Stokes, November 12th, 1884. Patient made a good and satisfactory recovery, with complete rectification of deformity.

CASE XXI.—David K., aged three years, admitted into Children's Hospital, Dublin, suffering from double-bowed legs, from rickets, November 5th, 1884. Both legs fractured by manipulative force, under ether, November 12th, 1884, assisted by Mr. William Stokes. Child made a rapid and satisfactory recovery.

CASE XXII.—Anne L., aged twenty-two months, admitted into the Children's Hospital, Dublin, December 2nd, 1884, suffering from double-bowed legs, caused by rickets. As the child was so young, splints were first applied; however, as no improvement appeared to take place, both legs were fractured by manipulative force, under ether, January 16th, 1885, assisted by Mr. William Stokes. Child made a rapid recovery, with complete rectification of deformity.

CASE XXIII.—Bridget C., aged three years, admitted into the Children's Hospital, Dublin, December 15th, 1884, suffering from double-bowed legs. Both legs fractured by manipulative force, January 16th, 1885, under ether, assisted by Mr. William Stokes. Limbs placed in a straight position, and treated with lateral splints; child made a good recovery, and was discharged February 27th, 1885.

CASE XXIV.—John H., aged three years, admitted into the Children's Hospital, Dublin, March 6th, 1885, suffering from double-bowed legs, from rickets. Both legs fractured by manipulative force, under ether, assisted by Mr. William Stokes. Child made a rapid and satisfactory recovery, and was discharged in one month.

CASE XXV.—Maurice F., aged two years and six months, admitted into Children's Hospital, Dublin, February 27th, 1885, suffering from double-bowed legs, from rickets. Both legs fractured by manipulative force, under ether, assisted by Mr. William Stokes. Child made a rapid and satisfactory recovery, with complete rectification of deformity, and was discharged in five weeks from date of operation.

ART. XXVI.—*Arthritis Neurotica; its Causation and Treatment.*

By J. M'ARDLE, F.R.C.S.I.; Surgeon to St. Vincent's Hospital.

IN most surgical text-books little, if any, mention is made of joint affections occurring in the course of spinal or other nerve injury. The following cases seem to me to have a direct bearing on the subject, and would prove (as far as I can see) that arthritis of neurotic origin is not so infrequent as is generally supposed.

My object in bringing them forward is to contrast this affection with Charcot's disease on the one hand, and with gouty and rheumatic inflammation of joints on the other.

For the notes of the first case I am indebted to my friend and former pupil, Mr. A. J. Smyth; the others are reports selected from my own case-book:—

CASE I.—*Paraplegia arising from Spinal Injury and accompanied by severe Inflammation of Ankles, Knees, and Hips; Recovery.*—Thomas F., aged thirty-five years, seaman, admitted to St. Vincent's Hospital, under Mr. M'Arde's care, on October 3rd, 1883. He had never any serious illness until January 23, 1883, when he fell through the hold of a vessel. In falling, he struck a plank placed between decks, and then fell heavily to the lower deck, where his spine came in contact with a log. He recovered himself a moment after the fall and stood up; he would have fallen again, but the captain and another walked him about; "but life," to use his own expression, "gradually leaving his legs," they laid him on some canvas, where he remained exposed to the cold for three hours; he was then taken ashore and brought home, a distance of two miles, where he was seen by a doctor, who recommended him to the County Infirmary. The symptoms first noticed were—loss of power in the legs, inability to pass water, dizziness in the head, stiffness of left arm, and a sensation as if a cord were tied around his waist.

On the second morning after the accident the upper extremities became affected, the left side being in a worse condition than the right. Catheters were passed, purgatives and enemata administered, leeches applied to the back, and iodide of potassium and bark given internally. This treatment had the effect of partially restoring the use of the arms and entirely the power of the bladder; but finding no further improvement, he came to St. Vincent's Hospital, as above noted, nine months after the accident. On admission he was found pale and emaciated, unable to make the slightest movement, except with his head, left arm, intercostal and abdominal muscles; breathing difficult; total loss of power in legs; muscles of back in a state of spastic rigidity, as also those of left arm, which was in a flexed position. It was impossible to place him in a sitting posture. There was no anæsthesia, but he complained of a peculiar prickling sensation in his legs and feet, which were always cold. His legs appeared slightly swollen; pressure produced pitting down to the bone; and joints (knees and ankles) were greatly enlarged, painful, and crepitant. There was a brawny feel about the joints, slight effusion into the synovial cavity, all the furrows about them quite obliterated and movement of them impossible; the muscles were quite wasted, but responded to electric stimuli; skin was thick and scaly, leaving the inner and the anterior part of the leg, the inner and dorsal surface of foot, covered by

great patches of ichthyosis. A large cicatrix remained after an eschar which had formed over the coccyx; there was a considerable swelling over the last cervical and the upper dorsal vertebræ, pressure on which caused severe pain along his arms. Heart normal; pulse 80; temperature 97°; respiration normal; patellar reflex exaggerated on both sides; cremasteric reflex slightly marked on right side, none on left; abdominal and pectoral reflexes absent. On applying cold to spine, no abnormal sensations.

Treatment.—Blister to spine; internally iodide of potassium, for which, in a short time, perchloride of mercury was substituted. In one month after admission, voluntary motion was re-established in legs and arms; then strychnine was substituted, and continued until the patient was discharged. From the beginning the constant current was applied, and after the pain of joints was relieved, passive motion was used. Friction and kneading of the dorsal muscles, as well as those of the extremities, was commenced at the same time. The arthritis in this case came on two months before admission to St. Vincent's, and at a time when he was kept at perfect rest; local applications had been used to relieve the pain, but no relief was obtained until after blistering the spine, when a gradual subsidence of the swelling took place and the pain disappeared.

CASE II.—Spinal Concussion followed by Hemi-paraplegia, then Complete Paraplegia and Arthritis of Knees and Ankle-joints; Recovery.—Mr. John L., aged sixty years, unmarried, family history good; he was quite strong until commencement of present attack; never had syphilis, gout, or rheumatism.

History.—On September 8th, 1884, patient fell on his back on a flagged floor. During the following day he moved about, but felt pain in the lumbar region; left leg became powerless, and on 11th he went to bed, where, on 13th, the right leg became powerless. In a few days both limbs became swollen; after a little rest and mild purgation improvement took place, but about 20th the limbs became again powerless, joints became swollen and tender, and on October 27th I found him (when called to see him for the first time) emaciated, and having a very anxious appearance. Respiratory, circulatory, and urinary systems normal; tongue furred, appetite bad. He suffered from constipation, complained of aching pain in the back, and the slightest movement caused intense pain in his knees, hips, and ankles, which were greatly swollen and tender. The patellæ were fixed by effused material; all the normal furrows about the joints were absent, the swelling having an ovoid appearance; the local temperature during my observation was never above normal. There was doughy œdema of both legs—the pitting produced by pressure reaching even in the femoral region down almost to the bone, and remaining for hours after removal of the pressure.

Patches of ichthyosis appeared on inner aspect of leg and foot. There was complete loss of power in both lower extremities, but the muscles responded to electric stimuli. A careful examination with the æsthesiometer showed that sensation was perfect. The feet and legs were numb and cold, and prickling sensations were constantly felt in them. Pressure in the course of tibia, femur, or crista ilii caused deep-seated pain at point compressed. No attempt at moving any of the joints could be made without producing excruciating pain. There was tenderness on pressure over lumbar spine, and any attempt at raising the patient into a sitting posture increased this trouble and produced painful twitchings of the muscles of lower extremity; the legs were everted, and could not be inverted without producing severe pain.

Treatment.—Counter-irritation over spine by chloroform; internally perchloride of mercury; the continuous current was applied. Slight improvement began after the first few days, and on November 20th he could move the ankle-joint without pain. On the 30th there was a decided diminution of the pain in the knees, the swelling gradually subsided, the joints, however, remaining enlarged and stiff. Mercury was now omitted, and iodide of potassium and bark were substituted. The joints, especially the knees, became again painful, and I was obliged to return to the mercury. Soon again improvement occurred, and when the pain disappeared patient was raised to the sitting posture, and liniment of iodine applied along the spine. Soon after this the patient was able to raise his right leg from the bed; the left was still immovable, but in a few days motor power was re-established in it, and since that time the pain has not returned; the swelling and stiffness have been gradually subsiding, and the patient's strength is now quite restored.

CASE III.—Inflammation of Joints, following Exposure to Cold, cured by Counter-irritation over Spine and Perchloride of Mercury internally.—P. D., aged forty, admitted to St. Vincent's Hospital, December 25th, 1884.

Family history.—Parents and relations are healthy, there being no sign of gout or rheumatism in the family. Some years ago, whilst working as fireman on a Transatlantic steamer, he left the engine-room, where the temperature was very high, and came on deck. The weather was cold and stormy at the time, and he was soon obliged to go below on account of a severe chill. He was placed in his hammock, and when there for a time pain in the lumbar region began, and gradually increased in severity. After some time he obtained a little sleep, but on waking found that he was unable to move his legs. This state of things went on for about forty-eight hours, when swelling appeared in the legs, and with it severe pain in the knees. He was then brought to hospital, where for sixteen weeks he was under treatment. Complete paralysis of both legs

was present—knees, ankles, and hips becoming fixed and swollen. The skin desquamated in patches from his legs. The stiffness remained for six months. He had no cardiac or respiratory trouble, no acid perspiration. Since then he has had eight attacks of a somewhat similar nature, arising from a like cause.

Condition on admission.—He is a well-developed, muscular subject, circulatory and respiratory systems normal; he complained of severe pain in the left shoulder, back of neck, and occiput; copious perspirations, especially about face and head. On 26th painful twitchings of the muscles of lower extremities set in, and with them considerable swelling and intense pain in the joints (left ankle, right ankle, knee, and hip); tongue furred, breath fœtid.

Treatment.—Perchloride of mercury, one-eighth grain thrice daily, Dover's powder, and counter-irritation by chloroform along upper fourth of spine. On 30th all the pain and swelling had disappeared, except in the right knee and hip. Counter-irritation was then applied to lumbar region, and in a few hours this only remaining trouble was removed. On January 4th, 1885, he was able to be about the ward, feeling quite vigorous. There is no trace of nodulation about any of his joints.

In this case myelo-meningitis was probably the cause of the distressing symptoms.

CASE IV.—Inflammation of Joints arising from Curvature of Spine, cured by Perchloride of Mercury and application of Poroplastic Jacket.—Miss B., aged nineteen years, came under my care on December 27th, 1884, suffering, as she thought, from an attack of rheumatism.

Family history.—There is no trace of gout or rheumatism in the family, but all her paternal relations are tubercular. Her brother died of phthisis, and she herself, some years ago, had suppurating glands in the neck.

History of present attack.—On November 28th, after sitting in a close room with her back to the fire, she came out into the cold, and felt very chilly. She was obliged to remain for some time in the cold waiting-room of a railway station. That night she complained of severe pain in the back, and the next morning her limbs were weak, and pain was felt in right hip, left knee, and ankle. Swelling of the legs now took place, the patient began to lose her appetite, and on December 27th she was pale and emaciated, had severe pain in the back, right hip and ankle, left knee and ankle, and œdema of both legs, which were weak. After counter-irritation over spine and rest in the recumbent posture for a few days, the swelling and pain of joints disappeared. She then moved about as usual, but pain, swelling, and weakness of the limbs returned; and being again consulted about her, I examined the spine, and found well-marked lateral curvature in the upper dorsal region; there was tenderness on pressure over the sixth dorsal vertebra, the right scapula

was very prominent, and there was some intercostal neuralgia on the left side. I now insisted on her remaining recumbent, when, after a few days, all pain and stiffness of the joints disappeared, and with them the œdema. She is now wearing a poroplastic jacket, and has not had a return of the trouble since.

In this case compression of the cord was evidently the cause of the articular dystrophy, since by removing the curvature we succeeded in preventing a recurrence of pain and swelling in the joints.

CASE V.—*Hyperæmia of Cord, followed by Arthritis of Knee and Ankle, cured by Counter-irritation over Spine and Perchloride of Mercury internally.*—Mrs. L., aged fifty years, admitted into St. Vincent's Hospital suffering from typhoid pneumonia. During convalescence from this affection swelling of the right leg and painful twitchings of the femoral muscles occurred. Soon after the knee and ankle of that side became stiff and very painful, and she complained of a dragging pain in the lumbar region. Many local applications were tried, but to no purpose. When she came under my care on February 10th, 1885, her condition was as follows:—

General health good; all signs of chest trouble had disappeared. I examined the right leg, and found that the epidermis was peeling off in large firm patches; the limb was very œdematous, the knee being twice the normal size, and very painful. She could not raise the leg from the bed; every attempt at doing so caused severe pain and a backward displacement of the tibia. On fixing the femur, I found that lateral movement of the leg, to a considerable extent, could be brought about. The ankle was stiff and greatly swollen; there was no phlebitis. She complained of dragging pain in the back, and on examining it there was pain on pressure over the upper lumbar and the lower dorsal vertebræ. The resemblance of the condition here to that in cases of injury of spine, led me to believe that I had to deal with some hyperæmic condition of the cord. Consequently, I stopped all local treatment, blistered the lower dorsal spine, and gave the patient perchloride of mercury in full doses. In a few days the pain disappeared, the swelling of the limb soon after became much less, and in the course of three weeks she was able to be out of bed, and now the only evidence of the disease is the lax knee-joint.

CASE VI.—Mr. T. J., aged twenty years, came under my care in September, 1880. After suffering a severe fall on the back of the neck spastic paraplegia occurred, and with it swelling and pain in the elbows and knees; there was general hyperæsthesia, and death took place on the tenth day from meningitis. The *post mortem* showed that the cerebral and spinal membranes were red, and covered here and there with patches of lymph, and that the cord was compressed in the lower cervical region by lymph deposited between it and the bodies of the vertebræ.

CASE VII.—In this case, notes of which are not forthcoming, the patient got severe pains in knees, ankles, and hips, and doughy œdema of legs, dying rapidly of meningitis, probably of syphilitic origin. The *post mortem* showed that the knee-joints were enlarged, the articular ends of femora soft, and the cartilages indented. The membranes of the cord were thickened in the lumbar region, and the nerves passing therefrom enlarged, and dark purple in colour.

This completes my list of cases in which joint trouble arose in the course of disease of the central nervous system; and before entering on the consideration of arthritis arising from peripheral nerve lesion, we may discuss the symptoms and relations of the cases noted.

We have, in the cases before us, spinal injury, or disease followed by more or less paralysis, painful swellings of the joints, the skin desquamating in patches, producing an appearance of ichthyosis. This latter condition was well marked in Cases I. and II., and I have never met with this condition so well defined in the course of any other affection.

The œdema, which I would term doughy, seemed quite characteristic, the pitting on pressure occurred only when considerable force was employed, and although there is great wasting of the muscles, the outline of the limb is well preserved.

Local treatment affords no relief from the pain, and no matter in what condition the limbs are placed, œdema is persistent. The arthritis is confined to the joints below the seat of injury, and pain is developed on pressure in the course of the long bones. The proofs of the neural origin of this arthropathy may be derived from—(1) clinical observation; (2) *post mortem* examinations; (3) therapeutic results; (4) experimental researches.

In all the cases in which arthritis has arisen after injury of the spinal cord, the symptoms of joint trouble came on after the patient had been at perfect rest, as in Cases I., II., and V.; consequently, they could not be the result of local injury. In all of them symptoms of myelitis, meningo-myelitis, or compression, as well as evidences of muscular and cutaneous degeneration, were present. Now, when injury of the cord is followed by paralysis, muscular atrophy, &c., we look upon those conditions as evidence of lesions or disturbances in trophic or other centres, and it is only fair to suppose that the graver affection (arthritis) is of like origin.

Dr. Ord, in his paper read at the meeting of the British Medical Association at Belfast last year, called attention to the

subject of arthritis myelitica, and mentions in support of the theory of its central origin the following case, which resembles one of mine:—

A lady, after a severe chill, found her knees become swollen and painful; the ankles, hips, elbows, hands, and shoulders were in succession attacked with the same trouble; all the joints were excessively swollen and tender. The joint affection was one of steady progression, and ended by rendering her practically helpless as regarded locomotion; the reflexes were exaggerated.

Dr. Gull, in "Guy's Hospital Reports" for 1858, Case XXVII., gives one in which the patient—after suffering severe pain in the back of the neck and between the shoulders, a constricting pain round the chest, and spasmodic twitchings—developed paraplegia, and with it severe pain and considerable swelling of the ankles, knees, and hands, perspirations being irregular.

In Case XXVIII. concussion of the spine was followed by partial paraplegia, painful swellings of the ankles and wrists, and œdema of the limbs; recovery.

Erb (*Ziems. Encyc.*) says that the joints in polio-myelitis are the subject of general atrophy—that they become deformed, abnormally movable, partly through disappearance of the articular extremities of bones and cartilage, partly through relaxation and stretching of the ligaments. He also mentions that in hemiplegia inflammatory affections of the knee-joint occur on the paralysed side. Pressure myelitis also causes, according to this authority, trophic disturbances at the joints.

In the *Berliner klin. Woch.* for 1883, Dr. B. Reidell records a case in which, after a punctured wound between the first and second lumbar vertibræ to the left of the middle line, the patient suffered from severe and destructive arthritis of ankle, knee, and hip of left side.

As regards the results of examination after death of patients in whom arthritis has been found to accompany paraplegia, in all the cases of which I am aware, compression of the cord, inflammation of its membranes, or some such condition, was present.

In Case VI. the *post mortem* revealed a thickening of the dura mater, with effusion between it and the bodies of the vertebræ, extending from the third to the seventh cervical. In Case VII. I also had an opportunity of examining the condition of the cord and its membranes. I found the latter thickened in the region of the lumbar enlargement, the nerves passing from which were dark

purple in colour, the lower part of the canal being filled with a gluey material.

Dr. Gull, in "Guy's Hospital Reports" for 1856, p. 145, records a case in which rheumatic-like swellings of the joints occurred in a patient suffering from paraplegia. The *post mortem* revealed a small tumour, the size of a hazel nut, pressing on the spinal cord at the region of the first dorsal vertebra.

The same authority, in the volume for 1858, records a case (XXXII.) in which partial paralysis occurred in both legs, and the right knee showed symptoms of spontaneous synovitis. The *post mortem* revealed tubercle in the cervical region of the cord, producing arachnitis and constricting the cord.

Although little reliance can be placed on the results of treatment as a proof of the pathology in any given case, still I think that, in the above cases, the rapid improvement which occurred after counter-irritation over the spine (when all local and constitutional treatment had failed to afford relief) would point to the central origin; and, taken in conjunction with the fact that not only was pain relieved and œdema removed, but muscular atrophy stopped and motor power restored, I look upon it as a link in the chain of evidence of primary implication of the cord.

Experiments on the nervous system are so surrounded with perplexing difficulties, and the results thereof so liable to be wrongly interpreted, that they must not be allowed to weigh too much with us in the consideration of this subject. The following, however, may aid us in our efforts at determining the source of an affection which deserves our attention, not so much on account of the frequency of its occurrence as on the danger of allowing it to run its course, should we mistake it for a more common but less formidable disease—a disease with which I have on two occasions seen it confounded—I allude to gouty synovitis. The experiments of Mantagazza show that artificial irritation of the cord is capable of producing degenerative changes in the soft tissues below the point of lesion, and also enlargement and softening of the articular ends of the bones, and, if persisted in, will even produce osteal fringes resembling those of rheumatic arthritis. Whether the results thus obtained can be truly said to depend on the neural disturbance or not, is still doubtful; but, apart from this, I think the other evidences just mentioned point strongly to the central nervous system as the point of origin of the articular dystrophy.

Now that I have endeavoured to lay before you some proof of

the neural origin of this disease, I shall point out the characters which distinguish it from those affections which are liable to be mistaken for it. In a small percentage of cases of locomotor ataxia, arthritic affections arise, but they are painless—they occur before paralysis sets in, and pass rapidly onwards to the production of loose joints. In neurotic arthritis, on the other hand, this state of things is all reversed. The characters which distinguish it from gouty and rheumatic inflammation may be tabulated thus:—

1st. It is rarely if ever accompanied by fever.

2nd. It comes on after or with paralysis, and affects only partially or entirely paralysed limbs.

3rd. The bones are tender on pressure below the point of spinal lesion.

4th. The articular swelling is due to a synovial effusion and periarticular exudation, which fixes the patella if the knee be affected.

5th. It is accompanied by a doughy œdema of the limbs and cutaneous and muscular atrophy.

6th. The treatment for gout or rheumatism utterly fails to afford relief.

7th. If the spinal trouble be not sufficient to produce death, the joints are completely restored to functional activity, the pain and œdema first disappearing, then the paralysis, and last the thickening and stiffness of joints. Contrast this with gout, in which there is no paralysis (until inflammation is propagated to the cord), no tenderness, except at the joints, especially that of the great toe, no œdema, no muscular or cutaneous atrophy, in which attacks are short, usually increasing in severity and leaving permanent traces behind in the shape of deformed joints, in which deposits of urates abound. Rheumatic inflammation is accompanied by high fever (paralysis is only secondary if it occurs at all), it has characteristic acid perspirations, all the joints are affected, there is no œdema, and wasting of the limb occurs, if it occurs at all, only from want of use.

There is sufficient dissimilarity here to render the diagnosis easy in the extreme; but when we compare neurotic arthritis with an affection variously styled arthritis deformans, rheumatic arthritis, osteo-arthritis, rheumatic gout, nodosity of the joints, and a host of other names, we evidently have to deal with an affection the existence of which is evidenced by such varied symptoms that the most conflicting conclusions are drawn therefrom as to the pathology of the affection.

Some who have noted cases similar to mine have called them rheumatic, and one of the cases which I have described was under treatment for gout for a considerable time before it came under my care. In my mind we might as well attempt to make the rheumatic or gouty diathesis account for the muscular and cutaneous degenerations which accompany compression or other simple myelitis, as to credit them with the production of articular troubles such as I have described. Here are patients without a trace of rheumatic or gouty tendency, and on receipt of an injury of the spine they become paralysed; in a definite time they develop arthritis with the peculiar symptoms described. After counter-irritation over the spine, and the internal administration of perchloride of mercury, all traces of the trouble disappear—am I to call this rheumatic gout? If so, the sooner we investigate the condition of the spinal cord in cases of rheumatic arthritis the better, for in the cases which have come under my notice the ordinary treatment for rheumatic and gouty inflammation was useless, while that directed to the removal of the spinal disabilities was successful; whatever may be the cause exciting or determining of this disease, I believe that in all cases the immediate one is inflammation or its products implicating the cord. The manner in which this central lesion implicates distant structures is still a vexed question, but when we come to consider cases of arthritis arising from peripheral nerve lesion, we shall discuss the views of the more reliable authorities.

The treatment which I have found most useful is as follows:—

1st. Insuring perfect rest by sand-bags, keeping the limbs raised, and avoiding all restricting appliances, which would interfere with the circulation.

2nd. Counter-irritation over the spine by Corrigan's button, blistering, or liniment of iodine.

3rd. The internal administration of perchloride of mercury in the early stage, strychnia and digitalis in the later.

4th. Having relieved pain, friction, and passive motion of the joints.