

BONE PLATES AND CLAMPS IN EXCISIONS OF THE KNEE-JOINT.

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(From the Orthopedic Department of the Massachusetts General Hospital.)

THE following is a general summary of eight excisions of tubercular knees, in which metal plates or clamps were used to keep the cut surfaces in good position. In these cases, it is very interesting to note how tolerant disease tissue is of the presence of metal plates; and that the results obtained by their use seem to justify the employment of this fixative method in these operations.

Patients having tubercular knees are usually those who have been disabled from work, and who have already had a considerable amount of conservative treatment tried. They submit to a radical operation as a last resort as well as from an economic point of view.

Under these circumstances, it becomes incumbent upon us to use whatever means we may have at our disposal for shortening their period of stay in the hospital, and also for giving them the advantage of a quick and firm ankylosis if possible.

The statistics taken from the Massachusetts General Hospital, and cited in this paper, seem to justify the statement that patients are much more assured of an ankylosis with the use of plates or clamps than without. It would also seem that the possibility of their future removal is more than over-balanced by the greater liability of a permanent and quicker ankylosis. These patients, furthermore, are usually more or less run down, and whatever can be done to shorten their confinement indoors is materially to the advantage of their general condition.

We know that the upright position naturally tends to separate the cut surfaces of the femur and tibia, and anything that we can do to help prevent this, and still get the patient up and about as soon as possible in the open air, cannot but influence the result. The plaster cast also adds increased weight to the lower leg, and quite naturally aids any tendency to separation or laxity at the knee. It is frequently necessary to change a plaster cast on the limb early after operation, and here, when plates or clamps are used, the position of the cut surfaces is maintained, and any slight callus which has formed is not disturbed.

The plates used in this group of cases are made of common steel, and the clamps of aluminum wire¹; the screws are the ordinary ones used to screw in wood, but with the thread carried up nearer the head so that it can get a good hold on the cortex of the bone. It seems from the results that the aluminum wire clamps serve the purpose of holding the two cut surfaces one against the other just as well as the larger steel plates which

are used where a greater immobilization is desired. The clamps have the advantage of not corroding and of being more easily adjusted at the time of operation. They are also much more readily removed if it should ever be necessary to do so; and, then, they present only a very small surface to produce any pressure on the periosteum.

There have been twenty-seven excisions of the knee in the past three years; of these, four have been re-excisions. One excision was done in the surgical service, in which silver wire was used and taken out later on account of a discharging sinus. Five had motion at a period dating six to fourteen weeks after operation. Four showed union at a period of from six to twelve weeks. In three knees, suture material was used, this being passed through holes drilled in the tibia and femur. In one of these cases the x-ray showed the suture broken and to have allowed poor position of the cut ends of the femur and tibia, which position was corrected under ether, and firm union obtained in eight weeks; another knee, in which suture was used, gave considerable motion at the end of eight weeks.

In the Orthopedic Service, since December, 1909, metal plates and clamps have been used in all excisions of the knees, to hold the cut surfaces in good position. There are eight cases now under observation in which either plates or clamps have been used. Six patients, three with plates and three with clamps, showed good union in three to six weeks after operation. The two cases which did not give as good results were the two in which re-excisions were done, a fact which leads one to infer that these patients lacked ability to form proper callus, rather than anything due to the presence of the plates. Both cases have now practical ankylosis; one at a period eight months after operation, the other nine months after.

The following is a brief outline of the cases in which the plates or clamps have been used in excisions of the knee-joint.

CASE 1. D. C., single, age fifty-six years. Male. Sheet-iron worker.

Family history. — Unimportant.

Past history. — Attack of arthritis of knee four years ago and was treated with bandage in out-patient department with relief of symptoms.

Present illness. — Injured one year ago by being struck with a piece of tiling weighing 140 lb., after which he began to have pain in knee at night.

March 3, 1908, arthrotomy was done, capsule found thickened, clear fluid in joint, bone and cartilage not eroded. Culture shows no growth and pathological report tuberculosis.

June 7, 1909. Patient readmitted to hospital.

Physical examination. — Right knee has 15° motion and can extend to only 15° of full extension. Has swelling and tenderness over inner tuberosity of tibia. No fluid in joint.

June 12. Excision of knee done, cartilage found to be badly eroded and much soft part involvement.

June 17. Incision still showed some pus around stitches.

At time of discharge patient had discharging sinus.

May 24, 1910. Patient readmitted for a re-excision of knee.

Physical examination. — Right knee shows dis-

¹ The aluminum wire clamps have been described in detail in the *American Journal of Orthopedic Surgery*, November, 1910, vol. viii, no. 2.

charging sinus, 15° motion, and 3½ inches atrophy of the thigh, 1½ inches atrophy of the calf, patient can bear weight on limb.

May 31. Operation, re-excision of knee-joint.

Usual operation for excision of knee-joint.

Three clamps used, one anterior and two anterior laterally.

June 1. Patient very comfortable.

June 5. Patient having some pain and does not look well, stitches removed and wound wicked, and hot creolin dressing used.

July 4. Plaster of Paris cast removed and very slight motion in knee. Area of fluctuation at inner aspect of joint, which was incised; 3 oz. of pus evacuated.

Aug. 16. Wound boggy at inner aspect, and draining; removal of bone clamps advised.

Clamps easily located. Outer clamp showed one screw loose, anterior clamp showed both screws loose, inner clamp showed both screws to be tight and had to be removed with screwdriver. Only very slight motion in knee.

This case is of interest because of the fact that the clamps were used in an infected area, and the clamp that was the strongest was at the seat of the greatest trouble, and all this time, eleven weeks after operation, apparently held the bones in position. The knee, at present, is firmly ankylosed, but still draining. This patient, from the start, had poor resistance, and was a poor risk.

CASE 2. P. D., age eighteen years.

Young man in apparent good health. Five years previous fell on ice injuring left knee. Knee was treated conservatively during this time. X-ray showed destruction of cartilage.

Physical examination showed left thigh much atrophied, knee much swollen and 10° motion and increased lateral mobility with considerable pain; patella not movable, limb was about one inch longer than the well one, atrophy of thigh 4½ inches and of the calf 2 inches.

Feb. 3. Operation, excision of knee-joint.

Usual operation for excision of knee-joint, extensive disease of the internal condyle of femur and articulating surface of the tibia patella removed, and wound drained through stab wound four inches down the anterolateral aspect of the tibia. Two bone clamps used.

March 1. About one week after operation, patient has had no opiate of any sort and expresses himself as feeling fine.

Patient seen eight weeks after operation and knee is firmly ankylosed.

Patient seen fourteen months after operation says he is working all the time and has no trouble whatsoever.

CASE 3. F. D., age fifty-seven years. Male. Admitted Jan. 5, 1910.

Family history. — Not important.

Past history. — Measles, 'whooping cough and rheumatic fever when seven years old.

Present illness. — In bed two years with discharging sinus on right forearm, from which a fragment of bone 1½ inches long was discharged.

Physical examination. — Well developed and nourished. No atrophy of calf, one inch shortening of the leg. Motions of the right hip limited in all directions. Patient stands with knee in position of 45° subluxation and 45° internal rotation; knee permits of about 60° flexion.

Jan. 6. Operation, excision of knee.

Usual operation for excision of knee-joint. Two

bone plates used; plates made of steel and about ½ inch by 2 inches in size; these were placed anterolaterally under the periosteum. Patella removed.

Jan. 20. New plaster applied and only very slight motion in knee, less than 5°.

Feb. 14. New plaster; patient in excellent condition. No motion in knee.

CASE 4. H. C., age twenty years. Male.

Family history. — Not important.

Past history. — Patient has enjoyed good health with exception of trouble with knee, which began six years ago. He had swelling of the knee off and on but was able to attend to his work. Eight months ago he injured the knee, which became painful and swollen, with less motion.

Physical examination. — Well developed and nourished. Right knee slightly swollen, 5° motion, with pain, limb held at about 10° permanent flexion, capsule much thickened.

Dec. 3, 1910. Operation.

Usual operation for excision of the knee, and two steel plates put in, one on either side.

Dec. 28. New plaster applied and there was no motion in the knee. Patient experienced no pain during manipulations necessary for new plaster.

CASE 5. G. G., age thirty-seven. Male. Barber.

Family history. — Negative.

Past history. — At age of ten fell down stairs and hit knee on stone. Knee then became swollen and painful. Treated at Children's Hospital four months later and was able to get about. At times knee gets swollen and painful, after a time knee quiets down for a while and is fairly comfortable.

Present illness. — Following an attack of malaria fifteen months ago knee became very painful to stand on and he was obliged to cease working. Since this time knee has been very painful and swollen, with much pain at night.

Physical examination. — Knee swollen, normal contour of knee lost, much capsular thickening and swelling. Knee flexed at 10°, ½ inch atrophy of calf and 3 inch atrophy of thigh, 10° motion permitted.

Dec. 9. Operation.

Usual operation for excision of knee, and two steel bone plates used to hold the two cut surfaces together, one at the inner aspect of the joint and the other at the outer aspect. Size of plates 2 inches by ½ inch and about ¼ inch thick. Limb was put up in posterior wire splint.

Dec. 10. Patient had pain and was given morphia ¼ gr. subcutaneously.

Dec. 11. Patient fairly comfortable.

Dec. 17. Plaster of Paris cast applied and x-ray shows good apposition of cut surfaces of tibia and femur.

Jan. 15. Good union, new cast applied.

Jan. 24. Discharged well.

This case had rather more pain than any of the other patients, and, in all probability, it was due to the fact that the wire splint did not immobilize the limb as a plaster cast would. Patient was much more comfortable after the cast was applied.

This patient is working every day, and has been for ten months. He is standing up from ten to fifteen hours, off and on, at his work and thus far he has had no trouble with his knee or plates.

CASE 6. B. S. R., age twenty-two years. Female.

Family history. — Negative.

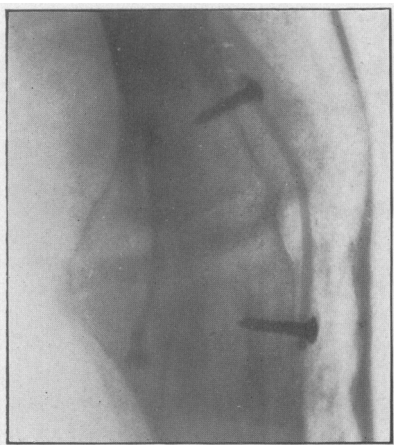
Past history. — When about ten years of age right



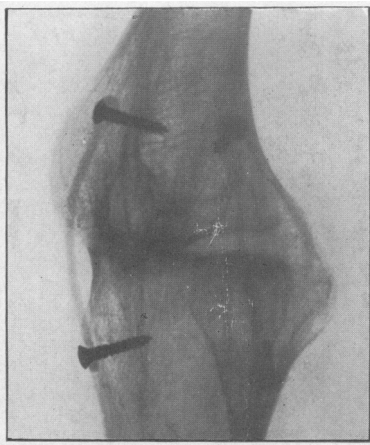
CASE 1. X-ray taken three weeks after operation, showing three bone clamps in position.



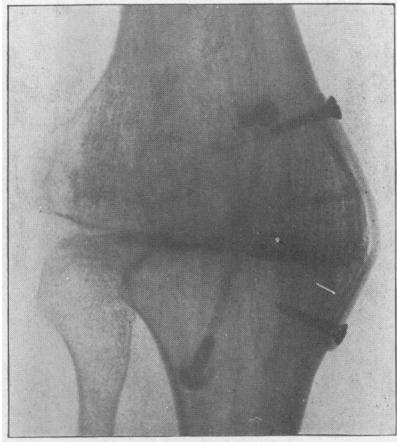
CASE 2. X-ray taken before operation showing extent of disease in knee-joint.



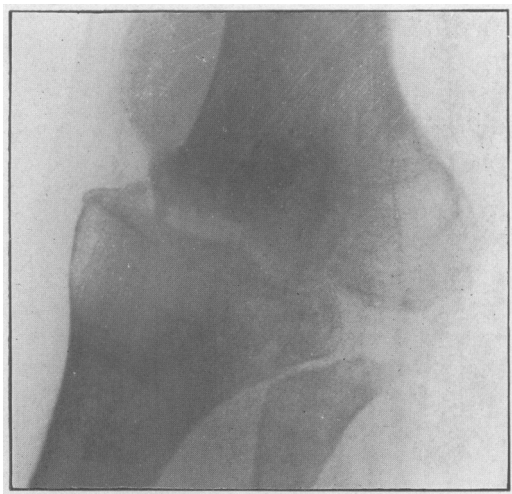
CASE 2. X-ray taken three weeks after operation with plaster cast still on.



CASE 2. Lateral x-ray taken fourteen months after operation and showing very plainly the new bone formation. Patient has firm ankylosis and no trouble with clamps.



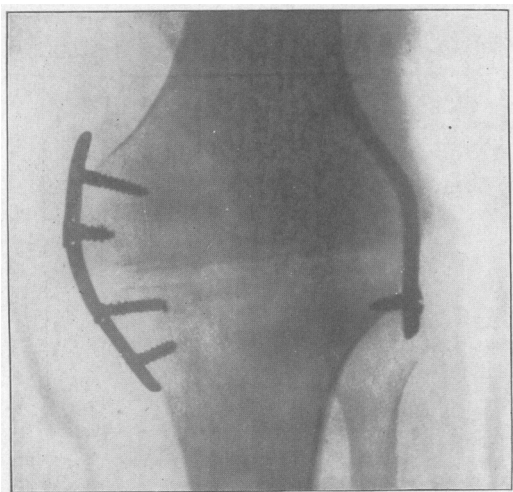
CASE 2. X-ray taken fourteen months after operation showing clamps in position and new bone formed, with firm ankylosis.



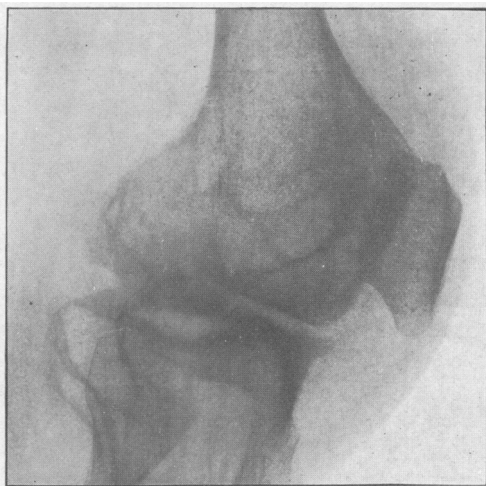
CASE 3. X-ray showing condition and position of joint surfaces before operation.



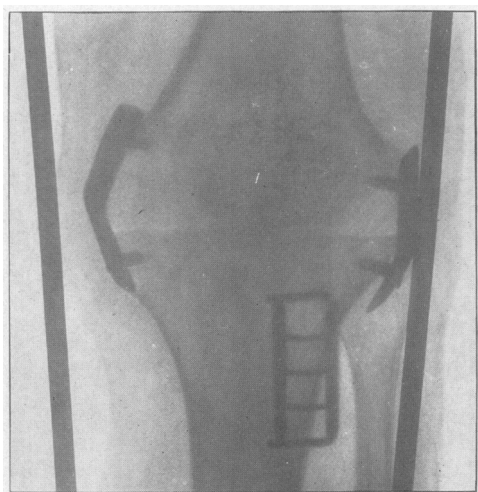
CASE 3. X-ray showing the two heavy steel plates and position of cut surfaces four weeks after operation; firm union five weeks after operation.



CASE 4. X-ray taken twenty-five days after operation, at which time new cast was applied and there was no motion in the knee.



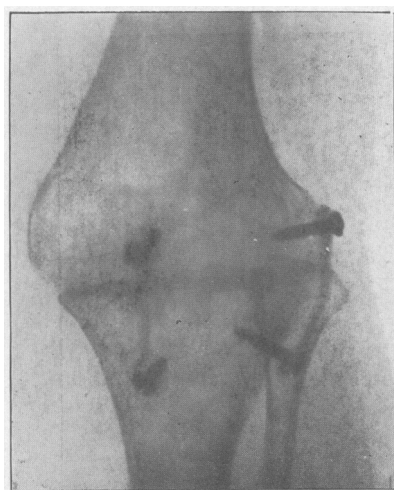
CASE 5. X-ray showing disease condition of knee-joint before operation.



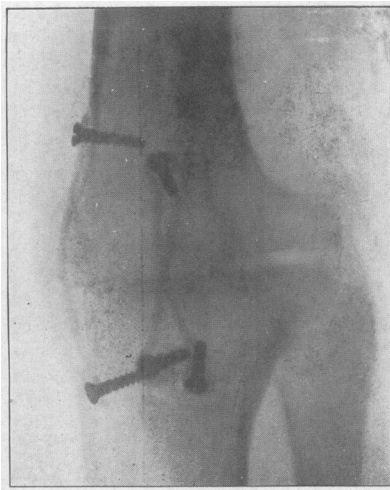
CASE 5. X-ray taken eight days after operation, showing the posterior wire splint and steel plates in position.



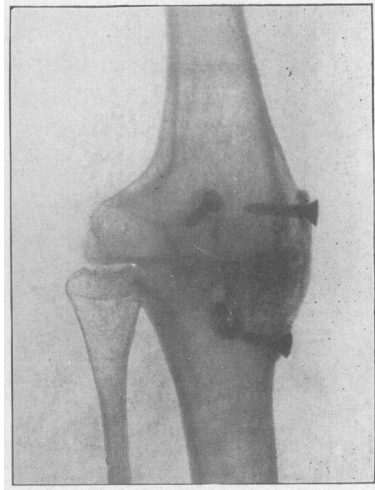
CASE 6. X-ray of knee-joint showing extent of disease before operation.



CASE 6. X-ray taken ten months after operation, showing good position and new bone formation. Patient has firm ankylosis and no symptoms from presence of clamps.



CASE 7. X-ray taken with plaster twenty-five days after operation, showing three clamps in position, cut surfaces not in excellent apposition, but firm ankylosis obtained in eight weeks.



CASE 8. X-ray taken ten months after operation, showing new bone formation and clamps in position, and giving no trouble whatever.

knee began to swell and get painful. Treated at Children's Hospital with plaster of Paris casts and splints, with gradual improvement of symptoms, and when about sixteen years of age stopped using crutches. Knee gave no great trouble until two years ago.

Present illness. — Two years ago knee began to swell and get painful, motion gradually becoming less. Patient has been treated during past year with plaster of Paris cast.

Physical examination. — Right knee shows 10° motion with pain. One inch atrophy of calf and two and one-half inches atrophy of the thigh. Patella not movable, no redness or increase of surface temperature, limb shows about $\frac{3}{4}$ inch shortening.

June 31. Operation.

Usual operation for excision of the knee-joint. Two bone clamps used and limb put up in plaster cast, ankle to groin.

July 3. Patient had no pain or discomfort at knee after the operation. She has slept well and expresses herself as feeling fine.

July 13. Stitches removed; wound looks fine and clean.

July 21. New cast, no motion in knee, x-ray shows good position of cut surfaces of tibia and femur.

July 29. Patient discharged relieved to out-patient department.

CASE 7. W. R., twenty-four years old. Male.

Past history. — Typhoid at seven years, malaria at twenty-one years.

Present illness. — Six months ago right knee began to swell and to pain slightly, tender to touch. Gradually increased limp and disability with much pain at night.

Physical examination. — Right limb held at 40° flexion at knee, can be brought to within 25° of complete extension with pain, patella movable with pain, capsular thickening, spasm of the thigh, increased surface temperature, marked tenderness at head of fibula; no marked loss of weight or night sweats; left calf shows 1 inch atrophy, left thigh $3\frac{1}{2}$ inch atrophy.

Jan. 6, 1910. Operation. Arthrotomy.

Simple lateral incision made, capsule found to be thickened, several rice bodies found; capsule was tied down by several adhesions which were broken up. Condition presented undoubted synovial tuberculosis; about 2 oz. of a 5% iodoform and olive emulsion was injected in the capsule after it was almost closed.

Jan. 15. Knee flexed to 45° with slight amount of pain.

Jan. 18. Knee flexed to right angle.

The pathological report of specimen from knee-joint showed tuberculosis and autopsy on pig injected with fluid from knee-joint showed tuberculous lesions. Patient seen two months later and condition is gradually becoming worse, increased pain and swelling, with decrease in motion.

Readmitted, April 11, for excision of knee-joint.

On admission knee was very much swollen and tender, increased surface temperature and capsule full of fluid. Patella readily floats and only 10° motion permitted at knee. Calf shows $1\frac{1}{2}$ inches atrophy and thigh shows $5\frac{1}{2}$ inches atrophy. Knee shows 2 inches enlargement.

April 14, 1910. Operation, excision of knee.

Usual incision for excision of knee-joint. Knee showed marked involvement of the soft parts with little bone involvement. Three bone clamps used, one anteriorly and two laterally.

April 14. Patient having a little pain and morphia given once only.

May 9. Window cut in the cast and clean dressing applied. X-ray shows good position.

May 10. New plaster, very little motion, not painful process to apply the new cast.

May 14. Discharged to out-patient department.

CASE 8. M. T. F., twenty-eight years. Female. Admitted Feb. 4.

Family history. — Brother died of tuberculosis.

Past history. — Two years previous to entrance to hospital patient fell from a car and since this time knee has gradually become swollen, stiff and painful, but in spite of this patient is able to continue at her work as housekeeper. Has had great loss of weight, but no night sweats.

Physical examination. — Patient looks tubercular. Left knee slightly swollen, no increase in surface temperature and motions of knee limited. Extension is possible to within 15° of full extension and about 75° of flexion permitted; no local tenderness or effusion into joint. X-ray shows a sharply defined area of disease in head of the tibia.

Feb. 6. Operation.

An incision made over anterior lateral aspect of tibia, and focus in tibia exposed; this was found filled with pus and detritus, joint cavity was not exposed. Cavity curetted and wicked.

March 9. Patient has small discharging sinus, motions of knee same as before operation, and abnormal mobility in knee-joint.

April 17, 1909. Patient admitted for excision of knee.

Physical examination. — At this time patient says she has been having considerable pain in knee. The knee shows a much swollen condition, marked tenderness over whole joint, especially over head of tibia at inner side, no motion permitted, any attempt very painful. X-ray shows marked involvement of articulating surfaces of femur and tibia.

April 22, 1909. Operation. Excision of knee.

Usual operation performed. No fixation methods employed and limb put up in plaster of Paris cast.

May 1. Patient has had some pain since operation; two subcutaneous injections of morphia given after the operation.

June 7. Patient discharged.

June 28. Readmitted.

Physical examination. — Left thigh shows 1 inch atrophy, left calf shows $\frac{1}{2}$ inch atrophy, and there is about 15° motion in the knee. Patient has had a good deal of pain and discomfort in limb since excision.

June 30. Operation, re-excision of knee.

Usual operation for excision of knee-joint, and two bone clamps used, limb put up in plaster of Paris cast.

July 3. Windows cut in cast, wicks removed and wound looks firm and clean. Patient has had no morphia and no pain, expresses herself as feeling fine and says she had far more discomfort after the first excision.

July 25. A new plaster applied. X-ray shows good position of cut surfaces and there is no motion in the knee apparently.

This patient was seen eight months later, and had been doing her work as housekeeper for four months previous; she expresses herself as feeling better than ever, and is putting on considerable weight. The knee at this time presented the smallest amount of motion, perhaps less than 5°.

All of the cases were not specially picked, but such as were operated on as they presented themselves one after the other in the general routine of the clinic. The knee-joints presented those from a mild to a marked disintegration. The ages of the patients varied from eighteen to

fifty-seven years. The period of conservative treatment varied from two to seven years. It is now about two years since the first knee in which plates were used was operated upon, and the patient has had no symptoms. The same may be said of the other patients.

From the foregoing facts it seems reasonable to make the following conclusions:

First, The use of metal fixation methods in excisions of the knee gives the patients far less pain than without their use.

Second, The holding of the cut surfaces immobile and in constant apposition is necessarily conducive to a more probable ankylosis.

Third, The disease tissue is evidently more tolerant of the presence of metals than is generally supposed.

SCIATICA; ETIOLOGY AND TREATMENT.

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IT is quite evident from a study of the standard books on medicine and nervous diseases, and of the current literature, that the pathology of sciatica is essentially a peri-neuritis, affecting a part or the whole of the nerve. The inflammatory condition of the nerve is supposed to be located at the point where the pain is most intense, and the various methods of treatment are based on this conception.

The etiology of sciatica is given as follows: "Exposure to cold"; rheumatism, including the common terms of sciatic rheumatism; any trauma causing an inflammation of the nerve sheath; and, most important, any pressure on the sacral plexus at the origin of the nerve as occurs in pelvic tumors, etc.

The various forms of treatment as advocated are drugs for the rheumatic element, electricity along the course of the nerve, cautery and hot applications at the various painful areas, injection of drugs into the nerve. The treatment is based on the prevalent theory of a peri-neuritis wherever the pain and tenderness are located.

Pathologically, neuritis means one of two conditions; either a degenerative process of the nerve itself, or an inflammatory process involving the nerve sheath. The degenerative type is found in such conditions as poisoning from lead, alcohol and the multiple neuritis from definite infections. This is a well-recognized pathological condition, but has nothing to do with sciatica. The inflammatory type, the so-called peri-neuritis, is supposed to be the condition found in sciatica. But we do not believe that it represents the pathology, and can find no evidence in the literature of such a process being proven. And yet it is on this pathological basis that all treatment has been established.

This paper is written to show that practically every case of sciatica is caused by some lesion near the exit of the sciatic nerve, and that the pain and tenderness along the course of the nerve are simply referred pain from the low portion of the

back. In order to properly treat sciatica, it is necessary to search for the cause of the trouble, which is either a mechanical pressure or inflammatory irritation at the origin of the nerve. If we find that there is some lesion in the lower portion of the back as the cause of the sciatic pain, then the ordinary methods of local treatment and the use of rheumatic remedies, except to relieve pain or to have an effect on some rheumatic process affecting the lower portion of the spine, is irrational and is not in accord with the pathological findings.

Before we take up the various pathological states that may be the cause of sciatica, we will enumerate the various points in the physical examination to show that everything points to some condition in the lower spine or sacro-iliac joint as the cause of the sciatic pain.

Pain and tenderness along the course of the nerve, being more accentuated at certain points, namely, posterior to the hip-joint and in the thigh, is present and means that there is some disturbance of the nerve. Flexion of the thigh with the leg held straight increases the pain, which is commonly supposed to put the nerve on the stretch. The explanation of this test, the so-called straight leg raising, is not that the nerve is stretched, but that, the knee being held straight, the ham-string muscles pull directly on the ischial tuberosity, and, therefore, make a direct leverage on the sacro-iliac joint. Flexion of the thigh with the knee bent should also stretch the nerve as it passes back of the hip-joint, but this never accentuates the pain. If we hyperextend the thigh, thus pulling directly on the sacro-iliac joint, the sciatic pain is always increased, and yet this cannot stretch the nerve.

If we next carefully examine the back in every case of sciatica, there will generally be found tenderness over one sacro-iliac joint, and there will always be restriction of motion of the lowest portion of the spine. Forward bending will often show a restriction of motion limited to one sacro-iliac joint, and the body will begin to list to one side so as to protect the joint and will cause pain down the sciatic nerve. Lateral bending will be restricted.

A careful examination of any case of sciatica will show that there is some trouble at or near the sacro-iliac joint, and in most cases we are dealing with a definite joint lesion. It is easily understood how the sciatic nerve may be involved if it is remembered that the sacral plexus passes directly over this joint so that any disturbance may affect the nerve.

It is well recognized that such gross lesions as pelvic tumors, tuberculous and hypertrophic processes of the low spine and sacro-iliac joints may cause pressure on the sciatic nerve. Such conditions should be considered and diagnosed.

This leaves a large number of cases which are called idiopathic sciatica, the pathology of which is supposed to be a peri-neuritis of unknown origin. It is in this group of cases that the seat of the trouble is to be found, in the sacro-iliac joint. Trauma of any kind, acute or chronic strain,