cruris). Otherwise tuberculosis isolated to the foot has not caused any deaths.

In most cases the material of the Disablement Pension Board gives a good impression of the course of the disease.

In cases where the disablement pension was given chiefly on account of the disorder of the foot and when there were no other tuberculous manifestations in the beneficiary, the time from the onset of the disease till the disablement pension was stopped was a good exponent of the duration of the disease, the average duration in the case of the *talocrural joint* being 6 years

in 25 cases with a maximum duration of 10 years, and in the case of the *tarsus* 4.7 years.

In cases with tuberculosis of other organs in connection with the disorder of the foot an average duration of the disease of 3.7 years was found in the case of the *talocrural joint* and in the case of the *tarsus* 3.2 years.

This difference may be explained among other things by the fact that the latter group comprises a number of milder cases which have already subsided when disablement pension is applied for, the disorder of the foot having thus been quite subordinate as compared with the older tuberculous affections of the patients.

In all the 121 cases of tuberculosis of the *talocrural joint* the duration is as follows:—

In 74 cases the average duration of the disorder is 4.5 years.

In 15 cases there is a very protracted chronic course (marked by frequent exacerbations). All these cases were of more than 10 years' duration. 4 pts. of this group constantly got disablement pension.

15 pts. were amputated or died during an active stage of the disease.

In 17 cases nothing could be ascertained with certainty about the duration of the disease, or the case before the Board had not yet been settled.

The figures comprise both the operated and non-operated patients.

Among the operated cases it is of special interest to consider 38 cases in which resectio artic. talocruralis or astragalectomy was performed.

In 29 of these cases (in which the disorder had settled down within the first 10 years) an average duration of the disease of 4.5 years was always found.

In 15 out of 17 resected cases a solid firmness developed at the place of resection; (in 11 cases an osseous ankylosis could be demonstrated roentgenologically).

In 2 cases the results were poor, as fistulae or abscesses developed. In one of them amputatio cruris had to be made. In

4 out of the 17 cases a simultaneous resection was made of the artic. talocalcanea post. which was involved.

In several of the cases in which astragalectomy was performed more extensive processes were found requiring the removal also of the scaphoid or the cuboid bone, or resection of the articular surface of the tibia in connection with the astragalectomy.

Otherwise the results were good in 15 cases (in 5 of these there was osseous ankylosis). Only in rare cases some mobility of the talocrural joint was retained.

1 pt. died 2 months after the interference of tub. pulm. In 5 pts. the results were less good, in 3 of them amputatio cruris had to be performed later on.

In 70 cases of tuberculosis of the talocrural joint, which were treated conservatively, the final results were as follows:—

Firm ankylosis	38	cases
Rocking movements possible	21	„
Partial mobility	9	„
Complete mobility	2	„

13 pts. were amputated or died in the course of an active stage. Only in 11 cases (or 15.7 per cent.) osseous ankylosis could be ascertained. In 10 of these cases the pts. were children.

Among the 11 cases with complete or partial mobility (15.7 per cent.) 8 pts. were children.

In the case of adults osseous ankylosis or complete-partial mobility was thus an equally rare result. As to the *duration* of the disorder, on the other hand, no difference could be demonstrated between children and adults. In 18 cases a more or less marked drop-foot position developed in connection with the disorder. This abnormal position gave rise to resection of the talocrural joint in 1 case.

In several pts. arthroitis deformans-like alterations developed after the original process had settled down long ago.

In 117 cases of tuberculosis of the tarsus or metatarsus the duration of the disease was found to be as follows:—

In 76 cases an average duration of the disorder of 4 years was found.

In 12 cases a very protracted course was found, partly with fistulae, or the condition was marked by frequent recidivation. In no case the duration of the disease was less than 10 years.

In 19 cases it was impossible to ascertain the duration of the disease, or the case is still before the Board.

10 pts. have died during an active stage of the disease or have been amputated.

In the case of the affected joints the consequence was as a rule ankylosis—in a number of cases of osseous nature. In 11 cases where there was an isolated process of the art. talocalcanea post. the disorder thus entailed a complete cessation of the combined movement that takes place here.

In many cases the destructive processes of the foot produced a flattening of the arches of the foot or other deformation.

If there was no tuberculosis worth mentioning elsewhere in the organism, most of the patients could take up their original occupation when the disorder of the foot had settled down.

In order to be fully capable of working a great number of the patients had, however, to be supplied with orthopedic boots through the Disablement Pension Board. In many cases the Board procured relief of different nature, whilst a training in another occupation was only successful in 5 cases.

SUMMARY

Tuberculosis of the foot constitutes about 10 per cent. of all tuberculosis of the bones.

Only in a small number of cases the disease will occur as an isolated tuberculosis of a single tarsal bone, in the material of the Disablement Pension Board comprising 238 cases thus only in 14.7 per cent. and with the following frequency for the individual tarsal bones: The calcaneus 28.6 per cent., 1st metatarsal bone 25.7 per cent., the scaphoid bone in 14.3 per cent.

In by far most of the cases one or more joints were involved, most frequently the artic. talocruralis: 121 cases or 50.8 per cent.

In 117 cases the disorder proved to be localized to the tarsus or metatarsus without involving the talocrural joint, 17 of these cases were more diffuse forms.

Altogether the individual tarsal bones were found to be attacked with the following frequency in 221 cases: The astragalus 37.4 per cent., the calcaneus 14.7 per cent., the scaphoid bone in 11.6 per cent. and the cuboid bone 6.5 per cent.

Reference to diagnosis and differential diagnosis is made.

The disease occurred with relatively greatest frequency in the counties of Tönder, Viborg, and Ringköbing.

In 57 per cent. of the cases the disorder began in the 2nd or 3rd decennium, especially at the ages from 15 to 20 years (22.7 per cent.).

The pts. state trauma as the cause of the disease in 21.4 per cent. of the cases.

In 136 pts. tuberculosis of other organs was ascertained, especially of the lungs.

Conservative and surgical methods of treatment are gone through. 17 resections of the talocrural joint and 21 astragalectomies have been made, besides 22 amputations of the crus and in 4 cases Pirogoff's or Syme's operation.

Otherwise the treatment was chiefly conservative: Immobilization, light therapy in connection with minor surgical interference.

An average of 12 years passed from the onset of the disease till the pts. were in connection with the Disablement Pension Board for the last time.

7 pts. died whilst the disorder of the foot was active. 19 pts. died later on, in most cases as a consequence of pulmonary tuberculosis.

In 121 cases of tuberculosis of the *talocrural joint* the following conditions were found:—

In 74 cases an average duration of 4.5 years was found. In 15 cases a chronic course of more than 10 years' duration. 15

pts. were amputated or died in an active stage. In 17 cases nothing could be said with certainty about the duration of the disease.

In the 38 cases of resection and astragalectomy an average duration of 4.5 years was also found.

In cases submitted to conservative treatment the disorder resulted in ankylosis of the joint in more than half the number of the cases, however, only of osseous nature in 11 cases (10 of them being children).

Only in 11 cases (3 adults and 8 children) complete or partial mobility of the joint was retained.

Drop-foot position moreover developed as a sequela in 18 cases and in several cases arthroitis deformans-like alterations.

In 117 cases of tub. of the *tarsus* and metatarsus the following course of the disease was seen:—

In 76 cases an average duration of the disorder of 4 years;

in 12 cases a chronic course of more than 10 years' duration;

in 19 cases nothing can be said about the course of the disease;

in 10 cases the pts. died during an active stage of the disease or were amputated.

In many cases the destructive processes resulted in a flattening of the foot or other deformity.

RÉSUMÉ

La tuberculose du pied représente à peu près 10 % de tous les cas de tuberculose osseuse.

Ce n'est que dans un petit nombre de cas que cette maladie apparaît comme une tuberculose isolée d'un seul os tarsien. Ainsi, parmi les 238 cas soumis à la Commission chargée de fixer les taux d'invalidité, ce n'était le cas que dans 14,7 %. Envisagé pour chacun des os tarsiens, ce pourcentage atteint les données suivantes: calcanéum 28,6 %, 1er métatarsien 25,7 %, scaphoïde 14,3 %. Dans le plus grand nombre des cas, une ou plusieurs articulations étaient atteintes et c'était le plus souvent l'articulation talocrurale, à savoir dans 121 cas, soit dans 50,8 %.

Dans 117 cas, on a pu constater que l'affection était localisée

au tarse ou au métatarse sans atteindre l'articulation talocrurale, 17 de ces cas présentaient des formes plus diffuses.

Dans l'ensemble, on constata chez 221 des malades examinés que les os tarsiens étaient atteints avec la fréquence suivante: astragale 37,4 %, calcanéum 14,7 %, scaphoïde 11,6 % et cuboïde 6,5 %.

Il est renvoyé au diagnostic et au diagnostic différentiel.

Cette maladie se manifeste avec une fréquence tout particulièrement grande dans les départements de Tønder, Viborg et Ringkøbing. Dans 57 % des cas, les troubles ont débuté dans les 2ème et 3ème dizaines d'années, notamment entre 15 et 20 ans (22,7 %).

Les malades indiquent que des traumas sont la cause de cette maladie dans 21,4 % des cas.

On a constaté chez 136 malades une tuberculose dans d'autres organes, spécialement dans les poumons.

Les méthodes de traitement conservateur et opératoire sont examinées. Il a été pratiqué 17 résections de l'articulation talocrurale et 21 astragalectomies, à côté de 22 amputations du crus et, dans 4 cas, l'opération de Pirogroff ou de Syme.

Par ailleurs, le traitement a été principalement conservateur: immobilisation, légère thérapie en connexion avec de petites interventions chirurgicales.

Une moyenne de 12 ans s'est écoulée depuis l'apparition de la maladie jusqu'au moment où les malades ont été en rapport avec le Conseil de l'Invalidité pour la derniére fois.

7 malades moururent pendant que les troubles du pied étaient actifs, 19 plus tard, dans la plupart des cas à la suite d'une tuberculose pulmonaire.

Dans 121 cas de tuberculose de l'*articulation talocrurale* on constata les faits suivants:

Dans 74 cas une durée moyenne de 4 ans et demi. Dans 15 cas présentant un cours plus chronique, une durée plus de 10 ans. 15 malades furent amputés et moururent au cours du stade actif. Dans 17 cas, il n'a pas été possible de donner des indications certaines quant à la durée de la maladie.

Dans 38 cas de résection et d'astragalectomie, on a aussi trouvé une durée moyenne de 4 ans et demi.

Dans les cas soumis au traitement conservateur, les inconvénients observés provenaient de l'ankylose de l'articulation dans plus de la moitié des cas, celle-ci n'étant toutefois de nature osseuse que dans 11 cas (dont 10 étaient des enfants).

On n'a obtenu une mobilité complète ou partielle de l'articulation que dans 11 cas (chez 3 adultes et 8 enfants).

Dans 18 cas on constata une tendance à la position du pied plat et dans plusieurs cas des altérations ressemblant à l'arthroite déformante.

Dans 117 cas de tuberculose du *tarse* et du métatarse, on a constaté les évolutions suivantes de la maladie:

Dans 76 cas, une durée moyenne de la maladie de 4 ans.

Dans 12 cas, un cours chronique d'une durée de plus de 10 ans; dans 19 cas on ne peut rien dire quant au cours de la maladie.

Dans 10 cas les malades décédèrent à un stade actif de la maladie ou furent amputés.

Dans beaucoup de cas le processus destructif a provoqué un aplatissement du pied ou occasionné une autre déformité.

ZUSAMMENFASSUNG

Tuberkulose in den Füssen macht ungefähr 10 % aller Knochentuberkulose aus.

Nur in einer geringen Anzahl von Fällen tritt die Krankheit als isolierte Tuberkulose eines einzelnen Tarsalbeines auf., s. z. B. nur in 14,7 % der 238 Fälle, die der Invalidenfürsorge vorgelegt wurden, und zwar verteilt sich die Häufigkeit des Auftretens auf die einzelnen Tarsalbeine wie folgt: Calcaneus 28,6 %, erster Metatarsal 25,7 %, Kahnbein 14,3 %. In weitaus den meisten Fällen waren ein oder mehrere Gelenke mitbetroffen, am häufigsten artic. talocruralis: 121 Fälle oder 50,8 %.

In 117 Fällen begrenzte sich die Erkrankung auf den Tarsus oder Metatarsus, ohne das Talocrural-Gelenk zu berühren. 17 dieser Fälle waren weniger ausgeprägte Erscheinungen.

Im ganzen genommen verteilte sich die Häufigkeit des Auftretens auf die einzelnen Tarsalbeine in 221 Fällen wie folgt: Astragalus 37,4 %, Calcaneus 14,7 %, Kahnbein 11,6 % und Würfelbein 6,5 %.

Es wird auf Diagnose und Differentialdiagnose hingewiesen.

Die Krankheit trat verhältnismässig am häufigsten in den Gauen Tondern, Viborg und Ringköbing auf.

In 57 % der Fälle begann die Krankheit im 2. und 3. Jahrzehnt, besonders im Alter von 15 bis 20 Jahren (22,7 %).

Die Patienten geben in 21,4 % der Fälle Traumen als Krankheitsursache an.

Bei 136 Patienten wurde Tuberkulose in anderen Organen, besonders in den Lungen, festgestellt.

Konservative und chirurgische Behandlungsmethoden werden besprochen. Es wurden 17 Resectionen des Talocrural-Gelenkes und 21 Astragalectomien vorgenommen, ausserdem 22 Amputationen des Crus und in vier Fällen Pirogoff's oder Syme's Operation.

Hiervon abgesehen war die Behandlung hauptsächlich konservativ: Immobilisation, leichte Therapie in Verbindung mit kleineren chirurgischen Eingriffen.

Im Durchschnitt verliefen vom Ausbruch der Krankheit bis zur Entlassung der Patienten durch die Invalidenfürsorge 12 Jahre.

7 Patienten starben im aktiven Stadium der Erkrankung am Fusse. 19 starben später, meist infolge von Lungentuberkulose.

In 121 Fällen von Tuberkulose im *Talocrural-Gelenk* ergaben sich folgende Umstände:

In 74 Fällen dauerte die Krankheit 4,5 Jahre, während sich in 15 Fällen ein chronischer Verlauf über mehr als 10 Jahre erstreckte. 15 Patienten starben im aktiven Stadium der Krankheit oder wurden während desselben einer Amputation unterzogen. In 17 Fällen konnte nichts Genaues über die Dauer der Krankheit ausgesagt werden.

Bei den 38 Fällen von Resection und Astragalectomie ergab sich auch eine Durchschnittsdauer von 4,5 Jahren.

In mehr als der Hälfte der konservativ behandelten Fälle führte die Erkrankung zu einer Gelenkankylose, jedoch nur in 11 Fällen (wovon 10 Kinder) zu knochiger Ankylose.

Nur in 11 Fällen (3 Erwachsene und 8 Kinder) wurde die vollständige oder teilweise Beweglichkeit der Gelenke beibehalten.

Eine *Neigung zum Plattfuss* entwickelte sich ausserdem in 18 Fällen als Folgeerscheinung und in mehreren Fällen Arthroitis deformität-ähnliche Veränderungen.

In 117 Fällen von Tuberkulose am *Tarsus* oder Metatarsus wurde folgender Krankheitsverkauf beobachtet:

In 76 Fällen eine Durchschnittsdauer der Krankheit von 4 Jahren.

In 12 Fällen ein chronischer Verlauf von mehr als 10 Jahren.

In 19 Fällen konnte über die Dauer der Krankheit nichts ausgesagt werden.

In 10 Fällen starben die Patienten im aktiven Stadium der Krankheit oder wurden einer Amputation unterworfen.

In vielen Fällen resultierte der Zerstörungsprozess in einer Abflachung des Fusses oder anderer Deformität.

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