

GENERAL STAFF MEETING  
MINNESOTA GENERAL HOSPITAL  
UNIVERSITY OF MINNESOTA

CONTENTS

	PAGE
TUBERCULOSIS OF BONE AND JOINTS	
I. CASE REPORT . . . . .	152 - 154
II. ABSTRACTS	
DIAGNOSIS AND TREATMENT OF BONE AND JOINT	
TUBERCULOSIS . . . . . Abstr. Koucky . . .	
1. THE HISTORY OF THE RECOGNITION OF TUBERCULOSIS IN BONES AND JOINTS . . . . . Little . . .	154 - 155
2. DIAGNOSIS OF BONE AND JOINT TUBERCULOSIS AT MINNESOTA GENERAL HOSPITAL . . . . .	155 - 156
3. THE DIAGNOSIS AND FREQUENCY OF TUBERCULOUS DISEASE OF THE KNEE . . . . . Sundt . . .	156 - 157
4. DIAGNOSTIC INACCURACY IN TUBERCULOSIS OF BONE . . . . . Milgram . . .	157 - 159
5. DIAGNOSIS OF BONE TUBERCULOSIS . . . Sorrel, etal . . .	159 - 160
6. LABORATORY TESTS FOR TUBERCLE BACILLI BY CULTURE METHODS . . . . . Norton & Brown . . .	160
7. OPERATIVE TREATMENT OF JOINT TUBERCULOSIS . . . . . Henderson . . .	161 - 162
III. ANNOUNCEMENTS	
1. OUR GUEST TODAY . . . . .	162 - 163
2. RELIABILITY OF CANCER STATISTICS . . . . . Wood . . .	163 - 165
3. BETTER HISTORIES OF COMMUNICABLE DISEASE IN THE HOME . . . . . Ogburn . . .	165
IV. MEETING . . . . .	165 - 166

## TUBERCULOSIS OF BONE AND JOINTS

Because of difficulty in finding tuberculous lesions in pieces of tissue removed from clinical cases of tuberculosis (and cases proven by animal inoculations) the subject is investigated. No attempt made to study cases diagnosed as tuberculosis by section, not accepted by clinicians. We learned that the problem was greatly discussed and difficulty encountered by others. According to Sundt -- 40 years ago and afterward, it was easy to make a gross diagnosis of tuberculosis of bone and joints; in the last 10 or 15 years more correct diagnoses have been made. With the ancient philosopher he agrees - "Where there is much wisdom, there is much vexation of mind; and he who increases knowledge increases pain."

### I. CASE REPORT

Case is that of 5 year old, white female admitted to Minnesota General Hospital 7-3-31, discharged 9-26-31 (90 days); readmitted 11-17-31, discharged 12-2-31 (15 days). Total stay 105 days. Followed in Out-Patient Department up to present time.

#### Fell

5-1-31 - Fell off steps at school and injured left hip. Pained her so that she could not walk home and thereafter was confined to bed for several days. When she got up, there was some residual pain. Limped on this leg. Limp progressively became worse.

#### Pain

5-15-31 - Pain appeared in back of thigh just above popliteal space. Pain was dull, intermittent and occasionally occurred at night.

#### Tuberculosis Exposure

7-3-31 - Admitted. Family history - Maternal cousin lived for 18 months with family up to one year prior to patient's admission to hospital when she was removed to a sanatorium as active case of tuberculosis. Past history - Apparently always healthy. Measles at 5 months. Weight

on admission 39 lbs, lost 5 lbs. since onset of illness.

#### Physical examination

5 year old girl apparently in no distress. Small, discrete glands in posterior cervical triangle of neck. Left leg shows tenderness on deep palpation about hip joint. Walks with limp of left leg. Body flexed to left. Slight pain in hip joint on movement in all directions. No note, however, of limitation of motion.

#### Laboratory

Urine - negative. Hb. 78%, rbc's 3,310,000, wbc's 6,350, Pmn's 69%, L 39%. Manteau - 2+. (At a subsequent date, Manteau 4+.) X-rays: Chest - no evidence of disease. Left hip - shows some irregular rarefaction in neck of femur just below epiphyseal line. Hip joint itself locks entirely normal. No evidence of tuberculosis. Appearance is typical of a low grade non-tuberculous osteomyelitis of epiphysitis type. Conclusions: Negative chest. Epiphysitis, head of left femur. Progress: Pulse, temperature and respirations normal.

#### Negative smear

7-6-31 - Left hip aspirated under amytal and ethylene -  $\frac{1}{2}$  cc. fluid withdrawn. Smears show no organisms. Cultures sterile.

7-22-31 - Condition same. Kept in bed. No apparent change. Pulse and temperature continue within normal limits.

#### New bone

X-ray of left femur: Some increase in density in area previously described indicating new bone formation. No apparent extension of process. Conclusions: Low grade osteomyelitis, neck of femur.

7-23-31 - No change.

#### Pus?

8-1-31 - Operation: Preoperative diagnosis - Osteomyelitis, neck of left femur. Procedure - Incision over left lateral surface directly over greater trochanter. This area was exposed and an electrically driven drill was then driven directly through

greater trochanter into neck of femur. Material of questionable nature removed. Existence of pus could not be excluded, although not identified with certainty. Wound was left open for drainage. Smear and culture of drainage - no organisms. Biopsy - microscopic section of tissue removed showed cartilage (only structure which could be identified), which was regular throughout. Diagnosis - cartilage. Another portion of material sent to State Board for guinea pig inoculation.

#### Sclerosis

8-17-31 - Condition unchanged. Very small amount of drainage from wound. Temperature remains normal. X-ray shows some sclerosis in neck of femur. Rarefaction also present. Appearance suggests some improvement. There is little or no periosteal new bone formation. Conclusion: Osteomyelitis of neck of femur (improving).

#### Right wrist lesion

9-10-31 - Temperature shows occasional rise above normal. Small painless nodule has appeared in right wrist. X-ray shows definite density in soft tissues in region of styloid process of ulna. No evidence of bone involvement. Conclusions: Soft tissue lesion.

9-15-31 - Nodule in wrist about same.

#### Positive pig

9-18-31 - Guinea pig report - guinea pig killed and tuberculous lesions in which tubercle bacilli have been demonstrated are found.

9-21-31 - Left hip immobilized in spica cast.

9-26-31 - Discharged to return to Out-Patient Department for observation.

#### Cast Off

11-17-31 - Readmitted. During interval, has had no pain in leg. Case on since discharge. On day of admission, cast removed. Leg inspected. Wound is well healed. Leg very weak and definite pain in region of hip on motion. X-ray of chest and femur: No evidence of tuberculosis in lungs. Process in neck of left femur has remained practically stationary. Laboratory: Urine - negative. Blood - Hb. 81%, wbc's 7,000. Manteau - positive.

#### Brace

Measured for Thomas ring, walking caliper brace. Stayed in hospital until apparatus was manufactured.

12-2-31 - Discharged with instructions to be up and about in apparatus. During 15 days stay in hospital, occasional rise in temperature above 99. To return to Out-Patient Department.

12-31-31 - X-ray of left hip - Findings practically same. Little or no change. Conclusions: Tuberculous osteomyelitis, neck of femur.

1-5-32 - No change in general condition. Measurement of extremity shows definite diminution in circumference of thigh and calf but no true shortening.

10-12-32 - Condition same. Question of taking brace off considered.

#### Hip better

11-9-32 - Returned complaining of pain and swelling in right wrist. (No note in chart regarding interval history between onset of nodule about wrist 9-10-31 and the present time.) X-ray of femur - appearance of left hip shows marked improvement. Small area of rarefaction suggestive of abscess in bone. This may be due merely to arrangement of trabeculae. Conclusion: Improvement in appearance of left hip. Possible small osteomyelitic abscess.

#### Wrist Worse

11-16-32 - Pain and swelling in right wrist more marked. Splint applied.

11-25-32 - Unable to move right wrist, which is swollen and tender. X-ray - shows definite cartilaginous destruction of epiphysis of lower end of right radius and some destruction of adjacent carpal bones of cartilaginous nature. Considerable atrophy of all bones of wrist. Picture suggests pyogenic arthritis. Conclusions: Probable pyogenic arthritis, right wrist.

#### Summary:

Case presents infection of bone in small child with sudden onset following trauma. Clinical and x-ray conclusion is chronic osteomyelitis. Routine laboratory methods prove to be of no help in diagnosis. Child, however, has positive Manteau test. Guinea pig inoculation shows presence of tuber-



culosis. One year later, involvement of wrist appears which again is of indefinite nature. X-ray diagnosis - pyogenic arthritis.

## II. ABSTRACTS:

### DIAGNOSIS AND TREATMENT OF BONE AND JOINT TUBERCULOSIS.

1. Little, M. The History of the Recognition of Tuberculosis in Bones and Joints. Proc. Royal Soc. Med. 25: 627-633, (Mar.) '32.
2. Minnesota General Hospital Records.
3. Sundt, H. The Diagnosis and Frequency of Tuberculous Disease of the Knee. J. Bone and Joint Surg. 13: 740-757, (Oct.) '31.
4. Milgram, J. E. Diagnostic Inaccuracy in Tuberculosis of Bone, Joint and Bursa, J.A.M.A. 97:232-235, (July 25) '31.
5. Sorrel, E., Bufnoir, P. and Furnet, J. Quelques Remarques sur les Tuberculosis Chirurgicales. Leur frequence, les difficultes de leur diagnostic. La Presse Medical 1:689-692, (May 13,) '31.
6. Norton, J. F. and Brown, T.J.G. Laboratory Tests for Tubercle Bacilli by Culture Methods. Am. Rev. Tuberc. 25:378-382, '32.
7. Henderson, M. S. Operative Treatment of Joint Tuberculosis. Minn. Med. 15:141-143, (Mar.) '32.

### 1. THE HISTORY OF THE RECOGNITION OF TUBERCULOSIS IN BONES AND JOINTS. (Little).

Hippocrates and Galen knew and described tuberculosis in lungs and also in spinal column. They connected in some way the different affections, and attributed the disorders, pulmonary consumption and caries of vertebrae, to the effects of tubercles (tuberculum - a lump).

1566 - Dalechamps gives a good clinical picture of severe caries of the vertebrae with paralysis, thus anticipating Pott.

1632 - Marcus Aurelius Severinus speaks of tubercle as a cause of spinal disease and deformity.

1676 - Richard Wiseman was first to use term "white swelling" and published book devoted to "white swelling" or the "King's Evil".

1743 - Haacke published volume the title of which translated literally is "that which makes Tuberculis Gibberosi."

1779 - Percival Pott published the celebrated description of Pott's Disease. While preceded by the other descriptions as mentioned, tuberculosis of spine has remained "Pott's Disease." Pott in addition condemned the use of "steel stays, swing, screw chair and other pieces of machinery" and advised rest.

1783 - Park reported two successful cases treated by excision of ends of bone. First operation done in 1781.

1797 - Hufeland presents prize essay which influenced German teachings.

1797 - Crowther emphasized value of rest in treatment.

1802 - Herdman published paper which was one of first attempts to establish differential diagnosis of diseases of joints; Note: And it is still going on. He stated in addition there was nothing so injurious as motion of affected joints.

1806 - Moreau practiced excision of diseased bone.

1818 - Brodie published another attempt to classify morbid anatomy of joint diseases.

1820 - Wilson published very clear account of differential diagnosis (pathologically) of joint disease and advocated rest and fixation.

1835 - Nichet published series of articles said to be real starting point of study of tuberculosis of bone. He clearly outlined relation between visceral and generalized tuberculosis and tuberculosis of bone.

1837 - Nelaton reviewed and summarized literature up to his time.

1844 - Rokitansky introduced modern pathological ideas.

1869 - Koster is credited as first

to study disease of bone histologically.

1883 - Great changes in knowledge have occurred during this period. Antiseptic surgery started. Koch found tubercle bacillus. Surgeons were convinced of its importance. Battle between operative and rest treatment already begun. Well known surgeons expressed radically opposing views.

1893 - author (Little) presented group of 133 patients in whom there were 10 cases of paralysis and 8 of paresis, all of which recovered on rest, fixation and extension.

Recent additions to our knowledge question ease of gross diagnosis of tuberculosis and attempt to standardize technic of differential diagnosis. It is of great importance because of difference in treatment and prognosis.

## 2. DIAGNOSIS OF BONE AND JOINT TUBERCULOSIS AT MINNESOTA GENERAL HOSPITAL. Jan. 1928 to July 1932.

Number: 69 cases: 41 spine (not studied), 28 all other bones. Spine not studied because diagnosis is more exact? but we have seen difficulty with some tumors.

Age: Vary from 5 to 71 )  
 ) not sufficient number for  
Sex: 13 females, 15 males ) conclusions (?)  
Duration: 2 weeks to 17 yrs. )

Family history:  
 13 negative, 4 positive (accuracy of history?)

Chronicity of disease: Onset (26 cases):  
 acute - 6 (least)  
 gradual - 20 (most)  
 with injury - 11 (nearly half)

Duration (under 6 months): 6 cases

### Diagnostic Value of Other Visceral Lesions (28 cases):

Pulmonary: 12 positive  
 15 negative (about half)  
Other visceral lesions:  
 7 cases (about one-fourth)

Smears of Exudate (aspirated or operative) 9 cases:

8 negative  
 1 positive (10%)

Manteaux (2 cases): both positive.

Note: How little this was used, still it is our best "screen."

Biopsy (18 cases):

1 - no section made  
 13 - negative for tuberculosis (Chronic inflammation usually).  
 4 - positive.

11 negative biopsies subjected to guinea pig test.

1 - died of intercurrent disease  
 1 - negative  
 7 positive (70% error)

1 positive biopsy subjected to pig test.

1 - positive result

Guinea pig: (13 cases - only half of series).

1 - not received at State Board.  
 1 - animal died of intercurrent disease.  
 2 - negative.  
 9 - positive (note this)

2 negative examinations:

1 - negative biopsy, negative x-ray. Clinical diagnosis: "Tuberculosis."  
 1 - no biopsy, x-ray "probable tuberculosis." Clinical diagnosis: "Osteomyelitis?"

X-ray (27 cases):

13 - definite diagnosis tuberculosis (50%).  
 10 - possible or probable tuberculosis.  
 4 - not tuberculous (1 changed to tuberculosis later):  
 (3 - positive guinea pig.  
 (1 - negative guinea pig.

Distribution of lesion (primary focus):

7 - hip  
 5 - ankle and foot  
 4 - elbow  
 3 - wrist and hand

- 3 - knee
- 3 - shoulder
- 3 - sacro-iliac (high?)

Multiple bones involved: 6 cases.

Comment: Difficulty in supporting clinical diagnosis is readily seen. How many not diagnosed, i.e., not suspected, is not known?

3. THE DIAGNOSIS AND FREQUENCY OF TUBERCULOUS DISEASE OF THE KNEE.  
(Norwegian Experience) (H. Sundt)

Diagnosis of primary, chronic monarticular lesions of joints is one of the most difficult diagnostic problems. The Norwegian surgeon, Strom, said regarding 200 cases of tuberculosis of the knee joint, "For the surgeon the clinical course and the macroscopic anatomical findings are sufficient to establish 'tuberculosis' as the diagnosis," wherefore he "has not hesitated in designating as tuberculous all the cases investigated." (This was 40 years ago!) The author's conclusions are based on 310 patients suffering with infections of knee joint of which 66% are found to be suffering with tuberculosis, 34% did not have tuberculosis. (Author threw all doubtful cases into tuberculosis group except whenever he could not possibly do so.)

Johansson	1924	127 cases	50% not TB.
Sorrell	1925	140 "	30% " "
Burckhardt	1927	223 "	83% " "

Guinea Pig test: 37 cases, 5 positive, 32 negative. By subsequent tests and course it was found that 25% of the 32 negatives were tuberculous. The conclusion drawn is "the guinea pig test is decisive only when the result is undoubtedly positive, whereas even a repeatedly negative result does not preclude tuberculosis, or even tuberculous synovitis."

Tuberculin test: Apparently in Scandinavian countries, 50% of older children have a positive tuberculin test although author comments that recent investigations seemed to indicate that this percentage has advanced to considerable later period

of life than before. Author is lead to conclusion that a positive focal reaction is no certain proof of the presence of tuberculosis and moreover that a negative skin reaction does not preclude existence of active bone or joint tuberculosis.

X-ray diagnosis: "The value of x-ray diagnosis in bone and joint tuberculosis has long been over-estimated." "There exists no x-ray picture which is entirely typical of joint tuberculosis in any of its stages." Formation of exostoses, presence of evenly diffused calcium atrophy, spotted calcium atrophy, uneven contours, presence of foci or sequestra may be present in both tuberculous and non-tuberculous disease. The author states "a roentgen picture of the kind we are accustomed to regard as characteristic of joint tuberculosis in pronounced and advanced cases offers no absolute decisive proof of the presence of tuberculosis."

Sedimentation rate test: This test is not entirely without importance although it apparently does not add in material degree to diagnosis. In doubtful cases, it will together with other diagnostic evidence lay its small weight either for or against. In general, sedimentation rate in tuberculous disease of bone is increased in a moderate or high degree. The more pronounced the clinical symptoms, the more will a low or normal sedimentation rate speak against tuberculosis and likewise a high sedimentation rate with no very marked clinical symptoms, where complications can be excluded, speaks against tuberculosis.

Complement - fixation test (Tuberculosis Wassermann reaction).

"In summing up the results of my investigations, it is found that the complement fixation whether made on puncture fluid or blood is unreliable and often misleading." A negative reaction in puncture fluid is also entirely without diagnostic significance. On the other hand, a decidedly positive reaction in puncture fluid or a more strongly positive reaction in puncture fluid than in blood must be

regarded as positive just as in the case with the Wassermann reaction in arthrolues.

Exploratory incision: Justification of such an operation in doubtful cases in adults cannot be questioned. In children, however, there is some hesitation in making any intervention including exploratory incision. Attitude toward children, however, is becoming more liberal. Negative results obtained from exploratory incision have rescued many patients from years of conservative treatment for tuberculosis and has also saved patient from unnecessary and depressing fear of disease. It is certain that cases where no exploratory incision has been made are often included as tuberculosis and improve statistics of cure.

The diagnostic value of procedure is illustrated in following: In 19 years covering author's experience, proportion of tuberculosis to non-tuberculosis is 2 to 1 during which period 43% of cases were subjected to operation and therefore to examination of tissue. In last 4 years, the proportion of tuberculosis to non-tuberculosis was 1 to 1 and during this period 64% of the cases were operated upon. In cases operated upon, it is possible to establish diagnosis in 100%. In cases not operated upon, it is possible to establish a diagnosis with absolute certainty in only 30%. Author is convinced that there is more value in statistics dealing with cures and end-results in operative group with positive diagnosis than in mixed groups in which the diagnosis many times is uncertain.

Pathological examination: Microscopic diagnosis is not always easy or decisive. Such a diagnosis as chronic inflammatory tissue reaction without specific character covers a number of conditions, and decision may be absolutely impossible.

Non-tuberculous lesions: The following table is a distribution of type of condition which had to be distinguished from tuberculosis of joints.

Arthritis deformans	<u>11</u>
Gonitis Osteomyelitic	7
Gonitis haemophilica	3
Gonitis luetica	<u>21</u>

Gonalgia hysterica	2
Chondrosarcoma gigante-cellulare genus	1
Xanthofibrosarcoma gigante-cellulare genus	1
Osteochondritis dissecans genus	3
Chondropathia patellae	1
<u>Gonitis incertae causae</u>	<u>55</u> 105
<u>Gonitis tuberculosa</u>	205 310

Author comments especially on last group (gonitis "incertae causae"). In this group were many cases characterized by more or less marked thickening of capsule with hydrops likewise more or less pronounced. In these cases even though tuberculosis cannot be discovered microscopically or by animal inoculation, the possibility that they are tuberculous infections cannot be ruled out. It must be remembered that tuberculosis has certain non-specific characteristics (exudate in nature). This type of case has been designated by Poncet as "tuberculous rheumatism." This concept has generally won recognition in Germany, France and Scandinavian countries. The author concludes his paper with the statement "Our search for more knowledge gives rise to doubt with all its torments; because, instead of greater clarity and greater certainty, it often begets only perplexity and uncertainty; and involuntarily we come to think of what was said by the ancient philosopher thousands of years ago: "Where there is much wisdom, there is much vexation of mind; and he who increases knowledge increases pain."

#### 4. DIAGNOSTIC INACCURACY IN TUBERCULOSIS OF BONE. (Milgram) (Experience at University of Iowa)

Author states that in recent years time honored statistics purporting to show this or that about tuberculosis have been subjected to criticism because of alleged inclusion of cases that are not tuberculous. Average response to this opinion is that clinicians of experience diagnosed tuberculosis repeatedly and correctly before isolation of tubercle bacillus and that

clinical picture is quite clear enough. Furthermore, if conservative treatment alone is to be utilized, operation for purpose of obtaining biopsies appear unjustifiable. However, when operative fusion is indicated, confirmation of diagnosis of tuberculosis is desired before proceeding to permanent eradication of joint function.

Author examined 142 cases with following questions in mind: 1. How many are incorrectly diagnosed clinically? 2. What factors entered into mis-diagnosis? Did the clinical picture approximate textbook description? 3. How valuable as aids to clinical diagnosis are x-rays and tuberculin tests? 4. In what percentage are operators able to recognize lesion at operation? The following tables summarize the results:

Table I. Accuracy of Clinical Diagnosis

	<u>Cases</u>	
	<u>No.</u>	<u>Percent.</u>
Total number of proved cases analyzed	142	100
Diagnosed clinically as tuberculous	87	60
Not diagnosed clinically as tuberculous	55	40
	(approximate)	

Comparison: Hibbs (22% inaccuracy) and Friedrich (35%).

Table 2. Onset.

	<u>Cases</u>	
	<u>No.</u>	<u>Percent.</u>
<u>Insidious</u>	100	70
Correctly diagnosed	71	70
Incorrectly diagnosed	29	30
<u>Sudden</u>	42	30
Correctly diagnosed	16	40
Incorrectly diagnosed	26	60
	(approximate)	

Note: Difficulty in group with sudden onset.

39, or 27% of entire group stated that pain was severe at onset whereas 73% presented classical picture of mild or absent pain. Insistence on mild pain in diagnosis of tuberculosis is not justified by facts.

Signs. Variability of signs marked, and statistical analysis not possible. There are amazing contrasts between patients. Some with extreme tuberculosis walked into clinic complaining of mild malaise. Others wheeled in, in dying condition, afflicted with lesions of same extent.

Multiplicity of Lesions: Monarticular or local character of surgical tuberculosis appears to be overstressed in classic descriptions. In this series 33% presented two or more lesions.

Table 4. Regional accuracy:

	<u>Total cases</u>	<u>Incorrectly diagnosed</u>	<u>Per-cent. error</u>
Sacro-iliac	5	0	00
Hip	17	7	41
Knee	35	13	37
Ankle and tarsus	16	4	25
Shoulder	5	4	80
Elbow	7	3	49
Wrist and carpus	5	3	60
Diaphyseal	10	10	100
Dactylitis	1	0	00
Bursae	6	5	83
Tendon sheath	5	3	60
Spine	30	3	10

This table shows that in those joint regions in which possible lesions are most numerous wrong diagnoses are most in evidence. In diaphysis of long bone in which tuberculosis is presumed to be rare occurrence, it was missed in every one of 10 cases encountered.

Diagnostic Adjuncts: X-ray - In 53 cases, 37%, such examinations were of no aid, or misleading. The review of the plates in light of pathological observations is often not illuminating. The error would probably be made as readily again. The conclusion is that the x-rays are merely a useful adjunct.

Tuberculin test - In this group of patients, tuberculin tests were performed on 103, 83 positive, and 20 negative. A check of this last group in as many cases as possible showed



that only 2 cases were negative. Note this. Of all simple diagnostic aids, a carefully controlled and repeated intradermal tuberculin test, if negative, is of greatest value in excluding tuberculosis.

Biopsy - Experienced pathologists frankly admit frequent inability to recognize tuberculous tissue grossly, and even with microscopic sections errors may be frequently made. In 12 cases, a section of tissue removed for biopsy failed to reveal nature of the lesions (% of failures not given).

Operative Recognition of Tuberculous Lesions: Since experienced pathologists frequently cannot recognize tuberculous tissue grossly, it is small wonder therefore that cases in clinically undiagnosed group were not labeled tuberculosis by operators at time of operation.

Table 5. Diagnosis of:

	<u>Cases</u>	
	<u>No.</u>	<u>Per Cent.</u>
Tuberculosis corrected at operation	18	23
Tuberculosis remained unrecognized at operation	37	67

One of these patients operated on for chronic pyogenic osteomyelitis 9 times in 12 years in various hospitals before section and inoculation revealed true lesion. Another patient underwent 4 drainages, and a third 3 sequestrectomies. Note: All the patients in this group were diagnosed by guinea pig inoculation where resultant lesions showed tubercle bacilli.

Author's conclusions: The clinical pathology of tuberculosis, as syphilis, may mimic a variety of lesions. We must resort at once wherever possible to tissue verification. Inoculation of guinea pigs, potato culture of aspirated fluid, and section, inoculation and culture of sinus curettings are therefore routine today. The tissues selected for examination should be chosen with care at the table and wrapped separately. The clinician who is timorous enough to assert without pathologic assurance the presence or absence of tuberculosis in atypical instances of disease of the bones, joints

or bursae is brave but as like as not to be quite mistaken.

## 5. DIAGNOSIS OF BONE TUBERCULOSIS.

(Sorrel, etal)

These authors studied admissions to Marine Hospital and Marine Hospital Annex in Paris between January 1920 and July 1930. In approximately 12,000 admissions, 9,512 cases were found suitable for study and this represented 10,489 lesions of bone. Distribution between adults and infants is dependent more upon beds than on other factors. There were 7,000 cases of infants and 2,500 adults with bone diseases. These cases showed following distributions: Infants - 4,660 tuberculosis (5,391 lesions), 2,435 non-tuberculous (2,445 lesions). Adults - 1,918 tuberculosis (2,138 lesions), 499 non-tuberculosis (515 lesions). Some of the tuberculosis listed in foregoing group represents visceral lesions. Total number of bone lesions as follows: Infants - 3,430, Adults 1,773, Total 5,203.

Distribution: Spine 1,515, hip 990, small long bones (foot and hand) 711, knee 690, elbow 236, short bones 217 (calcaneus 131, molar 37, others of foot 29, others of face 20), flat bones 188 (pubis 93, ilium 59, others 36), tibiotarsal joint 185, large long bones 183 (femur 54, ulna 37, tibia 30, radius 25, fibula 15, clavicle (and joint) 12, humerus 10), wrist 114, scapula 70, medio-tarsienne (?) 54, diffuse of foot 26, subastragaloid 25, sacroiliac 9.

### Frequency:

<u>Bone</u>	(under 15) <u>Infant %</u>	<u>Adult %</u>	<u>Total %</u>
spine	23	40	29
hip	20	18	19
knee	13	14	13
small long bones	19	3	15
short bones	5	2	4
others	Approximately same in all ages.		

Study of records shows that tuberculosis appeared "with an enormous frequency at 2 to 4 years. The frequency

thereafter drops abruptly after 5 years and remains at this level. A new rise of less importance is shown at puberty. In the adult, it is the 18 to 25th years which shows the most frequent incidence."

Cases of Incidence of 990 Tuberculosis of Hip by years: 1st yr. 48, 2nd 52, 3rd 89, 4th 89, 5th 85, 6th 92, 7th 67, 8th 60, 9th 56, 10th 45, 11th 17, 12th 28, 13th 30, 14th 31, 15th 29, 16th 22, 17th 23, 18th 7, 19th 8, 20th 8, 21st to 25th 44, 26th to 30th 28, 31st to 40th 28, 41st to 50th, 11, 51st to 60th 4.

Author's seires as noted above shows 5,203 are tuberculous lesions of bone and 2,959 lesions are not tuberculous. In group of non-tuberculous lesions, there are approximately 1000 cases of rickets. In following table, authors give frequency of various types of non-tuberculous bone lesion in which a differential diagnosis from tuberculosis was necessary. (Only the more important groups are included in this table, exclusive of rickets).

Arthritis (indeterminate origin)	(spine)	286 (104)
Hereditary syphilis		132
Acquired syphilis		83
Osteomyelitis		132
Scoliosis		99
Infantile paralysis		41
Coxa vara		37
Epiphysitis (vert.)		35
Congenital dislocation of joints		35
Osteochondritis		21

Authors emphasize value in diagnosis of x-ray particularly. Apparently their cases remain in hospital for long periods of time with x-rays taken throughout course of the illness which obviously improve value in diagnosis. In addition to x-rays, also emphasize skin reaction, serology, histological studies, bacterial studies and inoculations.

Authors comment that sometimes statement is made that tuberculosis is disseminated by operation. Meningitis was most frequent generalized visceral lesion acting as cause of death (20%).

### Incidence of Meningitis

	<u>Infant %</u>	<u>Adult %</u>
Operated cases	2	5
Non-operated	3	1

### 6. LABORATORY TESTS FOR TUBERCLE BACILLI BY CULTURE METHODS.

(Norton & Brown)

Corper (1928) stimulated interest in possibility of culture methods for diagnosis of tuberculosis. Advantages of such methods are obvious. Question of reliability was only drawback to its universal use. Author deals with this problem. Preparation of media and technique of inoculation are given in the article. Petroff media (modified) and Petragagni media were used. The following table shows the results obtained in 151 examinations in the guinea pig and culture.

### Guinea Pig and Culture Compared

<u>Specimen</u>	<u>No.</u>	<u>Total</u>	<u>Both</u>	<u>Guinea</u>	<u>Cul-</u>
		<u>+</u>	<u>+</u>	<u>pig</u>	<u>ture</u>
				<u>only +</u>	<u>only</u>
					<u>+</u>
Pleural fluid	44	28	17	3	8
Urine	84	13	5	0	8
Spinal fluid	6	4	4	0	0
Miscellaneous	17	9	9	0	0

The author concludes that neither culture methods or animal inoculations are 100% accurated. It would appear that the cultures were somewhat better.

It is necessary to use at least 4 tubes inoculated with the specimen since it is shown that in 21% only one of the 4 tubes showed the growth.

The time required for the appearance of growth: 137 cases, average 30 days, minimum 12 days, maximum 77 days.

The Petragagni media proved somewhat superior to the modified Petroff medium.

## 7. OPERATIVE TREATMENT OF JOINT TUBERCULOSIS. (Henderson)

Tuberculosis of bone is in reality systemic disease. Regardless of whether conservative or operative treatment is to be accorded affected joint, constitutional treatment is of primary importance. Perhaps greatest danger of operative treatment of tuberculous joints is that all attention may be focused on joint, and general and hygienic measures so essential to treatment may be neglected.

Treatment of tuberculosis of joint may be classified as: conservative and surgical. Generally American attitude is to reserve conservative treatment for child and surgical treatment for adult (see Sundt). There is, however, at present a definite tendency to include children in group eligible for surgical treatment because of frequent disappointment in conservative method. Author is fundamentally in sympathy with trend but there are many factors to be considered. Child's time is not so valuable as adult, he has no responsibilities, and numerous institutions are available for child.

Author's experience has been chiefly surgical treatment of adult case. End results in adults following carefully controlled and protracted conservative or nonoperative treatment of tuberculosis of joints, have been poor. American people will not submit to prolonged recumbency. American attitude is that tuberculous joints which will become ankylosed after years of conservative treatment may be ankylosed in as many months through operative measures and therefore represent saving in time.

Selection of patient: Patients for operative treatment should be beyond age of puberty, should be free of active pulmonary disease, should not have tuberculosis of genito-urinary tract, and should be in good health. Radical operations should not be done if draining sinuses are present. Exceptions may be made only for good reasons.

By complete study of patient and adherence to principle that patient should be in good general health, mortality rate

of operative treatment can be kept within low limit. In 600 cases, operative mortality was less than 1%. A follow-up study over a term of years showed a death rate of 8% in cases of tuberculosis of knee and 20% in tuberculosis of spinal column. Most patients who have died lived from 4 to 8 years after operation, and there is reason to believe that their lives were longer and their existence much more comfortable by virtue of having undergone operation.

Types of Operation: Aspiration and injection of various solutions - In main, results of aspiration followed by injection have been sadly disappointing.

Amputation: Should be resorted to only for definite reasons. Persistent draining sinuses from knee, with so much destruction and hopeless loss of function, severe pain, or severe systemic tuberculosis are indications. Economic conditions and advanced age are other factors. Tuberculosis of ankle often compels amputation because of poor response by other methods.

Operations leading to ankylosis or fusion: Experience with these types of operation has extended over many years, and results justify adherence to principle of radical operation. Result of 210 cases of arthrodesis for tuberculosis of knee, and 310 cases in which fusion operation for tuberculosis of spine showed good results, and many patients who had dragged themselves about for years, with aid of crutches and braces, were enabled to discard them entirely and enter normal life. When patient is given explanation as to what he may expect from either conservative or operative methods it is seldom that he fails to select the latter.

### Impressions:

1. Tuberculosis of bone described by ancients who connected in some way different tuberculous lesions.

2. Classical description of Pott's Disease was preceded by about

200 years by good clinical picture by Dalenchamps.

3. First operation in 1781 in which excision of diseased part of bone was done.

4. 1802 marked appearance of first paper which attempted to establish differential diagnosis.

5. By 1880, battle between operative and rest treatment had already begun.

6. Orthopedic literature for past few years is concerned with accuracy of diagnosis in tuberculosis of bone. Statistics dealing with end-results are criticized because of inaccuracy of diagnoses.

7. 38% of cases are diagnosed by clinical methods. Statistics range from 22% to 40%.

8. 30% of cases have a sudden onset and inaccuracy in diagnosis in such cases is approximately doubled.

9. About 30% of cases have acute pain at onset. Insistence for presence of mild pain for diagnosis of tuberculosis is not justified.

10. About one-third of cases present multiple lesions.

11. The diagnosis is most inaccurate in those areas in which possible number of lesions is most numerous.

12. In about one-third of cases, x-ray is of little information.

13. A confirmed negative skin tuberculin test excludes tuberculosis.

14. Pathologists are frequently unable to recognize tuberculous tissue grossly. On microscopic examinations, it is frequently impossible to distinguish type of chronic inflammation.

15. Surgeons cannot recognize tuberculous tissue at operation any more frequently than pathologist. Only 20% of errors are corrected at time of operation.

16. Culture of organism on special media and guinea pig inoculation are only certain methods of diagnosis. Neither, however, are 100% exact as both may give negative results in presence of a definite tuberculous lesion (choice of material?).

17. Cultural methods appear to be somewhat better than animal inoculations.

18. Average time required for appearance of a growth on culture is 30 days for guinea pig test 6 weeks.

19. Exploratory incision to confirm diagnosis is becoming more and more justi-

fied. Many clinics will not perform operative procedures until absolute diagnosis is made. The attitude even when conservative treatment is anticipated is becoming more liberal.

20. Diagnosis of tuberculous lesions of bone in proportion to non-tuberculous has dropped from 2 to 1 to 1 to 1 as the number of biopsies (exploratory arthrotomy) have increased.

21. In 5000 tuberculous lesions of bone, the distribution is spine, hip, small long bones (foot and hands), knee, elbow, short bones.

22. The only significant differences in age distribution occur in spine (23% infants, 40% adults) and in small long bones (19% infants, 3% adults).

23. The incidence of bone tuberculosis is greatest between 2 and 4 years.

24. The most common conditions which have to be distinguished are in order of frequency - arthritis, syphilis, osteomyelitis, scoliosis, infant paralysis (others less frequent).

25. Statistical studies in large groups of cases appear to indicate that tuberculosis is not disseminated by operation. The incidence of generalized tuberculosis is greatest in the non-operated group.

26. The American attitude toward treatment is swinging more and more toward operative fusion whenever the general condition permits. In the past this held for adults but at present attitude is becoming more liberal and children are being included as candidates for surgical treatment.

Abstracts by Rudolph Koucky.

### III. ANNOUNCEMENTS

#### 1. Our Guest Today,

Melvin S. Henderson,  
Professor of Orthopedic Surgery,  
Graduate School, University of Minnesota,  
Mayo Foundation. Born in St. Paul,  
Minnesota. University of Toronto Faculty of  
Medicine. M.B. '06, M.D. '14. Intern City and  
County Hospital, St. Paul, (06-'07. Clinical  
Assistant, Mayo Clinic, '07-'09. First  
surgical assistant '09-'11.



Graduate study with Sir Robert Jones and Harold Stiles '11. Junior Surgeon, Mayo Clinic, '11-'14. In charge of organizing and directing Division of Orthopedic Surgery, Section of Surgery, '14.

Author of numerous scientific publications. Member of Olmstead County Medical Society, Minnesota State Medical Association, American Medical Association, Western Surgical Association, Clinical Orthopedic Association, American Orthopedic Association, American College of Surgeons, and others. Past member of Council, Minnesota State Medical Association, Retiring president 1932.

Known to his associates for his kindness, thoughtfulness, and consideration for others, he has gone far in his chosen field and won the universal respect of his associates. He has found time in a busy career to devote to the interests of general medicine as exemplified by our state and county organizations. While many honors have been conferred on him and his ability recognized by appointment on national and international committees, he has remained unchanged. We cordially welcome you today and trust that you will find the time and inclination to visit us often. Dr. Henderson will address the medical students at 2:00 P.M., Anatomy Amphitheater, today on "The Treatment of Fractures of the Lower Extremities."

## 2. Reliability of Cancer Statistics.

H. B. Wood, Bull. Amer. Soc. for Control of Cancer, 15:1-4 (Jan.) '33. (Abstract)

Statistical evidence is exact when completely collected and correctly interpreted. Figures can be juggled to support any assertion, but that is not statistical evidence. The careless use or the incomplete collection of figures misleads to an extent as to seriously impair any investigation. Comparisons must be of large numbers to have value, and ratios that are nearly the same should be considered as equal. Minor differences are unimportant. Rates beyond the first decimal are probably of no value. A speaker who gives rates should use round numbers and omit the decimals so that the hearers will be more apt to remember the principal figures. In many

instances questions as to the correctness of statistics would be avoided if the sources or the methods of obtaining the figures were given.

The figures in reports frequently give only half of the whole truth. Often one reads the number of persons of a certain occupation who have cancer, but such an assertion, without giving rates, has no value. It merely indicates that some people in the neighborhood follow that occupation, and some have cancer. A survey accounts for certain conditions but never mentions the alternatives which are just as important.

Mortality statistics, as usually used, are tabulated from the punch-card records made from death certificates. The punch-card has room for only certain information and obviously it is impossible for every disease or every part of the body affected by cancer to be recorded separately on the punch-card. Groupings must be formed and the best effort has been made to have the groupings of disease and of organs made in the most scientific and practical way. These groupings are useful for many purposes but not for every occasion. Numerous attempts are made to utilize them for purposes for which they were not intended, to prove what they will not prove.

Attempts are frequently made to report statistically the duration of the development of cancer and the postoperative length of life. When these figures are the result of careful clinical study they probably are as dependable as it is possible to determine. But when they are collected from death certificates, they probably have little if any value.

The postoperative length of life is most reliably obtained by a follow-up of hospital cases rather than only by tabulations from death certificates. Postoperative mortality is not operative mortality, nor hospital mortality. The term operative mortality should be confined to deaths resulting as a complication of an operation.

Women are said to have more cancers than men, a meaningless statement. The increase of cancer has been both asserted and denied. The only just investigation of this subject, I believe, can be made of the only statistical group which contains a single organ, the breast, and should include adjusted rates of only the oft-termed cancer age. The number of deaths from cancer of the breast is increasing twice as fast as the population of Pennsylvania. A similar study to determine an increase of deaths from cancer of the stomach or of the uterus or lungs would require a separation of the deaths from cancer of the particular organ from all the others in the group.

The increase in the diagnosed cases of cancer can scarcely be credited to the betterment of facilities or technique of diagnosis. In the 1,842 fatal cases of cancer of the stomach the means of diagnosis was recorded for 826; clinical diagnosis in 40% of the 826 cases, laboratory analysis 4%, x-ray diagnosis 22%; the rest were diagnosed at operation or discovered at autopsy.

Clinics, hospitals or surgeons reporting an increase of a particular disease among their patients make a statement of their experience only, and this has no bearing whatever on the condition of their city or state. The increase of deaths from all malignant disease of all organs is undoubtedly a fact, but, according to Ewing, we do not care to know the changes in the totals of all cancers but only those of particular organs.

The deaths from cancer of the stomach as tabulated from state or federal death records are the group of deaths classed as from "malignant tumors of the stomach and liver." Many writers accept and quote these figures as representing cancer of the stomach. This group, however, includes deaths from carcinoma, from all the multiple forms of sarcoma and endothelioma. The organs included in the group comprise the fauces, throat, pharynx, esophagus, stomach, including the pylorus, the liver, gall-bladder, bile ducts and gall duct.

Hospital records cannot indicate rates in relation to the general population. Only three-fourths of the cancer

cases treated in 49 Philadelphia hospitals came from that city, and only 41% of the deaths from cancer in Philadelphia in that particular year occurred in the hospitals. These hospitals reported having 554 deaths from cancer, yet the death certificates from these same hospitals showed 682 deaths from cancer that year. Many death certificates of patients dying in hospitals do not indicate that the patients had been in any hospital. The inaccuracies on death certificates are notorious.

The questionnaire is frequently the only available method of collecting statistics but because of the great numbers of questionnaires inflicted on busy people the system has become a nuisance. Many persons return wild guesses as their replies and these very seriously damage an important investigation. A brief questionnaire sent to the hospitals of Pennsylvania included a question of the number of deaths they had from cancer during the year. Their replies gave a total of just 26% fewer deaths than the death certificates from these same hospitals showed for the same period. Thirty-five hospitals claimed fewer deaths and 41 admitted more deaths than could be checked on their death certificates. The questionnaire should be brief; should omit all questions not absolutely necessary, and should not be employed if it can be avoided.

Let us then be more careful of our statistics; compare comparable factors; give definitions which define; report figures which correctly confirm, deny or explain conditions. Let us determine as far as possible the cause of the differences of figures or rates of similar conditions; be not too critical of another person's records which are correctly shown, but explain the conditions under which our records were obtained and what locality or condition they represent. We should publish statistics which others may understand and employ; use rates adjusted to correctly interpret a definite subject of a definitely involved group of persons; omit comparisons of groups which are irregularly influenced

by various factors which cannot be eliminated and which are detrimental to the study in hand; and constantly endeavor to improve our records in completeness and accuracy.

### 3. Better histories of communicable disease in the home.

The following data is of interest in taking better histories of communicable disease in the home. Conditions in 1933 are probably more striking than in 1930.

The typical American family, often a subject of dispute, is here described on the basis of census figures for 1930. The article is the text of an address made by Professor Wm. F. Ogburn, of the University of Chicago at a sectional meeting of the American Association for the Advancement of Science at Atlantic City. (Mpls. Journal 1-15-33). Abstract.

"There are three family groups that are generally called the family. The first is the family which consists only of husband, wives, parents, children. The second is that of the foregoing plus blood relatives. This may be called the kinship family. The third group is the kinship family plus boarders, roomers, lodgers and servants living in. This may be called the household.

The census of 1930 furnishes data from which the sizes of these three types of families may be determined. The easiest to determine is the average size of the household, including relatives, servants and lodgers. This is found to be four (4.01) persons. If we subtract the total number of boarders, lodgers and servants and divide the remainder by the total number of families, we determine the average size of the kinship family, which is found to be 3.82 persons.

Just what part of this 3.82 persons represents kin living with the family, the published data of the family do not permit us to determine. But from sample studies made by the writer, but not reported on here, every three families have one relative living with one of them on the average.

The average family, then, consists of 3.5 persons, the kinship family of 3.82 persons and the household of 4.01 persons."

### IV. MEETING

Date: January 12, 1933.  
Place: Interne's Lounge, 6th Floor, West Building.  
Time: 12:05 to 1:20.  
Program: Treatment of Hypertrophy of Prostate.  
Present: 90.  
Discussion: C. D. Creevy  
 T. J. Thomas  
 E. L. Meland  
 R. A. Tyvan  
 O. H. Wangenstein  
 A. G. Wethall

#### Theme:

C.D.C.: Drs. Ritchie and O'Brien have covered the subject so well that there is very little to add. Use of punch, i.e., transurethral resection is still in question so far as generalized or lateral lobe prostatic hypertrophy is concerned. It is generally agreed that transurethral resection is ideal in inflammatory lesions (bars); best treatment available for carcinoma when lesion produces obstruction except in few cases when radical prostatectomy is advisable. When punch is used in carcinoma, it should be followed by radiation in order to attempt to control rate of recurrence as well as relieve obstruction. Difficult to evaluate results from literature. Average urologist usually too well satisfied with results of punch as are many patients. As a whole, we should stay open minded. Too much emphasis on this procedure as such at the present time.

T.J.T.: Subject of prostatic punch is interesting. As Dr. Creevy has indicated we still have the same

group of patients to work with. Dr. O'Brien showed that greatest mortality occurred in preparation. Mortality still present in this group. I doubt very much if we are reducing it because the operation of prostatectomy or resection is now being done by a great many. In my opinion it requires just as much technique, if not more, just as much sound judgment in picking and handling cases. We have a great group of people who believe themselves adept in the use of cystoscope and therefore able to use a resectoscope as well. The preoperative care of prostatic patients is still important. Infection is the important factor in death in enlargement of the prostate so I believe that infection is still present. Selecting cases is tremendously important.

The punch does open a new field for the prostatic, i.e., group in late forties who come in with certain amount of difficulty but who have no residual urine. If with cystostopic study they have a small amount of median enlargement or median bilateral enlargement, we are justified in doing a certain amount of prophylaxis. Good surgery to remove small portion of prostate which is beginning to produce symptoms. In taking out this small portion you can probably relieve the patient. Another group of patients that can be handled is the old fellow who comes in with P.S.P. of 15% or less. Many with suprapubic drains in place can have punch.

Gas oxygen anesthesia seems to be best because spinal may induce bladder injury. Technique is important, must have sufficient fluid on hand so we can wash out bladder to control infection. Technique of punch operation can only be understood by a urologist using the cystoscope. Control bleeding. Postoperative care of punch patients very important, more so than prostatectomy. Takes better trained man to watch patients after operations. Watch bladder and urethra carefully every day.

E.L.M.: This last summer I looked up a series of patients. They had residual urines of an ounce to 3 or 5 ounces. As soon as the diagnosis was established, provided that these patients were in good shape and had good renal

function, they went on to operation. Of these 63 patients, eight went on to prostatectomy. There were no fatalities. Average stay in hospital 5 days (Mayo Clinic). Punch operation plays an important part from the economic viewpoint. Dr. Creevy's new instrument, the modification of McCarthy instrument should be best instrument for use in punch operation. I watched Dr. Creevy yesterday, and was much impressed.

R.A.T.: What Dr. Thomas said about secondary hemorrhage, Dr. Bumpus feels the same way. Patients are not permitted to leave before three weeks on account of the possibility of secondary hemorrhage.

O.H.W.: Complimented Dr. Creevy on this instrument. Punch operation may supersede prostatectomy. In 1806 man in London did first transurethral resection. Early transurethral resection showed fairly favorable results.

A.G.W.: Just as much trouble following prostatectomy as ever. 50% of them have frequency, cystitis, stone formation. My experience is that the punch operation results are just as good, often better. It is 2 years since I have started this work. First instruments all right but there was trouble because of hemorrhage. With this radio instrument, it is impossible to do anything with the lateral lobes. Kirvin changed the method, used a knife in circular movement, one that rotates from side to side; then he added the cautery. Excellent instrument for the bar. Davis modification, then McCarthy instrument, this is most promising thing. Under perfect vision you see projecting prostate and with the cutting current you pull the lobe through. Hemorrhage is the thing you get very little of. Trouble with punch is hemorrhage. With this instrument one can take out as much as necessary. Demonstrated Wethall instrument.

Gertrude Gunn  
Record Librarian