THE ARTHROPATHIES OF TARES DORSALIS, WITH
SPECIAL REFERENCE TO CHARCOT'S DISEASE OF JOINTS.

by

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Charcot, one of the most outstanding medical men of the nineteenth century, was born in Paris on November 29th 1825. His father conducted a small coach-building establishment. Charcot began his medical studies in 1844, four years later he was an intern in the Parisian hospitals, beginning his service at Salpêtrière.

In 1853 he was appointed chief of the clinic in the Paris Faculty of Medicine, the same year writing his Thesis on "Arthritis Nodosa".

In 1872 he was elected Professor of Pathological Anatomy, that year he was admitted to the ranks of the Academy of Medicine. In 1883 he became a member of the Academy of Sciences.

Charcot's dearest wish was realised in the year 1882 when a chair of nervous diseases was created and he was appointed as its first occupant.

Although this Thesis deals with Charcot's disease of joints, it must be realised that the works of Charcot are of the greatest scope. His earlier studies were particularly applied to the chronic disorders which were so frequent at the Salpêtrière where he was Master, among them he emphasised chronic rheumatism, pulmonary scleroses, pneumonoconioses, the chronic pneumonias as well as diseases of the liver and kidneys.
Charcot's greatest works however were associated with neurological studies, his lectures on neurology were always largely attended, he created the greatest neurological clinic in the World, and there are to-day many branches of Medicine which have the name of Charcot associated with them.

Charcot died in 1893 from Angina pectoris in a little hotel on the shore of Lac des Lettons where he was holidaying, his remains were brought to Salpetriere and from there were taken to be interred in Pere Lachaise Cemetery.

Charcot was a self made man, who by supreme effort rose from a humble position in life to one of world wide renown.
HISTORICAL.

The historical facts of Syphilis have been investigated more thoroughly than that of any other disease. It has been assumed by some that Syphilis has been handed down from antiquity, the ancient Egyptians having been afflicted with this disease. Some hold that leprosy as mentioned in the Bible was in fact Syphilis.

The earlier records of this disease are obscure, but we do know that it appeared and was recognised in the Old World of Europe in the year 1493. Prior to this, however, Syphilis must have existed in the New World.

The Spaniards who sailed with Christopher Columbus on his first voyage became infected and brought the disease to Barcelona.

VIGO (1460-1517?) writing at that time states:--

"In the month of December, when Charles the French King took his journey into the parts of Italy to recover the Kingdom of Naples, there appeared a certain disease throughout all Italy of an unknown character, which sundry nations hath called by sundry names."
The Frenchmen call it the disease of Naples, because the soldiers brought it from thence into France. The Neapolitans call it the French disease, for it appeared first when they came to Naples.

In April 1497 we find the statute municipal authorities of the burgh of Aberdeen issuing the following edict:-

"The said day it was statut and ordanit be the Alderman and Consale (Council) for the eschewin of the infirmitye cumm out of Franche and strange partis, that all licht wemen be chargit and ordanit to decist fra thar vices and syne of venerie and all thar buthes and housis skalit, and thai to pass and wirk for thur sustenacioun, under the payne of ane key of het yrne one thair cheekis and banysene of the toune".

It is interesting to note that Alexander Duncan who quotes this edict points out that in addition to this being the earliest notice of the presence of Syphilis in Scotland, the town council of Aberdeen had realised the fact that this/
this disease was associated with the "Syne of Venerie" a conclusion subsequently admitted by the faculty.

In the same year 1497 we find the Scottish Privy Council issuing "Grangore Act" (a la grande gorre - the local name at Rouen for the disease) which ordered all the inhabitants of Edinburgh affected with the disease to pass out of the town and to appear upon the sands of Leith on a stated day and hour, thence to be transferred by boat to the island of Inchkeith.

The familiar name Syphilis is reputed to have been first given to the disease by Jerome Fracastoro a physician and poet of Padua (born in Verona about 1482). Fracastoro's legend was - Syphilus a herdsman of King Alcithous cursed the sun for a drought while tending a thousand oxen and a thousand snow white sheep. The sun in return for this curse smote Syphilus with the disease because he had transferred his sacrifices to Alcithous.

There was no recognition of Syphilis affecting the central nervous system until 1851. We find during the intervening period however, Paracelsus writing about inherited Syphilis. That famous French Surgeon Ambrose Pare at the same time 1530, discussing the association between Aneurysm and Syphilis, Mortagni (1719) describing degeneration of the brain arteries due to Syphilis. A controversy/
controversey waged between John Hunter the renowned Surgeon and Benjamin Bell as to whether Syphilis and Gonorrhoea were one and the same disease.

Romberg in 1651 described in detail the salient features of Tabes Dorsalis - the small fixed pupils, optic atrophy, shooting pains, girdle sensation, stamping gait and swaying of the body when the eyes are shut, the last named to-day bearing his name. At the same time as Romberg's description we find Duchenne of France claimed as the discoverer of "L'Ataxie locomotrice" - as he called it, or as it was known for a long time - "Duchenne's disease" - of which he gave a clear clinical picture to which we can add but little to-day.

In 1831 J.K.Mitchell published a short article on acute and chronic rheumatism - (1) - and in it we find a reference to arthropathies of a Tabetic origin.

Jean Martin Charcot, Physician to the Salpêtrière, and described by his biographer as the Prince of Neurologists, was, however, the first to definitely describe a peculiar form of arthritis met with in cases of locomotor ataxia and now known as Charcot's disease. His first reference was in 1868 (2) - but this was six years after his advent to the Salpêtrière and is not likely to be his original description. In the year 1885 he published a report of six cases - (3) -

After Charcot's description of this clinical entity there was/
was a flood of contributions in medical literature principally from Germany and France. In 1904, Blencke - (4) - reviewed the current medical literature on the subject of Tabetic Arthropathies quoting at that time nearly four hundred articles.

To-day the medical literature of the World has innumerable references to this condition, any standard medical text book, let alone a book especially dealing with venerology, describes Charcot's disease more or less in detail.
HISTORICAL REFERENCES.

(1) - MITCHELL, J.K. - The American Journal of Medical Science. 8:55 - 1851.


(3) - CHARCOT, J.M. - The Spinal Arthropathies - 1885.

THE TABETIC ARTHROPATHIES.

Under the heading Tabetic Arthropathies it is proposed to consider Charcot's disease of joints and also a condition known as "Pied Tabetique". Both conditions arise in the late stages of a Syphilitic infection and are more the result of interference with the trophic nerve supply rather than a localised affection due to the Spirochaeta Pallida.

Arthropathies are known to occur in other conditions such as Myelitis, Anterior Poliomyelitis - (1) - and Syringomyelia - (2) - likewise in lesions of the cord following injury of the spine - (3) - in Tuberculosis of the Spine - (4) - Haematomyelia, peripheral nerve lesions and in Spina bifida manifesta or occulta. Arthropathies are also known to arise in Leprosy where it is the fingers and toes which are commonly affected, but here the process is purely of a destructive nature, no bony hypertrophic changes being present - (5) -.

Charcot in originally describing this disease stated - (6):-

"This disorder generally shows itself

at/
at a determinate epoch of the ataxia, and its appearance coincides, so to speak, in many cases with the setting in of motor incoordination".

In observing a series of cases it is soon realised that the condition may arise before a Tabes Dorsalis is manifest, or that it may eventuate at any time during the course of the disease.

The incidence of joint affections in Tabes has been computed to be ten per cent - (7) -. Marie contends, however, that only four to five per cent of Tabetics show signs of Charcot's disease.

There is undoubtedly a preponderance for Charcot's disease to affect the male sex. Erb gives the ratio of 19.5 males to 1 female. Mendel gives 3.5 males to 1.31 females - (8) -. Byrom Bramwell states - (9) :-

"I may say in passing that the joint affection seems to be comparatively speaking, more common in women than in men".

These frequencies however, are only apparent when one considers the greater number of males affected with Tabes as against the number of females.

The Tabetic Arthropathies (Charcot's disease) are more/
more common in the lower extremities, nevertheless any joint may be affected or two or three joints at one and the same time, but whatever group of joints is affected it is usual to find that it is more commonly the larger joints which suffer - (10 and 11). Trauma seems to play an important part in the production of Charcot joints, in consequence of which we usually find our Tabetic patient showing signs of an incipient Charcot of the knee, hip or foot, these being naturally the joints mostly exposed to traumatic influences. Wile and Butler - (12) - in a series of eighty eight cases under review consider that trauma is not so important a factor as are faulty posture ataxia and hypotonus.

The age onset of Charcot's disease of joints is naturally consistent with the tabetic process and is somewhere in the vast majority of cases between the ages of 35 to 55 years.

Trophic disorders associated with a juvenile tabes are very uncommon; Charcot's arthropathies have been recorded a few times, but it is interesting to note that there is no instance in the literature of the co-existing condition perforating ulcer of the foot arising in juvenile tabes - (13).

The coloured races are as subject to Charcot's disease as are the white. A great deal of work has been done on the subject of Tabetic Arthropathies by American neurologists and venerologists since the beginning of this century, and the consensus/
consensus of opinion is that all races are equally affected in proportion to the extent of tabes present in the population.

Yaws cannot be compared with Syphilis from the neurological point of view as recently stressed by Blacklock - (14).
REFERENCES.

(1) LABORDE. Bulletin de la Societie d'anatomie. 1873, 744.

(2) SOKOLOFF. Zeutsch. Zeitsch. fur Chir. 1892 - 505.


(4) MITCHELL. American Journal Medical Science. April 1875.

(5) PURVES STEWART. "The Diagnosis of Nervous Diseases" Ed. 6, 1924. p.411.

(6) CHARCOT, J.M. "Lectures on Diseases of Nervous System" - delivered at La Salpetriere.


(9) BRAMWELL, BYROM. "Diseases of the Spinal Cord". Ed.3. p.334 - 1895.

(10) LEES, D. "Diagnosis and Treatment of Venereal Diseases" Ed.2 p.107. 1931.


(12) WILE AND BUTLER. Journal American Medical Assoc. 1930 April 5 - 1053.

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REFERENCES, cont'd.


SYMPTOMATOLOGY OF CHARCOT'S DISEASE OF JOINTS.

In describing the symptoms of Charcot's disease of joints one can hardly do better than quote Charcot's original words where he says - (1) :-

"Without any appreciable external cause, we may see, between one day and the next, the development of a general and often enormous tumefaction of the member, most commonly without any pain whatever or febrile reaction. At the end of a few days the general tumefaction disappears, but a more or less considerable swelling of the joint remains".

Again he states:-

"One or two weeks after the invasion, sometimes much sooner, the existence of more or less marked cracking sounds may be noted, ........... consecutive luxations are frequently found".

A joint showing Charcot's disease is therefore com-
A photograph showing the swelling present in Case 1 of the left knee taken after the patient had been in bed for three weeks receiving the requisite treatment.
comparatively easy to diagnose, there is given by the patient a definite history of a swelling which has appeared suddenly around a joint and in the great majority of cases that swelling is painless. If however, the disintegration of the joint follows upon trauma then it is more than likely that pain and tenderness will be a distinct feature. It has to be remembered that the arthropathy may be to the patient the first tabetic symptom.

Stendler - (2) - quotes eleven cases showing this joint abnormality as the first symptom out of sixty four cases of Tabes with arthropathies.

An interesting feature is, that where one finds a tabetic arthropathy developing as the initial tabetic symptom it is quite a common experience to discover that the patient has had for some time past, so called attacks of abdominal colic which have really been - "Gastric crises". This however, is more likely to arise in women.

The commonest joints to be affected are the knee, ankle, spine, hip and shoulder, when the small joints are involved the affection is usually polyarticular.

Sometimes pathological fractures may precede a Charcot's swelling, likewise an arthropathy may follow upon an acute arthritis in any joint.

The disease if affecting the lower extremities may be bilateral/
Perforating ulcer on the sole of the right foot.

This photograph was taken from Case 1.
bilateral in a considerable number of cases.

This swelling which develops around the joint in addition to being usually painless shows neither redness nor heat, nor yet is there any pain on movement. The periarticular swelling which in some cases is extensive, is unlike an ordinary oedema, in that it shows no pitting on pressure.

This indolent, analgesic swelling of the joint may persist for some time without any appreciable difference, may be for months, but sooner or later destructive changes set in, the ends of the bones become eroded and irregularly deformed, loose bodies appear in the joint cavity and there is great oedema of periarticular tissues. The joint becomes completely disintegrated and is "flail-like", it can be moved about with great freedom, extended and flexed to an extraordinary degree without any appreciable pain. Ligamentous tears and severe soft tissue strains frequently accompany an arthropathy.

A recent publication -(3) - has noted the fact that glandular swellings may be found in the vicinity of joints showing Charcot changes, biopsy has proved these swellings to be Syphilomata.

Naturally any other symptom of Tabes may be present with an arthropathy, ataxia, lancinating pains, numbness or paraesthesia, loss of sphincter control, optic atrophy, girdle pains or perforating ulcer.

The diagnosis of a tabetic arthropathy is therefore not difficult/
difficult, and especially so is it easy if there are found co-
existent symptoms of tabes or if there is discovered in a
cursory neurological examination such signs as absent ankle
jerks, a positive Romberg's sign, Argyll-Robertson pupils, etc.
or if there is a history of a primary syphilitic infection at
some earlier date.

The diagnosis may be arrived at by noting the scar of an
old sore on the genitals by seeing the signs of a late
syphilitic skin rash. A blood Wassermann is not always
going to be consistently positive because there is a tabetic
arthropathy, nevertheless if it is positive it is going to be
an invaluable aid to the diagnosis. Enlarged inguinal or
epitrochlear glands may help a decision to be arrived at in an
early case.

X-ray examination in Charcot's disease is typical of the
affection. Usually the joint spaces are ragged and
irregular with bone debris lying free in the joint. Sub-
luxation is always visible. In the hypertrophic forms there
is considerable sclerosis of the bones and in many cases
ossification of the ligaments. In the atrophic forms large
pieces of bone may completely disappear. The changes of
a Charcot's disease are so coarse and so characteristic that
they cannot be confused with any other form of arthritis.
REFERENCES OF SYMPTOMATOLOGY.


(3) M. FAURE-BEAULIEU. Presse Medical 1932 April 2. M. E. BERNARD. page 455. M. C. BRUN.
THE PATHOGENESIS OF THE TABETIC ARTHROPATHIES.

It is difficult to explain the various "trophic" disturbances which arise in the tissues in Tabes Dorsalis, such as alterations in the nails, skin bone and joint changes.

From the time of Charcot's original publications a controversy as to the pathogenesis of the arthropathies has been carried on. Charcot himself definitely put the condition down to be one entirely of neurogenic origin. He believed that degeneration of the spinal cord - that is degeneration of the posterior columns of the cord - was entirely responsible for all trophic changes. Volkmann - (1) - acquiesed with Charcot, in that there was degeneration of the posterior columns of the cord, but he insisted that trauma played a very definite part in such joint disorganisations. In other words, a joint predisposed to such a condition by previous spinal cord degeneration, traumatised, would give rise to a typical Charcot's joint.

Barre - (2) - advanced the theory that a syphilitic infiltration of the nutrient vessels supplying the affected bones and articulations was the cause.
An organismal theory has also been sought after, and in proof of this Delbet and Cartier have demonstrated a bacterium of inconstant identity in the synovial fluid of the affected joints - (3).

It has also been suggested by Oberthür that Charcot's arthropathy is really an infective arthritis to which tabes gives a particular allure, and he has tentatively hypothesized a urinary organism as the cause of the infective arthritis - (4).

Experiments carried out to test the effects of peripheral nerve lesions prove that there is no definite bone change after section of a nerve. Ghilline - (5) - showed that cutting through the sciatic nerve only gave rise to an increase in length growth of the femur, and this he contended was due to the diminution of pressure. Eloesser - (6) - likewise proved that peripheral nerve section only brought about increase in length growth of the bone, and that there were no joint changes apparent after complete division of a nerve.

It would therefore seem, that having destroyed the nerve alone is not going to give rise to an arthropathy, something else must be present beyond that. Whether any of the theories already advanced answer this question, it is difficult to say. There is no doubt about it that in tabes there is posterior nerve root degeneration in every case; there is also a toxic element and there is also a organismal infection, but whether the one factor alone is the cause, or a combine of all is the essential/
essential factor, it is very difficult to decide.

Oberthur's theory is particularly attractive because certainly the allure or soil in every case is almost the same. The suggestion of a urinary organism however cannot be accepted without very convincing proof. There has been no offer of a bowel organism as the cause in a like manner as there is suggested a urinary organism. This may be a possibility.
REFERENCES AS TO PATHOGENESIS.

(1) VOLKMANN. Zentralbl. f. Chir. 1886, p.89.

(2) BARRE. These de Paris, 1912.


(4) OBERTHUR Rev. de Chir. 1929 No.4 - 304.


THE PATHOLOGY OF THE TABETIC ARTHROPATHIES.

Charcot originally stressed the characteristics as the sudden appearance of a firm, painless swelling of the joint affected, this swelling gradually extending into the surrounding soft parts, and according to Charcot apparently arising without any preceding trauma.

The rapid changes which the joint surfaces undergo cause luxations and false positions of the bones within a short time after the onset. Lastly, he stipulates that the arthropathy usually arises at a particular stage in the development of the ataxia, that is in the so called "transitional phase" when the ataxia begins to manifest itself.

Charcot distinguished between a "malignant" and a "benign" type of arthropathy, but exception must be taken to this definite cut and dry distinction because the benign form of arthropathy may become malignant in the course of development. More to the point is to try and distinguish between a hypertrophic and an atrophic form, that is a proliferating and a degenerative type.

Kienbock - (1) - distinguishes two such types, a gross hypertrophic/
hypertrophic form in which the joint cavity is much stretched and where there are fractures with haemorrhage, also tearing of the soft parts. In the atrophic form there is fracture and separation of the bones, no attempt at reunion but atrophy of the ends of the bones.

The absence of pain in the affected joint is one of the most important features for the clinician to remember, it is of course no more than an expected manifestation of the tabes. From the pathological standpoint we have to refer to the co-existent nerve lesions of tabes which are both central and peripheral, and to-day it is known that a peripheral degeneration of the sensory nerves is a common occurrence in Tabes Dorsalis.

Occasionally a case is brought to our notice which has all the features of a tabetic arthropathy, but where there is pain, this however, is quite consistent with the variability of all the tabetic symptoms.

Charcot in his original lectures recorded a case where the swelling was accompanied by pain and redness for the first day or so. Quénu in his text book on surgery states that he found twenty painful and thirty-four indolent cases in a series of fifty-four cases, this however seems an incredibly high proportion.

The swelling usually appears very rapidly, in many cases
being fully developed in twenty four hours. This swelling has not the characters of an ordinary oedema, it is usually firm, does not pit on pressure and invariably extends far beyond the capsule and bursae of the joint.

Crepitations are sometimes noticed and may even be present before the swelling. Charcot himself observed crepitations in some of his cases and he likewise included cases in which a dislocation or a fracture within the joint capsule was the first noted lesion.

In the benign type of arthropathy the fluid around the joint quickly disappears, may be in two or three weeks and then there is left a normal joint with but a few crepitations. Should there be a recurrence of this hydrarthrosis then the benign form takes on the characters of a malignant arthropathy.

The difference therefore between the benign and malignant forms would seem to depend on the line of treatment adopted and the care that is taken to ensure sufficient rest and protection to the joint.

The type usually encountered would therefore appear to be the malignant form. Naturally if in spite of swelling such a joint be freely moved, as it can be since there is no pain, then the ligaments become stretched and loosened, the bony parts become rapidly distorted, worn and fractured. Subluxations, dislocations and the presence of free bodies may become/
become evident in a few days. The ligaments and capsule of a joint affected in such a manner will become so relaxed as to give rise to a flail joint of a high degree of movability. The so called "Jambe de polichenne" of the French or "Hampelmannsnien" of the Germans.

Charcot emphasised the rapidity of disorganisation of the joint as a differentiating factor for clinical diagnosis. He records this case:-

"A soldier aged 28 years with no previous history of tabes, who was marching with his regiment twenty five to thirty kilometres daily, one day felt a pain in the left hip and began to limp. The regimental physician, however, sent him back to the ranks, and as the pain was slight he remained with the regiment for three days longer, when he fell, unable to proceed further. He was examined by Charcot within eleven days of the onset of his trouble, and a marked disorganisation of both hips with dislocation was observed".

One could find other cases of a similar type recorded in the literature, but such rapid disorganisation is unusual. Likewise this case is particularly interesting in view of the patient's/
patient's age which is ten years younger than the average case affected.

The extent and character of the disorganisation of the joint is much more characteristic than the rapidity.

Such outstanding dislocations and deformities of joints dependant on relaxation of capsule and ligaments and bone destruction are found only in arthropathies accompanying a nervous lesion, and almost never except in Tabes and Syringomyelia.

Charcot was of the opinion that tabetic arthropathies arose at a particular time of the disease - during the "transitional phase" - this, however, is incorrect as it is now generally conceded that the condition may arise at any stage of the tabes.

Post-mortem reports of the early changes in Charcot's joints are naturally few if any, but the later changes have been well recorded. Tapping of a swollen Charcot's joint by a surgeon would show a pale colourless fluid, sometimes darker due to the admixture of blood. Flecks of fibrin may be found. As has already been recorded a bacterium of inconstant identity may be present. Incisions made will show only a slightly reddened synovia and in some cases enlarged synovial fringes. At autopsy from where we glean our knowledge of the true extent of destruction of this disease we find the synovial membrane increased in vascularity, thicker/
A pathological specimen of a Charcot's knee joint showing the gross destruction of the lower end of the Femur and upper end of the Tibia and Fibula.
thicker and tougher than usual. The fringes may be increased in size, their villous tufts hypertrophied and sub-divided and the whole membrane assuming a shaggy villous appearance. Cartilage may be developed in the villi and in some cases they may become calcified or ossified. As they increase in size they become pedunculated and may be detached forming one of the varieties of loose bodies in joints.

Consequent on this synovial change there is to be found a gradual disappearance of the cartilage with a rapid destructive frictional wearing away of the bones. The bones are destroyed to an extent such as is never seen in osteoarthritis, a condition which shows many pathological joint changes the same as Charcot's disease. The bone is usually worn down without any new bone being produced. The whole head of a bone may be ground down and destroyed. This extensive destruction of bone must be more accountable for the undue mobility and dislocations which are found, than the wearing away of ligaments.

A joint showing such gross changes must be naturally useless, as it is completely disorganised. Spontaneous fractures are prone to result because of the degenerated state of the bones. Additionally many may show associated with the destructive bone changes large irregular masses of new bone thrown out around the remains of the joint.

We know definitely that this condition which so closely resembles/
resembles a severe osteo-arthritis is only found in tabes, whether the disease of the central nervous system, in some at present obscure manner, causes a profound interference with the nutrition of the affected joints, probably from interference with the reflex regulation of the blood supply, or from the action of the syphilitic toxin, it is impossible to state.

The affection is generally monarticular and adults are as a rule affected. The knee, hip, shoulder, tarsus, elbow, ankle and wrist is the usual order of affection.

The X-ray appearances are characteristic - a badly disorganised joint - Syringomyelia shows similar joint changes, but clinically we can easily differentiate the two. It is usually the shoulder or elbow which is affected in Syringomyelia and there are important co-existent diagnostic features such as impairment of loss of sensation of pain, cold and heat in the affected limb, wasting of the hand, forearm and trophic lesions in the form of painless whitlows and ulcers.

Changes in the vertebral column are some times present in Tabes Dorsalis and they are undoubtedly closely analogous to the tabetic arthropathies. Kronig - (2) - in 1885 was the first to bring this to our notice. Destruction of any of the lumbar vertebrae may be found with osteophytes. If such a thing be present very definite and serious damage may follow the slightest trauma to the vertebral column.

Charcot's disease of the spine has been recorded in two cases/
cases following the operation of lumbar puncture. In each case
the lumbar vertebrae had been traumatised with the lumbar
puncture needle - (3) -. The first case developed spinal
symptoms two days after lumbar puncture, this case was one of
a definite tabetic who had a Charcot's disease of the hip.
The second case had no trouble immediately following the
lumbar puncture, but four months later developed a gibbous at
the third and fourth lumbar vertebrae and roentgenograms re-
vealed the bony overgrowth and other signs of a tabetic
arthropathy.

The condition known as "Pied Tabetique" (Charcot) has to
be considered in any review of the tabetic arthropathies.
Usually the first symptom to be noticed in such a case is a
swelling of the dorsum pedis which arises suddenly. The
foot is flattened because of the spreading of the bones of the
inner longitudinal arch, the bones of this arch being
thickened dorsoventrally. The cuneiform bones, the proximal
ends of the metatarsi, the navicular and the cuboid are
thickened in varying degrees. Characteristic displacements
of the metatarsal bones are found. In some cases they are
displaced outwards, in others dorsally. Occasionally a
fusion of bones may be present, the cuneiformi and the
metatarsi being most frequently involved by bony growth
arising across the joint from which the cartilage has been
denuded or by osteophytic outgrowths.

"Pied Tabetique" has to be distinguished from another
condition/
condition known as "Pied bot Tabétique" which is really a talipes arising due to disuse and pressure, or caused by muscular atrophy. Both conditions however are extremely rare and in the initial stages are particularly difficult to diagnose unless an X-ray examination be undertaken it is more than likely that the true nature of the disease will be overlooked and that it will be classed as flat foot.

PATHOLOGICAL REFERENCES.


(3) GIESELER. Fortschr. a. a. Gebiete, d. Rontgenstrahlen, April 28, 1921.
CASE - 1.

Male Aged 48 years.

Occupation Chef.

Married twice. First wife died Cancer of the liver 2. Had four children no miscarriages and no stillbirths. Second wife alive and well.

Examined first 7/1/27.

History. The patient developed an ulcer on the foot 18 months before being first seen. He had a urethral discharge eight years ago, no other history of venereal disease.

Complaint (1) Ulcer on foot. (2) Shooting pains in the arms and legs with cramp of legs at night, present for some months. (3) Inability to concentrate.

EXAMINATION OF CENTRAL NERVOUS SYSTEM:-

History. Mentally alert, patient a good witness, no speech defects. States that eighteen months ago he developed ulcer on sole on foot which has not improved and has recently been giving pain. About three months ago he developed "Rheumaticy" pains in arms and legs.

Cranial symptoms.

No headache.
No visual disturbances.
No diplopia
No hearing defects.
Normal speech.

Upper limb symptoms.

No loss of power.
Stabbing pains, radiating down both arms and forearms, affecting any part of limbs. Sometimes a numbness and tingling.
Noted difficulty in writing recently.
Shakiness.
No involuntary movements.

Physiological functions of micturition and defaecation normal.
Lower limb symptoms.

Power normal.
Pains of a sharp irregular character.
Unsteady.

PHYSICAL EXAMINATION:-

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.

Eyes move to right, left up and down and converge in the usual manner.
Pupils contract on convergence.
No nystagmus.
Pupils - unequal, left much larger than the right, margins irregular, do not react to light.
Vision - good.
Optic discs - normal.

5th nerve.
Muscles of mastication strong and active.
Corneal reflex present.
Sensibility of the face normal.

7th nerve.
Upper and lower facial movements nothing to note voluntary and emotional.

8th nerve.
Hearing good.

10th nerve.
Movements palate healthy.

12th nerve.
Tongue protruded straight, showed no tremor and moved easily from side to side.

Upper limbs.


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Trunk.
Abdominal reflexes present on both sides and very active.
Definite hyperaesthesia of the lower part of the trunk, affecting an area about two inches broad between the umbilicus and pubis.
Spinal column shows no deformity, no rigidity and no tenderness.

Lower limbs.
Show no wasting but the muscle tone poor.
Heel-knee test satisfactory.
Patellar and Achilles reflexes absent on both sides.
Plantar reflexes - flexor in type.
No loss of sensation to pin, touch, heat or cold.
Atrophic ulcer was present on the right foot over the ball of the great toe. The ulceration was about the size of a florin. The tissues round about it were inflamed and oedematus. A super-added secondary infection made it painful to touch.
Gait - high stepping.
Romberg's sign - present.

CEREBRO-SPINAL FLUID EXAMINATION:

Obtained under slight pressure.
Colour clear, no turbidity.
Cell count:- 12 cells per c.mm.
Globulin: - Negative.
Wassermann Reaction:- Strong positive.
Colloidal Gold (Lang's Test):- 1233100000.

CARDIOVASCULAR SYSTEM.

Accentuation of the second Aortic sound was noted. There was nothing else observed.
Blood Wassermann - weak positive.

GENERAL BODY EXAMINATION.

This revealed the site of an old primary sore on the glans penis, but no definite history could be obtained of this. The femoral glands of the right thigh were enlarged and painful. There was an intertrigo of the inner aspect of both thighs. Nothing else was noted.
DIAGNOSIS.

A case of Tabes Dorsalis with a trophic ulcer on the sole of the right foot.

In view of the above findings and diagnosis this patient was treated with intravenous Tryparsamide and intramuscular Bismuth. He was given an initial course of 26 Gms. of Tryparsamide and 3.3 Gms. of Bismuth in a period of eleven weeks. Then he had administered Potassium Iodide grains xxx. for fourteen days three times a day, and following on that fourteen days rest without any treatment. At the end of that time a thorough clinical and serological examination was undertaken. Clinically he had reacted remarkably well to treatment, he felt better he looked better and the ulcer on the foot had completely disappeared.

Serologically - Blood Wassermann: Weak positive. The same.
Cerebro Spinal Fluid: -
Cell count - 5 cells per c.mm.
Globulin - Negative.
Wassermann - Weak positive. Proved.
Colloidal Gold 1232200000.

A similar course to the first course was now undertaken, but the patient developed a jaundice two days after receiving the first injection. This jaundice was treated with Sodium Thiosulphate and 20% Glucose solution intravenously. After three weeks of this treatment the jaundice had disappeared. Bismuth alone was then administered. Unfortunately then the patient considered that his cure was complete and he had no further treatment.

Nine and a half months afterwards he again came under/
under notice complaining of swelling of the left knee joint. This he stated had arisen quite suddenly some three days before being seen, and that he had injured the knee by knocking it on the side of a chair. He had little pain in it but said that it had been painful the day before he was examined. Examination of the knee showed a very much swollen joint the circumference of the knee being seventeen inches on that side as against thirteen inches on the right side. The leg was swollen in its upper third, there was no sign of any redness or inflammation. The swelling did not pit on pressure. The knee could be easily flexed, unduly extended and lateral mobility was present. Clinically the condition was diagnosed to be a Charcot's joint. X-ray examination showed definite erosion of the joint surface of the medial half of the upper end of the Tibia, with a de-
position of calcified material in the surrounding soft tissues. Appearances suggesting a Charcot's joint.

The only other clinical fact which was worthy of note at that time was the patient's cardiac condition. He himself had noted that he was becoming a little breathless on exertion. Auscultation revealed a tachycardia plus a markedly accentuated second aortic sound. An X-ray of the heart showed an enlargement of the descending portion of the aorta extending through the level of the arch for a distance of four to five inches.

The patient had then a Charcot's disease of the left knee-joint/
knee-joint along with a specific aortitis both of which had appeared during a lapse in the course of treatment. For this knee and heart condition the patient was put to bed, anti-specific treatment was carried out on a mild basis. While under treatment some two months later the patient developed signs and symptoms suggestive of a Charcot's disease of the left hip joint. An X-ray examination was immediately done and this proved that Charcot's destruction was unfortunately present in this joint.
X-ray photographs of Case 1 showing early Charcot changes of left knee joint, and fairly advanced disintegration of the left hip joint.
CASE 2.

Male: Aged 54 years.

Occupation: Labourer.

Married: Wife perfectly healthy, has had two children, both alike and healthy.

Examined first 16/11/28

History: Had a genital sore thirty years ago, was circumcised for this. Was diagnosed as tabes eighteen years ago, had one injection of "606" at that time. Noted loose action of shoulder joint (right) four years ago.

Complaint:
(1) Swelling of right shoulder joint.
(2) Difficulty in walking.
(3) Shooting pains in legs.
(4) Difficulty with micturition.

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM:

History: Not a good witness, speech sluggish. Has had difficulty in walking for the last ten years. Has had difficulty in urinating, i.e., beginning the act, for about twelve years. Shooting pains in legs, and also around waist developed six years ago. Right shoulder joint became enlarged three weeks before examination although it had been very loose for four years.

Cerebral symptoms:
Has frequent headaches.
No visual disturbances. - excellent sight.
Hearing not alert.
Speech slovenly.

Upper limb symptoms:
Loss of power on right side.
Shakiness.
No involuntary movements.

Difficulty in starting the act of micturition and definite constipation.

Lower limb symptoms:
Power weak - sharp shooting pains.
Unsteady ataxic.
PHYSICAL EXAMINATION:

Cranial Nerves.

Visual functions - 2nd. 3rd. 4th and 6th nerves.
Eyes move to right and left up and down and converge in usual manner.
Pupils contract on convergence.
No nystagmus.
Pupils very small, equal, margins irregular, do not react to light.
Vision good.
Optic discs - Normal.

5th nerve.
Mastication muscles normal.
Corneal reflex present.
Sensibility of face normal.

7th nerve.
Movements of upper and lower parts of face normal.

8th nerve.
Hearing dull.

10th nerve.
Palatal movements normal.

12th nerve.
Tongue protruded straight with tremor, moved easily and freely from side to side.

Upper limbs.

The patient had practically no control over the right upper limb. Left limb could be outstretched and maintained in that position, with marked tremor. No paralysis of limbs. Wasting of right arm below swelling. Muscle tone fair on left side, but not on right side. Biceps, Triceps and Radial reflexes absent on both sides. Ulnar analgesia present. A very marked painless swelling of the right shoulder joint was present - see description later.

Trunk.

Abdominal reflexes absent on both sides.
No hyperaesthesia of trunk.
Spinal column shows no deformity and no tenderness.
Lower Limbs.


CEREBRO-SPINAL FLUID EXAMINATION:


CARDIOVASCULAR SYSTEM:


GENERAL BODY EXAMINATION.

Circular scar, the site of an old sore on glans. No skin or mucous membrane lesion. The swelling of the right shoulder joint was the most obvious abnormality. This shoulder was twice the size of the left shoulder, was not red and was not inflamed, It was quite painless to move. The arm could be moved about very freely. There were crepitations on moving the joint. The swelling did not pit on pressure. Below the swelling the arm muscles were flabby and soft, and smaller than those of the left side. The swelling extended down one third of the arm, across to the middle third of the clavicle and was marked off by the spine of the scapula behind. The X-ray appearances were typically those of advanced Charcot's disease showing disintegration of the head of the humerus with destruction of the glenoid cavity. Foreign bodies being present in the disorganised joint cavity.

DIAGNOSIS.

A case of Tabes Dorsalis with a typical Charcot's right shoulder.
The diagnosis being here obvious from the clinical examination, and there being no contra-indication, the patient was treated with Tryparsamide for the tabetic condition and locally the joint was treated with "Antiphlogistine". The patient received 23 Gms. Tryparsamide and 5.5 Gms. Bismuth, in all, distributed carefully over a period of one year. He showed unfortunately signs of a chronic gastritis throughout his treatment, and this on many occasions deterred the requisite amount of treatment from being given. He died on 19/11/29 when the following pathological report was obtained.

Aorta.  
Showed well marked Syphilitic aortitis in its first part together with a great deal of super-added atheromatous degeneration. There was little disease of either type in the remainder of the artery.

Heart.  
Reduced in size, moderate degree of brown atrophy. Tricuspid, Pulmonary, Mitral and Aortic valves healthy.

Stomach.  
Was greatly dilated. The mucous membrane was thin and atrophic. It presented a number of points of congestion and in some areas showed slight superficial erosion. The surface was covered by a thick layer of viscid, tenacious mucus mixed with a considerable amount of catarrhal debris. There was a very well marked chronic gastritis.

Right Shoulder.  
This presented the typical appearances of a Charcot joint, the ends of the bones being greatly enlarged, and the capsule distended by a quantity of fluid mixed with numerous necrotic fragments of tissue. The enlargement was so great that the upper part of the chest was considerably indented on that side.
Brain.

Very little abnormality was noted in the cerebral hemispheres. The meshes of the pia-arachnoid were slightly wider than usual and contained a somewhat excessive amount of cerebro-spinal fluid, which was slightly blood stained in several areas over the vertex. The convolutions showed a very mild degree of atrophy in the central and pre-frontal areas. The only other definite abnormality noted in the brain was a marked atrophy of the optic nerves.

Spinal Cord.

The pia-arachnoid showed slight thickening towards the lower end of the cord. It was noted that a number of the posterior roots in the lumbo-sacral region were somewhat thinner than usual. Cross section of the cord showed well marked sclerosis of the posterior columns. The nerve tissues in this region were somewhat contracted and presented a greyish pink and slightly translucent appearance, which contrasted in a very striking way with the opaque, dead white colour of the anterior and lateral columns.
X-ray photograph of the right shoulder joint of case 2, showing disintegration of the head of the humerus with destruction of the glenoid cavity.

Appearances typically those of an advanced Charcot's disease.
CASE 3.

Male  Aged 71 years.

Occupation  Labourer.

Married.  Wife had thirteen children, six at present alive and healthy, seven dead, cause of deaths unknown. Had one still-born child.

Examined first 19/2/32.

History.  Urethral discharge fifty years ago.  No other history of Venereal disease.

Complaint.  (1) Difficulty with vision.
               (2) Swelling of left knee.
               (3) Loss of memory.

EXAMINATION OF CENTRAL NERVOUS SYSTEM.

History.  Mentally slow.  A difficult type of patient to elicit a clear history from.  Complaints as above but jumbled ideas as to the onset of any of them.  Seemingly diplopia off and on for some years.  Swelling of the left knee for about two years.  Loss of memory for a long time.  Irregular pains in the back - lumbar region for a questionable length of time.

Cranial symptoms.

  Headaches.
  Diplopia.
  Difficulty in hearing.
  Speech slow and indistinct.

Upper limb symptoms.

  Power weak.
  No pains.  Numbness and tingling of arms and forearms.
  Shakiness of hands.
  Tremors.
  Unable to write.

Precipitancy of micturition.  Constipated.

Lower limb symptoms.

  Definite loss of power.
  Unsteady.
  States no pain now, but has had sharp rheumatic pains.
Lower limb symptoms (continued).

Has sometimes seen a rash down the outside of the thigh where the pain was, but that was a long time ago?
As far as can be made out this rash was seemingly of an herpetic nature.

PHYSICAL EXAMINATION.

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.

Paralysis of the 6th nerve - double - therefore no lateral movements of the eyes. Convergent strabismus.
Pupils do not contract on convergence.
Cannot properly test nystagmus.
Pupils both irregular and do not contract to light or accommodation.
Double cataract present.
Vision very bad.
Optic discs - show marked arterio-sclerosis of vessels.

5th nerve.
Mastication muscles poor.
Sensibility of face - analgesia.
Corneal reflex present.

7th nerve.
Movements of upper and lower part of face weak.

8th nerve.
Hearing very dull.

10th nerve.
Movements of palate normal.

12th nerve.
Tongue protruded not straight but to left side and very tremulous, can move it freely from side to side.

Upper limbs.

Limbs outstretched but could not be retained in that position for any length of time. Marked tremors. Wasting of muscles (senile).
Finger-nose test could not be elicited on account of tremors.
Bicep, Triceps and Radial reflexes absent, or not obtained/
Upper limbs (continued)

obtained on both sides.
Unable to discriminate properly for sense of touch, pain, heat and cold.

Trunk.

Abdominal reflexes present on both sides.
No hyperaesthesia of trunk.
Spinal column no deformity, no tenderness.

Lower limbs.

Wasting of calf muscles. Heel-knee test unsatisfactory
Right knee jerk sluggish, left knee jerk could not be elicited.
Plantar reflexes absent.
Definite analgesia of calf muscles.
There was a marked swelling of the left knee - see later.
Gait - staggering.
Romberg's sign - positive.

CEREBRO-SPINAL FLUID EXAMINATION.

Obtained under pressure.
Colour clear, no turbidity.
Cell count:- 9 cells per c.mm.
Globulin:- A trace.
Wassermann reaction:- Strong positive.
Colloidal Gold (Lange's Test):- CO1321CC00.

CARDIOVASCULAR SYSTEM.

All heart sounds normal, and closed, no enlargement of the heart.
Arteries atheromatous.
Blood pressure - 135 Systolic, 85 Diastolic.
Blood Wassermann - strong positive.

GENERAL BODY EXAMINATION.

The patient was a frail dark complexioned type of man, very haggard looking. Marked scarring was present on the glans penis. The patient had a typical nodulo-cutaneous syphilide on the buttocks. There was a definite swelling of the left knee joint. This swelling was painless and the knee could be freely/
freely moved even to the extent of lateral mobility.
No crepitations were found on moving the knee. The swelling was not discoloured and it did not pit on pressure.

**DIAGNOSIS**

A case of Tabes Dorsalis with sixth nerve paralysis and an early Charcot's disease of the left knee-joint.

This patient unfortunately declined treatment, but an X-ray examination was undertaken to confirm the clinical findings. The X-ray showed marked osteo-arthritisic changes present to such an extent as to suggest a Charcot's disease. The only thing that could be done for the patient was to recommend a poro-plastic splint to try and aid him with his walking. Whether this has been satisfactory or not is unknown because the patient did not reappear for further advice.
X-ray photographs of Case 3 showing early osteo-arthritic changes sufficient to suggest a Charcot's disease.
CASE 4.

Female Aged 46 years.
Occupation. Housewife.
Married. Had eight children, six of whom alive, one died of empyema aged 15 years, another drowned. Had three miscarriages between the first and second children. Father died of cancer of the liver.
Died. 3/12/24.

The reason for recording this case which was not personally observed but the records and specimens of which have been available, is to draw attention to the extensive changes which can appear in a joint affected with Charcot's disease with remarkable rapidity.

This patient had been treated for the typical symptoms of Tabes Dorsalis since 1920 and up until early in 1924 she had felt perfectly well and was quite able to do her work. The treatment she had been given had consisted of the requisite amount of the "914" preparations along with Tryparsamide and also Bismuth.

The patient noticed in July 1924 that her right ankle was beginning to swell, and within a few days this swelling became so marked that she had to take to bed. The swelling extended upwards from the ankle over the whole leg. About the middle of August the swelling gradually subsided, except in the region of the hip. By this time the patient was getting up and she noted that the right leg was shorter than the left and that she had a limp on walking.

Examination when the patient was first seen showed an/
an obvious fullness of the right hip, extending from about one inch above Poupart's ligament in front, and from the iliac crest laterally downwards to the upper third of the femur. This swelling was quite firm, fixed and non-lobulated. The head of the femur was felt to be displaced upwards and out of the acetabulum. With the knowledge that the patient had Tabes a blood Wassermann was done and this was returned as negative. An X-ray examination showed a complete absence of the head and the neck of the femur and an upward displacement of the trochanter. There was new bone formation apparently in the upper part of the capsule and loose body formation in the lower part of the joint.

The brief notes available on the general examination of the patient revealed:-

**Central nervous system.**

Loss of knee jerks.
Loss of ankle jerks.
Argyll-Robertson pupils.
Romberg's sign - present.

**Heart.**

The heart sounds were normal and closed in all areas.

The patient died in a state of coma on 3/12/24.

An autopsy was carried out when the right hip was removed with the upper third of the femur. The changes in the joint were atrophic and hypertrophic in character. The joint capsule was greatly thickened and expanded. The articular/
Articular cartilage lining the acetabulum was destroyed and replaced by fibro-cartilage. The articular surface of the upper end of the femur was formed by an area corresponding to the base of the neck. In the lower part of the joint there were numerous sessile cartilaginous nodules. New bone formation was present in some of the nodules. Ossification had extended into the psoas and iliacus muscles above Poupart's ligaments.

From the history it would seem that the gross pathological joint changes observed at autopsy had developed between the months of July and December 1924. This case demonstrates that such changes can therefore develop in a comparatively short time, and may be advanced to a very great extent within a period of a few months. The pathological specimens showed the extensive disorganisation of the joint which took place in a period of six months.
CASE 5.

Female  Aged 56 years.

Occupation. Laundry worker.

Married in 1893 but divorced, no family no miscarriages.

Examined first 9/5/30.

History.  Four years ago the patient noted that she was staggering. She has had frequent occipital headaches for the last two years.

Complaint.  (1) Swelling of the right knee following a knock on a table, six months ago.  (2) Headaches.

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM.

History.  The patient answers questions quite well, but she is a little reticent. Speech perfectly normal. Gives a history of not having felt well for about four years, but considered her condition to be due to the menopause. Has not felt fit for work frequently because of giddy turns. Six months ago she injured the outer side of the right knee joint by knocking it sharply on a table. A swelling developed around knee which has persisted in spite of treatment with Iodine, tight bandaging and various ointments.

Cranial symptoms.

Headaches. - occipital.
Dimness of vision.
No diplopia.
Hearing good.
Speech normal.

Upper limb symptoms.

Power of limbs good.
No pains.
Can write very well.
No shaking.
No involuntary movements.

Physiological functions normal.

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Lower limb symptoms.

Power of left lower limb good.
Right lower limb no power of resistance.
No pains.
Unsteady.

PHYSICAL EXAMINATION.

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.
Eyes can be moved in all directions quite well.
No nystagmus.
Pupils - both irregular in outline and very small.
React to accommodation but not to light.
Vision - poor.
Optic discs - no pathological changes.

5th nerve.
Muscles of mastication good.
Corneal reflex present.
Sensibility of face normal.

7th nerve.
Upper and lower facial movements perfectly good.

8th nerve.
Hearing acute.

10th nerve.
Normal movement of palate.

12th nerve.
Tongue protruded straight, no tremor and moved freely.

Upper limbs.

Limbs outstretched well and no tremor. No paralysis.
Muscular condition good. Finger-nose test perfect.
Biceps, Triceps and Radial reflexes absent on both sides.
No distortion of pin and touch sensation.

Trunk.

Abdominal reflexes absent on both sides.
No hyperaesthesia of trunk.
Spinal column normal, no deformity and no tenderness.
Lower limbs.

Wasting of calf and thigh muscles both legs.
Marked swelling of the right knee.
Heel-knee test, left side fairly accurate, right side impossible.
Patellar and Achilles reflexes absent on both sides.
Plantar reflexes - flexor in type.
Muscular analgesia present in legs.
Gait - staggering.
Romberg's sign - could not be elicited because patient could not stand properly on account of right knee joint.

CEREBRO-SPINAL FLUID EXAMINATION.

Normal pressure. Colour clear, no turbidity.
Cell count: 9 cells per c.mm.
Globulin: No increase.
Wassermann Reaction: Strong positive.
Colloidal Gold: 0013100000.

CARDIOVASCULAR SYSTEM.

Heart sounds good. Tachycardia present, no irregularity.
Blood pressure Systolic 148, Diastolic 90.
Blood Wassermann - Weak positive.

GENERAL BODY EXAMINATION.

The only thing to note was the swelling of the right knee joint. This knee was much larger than the left, and the swelling was more pronounced on the inner side. The skin over the knee was tense and red - the patient had been massaging the area -. The swelling was fluctuant, non lobulated and uniform, it did not pit on pressure and was painless. It extended from about the lower quarter of the thigh to the upper third of the leg. The knee joint could be freely moved, although the patient said that the most comfortable position was that of semi-flexion. There was definite lateral mobility of the joint but no hyperextension. No crepitations were present on moving the joint. If the patient tried to stand erect the knee gave way under her. The hip joint and ankle joint were perfectly normal.

DIAGNOSIS.

A case of Tabes Dorsalis with Charcot's disease of the right knee.
CASE 6.

Male. Aged 51 years.

Occupation. Telephone Operator.

Married. Wife had nine pregnancies, one miscarriage, one child died aged six months - spina-bifida, One child now aged six years of doubtful sex, others alive, well and perfectly healthy.

Examined first 19/5/32.

History. Had a genital sore at nineteen years of age, no treatment then. Noticed difficulty in walking about seven years ago, condition was then diagnosed as Locomotor Ataxia, and he got about a dozen intravenous injections.

Complaint. (1) Looseness of left knee. (2) Difficulty in walking. (3) Attacks of acute "indigestion".

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM.

History. Gives good answers to questions. No speech defects. For seven years has noticed difficulty in walking. Has had frequent attacks of acute abdominal pain during the last five years, which were considered by patient to be indigestion. Two years ago the left knee joint became very loose, the joint became swollen about one year ago.

Cerebral symptoms.

No headaches.
No visual disturbances. - good sight.
Hearing good.
Speech normal.

Upper limb symptoms.

Power of both arms good.
No shaking.
No involuntary movements.
Co-ordination perfect.

No difficulty with micturition, constipated.

Lower limb symptoms.

No power in lower limbs. No pain.
Extreme condition of ataxia.

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PHYSICAL EXAMINATION.

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.

Eyes move to right and left, up and down and converge in the usual manner.
Pupils contract on convergence.
No nystagmus.
Pupils unequal, left larger than the right, margins irregular, do not react to light.
Vision - good.
Optic discs - no abnormality.

5th nerve.
Muscles of mastication good.
Corneal reflex present.
Sensibility of face normal.

7th nerve.
Movements of upper and lower part of face normal.

8th nerve.
Hearing good.

10th nerve.
Normal movements of palate.

12th nerve.
Tongue protruded straight with marked tremor, moved freely from side to side.

Upper limbs.

Limbs outstretched without tremor. No paralysis.

Trunk.

Abdominal and cremasteric reflexes present on both sides.
Hyperaesthesia of abdomen just below umbilicus.
Spinal column normal, no rigidity no tenderness.

Lower limbs.

Wasting of thigh and calf muscles, both limbs.
Patellar and Achilles jerks absent on both sides.
Lower limbs (continued).

Plantar reflexes - none.
Delayed sensation to touch, heat and cold.
Marked painless swelling of the left knee joint.
Gait - ataxic.
Romberg's sign - present.

CEREBRO-SPINAL FLUID EXAMINATION.

Normal pressure.
Colour clear, no turbidity.
Cell count..: 1 cell per c.mm.
Globulin:- No increase.
Wassermann Reaction - Negative.
Colloidal Gold:- 0,000,000,000.

CARDIOVASCULAR SYSTEM.

No enlargement of the heart. Sounds in all areas closed. Second aortic sound accentuated. Arterial walls healthy.
Blood Wassermann - negative.

GENERAL BODY EXAMINATION.

Site of an old scar on glans. Skin and mucous membrane healthy. The left knee joint was much larger than the right. The swelling was smooth and regular, the skin over the swelling being glossy but not inflamed. The joint could be moved about in a most extraordinary manner; flexed, hyperextended to an outstanding degree, and had lateral mobility. There was not the slightest pain on moving the joint, there were no crepitations. On standing erect the patient could bend back the left knee joint to a marked extent. The thigh could be held and the leg shaken in a most useless manner. The joint was almost "flail like".

DIAGNOSIS.

A case of Tabes Dorsalis with a Charcot's disease of the left knee joint.

A clinical diagnosis having been made in this case an X-ray examination was undertaken when the following was found/
"Multiple loose bodies in the left knee joint, definite osteo-arthritic changes, articular surfaces still intact".

Unfortunately this patient was unable because of his occupation, which he is still carrying on, to undergo any intensive course of anti-tabetic treatment, he had however, administered intramuscularly 2.8 Gms. of Bismuth. During the time he was receiving this treatment he developed a laxness of the right hip joint. There was no pain in the joint and no swelling, the right leg became shorter than the left leg by one inch, and the patient found that he had no control over the joint. A Charcot's disease was suspected and an X-ray taken with the following result:

"A definite Charcot of the right hip joint showing destruction of the neck and head of the femur, and an irregularity of the acetabulum, loose bodies present in the lower part of the joint cavity".

The patient gave no history of trauma to the hip joint, but he stated that the condition just came on gradually and he thought that it was probably due to the fact that he had been throwing a greater strain on the right leg in trying to protect the left knee joint. This may be, and probably is the answer to the development of the right Charcot hip, although he had a splint supporting the left knee joint.
The patient had been sitting mostly on the chair at the telephone board at which he was employed, throwing his weight directly on to the right hip joint with the left knee fully extended in the splint, this would quite easily account for the disorganisation of the hip.
X-ray photographs of Case 6 showing Charcot changes of left knee joint and also complete destruction of right hip joint.

A photograph of the left knee joint illustrating the extraordinary degree of hyperextension present is included.
CASE 7.

Male Aged 52 Years.

Occupation. Labourer.

Married. Wife had six children, all alive and healthy.

Had one miscarriage.

Examined first 5/4/27.

History. Had a urethral discharge at the age of 20.

Right knee started to swell in October 1926, since when patient has found it increasingly difficult to walk, as knee "gives way" under him. Has had headaches for two years, and has not been too fit for work because of repeated attacks of rheumaticy pains, in the arms and legs.

Complaint. (1) Swelling of right knee, causing difficulty in walking.

(2) Sharp pains in arms and legs.

(3) Headaches.

(4) Difficulty with micturition - pain sometimes during the act, and often difficulty in commencing the flow.

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM.

History. Patient makes a good witness. States that he was feeling very well until about two years ago, when he began to suffer from headaches on the top of his head. Somewhere about that time he developed rheumatism in the arms and legs, which seemed to be much worse in the cold and damp weather. In October 1926 he injured his knee - (right) while loading bricks on to a lorry, the knee became slightly discoloured at the time but was not very painful. It swelled up and has remained swellen ever since, even although he has rested and massaged it quite a lot. He has noticed that since this injury he can move the knee about very freely but that it "gives way" under him.

Cranial symptoms.

Headaches.

No visual disturbances.

No hearing defects.

Speech normal.
Upper limb symptoms.

No loss of power.
Sharp pains in arms, at any part of the arms or forearms.
No numbness and no tingling.
No involuntary movements.

Difficulty with micturition, not constipated.

Lower limb symptoms.

Power left leg normal.
Power right leg very poor.
Muscular wasting below swelling on right knee.
Unsteady on feet.

PHYSICAL EXAMINATION.

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.

Eyes move normally no right, left up and down.
Pupils contract on convergence.
No nystagmus.
Left pupil irregular in outline, right pupil regular but small.
Pupils do not react to light.
Vision - quite good.
Fundus oculi - normal.

5th nerve.
Muscles of mastication good.
Corneal reflex present.
Analgesia of face - lower half.

7th nerve.
Upper and lower facial movements good.

8th nerve.
Hearing normal.

10th nerve.
Normal palate movements.

12th nerve.
Tongue protruded easily, straight and moved freely.
Upper limbs.


Trunk.

Abdominal reflexes present and active on both sides. The reflexes are very active, and the sign of "chasing the pin" with the umbilicus can be easily elicited. Cremasteric reflexes present. No hyperaesthesia of trunk. Spinal column normal, nor deformity, no tenderness and no rigidity.

Lower limbs.


CEREBRO-SPINAL FLUID EXAMINATION.


CARDIOVASCULAR SYSTEM.


GENERAL BODY EXAMINATION.

No skin or mucous membrane lesion. No signs of a genital sore. No glandular enlargement. The right knee was enlarged to almost twice the size.
size of the left, it was tense and full of fluid, there was no discolouration of the skin. There was no pain in the joint and the knee could be freely moved about. There was a sensation of creaking on flexing the knee. There was no pitting on pressure. The joint had a hinge movement from side to side. A foreign body about the size of a small bean was palpable on the outer side of the knee.

DIAGNOSIS.

A case of Tabes Dorsalis with a Charcot's disease of the right knee joint.

This patient was treated for his tabetic condition with Tryparsamide, Bismuth and Sodium Iodide and his general health materially improved. A suitable splint was made to overcome the joint derangement. At the end of one year exactly, the blood Wassermann was negative and the Cerebro-Spinal Fluid was:

Cell count:- 2 cells per c.mm.
Globulin:- Negative.
Wassermann - Weak positive.
Colloidal Gold:- 0122100000.

all showing a definite improvement on the original findings.

At this time unfortunately the patient decided that a splint was no longer required and he discarded his, he got along very well for a fortnight without it. One day while out walking he heard something snap, like a boot lace, but did not attach any importance to this. Ten days after this incident while he was going to the bathroom, his right leg snapped just above the ankle joint and as a result he fell down.

Examination at that time showed a fracture of the right Tibia/

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Tibia and Fibula about four inches above the malleoli. There was three inches shortening of the limb as measured from the anterior superior spine to the medial malleolar tip, and one and a half inches shortening as measured from the adductor tubercle to the tip of the medial malleolus.

The right knee joint which had been smaller in size during the last six months was again greatly enlarged and was exactly the same as it had been one year previously.

An X-ray examination showed a comminuted fracture of both bones of the right leg three to four inches above the ankle joint. There were apparently numerous foreign bodies in the soft tissues. The knee joint showed typical Charcot changes.

The fractured leg was put up in a McIntyre's Splint and was bandaged into it. The splint was screwed to a cross piece of wood. Three weeks later the leg was put up in plaster, the plaster extending from the hip down to the toes, this was kept on for twenty seven days when it was removed and massage commenced. The fracture was then satisfactory and bony union was complete. (It is interesting to note that nearly all tabetic fractures heal kindly with a large callus after the usual splinting, which should, however be somewhat longer continued than in ordinary cases). Following on this the patient adopted the original splint he had worn for his knee, it was however, necessary to alter it owing to the increased angling of the limb at the knee joint.
X-ray photograph of right knee joint of Case 7 showing typical Charcot changes.
CASE 8.

Male. ... Aged 45 years.

Occupation. Chartered Accountant.

Married. Wife had two children, both alive and well, no miscarriages.

Examined first 3/2/27.

History. Syphilitic infection at the age of 20.

Complaint. (1) Loss of sight, in the right eye, dimness of vision in the left eye.
(2) Nervous.
(3) Shooting pains in legs for two years.
(4) Dribbling of urine.
(5) Loss of memory.

EXAMINATION OF CENTRAL NERVOUS SYSTEM.

History. Mentally alert. Gives a concise well tabulated history. Complaints exactly as above. Had visual upset since 1915 when the right eye became hazy, this has been getting progressively worse. During the period 1915-1927 had anti-syphilitic treatment at irregular intervals.

Cranial symptoms.

Headaches, occipital.
Loss of vision, right eye, weakness of vision left eye.
Hearing normal.
Speech normal.

Upper limb symptoms.

Power good.
No pains.
Tremor of hands.

Slight urinary difficulty - dribbling, No constipation.

Lower limb symptoms.

Power not as good as it should be.
Pains of a sharp shooting nature.
Unsteady. Ataxic.
PHYSICAL EXAMINATION.

Cranial Nerves.

Visual functions - 2nd, 3rd, 4th and 6th nerves.

Eyes move to right and left, up and down in normal manner.
No nystagmus.
Pupils unequal, right much larger than left.
Right pupil irregular. Both react to accommodation but not to light.

Optic discs.

Right, completely atrophic condition of optic nerve.
Left slight atrophy of optic nerve.

Right eye, perception of light and no more.
Left eye, quadrant defect nasal half of field.

5th nerve.
Mastication normal.
Corneal reflex present.
Sensibility of face normal.

7th nerve.
Movements of upper and lower part of face normal.

8th nerve.
Hearing normal.

10th nerve.
Normal movements of palate.

12th nerve.
Tongue protruded straight, moves freely from side to side, marked tremor.

Upper limbs.

Limbs outstretched and retained in that position with only a little tremor. No muscle wasting.
Finger-nose test fair - tremor of hands.
Biceps, Triceps and Radial reflexes absent on both sides.

Trunk.

Abdominal reflexes present, both sides very active. No hyperaesthesia of trunk.
Spinal column, no deformity, no rigidity, no tenderness.
Lower limbs.

CEREBRO-SPINAL FLUID EXAMINATION.

CARDIOVASCULAR SYSTEM.

GENERAL BODY EXAMINATION.
There was the scar of an old sore on the glans penis. There was no sign of any glandular enlargement anywhere. No skin on mucous-membrane lesion was present.

DIAGNOSIS.
A case of Tabes Dorsalis with atrophy of the right optic nerve and commencing atrophy of the left optic nerve.

In view of the above diagnosis it was difficult to decide the exact line of treatment that this patient should have. Tryparsamide was undoubtedly the drug of choice, but with the knowledge that the patient had only a quarter of his vision present it was taking a risk in administering this drug. The possibility of complete blindness developing by giving the patient/
Tryparsamide had to be seriously considered. The facts of the case and the grave possibilities of such a line of treatment were put before the patient and with his consent Tryparsamide was used.

In a period of two years the patient had given to him the following:-

<table>
<thead>
<tr>
<th>Drug</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Tryparsamide</td>
<td>79 Gms.</td>
</tr>
<tr>
<td>Silver Salbersen</td>
<td>.2 Gms.</td>
</tr>
<tr>
<td>Quinby</td>
<td>5.2 Gms.</td>
</tr>
<tr>
<td>Bismuth</td>
<td>13.8 Gms.</td>
</tr>
</tbody>
</table>

At the end of this intensive course of treatment a thorough clinical and serological examination was undertaken, with the following results:

**Cerebro-Spinal Fluid.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell count</td>
<td>2 cells per c.mm.</td>
</tr>
<tr>
<td>Globulin</td>
<td>Nil.</td>
</tr>
<tr>
<td>Wassermann</td>
<td>Weak positive.</td>
</tr>
<tr>
<td>Colloidal Gold</td>
<td>CCCCCC00000.</td>
</tr>
</tbody>
</table>

The Blood Wassermann was negative and clinically the patient was feeling very well, having gained weight, looking better and feeling much more active. A report from a competent ophthalmologist on the optic discs was as follows:

"No failure whatever in the patient's vision. He has still 6/6 central vision, and there is no further diminution of his field".

All this was highly satisfactory in view of the clinical condition of the patient plus the gravity of the obvious advancing/
advancing optic atrophy when the patient was first seen two years previous.

Treatment however was further continued and between the months of March and September 1929 the patient had 3 Gms. of Bismuth administered. At the end of that time there developed a swelling of the dorsum of the left foot, the swelling extended around the ankle. The right foot was normal. This swelling was not painful, it did not pit on pressure, and it was not discoloured. The movements of the foot were in no way restricted but the patient felt that he was walking as though he had a flat foot on that side. Comparing the left foot with the right, there was a much lower instep of the left and the sole of the foot was flatter on the ground than that of the right side. The patient could not recall having injured the foot. The possibility of Charcot's disintegration having developed, irrespective of the amount of treatment the patient had, was considered, and an X-ray examination was undertaken. The X-ray revealed:-

"Rarefaction of bones, Cuneiform almost totally disintegrated, Scaphoid partially eroded on anterior surface and this is spreading from the joint outwards simulating a condition known as Pied Tabetique".

The treatment adopted for this unexpected complication was, rest, strapping the foot with Leucoplast for a period of three weeks. At the end of that time elastic webbing was applied, massage was undertaken and a special boot with supports/
supports was worn.

The swelling of the foot had completely subsided with this treatment, the patient was able to get about and carry on his normal duties without the slightest inconvenience. The foot was still flat as compared with the other side and an X-ray revealed exactly the same state of affairs, as before.

It is interesting to note that it is now over three years since this condition developed and beyond the inconvenience caused to the patient by the initial swelling and slight discomfort there has been no other hindrance to him, and the condition seems to be exactly the same now as it was after the rest in 1929.
OBSERVATIONS ON THE CASES QUOTED.

The age onset of the disease.

The ages of the seven patients observed were:

<table>
<thead>
<tr>
<th>Case</th>
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</tr>
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<tr>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
</tr>
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<td>3</td>
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<td>4</td>
<td>48</td>
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<td>6</td>
<td>51</td>
</tr>
<tr>
<td>7</td>
<td>52</td>
</tr>
</tbody>
</table>

This series of cases showed the youngest case to be 48 years of age and the oldest one to be 71 years of age. The onset of Charcot's joint disease is usually between 35 years and 55 years of age, a finding which parallels the age period of the incidence of Syphilis of the central nervous system.

A committee of The Clinical Society - (1) - reporting on sixty-six cases of Charcot's joint disease in connection with Locomotor Ataxy in 1884, recorded their youngest case to be 25 years of age and their oldest one to be 62 years of age. The greatest number of their cases was between the years of 40 and 50, and an equal number was found between 30 and 40, and 50 and 60 years of age. The Society recorded one case of over 60 years of age that being the oldest in their series and was 62.

Of seventy-two cases of this disease recorded by Wile & Butler - (2) - sixty-two of them occurred between the ages of 35 and 55 years, eight after 55, and two under 35 years. The
The majority therefore arising between the ages of 35 and 55 years.

The oldest case (Case 3) of the series under consideration was that of a man aged 71 years, he gave a history however of having developed his joint condition two years prior to his initial examination, making his age then to be 69 years. Assuming this to be absolutely correct regarding the earliest development of his signs and symptoms, then his case would seem to be out of the usual in so far as he was much older than the average age at which this disease appears first.
The sex influence of Charcot's disease.

There are recorded in this small series of cases five males and two females suffering from Charcot's disease. This shows more than a two to one preponderance of males over females.

OCHSNER - (3) - in 1917 concluded from his studies of this subject that a definite susceptibility to the disease occurred in females.

In the series of sixty-six tabulated cases quoted by The Clinical Society's transactions, Vol.xx., thirty-eight of them were males and twenty-eight females, showing a preponderance of males.

BYROM BRAMWELL - (4) - states with reference to Charcot's disease:

"And I may say in passing that the joint affection seems to be, comparatively speaking, more common in women than in men".

ROSE and CARLESS - (5) - referring to Charcot's disease state:

"It is slightly more common in women than in men".

Orthopedists for the most part believe that the condition is uncommon or rare in the female sex, there are however, no statistics to prove their statement.

It has been said that Tabes occurs in men almost ten times as frequently as it does in women. Considering even the/
the figures of the small series of cases noted, two women and five men, it seems a large proportion of women. From this, the conclusion would tend to be drawn that a much larger percentage of cases occur in women than might be expected in view of the incidence of Tabes in the female sex.
The time of onset of Charcot's disease from the time of the initial infection.

The time of each case recorded was as follows:

Case 1. No infection recorded.

Case 2. Primary sore 30 years before joint affection.

Case 3. Urethral discharge 50 years before joint condition. (This may have been an intra-meatal chancre).

Case 4. No known infection.

Case 5. Unknown.

Case 6. Primary syphilitic sore 30 years before joint condition.

Case 7. Urethral discharge 32 years before development of joint disease. (This again may have been a syphilitic infection).

This shows that the joint condition has developed somewhere about 35 years after the specific infection. This seems rather a long time but it is usually somewhere about 20 years after the original infection that Tabes develops. It must be remembered however, that syphilis can affect the nervous system at any time after the Spirochaete has been implanted, may be a matter of months or years.
The Cardiac condition of the Cases.

An interesting feature of the cases noted, and one worth observing is the cardio-vascular condition of each patient. A study of this however, is more applicable to a review of cases of Tabes, as the syphilitic cardio-vascular lesions and Tabes fall into the same epoch, a stage of the specific infection about twenty years after its origin.

COOMBS. - (6) - has recently reviewed this fertile source of research, emphasising that aortitis, a distressing and fatal malady, is the inevitable lot of the patient suffering from syphilis who has no treatment or is inadequately treated.

MACKENZIE. - (7) - points out that aortic disease due to syphilis is often progressive and of grave significance. He emphasises however, that if it be taken in time and treated energetically by anti-syphilitic drugs, that the disease may be stopped, and a fair degree of recovery may follow.

The seven cases under review showed the following:-

Case 1. Accentuated second aortic sound.
X-ray showed enlargement of the descending portion of the aorta, extending through the level of the arch for a distance of four to five inches.

Case 2. Clinically a normal heart.
Post-mortem examination revealed marked syphilitic aortitis.
Case 3. Clinically a normal heart.

Case 4. No notes on heart condition.

Case 5. A marked degree of Tachycardia present.

Case 6. Accentuation of the second aortic sound noted.

Case 7. Tachycardia present.

FRISCH. - (6) - published observations in which he showed that among one hundred and fifteen cases of nerve syphilis, there was disease of the aorta in thirty-nine per cent of the cases of which twenty-nine per cent accompanied Faresis; forty-eight per cent Tabes, and thirty-four point eight per cent Cerebro-Spinal Syphilis.

Case 3 the oldest case of the series, and the one with the longest history of a syphilitic infection, is the one case where there is no sign of a cardio-vascular upset. In case 4 there is unfortunately no pathological report of any heart or aortic lesion. The other five cases show some form of upset of the cardio-vascular mechanism, significant of a syphilitic infection, as even the two cases 5 and 7 showing Tachycardia, must be regarded as indicating myocardial involvement of a syphilitic nature.

It is interesting to note that in all the cases the patient has been brought under notice, not because of cardiac symptoms but because of symptoms referable to the nervous system.

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Notes on the Blood Wassermann of the cases.

The following were the readings of each case:-

Case 1. Weak positive.
Case 2. Negative.
Case 3. Strong positive.
Case 4. Unknown.
Case 5. Weak positive.
Case 6. Negative.
Case 7. Strong positive.

Cases 1, 3, 5 and 7 had Wassermanns definitely indicating the presence of a syphilitic infection.

Cases 2 and 6 had negative Blood Wassermanns, this, however, does not contradict the diagnosis of Charcot's disease, as it has been observed that 20% of Tabetics give a negative Blood Wassermann. A negative Blood Wassermann in a case of Tabes Dorsalis probably indicates that the syphilitic process has become cut off from the patient's blood stream and because of this a negative Wassermann will be recorded. It was in the two negative cases (Cases 2 and 6) that there was a definite history of a known primary sore some thirty years previously.

No less an authority on Syphilology than Stokes - (9) - notes the frequency with which cases of Charcot joint disease have negative Blood Wassermann reactions and also negative/
negative spinal fluid Wassermanns in spite of obvious clinical evidence of active and advancing Tabes Dorsalis. The same authority also observes that 30% to 40% of Blood Wassermanns are negative in cases of Tabes Dorsalis after the syphilitic infection has been present for one decade.

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Notes on the joints involved.

The joints involved were in each case as follows:

Case 1. Left knee and left hip.
Case 2. Right shoulder.
Case 3. Left knee.
Case 4. Right hip.
Case 5. Right knee.
Case 6. Left knee and right hip.
Case 7. Right knee and pathological fracture of the right Tibia and Fibula.

In this series it is to be noted that in every case it is a joint of the lower extremity which has been affected, excepting in Case 2 where the right shoulder joint showed the disease. In Cases 1 and 6 more than one joint was involved.

OSLER - (10) - made the suggestion that the involvement of the lower extremities was seen most frequently because of the fact that the most pathologic change in Tabes occurs in the lumbar enlargement of the cord. The fact that it is in practically every case here the lower limbs that are involved, would suggest that a more important factor is the frequent strain which the joints have to undergo in their daily use.

The great number of cases is monarticular only Cases 1 and 6 being polyarticular. There are however, no X-ray reports/
reports of other joints than those definitely affected with Charcot's disease in each case. It sometimes happens that a joint may have early Charcot changes present and obvious only on X-ray examination with no signs of Charcot's disease clinically.

There are no cases in this series of bilateral joint involvement.

In Cases 1 and 6 where more than one joint was clinically involved the two joints were not affected simultaneously but developed the condition at different times.

None of the cases showed an affection of the smaller joints of the hand or foot.
Notes on the association of Trauma with Charcot's Arthropathy.

In the cases under review the following was elicited:

Case 1. Gave a history of trauma.
Case 2. No traumatic history.
Case 3. ditto.
Case 4. ditto.
Case 5. Gave a history of trauma.
Case 6. No traumatic history.
Case 7. ditto.

The association of Trauma and the effect of injury in producing this disease has been stressed by practically every writer on this subject. Frequently the disease follows on an acute arthritis but there are no notes of that having happened in this lot of cases. Unless a very definite history of trauma is given by the patient, it has to be remembered that suggestion on the part of the interrogator may influence a positive history in many cases.

In considering cases where a history of trauma has been obtained it may be properly questioned whether the injury was the exciting cause, or as seems more likely, the accident resulted from structural weakness in the joint due to the disease already being present, that is before it becomes clinically evident to the patient.
It would seem in the seven cases noted, with only two giving a history of injury, that actual trauma is not so frequently a causal agent as is stressed, but that there must be an inherent weakness present in an already diseased joint.

In reviewing the literature the high incidence of Charcot Arthropathies in Tabes is at first suggestive, but becomes less so when one considers that only a small percentage of Tabetics really develop the syndrome.

From the time that Charcot originally described the condition until to-day a controversy has existed as to the actual relationship of the tabetic cord to the development of the diseased joint. The existence of conditions other than Tabes, as the ultimate aetiological factor has been suggested by Eloesser's experiments - (11) - where by cutting the posterior nerve roots in cats, he produced changes which were to all intents and purposes identical with those changes as are seen in Charcot's Arthropathy in man. Eloesser believed that such lesions were not related to a syphilitic arthritis or that the joints were the result of destruction of so-called trophic fibres. He believed that the joint changes were entirely due to "Trauma and a lack of warning sense of pain".

COTTON - (12) - considered the joint condition to be a syphilitic arthritides and that trauma played little or no part in its production.
PHILIPS and ROSENBECK - (13) - emphasised the view that the joint condition was the result of peripheral nerve degeneration, which they could demonstrate microscopically.

One constant factor stands out in all the theories set forth. In every instance the joints involved are associated with destruction of the afferent (proprioceptive) nerves, rendering them unable to compensate for injury. With each minor injury under these conditions, or with trauma which might be considered physiological, further deviation in the structure of the joint occurs, resulting finally in the gross pathological picture which makes up the end result of a Charcot's joint.

The condition which deprives the joint of its ability to compensate for injury is most frequently seen in destruction of the dorsal columns, therefore it is most frequently seen in association with Tabes.

The incoordinated movements associated with the ataxia resulting from Tabes also play a role in subjecting a patient to greater stress by false motion and by greater susceptibility to injury. In this connection, faulty posture as a result of hypotonia in Tabes, likewise becomes a contributing factor.

Subclinical insults, such as faulty posture and ataxia therefore play a larger part than actual trauma antedating the condition.
### The Cerebro-Spinal Fluid of the Cases

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<tr>
<th>Cases</th>
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<th>3.</th>
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<td>A trace</td>
</tr>
<tr>
<td>Wassermann</td>
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<td>Very weak Positive</td>
<td>Strong Positive</td>
</tr>
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<td>1233100000</td>
<td>0013210000</td>
</tr>
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<td>5.</td>
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<td>7.</td>
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<tr>
<td>Wassermann</td>
<td>Strong Positive</td>
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</tr>
<tr>
<td>Coll. Gold</td>
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<td>0000000000</td>
<td>1233100000</td>
</tr>
</tbody>
</table>

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-82-
All the cases showed definite serological findings of Cerebro-Spinal Syphilis excepting Case 6, where the findings were completely negative. This case however, had a history of a known primary infection, which had arisen thirty years previously, had admittedly a negative Blood Wasserman but nevertheless had clinically a definite Charcot's disease of the left knee and right hip.

The above findings although taken from a very small group of cases, would tend to show that although Cerebro-Spinal Syphilis is present in the majority of cases, it is not a necessary primary cause, as the condition may arise absolutely independent of spinal cord injury to Syphilitic disease. The type of Cerebro-Spinal Syphilis as furnished by examination of the Cerebro-Spinal Fluid was in each case as follows-

Case 1. Tabetic.
Case 2. Tabetic.
Case 3. Acute Meningovascular.
Case 5. Acute Meningovascular.
Case 6. Nil.
Case 7. Tabetic.

The greater number of cases viewed from this angle therefore, shows a proponderance of Tabes over the other forms of Cerebro-Spinal Syphilis.

The Wassermann reactions of the cerebro-spinal Fluid were/
were positive in all the cases excepting Case 6.

The Cell Counts show an increase of over 5 cells per c.mm. in four of the cases, and a smaller number than five in two cases.

The organic solids of the fluids showed an increase in two cases, and no increase in the other four.

From the data given it must therefore be concluded that Cerebro-Spinal Syphilis is present in the majority of cases. Its absence however, in typical cases (as in Case 6) indicates that it is not the essential primary etiological factor. Where Cerebro-Spinal Syphilis is present then the form of involvement is most commonly Tabes.
REFERENCES.


(8). SCHAMBERG and WRIGHT. Treatment of Syphilis. 1932.

(9). STOKES, John H. Modern Clinical Syphilology 1927.

(10). OSLER, Wm. Sir. Principles and Practice of Medicine, Ed.10. 1926.


THE TREATMENT OF CHARCOT'S DISEASE OF JOINTS.

This may safely be considered under three headings:

1. GENERAL TREATMENT OF THE PATIENT.

2. TREATMENT OF THE JOINT AFFECTED.

   (A) Conservative.
   (B) Surgical.

3. TREATMENT OF THE TABES.

1. The general treatment of the patient.

   The general condition of the patient must be summed up, due consideration being given to any co-existent lesion which is present at the same time as the joint affection. It has been noted in the examination of the cases that the cardiovascular state has to be carefully enquired into, because naturally should a heart lesion of the slightest degree be present it must have the first consideration in treatment. Other organs such as the liver and kidneys must be examined as they may require attention.

   It can hardly be stressed too strongly, that in treating any case of central nervous system syphilis, that it is not a positive blood or cerebro-spinal fluid Wassermann which is under review, but a patient whose whole body has succumbed to an infecting organism, and that the aim in treatment is to eradicate that infecting agent and to restore the damaged tissues to their normal state and the patient to normal health.

   General hygienic measures must be instituted, stress has/
has been laid on the principles of general health by WILLIAMS -
(1) - such as may be safely recommended to any patient, let
alone a patient suffering from Charcot's joint disease. The
factors of health to which attention must be drawn are:-
(a) Clothing, an adequate amount, (b) Sufficiency of Oxygen,
(c) Ample sunshine, (d) A suitable diet, (e) Sufficiency of
exercise, (f) Regular sleep. Not only is it advisable for the
patient to reconstruct the routine of his life and to adapt
himself to attaining as high a standard of general health as is
within his power, to try and counteract the onslaught of the
infecting agent, but also is this necessary to avoid any signs
of intolerance to specific treatment which has to be administered.

Each individual case demands its own treatment and must
be judged on its own merits, nevertheless the above principles
must be brought forward at all times, so that such a case be
viewed not as a distinct pathological entity, but in its true
perspective.

HARRISON - (2) - states with reference to the general
treatment of cases:-

"Lowering of the resistance of any portion
of the body, by injury or overwork, is
apt to be followed by recurrence of
syphilitic lesions there, owing to the
Spirogyrnes temporarily gaining the upper
hand. It is particularly important to
maintain the bodily health by all means
possible".
2. Treatment of the joint affected.

(A) Conservative treatment:

It is particularly difficult to know what is the best thing to do for a Charcot's joint, obviously the ideal line of treatment is to arrange some form of splint which is going to "lock" the joint.

A Charcot knee or hip is going to incapacitate the patient because of the flail-like movement present, therefore splinting of wood, metal or poroplastic material will overcome this difficulty and allow the patient to get about. There can be little hope of ever getting a disorganised joint back to normal, and all that can be attained by conservative treatment is a fixed joint, in any form of casing which is suitable.

Case 1. in the recorded series, where there was a Charcot's disease of the left knee, had a very satisfactory splint made with two light metal supports, which extended from the hip to the foot and had cross bands of strong leather around the knee joint. This did particularly well and the patient was able to wear this with comfort and carry on his duties. A similar type of light metal and leather splinting was made for Case 6, and it was likewise sufficiently useful to allow the patient to carry on with his work. The most comfortable and satisfactory angling of the joint has to be thought out for each case, an elbow joint would have to have a splinting arranged so that the joint would be in the semi-flexed attitude. The angle/
angle of the joint must be such that it is going to give the most useful position to the patient, from the point of view of occupation and that it will be comfortable.

The local treatment of a Charcot's joint when it commences, and is very much distended with fluid, is rest and support. Any form of soothing dressing may be applied, if it is necessary, but perhaps the safest and most effective thing to do is to surround the joint with layers of cotton wool and put it into a position of comfort. A Charcot joint is painless as a rule, therefore the application of "Antiphlogistine", Ichthyol in Glycerine, Glycerine and Belladonna, is not of very much use. Diathermy is of no value in such a case. Massage cannot do any good. The only form of conservative treatment therefore, is to try and make the joint useful, as far as it is possible, and to rest it in the initial stages of the disease.

(B) Surgical treatment:

In certain cases operative treatment may be deemed to be advisable, particularly so when the disease affects a knee or an ankle. If a knee is flail in all directions then it may be advantageous to excise the joint completely, or to ankylose the joint. In ankylosing the joint, union of the bone ends will occur, although it may be slow.

In the case of an ankle being affected with Charcot's disease an arthrodesis operation is the one of choice. A firmly/
firmly fixed ankle will be much appreciated by the patient.

There is no set operation which can be performed on all cases of Charcot's disease. Each case has to be decided by the surgeon with a view as to what is considered by him, will give the patient the best result.
3. The treatment of the Tabes:

Since the symptoms of Tabes are in large part due to degenerative changes in the nervous system, the most that can be expected from treatment is firstly, the relief of symptoms and secondly, the arrest of the progress of the disease.

Having stressed general hygienic measures under a previous heading, as applicable to any medical or surgical condition, let alone Tabes, the next step would be to make a thorough examination of the body and have any source of focal infections carefully removed. A point always worthy of the most thorough investigation in a patient with Tabes is the condition of the bladder, and if necessary urinary antiseptics should be administered. Pains of lightning character may require relief with such drugs as Amidopyrin, Phenacitine, Aspirin and like medicaments. Muscular re-education as advocated by FRENKEL and others, often serve to overcome difficulties in walking and improve the gait.

 Rather surprising is it, that the proper "Suggestive Therapeutics" are hardly given a place in the treatment of Tabes. Psychotherapy is of undoubted value and will often allay marked mental depression and materially aid the patient with his difficulty in walking. Considering the specific treatment of Tabes a golden rule should be - "Do not administer any antispecific drug which will cause an unfavourable re-action" - as such is only likely to badly upset the patient
and at the same time cause an interruption of the treatment.

Tabetics react better to specific antiluetic drugs than do Paretics, therefore it is advisable that the simpler methods of treatment should be tried before resorting to such lines as Intraspinal therapy or Fever therapy. The patient should be started with Potassium Iodide grs. x three times a day, at the same time receiving an intramuscular injection of Bismuth once a week. Bismarsen (Bismuth Arsphenamine Sulphonate) has been used in Tabes, and it is alleged that the lancinating pains and gastric and other crises have been benefited through its employment. If the treatment with Iodides and Bismuth is not producing progress, it is advisable to employ the organic arsenical preparations, preferably those of the "914" series, a number of which are available. Intravenously may be used Neosalvarsan - Ehrlich's original "914" - or Novarsenobillon, Neokharsivan and Neoarsphenamine, each containing 22% of arsenic and used in doses of .45 Gm to .75 Gm., depending on the weight, the age and the clinical condition of the patient. The interval between each dose being at least one week. Intramuscularly Kharsulphan, Sulfostab and Sulfarsenol may be used.

Of all the drugs of use in Tabes, perhaps the most useful is Tryparsamide - a pentavalent arsenical compound containing 24.5% of arsenic. This drug is not strongly spirochaeticidal but it has a high degree of penetration and it appears to have a definite remedial action in certain cases of/
of Syphilis of the nervous system. Tryparsamide may be given either intravenously or intramuscularly and is used in doses of 3 Gms.

**SOLOMOM - (3) - states that:**

"In order to get the best results with Tryparsamide it is necessary to continue the injections for a long period. While clinical results are often obtained within a few weeks, it is sometimes necessary to use the drug over a period of two years or more to get the most satisfactory results".

**O'LEARY and BAKER - (4) - confirm this observation and they say that:**

"Of 11 patients in the group who had been most intensively treated with slight benefit by arsphenamine intravenously, intraspinal medication, and mercury and the iodides, before receiving Tryparsamide, 5 showed decided serological and clinical improvement after Tryparsamide, indicating that Tryparsamide would sometimes accomplish results when routine measures fail".

Tryparsamide may therefore be placed as a symptomatic remedy worthy of trial, and used with the knowledge that no excessive hope be put in it. The most serious complication which can arise from the use of Tryparsamide, is permanent visual injury.

Other than Tryparsamide we may have recourse to soluble injections of Mercury Succinimide gr.1/6th intramuscularly, five times a week for a course of thirty injections. STOKES and SHAFFER - (5) - quote satisfactory results with this line of/
of treatment.

Intraspinal therapy had a certain vogue in the treatment of Tabes about eight years ago, advocated by SWIFT-ELLIS, this however, has been replaced to-day by malarial inoculation and other forms of fever producing therapy. Malarial inoculation is used with more success in paresis than in tabes. Views of various workers vary as to the value of malaria in tabes. BERING of Essen - (6) - Germany, reported the results of 24 tabetics treated with malaria, 4 cases were not influenced, 13 cases improved and 6 cases showed improvement of bladder and rectal disturbances. BERING says that malarial inoculation is of value in appropriate cases of tabes.

NONNE - (7) - stated that among 36 patients treated for tabes with malaria, some were improved. Shooting pains or gastric crises were aggravated during the fever, or appeared for the first time. There was little or no effect on the spinal fluid.

WEYGANDT - (8) - expressed the opinion that tabes was materially benefited by malarial therapy.

O'LEARY - (9) - writes:-

"My experience with treatment by malaria in uncomplicated cases of tabes has been unsatisfactory".

From a survey of the literature, this fact stands out that malarial inoculation is justifiable in tabetics who have symptoms./
symptoms of gastric crises and shooting pains, the inoculation seems to accentuate the pains or crises during the fever, but would seem to give relief from such symptoms after the attacks of fever are stopped.

Physiotherapy has been recommended by SAMSON of St. Louis - (10) - using spinal diathermy, static electricity and soft X-ray treatment in the treatment of Tabes Dorsalis. This form of treatment has not found favour in this country up to present, although it must be admitted that spinal diathermy may help to alleviate lightning pains. As to the possibility of serological changes arising from this form of treatment, that can hardly be expected.
REFERENCES AS TO TREATMENT.


(2). HARRISON, L.W. Modern Diagnosis and Treatment of Syphilis, Chancroid and Gonorrhoea, Medical Monograph: 1924.


SUMMARY.

1. The historical facts of Syphilis are discussed, with special reference to Charcot's disease of joints.

2. Throughout the Thesis the literature on the Arthropathies of Tabes Dorsalis is reviewed.

3. The symptomatology of Charcot's disease of joints is considered outlining the salient features of this disease.

4. The pathogenesis of Charcot's disease is reviewed, and the possibility of an organismal infection plus a susceptible "allure" is considered.

5. The pathology of the disease is fully discussed, and also there is a description from a pathological standpoint of a condition known as "Pied Tabetique", (Charcot).

6. There are eight cases fully recorded, and wherever possible X-ray photographs and illustrations have been included.

7. The cases are discussed from the point of view of A. The age onset, B. The sex influence, C. The time of onset of the disease, from the time of the initial infection, D. The cardiac condition of the patient, E. The Blood Wassermann findings, F. The joints affected, G. The association of Traumatic influences, H. The reading of the Cerebro-Spinal Fluids.

8. The treatment of Charcot's disease of joints is discussed, under the following headings. A. General treatment of the patient. B. Local treatment to the joint - (1) Conservative, (2) Surgical. C. A short discussion on the treatment of Tabes Dorsalis in general.

The cases reviewed were under the charge of Dr David Lees in his wards in The Royal Infirmary Edinburgh.

I am indebted to Dr Lees for his generosity in permitting me to study the cases and allowing me the privilege of recording them in this thesis.
REFERENCES.


(3) The British Journal of Childrens' Diseases - 1930, xxvii.l.


(5) M. FAURE-BEAULIEU. Presse Medical 1932, April 2.
M. E. BERNARD........... page 455.
M. C. BRUN..............

(6) BARRE................. These de Paris, 1912.

(7) BRAMWELL, Byrom Sir. Diseases of the Spinal Cord. Ibid.


(10) CHARCOT, J.M........... The Spinal Arthropathies - 1885.

(11) CHARCOT, J.M......... "Lectures on Diseases of Nervous System" - delivered at La Salpetriere.


(14) COOMBS. Carey F....... British Medical Journal, Nov. 29, 1930.


(20) GIESELER........ Fortschr. a. a. Gebiete, d. Rontgenstrahlen, April 28, 1921.


(22) HARRISON, L.W....... Modern Diagnosis and Treatment of Syphilis, Chancroid and Gonorrhoea, Med. Monograph - 1924.


(27) LEES, D.............. "Diagnosis and Treatment of Venereal Diseases" Ed.2, p.107, 1931.

(28) MITCHELL, J.K......... The American Journal of Medical Science, 8:55 - 1831.

(29) MACKENZIE, Jas. Sir..... Principles of diagnosis and treatment in Heart affections Ed. 3. - 1927, p. 158.

(30) MITCHELL, ............ American Journal Medical Science, April 1875.


(33) O'LEARY and BAKER..... Medical Journal and Record 1926, 123: 305.

(34) O'LEARY............... Californ. and West. Med. 1928 29: 3.
(36) OSLER, Wm. Sir ...... Principles and Practice of Medicine, Ed. 10 - 1926.
(37) OBERTHUR .......... Rev. de Chir. 1929, No.4. - 304.
(40) ROSE and CARLESS .... Manual of Surgery, Ed. 3, p. 564.
(43) SAMPSON .......... A Practice of Physiotherapy. Mosby, 1926, 537.
(44) STEWART, Purves .... "The Diagnosis of Nervous Diseases" Ed. 6. 1924, p. 411.
(46) SCHAMBERG and WRIGHT ... Treatment of Syphilis, 1932.
(47) STOKES, John H. .... Modern Clinical Syphilology, 1927.
(49) VOLKMAN ...... Zentralbl. f. Chir. 1886, p. 89.