Remarks on sciatica and morbus coxae senilis : especially with regard to their treatment / by Karl Petrén.

REMARKS ON SCIATICA AND MORBUS COXÆ SENILIS, ESPECIALLY WITH REGARD TO THEIR TREATMENT.

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KARL PETRÉN, M.D.,

Professor of Medicine, Upsala. From the Medical Clinic of the University.

(WITH PLATES 5, 6 AND 7)

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With regard to the question of the nature of sciatica, the prevailing opinion has for a long time been that certain cases are to be considered as neuritis, others only as neuralgia. This opinion was, as far as I know, first expressed by Landouzy in his well-known exhaustive work on sciatica (1875). A similar view has in later years been held by Homolle, Grasset, Rauzier, Eichhorst, Stintzing, Bernhardt, Feddersen, Sommer, Oppenheim, and others. According to this view, those cases were to be looked upon as neuritis in which there were found "Ausfallserscheinungen" (*i.e.* phenomena of lost function), such as more or less marked atrophy of the muscles, loss or weakening of the Achilles-tendon reflex, impairment of cutaneous sensibility.

On the other hand, however, the view which considered all well-marked cases of sciatica as neuritis has been also supported. This opinion seems first to have been expressed by Fernet (1878), who, however, has not discussed in detail the grounds for it. Somewhat later Hammond advocated this view. The same position is very strongly held by Gowers, who points out that all stages occur, from the severe cases with phenomena of

lost function which must be regarded as neuritis, to those other cases where these phenomena are not found, and that the former cases are not at first associated with loss of function, thus giving rise to a picture usually regarded as neuralgia. Gowers consequently concludes that all cases with marked symptoms of sciatica are to be considered as neuritis or perineuritis, and that only cases with transient pains, coming and going, may be regarded as neuralgia. This view, according to which sciatica as a rule is due to neuritis, has since then also been supported by other authors such as Eulenburg, Strümpell, Moritz, Pitres and Vaillard, Gibson and Fleming, Lloyd and Schultze. As a reason for this supposition, Schultze also states that the pains of sciatica do not come on under the type of limited attacks as is usually the case in neuralgia, but are more constant, a difference between the affections to which Lasègue (1864), had already called attention. For my own part, I cannot but think that the reasons given by Gowers and Schultze are conclusive as to the nature of the disease. As a further support for the same view, those observations might possibly be quoted which have been made by Pers at operations for sciatica (viz., neurolysis), to the effect that in at least half the number of cases the nerve has been abnormally red; this might possibly be regarded as a support for the assumption of an inflammation, most likely a perineuritis.

Thus, on the one hand, I must fully agree with the opinion nowadays held by many, that marked symptoms of sciatica can not be explained as neuralgia, but must be attributed to a real anatomical inflammation. On the other hand, I must especially call attention to a large group of cases of sciatica, the special position of which has hitherto remained quite unnoticed in the literature. They show, as regards the symptomatology, an essential difference from the usual forms of sciatica, and their theoretical interpretation is, at least, more uncertain than that of the usual forms of sciatica.

For a long time I have had an opportunity of observing that cases exist which subjectively give the characteristic picture of sciatica: pain along the course of the nerve right down to the leg or foot, increased pain on moving the leg and more or less marked limping gait, but in which painful spots are to be found along the course of the sciatic nerve or its branches lower down in the leg, or over the point of emergence of the

nerve. What is regularly found in these cases—as also in the majority of other cases of sciatica, according to my experience—is tenderness of the muscles above and in front gluteus maximus, *i.e.* in the region of the gluteus medius. This painful point is, as far as my experience goes, not situated so near the iliac crest as Valleix makes his "point iliaque," but lower down towards the border of the gluteus maximus, corresponding to about the thickest part of the gluteus medius. Its position is consequently not far from the highest part of the border of the sciatic notch, and might be situated about midway between the "point iliaque" and the "point fessier" of Valleix. It is not unusual to find in these cases, as also in ordinary cases of sciatica with painful spots along the nerve, an abnormal resistance when palpating this region. In these cases of sciatica without painful spots along the nerve the symptom of Lasègue is also decidedly present, but not to any higher degree.

The occurrence of these cases characterised by a group of symptoms otherwise corresponding to those found in sciatica, but with tenderness on pressure only over the gluteus medius, not over any point of the nerve, has for a long time attracted attention, and I have observed such cases for the last fifteen years, but have not previously published anything on the subject. According to my experience, these cases naturally constitute a minority, but by no means a very small percentage of all cases of sciatica. The occurrence of such cases has remained generally unnoticed in the literature. It is, however, remarked by Eichhorst and by Erben (and in the older literature by Trousseau, quoting Homolle), that there are cases of sciatica in which there are no points of tenderness on pressure on the nerve. They have not mentioned the constant presence, which I have here emphasised, of tenderness to pressure in the region of the gluteus medius. Feddersen has observed that in rheumatic sciatica the symptoms of myositis may appear first, the ordinary symptoms of sciatica following later, but he has not noted the occurrence of cases with the general picture of sciatica, but without the points on the nerve trunk of tenderness on pressure. In the text-books, it is true, the relation between sciatica and myositis is discussed, but in a sense entirely different from that mentioned by me.

On the one hand, the importance of a differential diagnosis between sciatica and myositis is pointed out, and as a distinguish-

ing character between them it is generally noted that in myositis the tenderness and pain extend more diffusely over the leg than in sciatica (Moritz, Hallion, Eichhorst, Bernhardt). Cases of myositis affecting other parts of the lower extremities and giving rise to pain of other localisation than in sciatica do certainly exist; but it is at once apparent that these represent a complex of symptoms of quite another type than that to which I have directed attention, viz., the common picture of sciatica with the usual localisation of the pain, but with absence of tenderness to pressure over the nerve and presence of tenderness to pressure over a certain area of the gluteal muscles.

On the other hand, it is generally admitted that sciatica may be connected with a myositis, a lumbago being the primary affection, the inflammation spreading from this by contiguity (along the fascia, Eulenburg) until it reaches the great sciatic nerve (Eulenburg, Herter). These authors consequently assume that a myositis may give rise to a sciatica.

With regard to the type of sciatica under discussion the question is somewhat different. Here we are dealing with cases where a myositis of the gluteus medius seems to be proved (at any rate a circumscribed tenderness to pressure has been established, associated in many cases at least with an abnormal resistance of the muscles at the same place), but where that important symptom of sciatica-tenderness to pressure over the nerve is absent. With regard to our conception of these cases the question is first of all this : whether we are dealing with myositis alone or with a neuritis as well. Supposing we have to deal only with a myositis, then the apparent symptoms of sciatica must be explained through pressure on the nerve trunk by the inflamed muscles. In such cases the most evident suggestion is that this pressure would be exerted at the point where the nerve passes through the great sciatic notch, a myositis of the pyriformis muscle being the most likely explanation. The presence of a myositis of this muscle is difficult to establish with any degree of certainty on account of its protected position. Thus we have to content ourselves with the probable conclusion that an inflammation of the gluteus medius would often likely be connected with an inflammation of the adjoining pyriformis muscle, thus giving rise to pressure on the sciatic nerve.

On the other hand, it seems not permissible to neglect the possibility of the symptoms being attributable to a neuritis. I

have mentioned above that in these cases a palpable resistance, as a rule, is found at the site of the tender portion of the gluteus medius. With regard to the immediate cause of this resistance it must be admitted that the first thing suggested is a myositis, an inflammatory process of the muscle. Granting this, the most plausible explanation, another possibility has, however, to be taken into consideration, viz., that the resistance on palpation might be due to a localised muscular defence on account of a circumscribed tenderness to pressure; this, again, might be due either to an inflammation of the nerve twigs supplying the muscle or possibly to an inflammation of the muscle itself (though not directly palpable). The site of the palpable resistance and tenderness corresponds fairly well to the superior gluteal nerve as it passes through the great sciatic notch.

Thus the assumption of a neuritis as the most probable cause of the tenderness is not excluded. Whether we are dealing with a myositis or with a neuritis of the superior gluteal nerve, it is evident that we must take into account the possibility of the inflammation having extended as far as the sciatic nerve, probably thus causing, in the first instance, a perineuritis. The fact that in these cases the nerve trunk has not been found to be tender to pressure would thus be explained by the perineuritis or neuritis not having extended along the nerve trunk, and by its being, especially where the muscles are well developed, somewhat inaccessible to palpation just at the margin of the great sciatic notch. This view implies that the nerve trunk is tender to pressure in as far only as it is the site of a perineuritis or a neuritis. This would seem to be very likely, if the view here put forth is correct, viz., that sciatica as a rule is due to a real inflammation of the nerve or its surroundings.

There are thus two possible explanations of the type of sciatica which I have described: (1) that the symptoms may be due to a myositis followed by compression of the nerve, or (2) that the inflammation may have extended to the trunk of the great sciatic nerve or its immediate neighbourhood, the strict limitation of the inflammation to that part of the nerve which lies exactly at the margin of the great sciatic notch having made it impossible for us to demonstrate the tenderness to pressure over the nerve-trunk. I do not think that we can at present decide which of these possibilities is the correct one. It may be that each holds good in different cases. I may add that rectal

examination has not revealed any tenderness to pressure, although I have not examined every case with regard to this point, my observations having extended over many years.

If we accept the view that the type of sciatica here described is due to a localised perineuritis inaccessible to palpation and caused by a myositis of the surrounding muscles, that would correspond fairly well with the mode of origin assumed by Eulenburg and Herter in some cases of sciatica, viz., the inflammation from a lumbago extending by contiguity to the nerve. It seems more probable that the inflammation extends to the sciatic nerve from the surrounding muscles than from the long muscles of the back. As to the presence of lumbago in such cases, I have not infrequently observed this complication, but I have not arrived at any conclusion as to its relatively greater frequency in this type of sciatica than in the common form with painful points along the nerve.

I have already remarked that the occurrence of cases of sciatica of this type has hardly been noticed in the literature. There are, however, a few exceptions. Taking in the first instance the classical work of Valleix, I am doubtful whether he has observed similar cases or not. He emphasises the fact that what he calls "le point sacro-iliaque or posterieur," situated immediately external to the sacro-iliac articulation, is the painful spot found most constantly in sciatica, so much so that painful points on the sciatic nerve itself may be absent, the former only being present. This points to an experience similar to my own (although I would localise the area of constant tenderness to pressure further forwards and outwards than Valleix). Closer study of Valleix' descriptions, however, shows that what he calls painful points are not merely points at which tenderness to pressure is felt, but are also points where spontaneous pains are most acutely manifested (a fact which seems to have escaped later writers who quote his work). On the other hand, he admits that these two phenomena, spontaneous pains and tenderness to pressure, do not necessarily coincide in their localisation, although they do so as a rule. As to the cases with painful points along the sciatic nerve, I cannot find in Valleix precise information whether pain was present along the course of the nerve; consequently I cannot arrive at any definite conclusion as to whether his cases are really to be regarded as sciatica in the present sense of the word, or simply as affections localised

in the hip, that is to say, the spontaneous pains being confined to that region.

Schreiber has expressed the opinion that a certain number of cases described as sciatica, especially as chronic sciatica, are really not sciatica, but are due to rheumatic processes in the muscles, tendons, fasciæ or ligaments in the hip-joint. He does not particularly mention morbus coxæ senilis, nor does he give information such as would permit of a definite conclusion as to the nature of his cases. In the "Text-Book on Massage and Medical Gymnastics" (1906), edited by Kleen, with the co-operation of other Swedish specialists, greater attention has been paid to this question. Kleen says: "As a matter of fact, we might equally well have dealt with sciatica in the chapter on affections of the muscles, the disease in a very great number of cases being of muscular origin, due to myositis in the neighbourhood of the nerve, especially of the gluteus max. and med." He does not, however, give further details. Dr Arvedson of Stockholm, a well-known and experienced specialist on medical gymnastics and massage, and director of an institute for training gymnastic teachers, has personally told me that he has for a number of years repeatedly observed cases of sciatica corresponding to the type I have described, with painful points, not along the nerve, but only over the gluteal muscles. I refer to his experience by his kind permission. As far as I can see, it is not by chance merely that this fact has been noted by Swedish medical men, for there is no doubt that we more frequently personally carry out such manual treatment as massage (evidently the best opportunity for close study of the question) than do the members of the medical profession of other countries.

I now pass on to the *treatment of sciatica*, and shall later return to the question of the course and the so-called chronic cases of the disease.

In a case of acute sciatica, unless it is very slight, *uninterrupted rest in bed* for a time seems to me to be unquestionably indicated. If the case is more severe in nature, the confinement to bed ought to be very strictly enforced (the bed-pan should be used, for instance). This should be continued until essential improvement is obtained. It is not possible to state definitely the length of time to be spent in bed, but I believe, as a rule, two weeks' rest at least is advisable, the time naturally

varying according to the nature and course of each case. The great majority of authors seem to agree as to the enforcement of rest in bed when dealing with the first stage of an acute sciatica. Some English and American writers (Gowers, Clarke. Harburn, Herter) recommend, in accordance with the suggestion of Weir-Mitchell and Hammond, complete immobilisation of the affected limb by means of a long splint. I have never found any necessity for this.

As to the *treatment by drugs*, the majority of text-books recommend the use of salicylates, but without, as a rule, laying any special stress on these, mentioning them sometimes along with many other drugs (Oppenheim). For my own part I have for long taken a different position on this point, *having treated all cases, without exception, with salicylates.* Of recent years I have regularly used acetylosalicylic acid, in considerable doses, commencing as a rule with 6 grams a day. Even if the effect of the aspirin treatment is undoubtedly greater and more rapid in acute rheumatic fever than in sciatica, I am convinced from experience that the consistent treatment of sciatica with large doses of aspirin, in combination with confinement to bed, exercises a considerable influence on the progress of the disease. Feddersen and Schultze have recently expressed similar opinions, as well as v. Noorden and Treunel at the Congress at Wiesbaden in 1907.

During the last few years I have also frequently employed the external applications of salicylates (such as mesotan, unguentum salenæ, salite, spirosal), and I believe not without good effect. Treatment with drugs other than salicylates seems unnecessary in acute sciatica. In my experience, the use of narcotics of any kind may almost always be entirely omitted, when vigorous aspirin-treatment is employed along with confinement to bed. I need not dwell on the advantage of dispensing with narcotics in dealing with a disease, the duration of which is so uncertain as sciatica.

As to the *physical treatment* of sciatica, massage is, in my opinion, the most important method. There is greater diversity of opinion on this point than on any other detail of treatment. Some writers are strongly against the use of massage in acute and subacute sciatica, allowing it only in chronic cases (Christiansen, Eulenburg). Others, again, admit that it may be used at an earlier stage (Oppenheim, Edinger, Levison). According to my own experience, massage may be employed with the greatest

benefit in subacute as well as acute sciatica. It must, however, be admitted that in the most severe cases of acute sciatica it seems advisable to wait for a time before commencing massage, using in the meantime rest in bed and aspirin. I do not believe it necessary, however, to prolong this expectation period beyond a week. Without doubt, in giving such wide indications for massage treatment, we make comparatively great demands upon the judgment and technical skill of the person who carries it out. Unsuitable treatment, especially if too vigorous, may undoubtedly aggravate the symptoms during the acute phase of an attack. For my own part, however, I can remember no case in which massage has increased the severity of the symptoms. I have had several opportunities of observing acute and severe cases in which massage, used at an early stage and along with rest in bed and salicylates, has induced a rapid recovery.

As far as I know, the indications for the use of massage in sciatica given in Sweden generally are similar to those here laid down. It is not unlikely that in our country, where those who practise massage and medical gymnastics are thoroughly trained (a two-years' course, including the study of the anatomy and physiology of the body), the number of those well acquainted with massage treatment is greater than in many other countries, though no doubt there are many places abroad situated as well as we are in this respect.

Massage of the nerve-trunk may also be combined with vibrations over it, either given manually or by means of one of the many apparatus in use. Personally I have no great experience of this method, but I have seen good results from it, and everything seems to point to its usefulness.

Observation of the type of sciatica here described is of interest as regards the treatment of this affection. This specially applies to massage treatment, for in these cases which have no tenderness to pressure over the nerve, but only over the gluteal muscles—over the gluteus medius as a rule—I have found by experience that massage is necessary only over the tender area. The nerve-trunk itself may be left untreated. In this way a result is obtained quite as satisfactory as that which follows in sciatica with painful spots along the nerve from treating the nerve-trunk itself with massage.

There is yet another method which I believe to be very useful, viz., *nerve-stretching*. I refer to the so-called bloodless

stretching, having no experience of stretching performed by operation. With this restriction the method is frequently recommended in text-books. Different writers seem, however, to have different methods of procedure in mind. Some (Eulenburg, Eichhorst, Dollinger, Büeler—the last two quoted after Naegeli) state that nerve stretching is carried out by flexing the hip-joint as forcibly as possible, the knee being kept straight. This means, if I understand rightly, that this severe operation is to be performed once only, or, at any rate, only at long intervals. Edinger, on the other hand, recommends daily and successive stretchings by means of gradually increased flexion of the hip-joint (the knee being kept straight). Strümpell seems to hold a position midway between these two methods. He uses daily, but comparatively forcible stretchings, as far as I can make out. He would, however, reserve this method for the later stages of the disease. Goldscheider also recommends that the stretching be carried to such an extent as to cause severe pain. Sommer holds a similar view.

For my own part I have experience of nerve-stretching only as a method of treatment carried out very cautiously, and repeated frequently, sometimes daily. This corresponds most nearly to the method introduced by Schreiber, and recommended by Edinger. So far as I can understand, Edinger advocates that the operation be done while the patient is in the standing position. Goldscheider has constructed a special chair for the purpose, but this seems quite unnecessary. The best and simplest method is to place patient on his back, then raise the leg with the knee straight until a very moderate degree of pain is felt along the sciatic nerve. When this is repeated daily, it usually very soon becomes evident that the foot can be raised gradually higher and higher, *i.e.* an increasing degree of stretching is possible without giving rise to severe pain. If this treatment be carried out with sufficient care, without trying to force the stretching of the nerve, it may, in my experience, be early commenced as part of the treatment, even while the symptoms are somewhat severe. When dealing with the *most* severe cases, however, it seems wiser not to begin the stretching at once. Should pain or any other sign of exacerbation of the symptoms appear during this treatment, which I believe is more likely to happen than when massage only is used, it seems

advisable to defer the nerve-stretching for a time. But nerve-stretching, when carried out as described here, is, in my opinion, a very effective mode of treatment, even in the acute stage of sciatica.

A Danish surgeon, Pers, a short time ago reported a series of cases of sciatica in which he performed neurolysis with good results. He assumes that pathological adhesions of the nerve-trunk are loosened at the operation, a supposition which he has not tried to confirm by control operations on healthy animals, or by post-mortem investigations on human bodies where sciatica has not been present. Should his assumption be found to be correct, it would imply that adhesions are frequent in sciatica, and would not exclude the possibility of gradually loosening, if not actually breaking, such adhesions by means of gradually increased nerve-stretching as described above.

I may point out in passing that I consider this method of nerve-stretching not merely as a therapeutic measure, but as the best way of examining a patient for Lasègue's symptom. It also affords a convenient indication, which may be easily registered, of the degree in which this symptom is present. Some writers recommend another method of testing for this symptom, the patient being in a sitting posture, but it does not seem to present the same advantages. Oppenheim recommends the test as here described, or with the patient in the standing position.

In this connection I would draw attention to the relation between the symptoms of Lasègue and Kernig. Some writers, Bechterew for instance, have lately pointed out the frequent presence of Kernig's sign in sciatica. I must give it as my decided opinion that *Lasègue's symptom in sciatica and Kernig's symptom in meningitis are one and the same phenomenon,* the symptom having received a different name in each of the two affections in which it occurs. The most common method of demonstrating Kernig's sign in meningitis (*i.e.* incapability of simultaneous flexion of the hip-joint and of extension of the knee-joint) is to place the patient in the sitting posture while he tries to extend the knee-joint. It may be equally well applied, however, by the patient trying to raise his leg with the knee straight, while he lies on his back. This is advocated by Kernig himself in his exhaustive work lately published on the occurrence of this symptom in meningitis. He indicates this as the simplest

method of establishing the presence of his symptom. It is identical with the method advocated by myself, Oppenheim, and others, of testing for the symptom of Lasègue.

There seems to be no real reason for giving to the same phenomenon two different names according as it appears in either of the two affections, and this practice tends to confusion. As the most practical means of avoiding future confusion, I would propose that *the symptom be called the Lasègue-Kernig symptom.*

It is not difficult to explain why the same phenomenon should be found in these two different diseases. In the one case we have an inflammation of the nerve-trunk (perhaps sometimes also of the extra-dural portions of the roots); in the other we have an inflammation which has affected, among other parts, the intra-dural portions of the roots of the sciatic nerve. When testing for the Lasègue-Kernig symptom, stretching of both these portions—the nerve-trunk as well as the nerve roots in their whole length—takes place, pain being elicited in both cases in spite of the different localisation of the inflammation, and of its more or less different nature.

The process of nerve-stretching (for therapeutic purposes) here described has been recommended by Wide and by Kleen, and is said by the former to emanate from Ling, the founder of Swedish gymnastics. There is every reason to assume that cautious and gradually increased nerve-stretching as here described now forms a very general method of treating sciatica in Sweden.

That nerve-stretching performed more recklessly may also give good results cannot be denied, this being recommended by such well-known writers. But it may be fraught with danger, and I do not believe it gives better results than the more gentle and gradually increased method of stretching. The grave danger which may accompany careless stretching of the nerve is very strikingly illustrated by the following observation :—

Case I.—A. F. N., formerly a farmer, aged 56, from the Out-Patient Department, University Hospital, Upsala. Had previously been quite well. In 1892 had attack of sciatica on right side. After eight days' illness consulted a doctor, who, without an anæsthetic, performed a forcible (bloodless) stretching of the sciatic nerve (patient being on his back, the leg being raised with the knee straight). At that moment the patient was "paralysed" in his right leg, in which

anæsthesia also appeared. The pain due to the sciatica, however, passed off at once. As far as one can judge from his description, a general paresis of all the muscles of the extremity developed. He could walk with the aid of a stick, but with considerable difficulty. This condition lasted for about half a year. Later the gait improved somewhat, as did also the sensibility, but the symptoms never entirely disappeared.

In 1893 symptoms of hyperæsthesia of the toes of the right foot were noticed, and on the external border of the foot a spontaneous ulcer appeared, which showed no tendency to heal. From this time on patient has suffered from pain in the foot. There has, however, been no return of the sciatica. In 1895 patient, on account of his illness, gave up farm-work and removed to Upsala. In January 1896 the fifth toe of the right foot was amputated by a surgeon, who, according to patient, considered the ulcer to be due to a suppurative inflammation of the metatarsal-phalangeal joint. But the ulcer took several months to heal and very soon opened up again. Patient states that during those years several doctors on different occasions made incisions into the soft parts surrounding the ulcer. No fragments of bone were found in the ulcer.

During September 1897 patient was for two weeks an in-patient at our Surgical Clinique (Professor Lennander) on account of the ulcer. It was then ascertained that the whole of the right leg, especially the part below the knee, was thinner than the left. Over the posterior aspect of the thigh and the posterior and external surface of the leg the sense of pain and of touch was diminished, the sense of pain absent. The urine contained from 1·6 to 0·4 per cent. of sugar.

During September and October 1900 patient was treated in the Medical Clinique for a right-sided pleurisy. During convalescence he had thrombosis of the right leg. During this time the urine contained at times a small quantity of sugar, which disappeared when the carbohydrates were reduced. Patient informs me that the ulcer on the right foot healed while he was in bed at this time.

The condition has since remained almost unaltered. The ulcer on the foot has at times been healed, at other times open. Patient is of opinion that the right leg has in the course of years become somewhat stronger. He has suffered from pain always confined to the right foot. He believes that the pain has been more intense when the ulcer was healed than at other times.

Patient was examined by myself on December 6, 1897, and was observed on several occasions in the Out-Patient Department of the University by my colleague, Dr Bergmark, who has been kind enough to let me have the details.

Examination, December 6, 1907.—No signs of any brain disease; no marked functional nervous symptoms. Sleep is fairly good when not disturbed by pain in the foot. The urine is at times free from sugar, at others contains a quantity less than 1 per cent. Patient, as a rule, keeps to no special diet, and has refused dietetic treatment for his diabetes.

The arms are not affected, the muscles of the hypothenar being normally developed on both sides. There is no paresis of the interosseous muscles of the hands. No disturbance of sensibility to pain in hands or fingers.

Sensibility of the left leg is quite normal in every respect. No disturbance of functions of bladder or rectum.

Right Leg: Movements and Reflexes.—Circumference of the right thigh and leg is somewhat less than on left side. Consistency of muscles of right leg is good. Power of flexion of right knee-joint somewhat reduced, extension very slightly reduced. Dorsal flexion of right ankle-joint possibly shows very slight degree of weakness. Plantar-flexion does not show definite alteration in power.

Gait is fairly good. Patient limps slightly on right leg. He cannot, however, stand on the right leg alone, even with the eyes open. He can stand on the left leg alone with his eyes closed.

The patellar reflex is present on the right side, but is diminished. The Achilles-tendon reflex is absent on the right side, but present on the left. Plantar reflex is normal on both sides.

Sense of Passive Position and Movement.—Passive movements of the right ankle-joint, even though slight, are correctly interpreted. Movements of the great toe are not recognised until they exceed 30°, movements of the other toes only when they are maximal.

Sensibility to Pain is diminished on all the posterior aspect of the right lower extremity and on the external as well as the internal surface of the leg, painful impressions being correctly perceived only over a narrow portion of the skin of the anterior surface of the leg. Sensibility to pain has been tested both with a needle (January 1908) and with the algesimeter of Alrutz (August 1908, Dr Bergmark). This examination, carried out partly with a weight of 2, and partly with one of 6 grams, reveals the presence of a hypalgesia over the whole of the posterior surface of the thigh and leg, as well as over the anterior surface of the leg (with the exception only of a narrow strip along the anterior border of the tibia). Over the perineum, penis and scrotum pricks are felt with precision and equally on both sides, the weight used being 2 grams.

Sensibility to Heat and Cold (Examination in October 1908 by Dr Bergmark).—Over the whole posterior aspect of the right lower extremity, and over the external surface of the right leg, as well as over the whole of the right foot with the exception only of the internal border, temperatures of 25° and 27° C. are not differentiated. Over the same areas a temperature of 45° C. is not appreciated as warm. Over the greater part of this thermohypæsthetic area temperatures even of 90° C. and 17° C. are not distinguished from each other. On the posterior part of the leg, however, this thermoanæsthesia does not reach the internal border. The appreciation of cold is somewhat better retained, the area over which 0° C is not appreciated as cold forming a comparatively narrow strip along the posterior aspect of the thigh. The patient states that he does not feel anything when the right foot is burned. On the right side

of the scrotum a slight degree of uncertainty possibly exists with regard to the differentiation between 25° C. and 27° C.; on the left no such uncertainty exists.

Sensibility to Touch (tested with cotton wool; examination in May 1908, by Dr Bergmark) is disturbed on the posterior surface of the right lower extremity, the external part of the right leg and the whole of the right foot, very light touches not being appreciated. The area of anæsthesia to touch on the posterior part of the lower extremity is narrower than the area of slight degrees of hypalgesia and thermohypæsthesia. Over the perineum, penis and scrotum the slightest touch is correctly appreciated. Over some small areas of the posterior surface of the right lower extremity even firmer touches with the finger are not appreciated.

The ulcer on the foot still exists. It is quite circular, with sharply-cut borders and a diameter of 4 by 5 mm. It is situated on the external border of the foot, 2 to 3 cm. behind the (exarticulated) metatarso-phalangeal joint.

The condition which the patient now presents corresponds well to that of a syringomyelia, although the limitation of the symptoms to one side is uncommon. Otherwise they are very similar to those characteristic of a localised syringomyelia (viz., an anæsthesia of cutaneous sensibility of segmental type (affecting the 1st and 2nd sacral segments, the 5th lumbar segment, and partly the 4th lumbar segment), the typical dissociation of the anæsthesia, less markedly developed in so far that the area of impaired sensibility to touch is only slightly smaller than that of hypalgesia and thermohypæsthesia, trophic changes on the right foot (spontaneous ulcer of many years' standing and only temporarily healed), tendon reflexes absent or diminished, atrophy of muscles, with a slight degree of paresis.

We can, however, definitely exclude syringomyelia. Although this affection not infrequently runs a very chronic course, even extending over several decades, it is nevertheless a progressive disease. Before diagnosing a syringomyelia, we must have ascertained that the history of the illness shows progression of the symptoms. Exceptions to this rule can only be afforded by cases in the first stage of the disease, and there can be no question of this here, in view of the fifteen years' duration. The course of the illness in this case is quite the reverse; the symptoms began quite suddenly, and subsequently, during the first years at least, they slowly improved, and then remained stationary as a whole. This course in the first

place suggests a hæmatomyelia, which has healed under some form of cicatrization or cystic degeneration. It is a well-known fact that hæmatomyelia selects precisely the same parts of the section of the spinal cord as does syringomyelia, *i.e.* mainly the grey matter, especially the posterior cornua and the central grey matter. This fully explains the great correspondence in the symptomatology of the two diseases. The difference in their clinical aspect becomes evident during their course. In syringomyelia the symptoms are progressive, though slowly so; in hæmatomyelia there is an acute onset, and a partial regression of the symptoms during the first stage of the disease, the symptoms subsequently remaining stationary. It is evident that the course of this case corresponds entirely to that of a hæmatomyelia.

There is only one other possible diagnosis—that of a traumatic destruction of the roots which form the sciatic nerve. As already mentioned, the anæsthesia showed no marked degree of dissociation, a fact which might possibly be brought forward as a reason against the assumption of a destruction of the grey matter as the cause of the symptoms and for the assumption of a destruction of the roots themselves. It should be noted, however, that the sense of passive movements of the right leg was also severely impaired, a fact which, assuming the existence of a hæmatomyelia, would point to a lesion of the right posterior column also. In this case the analgesia and the thermoanæsthesia would be caused by destruction of the right posterior horn.

To understand the symptoms in this case, I must again refer to the view which I brought forward some years ago after considering all the clinical and pathological literature as regards the paths of cutaneous sensibility, viz., that tactile impressions are conveyed by two different paths, one passing along with the paths for sensibility to heat and cold in the lateral column, the other passing in the posterior column of the same side in conjunction with the sense of passive movements. Thus we must always expect that as soon as sensibility to pain and temperature as well as to passive movements is impaired, the tactile sense will also be affected. Therefore the sensory disturbances in this case can be easily explained if we assume a traumatic hæmatomyelia as the cause of the symptoms. Lesion of the posterior columns in connection with a traumatic hæmatomyelia occurring without

injury to the spine is also known to occur. I need only cite a case lately observed by Winkler and Jochmann.

When, on the other hand, we consider the possibility of tracing the symptoms to a traumatic affection of the roots, we are met with the great difficulty that we have absolutely no positive knowledge of the sensory impairments which were probably present. This is so, at least, with regard to a point of special interest, viz., to what degree the different forms of cutaneous sensibility show an overlapping between the different nerve roots. The well-known investigations by Head and Sherren on "protopathic and epicritic sensibility" go, on the whole, to prove that the overlapping—as far as the peripheral nerves of the extremities are concerned—is more marked as regards sensibility to touch than as regards sensibility to pain. On the other hand, Bergmark and myself have shown by an investigation into the sensory disturbances in herpes zoster that an overlapping—as far as the thoracic spinal ganglia are concerned, which evidently must correspond to the overlapping of the respective roots—exists only to a small extent as regards sensibility to pain, but is present to a considerable degree as regards sensibility to touch. As to the anæsthesia of the extremities following lesion of the roots, Head and Sherren have examined two cases (in which Horsley had cut some roots of the brachial plexus on account of pain), and have been able to demonstrate that the impairment of sensibility to pain was more extensive than that of sensibility to touch. This would go to prove a different arrangement and distribution of the sensory paths in the peripheral nerves on the one hand, and in the roots on the other, but at the same time to show a correspondence between the thoracic nerves (examined by Bergmark and myself) and the roots of the brachial plexus as regards the overlapping of the different forms of cutaneous sensibility.

Observations of a similar kind have been made with regard to the roots of the lower extremities. Müller, for instance, has in a case of fracture of the sacrum with lesion of some sacral roots (Case IV.) found hypæsthesia involving all the cutaneous sensations in the same degree. On the other hand, a number of cases have been observed in which lesion of some of the nerve-roots of the lower extremities has given rise to an anæsthesia which has this constant characteristic, that the analgesia and

the thermoanæsthesia, while occupying the same area, both extend somewhat further than do the impairment of sensibility to touch. The following cases are known to me:—One of lesion of the roots following dislocation of the 5th lumbar vertebra (Kahler, quoted from Thorburn); one of spontaneous affection of the cauda of uncertain nature; one of fracture of the 5th lumbar vertebra with damage to the roots (Gierlich); and lastly, one of traumatic injury to the 1st lumbar vertebra with unilateral affection of the roots (Stertz).

The conclusion which we may draw from these four cases coincides with the result of the investigations by Head and Sherren, and by Bergmark and myself, viz., that the overlapping between the different roots is less extensive as regards sensibility to pain and to temperature than as regards sensibility to touch, a fact which should thus apply to all the spinal roots (the 1-4 cervical nerves not having been taken into consideration). I have not studied the question of the absolute extent of overlapping shown by different roots, having restricted myself to that of the relative degree of overlapping shown by the various forms of cutaneous sensibility.

If we go back to the observations made in our case, we find that the extent of anæsthesia shown by the different forms of cutaneous sensibility can, so far as our present knowledge goes, be brought into accordance with the assumption of a traumatic lesion of the roots being the cause of the disease.

Supposing that we are dealing here with a traumatic lesion of the roots, we must assume that the injury to the anterior roots has not been severe, as the paralysis was evidently incomplete, and the motor function was almost entirely recovered in course of time. But with regard to the posterior roots, we must conclude that they have been entirely torn, for we cannot otherwise explain the extensive residuary sensory disturbances. When such a tearing of the roots takes place, however, we must assume a simultaneous hæmorrhage into the membranes of the cord. But in the history of the case there is no mention of the pain which we would expect as the probable result of such a hæmatorachis. It may be possible that this is to be explained by a *complete* tearing of the roots. At first sight it seems remarkable that no regeneration of the posterior roots occurred during so long a period of time, but

should the roots have been completely torn, there is no difficulty in understanding the absence of regeneration.

There seems to be no definite reason against the assumption of a traumatic lesion of the roots being the cause of the symptoms in this case. Consequently, it must be left an open question whether bloodless stretching of the sciatic nerve, performed without an anæsthetic, may actually give rise to complete tearing of the roots. I know of no other observation which shows such a possibility.

It may be admitted, however, that the occurrence of a hæmatomyelia after bloodless nerve-stretching is not quite easy to understand, even though we bear in mind that the grey matter is much more fragile than the roots. I can quote a case by Rumpf in which, "bloodless and moderate," stretching of the sciatic nerve in tabes was followed by a hæmorrhage into the membranes of the cord, confirmed by anatomical examination. Pribram also (quoted by Lépine, jun.) has observed "a hæmorrhage into the cord" after forced stretching of both legs on account of a contracture (death from collapse). Taking all the circumstances into account, I am inclined to conclude that a hæmatomyelia is the most likely diagnosis, but, on the other hand, we cannot exclude the possibility of a traumatic lesion of the roots directly due to the stretching. Whichever of these diagnoses we may accept, the case at least forms a good illustration of the dangers attending an "excessive" stretching.

Amongst the physical methods of treatment, I have still to discuss the various *methods of applying heat.* In the first place, the application of poultices and hot fomentations over the gluteal region, and eventually over the nerve lower down the leg, should be mentioned. This is indicated during the acute stage and in severe cases. Personally I have experience of the latter of these methods only, but treatment with hot poultices may have exactly the same effect (Gowers, Edinger, Herter).

Of still greater value, however, is the use of hot baths. Their importance is so universally admitted that I need not dwell on this point. On the whole, the various kinds of hot air or steam baths (so-called Russian steam baths, steam or hot-air cabinets) are, in my opinion, preferable to hot-water baths. I should like to point out that the latter should not be

combined with brushing when the symptoms are acute and severe. Further, the various forms of local application of hot dry air, according to the methods of Tallerman and others, are no doubt useful. When the electric current is at hand, this may be very conveniently arranged in the following way:—A cradle having been placed under the bed-clothes, several ordinary electric lamps are fastened to this, and a few extra blankets are put on. In this way a temperature of 80° C. is easily obtained, sometimes increased to 100° C. These electric light baths are very easily arranged, and have lately been used with advantage in various diseases besides sciatica.

It is perhaps advisable to postpone treatment with baths until after the first treatment (the first week or so). I do not, however, hesitate to use baths early provided that the patient can be kept in bed and can have his baths—unless in summer—in the same building, in a hospital, bathing establishment, or sanatorium equipped for the winter season.

Massage baths, which are much in use in Sweden, and are a speciality of our country, deserve special mention. The mud-bath has the most powerful action. Massage is here given over the whole body, in a rather well-heated room, as a rule by two shampooers. For the shampooing "bath-mud" is used. This consists to a great extent of deposits of very small animal skeletons, very rich in silicates. On account of these ingredients the mud irritates the skin somewhat powerfully. After the mud-shampooing a warm douch is given, followed immediately by a warm bath. This kind of bath, which has been for a long time in use at several watering-places in Sweden, is of very great service in chronic rheumatic affections of different kinds. With regard to the more acute cases of sciatica, however, I am very averse to the use of these baths, and would warn my readers against them, as they are, in my opinion, too irritating. In sciatica not in the acute stage, and showing no very severe symptoms, they may, on the other hand, be of great service.

In Sweden another kind of massage bath is frequently used, viz., the "soap-massage" bath. The shampooing is here done with soap all over the body. Otherwise the bath is given in exactly the same manner as the mud-bath. The soap-bath is much less irritating than the mud-bath. Shampooing with soap may also be performed while the patient is in a warm or tepid

bath, which makes it still less irritating. Yet I believe the same warning to hold good here also, viz., that it should not be used in acute or severe cases, more especially as massage in these baths is given by persons who obviously cannot have the same training in giving massage as professionals, and can still less have the same medical education.

As regards treatment with electricity, I have been in the habit of using it only in cases which have shown a tendency to become chronic, and here the faradic current seems to be advantageous. When electrical treatment is to be employed in the acute stage of sciatica, experience has shown that the galvanic current should be chosen. For my own part, I have no experience of electrical treatment during the acute stage, and I believe it is the general view of my Swedish colleagues that at this stage massage, especially when combined with careful, gradual nerve-stretching, is decidedly a more effective method of treatment than electricity.

Personally I have no experience of the methods of injection and infiltration of which many modifications have been in use during the last few years, nor of the numerous counter-irritants which were formerly much employed. The reason is simply that the other methods of treatment already described have proved efficacious, and that consequently I have found no need of trying other methods. I do not, however, thus imply any doubt as to their efficacy, although I cannot but think that the injection of chemical solutions into the nerve-trunk or its vicinity is not a very attractive method, especially as experience has proved that the disease may always, or very nearly so, be cured by suitable treatment without the aid of such severe methods. *A priori*, one could hardly expect injections to be entirely without danger. Without entering into details, I may remark that the results so far do not entirely negative this supposition (Oppenheim, Brissaud). These remarks, however, apply in a much less degree to Lange's method of injecting large quantities of a weak Eucain solution (1 per thousand). That there can be no question here of the chemical action of the solution of Eucain is obvious, since several writers, after Lange's communication, obtained the same result by injecting in the same way physiological $NaCl_2$ solution instead of a Eucain solution (Umber and Wolff). Good results have also been obtained from injections of

air (Gubb) or oxygen (Massalongo and Danio). Similar methods of treatment were in use long before Lange's communication drew greater attention to them. Grasset, for instance, mentioned in 1894 that he had for a long time treated neuralgias with injections of simple water.

With regard to the mode of action of injections of indifferent substances, such as air, oxygen, $NaCl_2$ solution, water (and to this category Lange's Eucain solution probably belongs), I cannot but think that their action on the nerve trunk is most likely similar to a certain degree to the action determined by nerve-stretching. In both methods we apparently have a kind of neurolysis, or at least a breaking down of adhesions due to a perineuritis.

As to the various kinds of counter-irritants, their marked influence on the course of the disease leaves no room for doubt. Nor can the above-mentioned apprehension be justly advanced against this method, as against the method of injections. When comparing counter-irritants with massage, combined with cautious and gradual nerve-stretching—a method which has now most probably replaced the former methods—I cannot but think that massage and nerve-stretching are the more rational forms of treatment. They aim directly and intentionally at the anatomo-pathological foundation of the disease (which is, I presume, a perineuritis or a neuritis). In any case the explanation of the action of counter-irritants remains completely obscure. Although I have no personal experience of them, I can hardly be wrong in assuming that their action is very variable in different cases, and cannot be estimated with any certainty. To use them seems to me like taking a step in the dark. I readily admit that this is no decisive argument against the use of these methods, had we no others more certain in their action. But it seems to me that massage and nerve-stretching, used in combination with rest in bed, salicylates and suitable baths, as described above, constitute a more reliable method of treatment.

As to the *course of sciatica*, it is surprising to find, when comparing the descriptions in certain text-books, how fundamentally the prognosis differs. Bernhardt takes an especially pessimistic view: "Without doubt recovery is attained in not a small number of cases of sciatica, but in a still greater number improvement or defective recovery only are obtained, a certain amount of stiffness and a tendency to the recurrence of

pain (*Schmerzhaftigkeit*) in the leg being observed, especially after exertion. If the disease be the consequence of inflammation of the nerve, a real paralysis, or at least a paresis of certain muscles, may remain."

Eichhorst also takes a pessimistic standpoint: "The course of sciatica is seldom complete in two to eight weeks. Much more frequently it is a question of a chronic disease. Cases are known of more than thirty years' duration." Edinger briefly mentions that very severe cases lasting over decades are known.

The opinion of most authors, however, differs from this. Oppenheim says: "Sciatica in many cases has a favourable and speedy course, and ends in a few weeks or months in perfect recovery. But in other cases the disease may prove to be very obstinate, lasting for a year or more, then showing various changes, and, even after recovery, leaving a great tendency to relapse. . . . If the patient can from the very first do what is necessary for the recovery of health, and especially if he can spare himself exertion, there is every reason to expect a rapid recovery. The prognosis is unfavourable in old cases, in senility, and in those cases in which the cause of the disease is inaccessible to treatment."

Eulenburg's statement is similar: "The prognosis in sciatica is, with suitable treatment, more favourable on the whole than in most other neuralgias. In recent cases of perineuritis without any considerable degeneration, especially in those due to slighter mechanical or atmospheric influences, perfect health may as a rule be looked for, often in a surprisingly short time. But even more severe and long-standing cases may very often be brought to perfect recovery under the influence of intelligent and persevering treatment, a considerable tendency to relapse often remaining however. And after the disappearance of the neuralgia proper there frequently remain for some time troublesome paræsthesiæ, such as a feeling of numbness or tingling, and of weakness and tiredness of the leg after slight exertion."

Strümpell lays stress upon the ultimate favourable issue generally obtained: "The duration of sciatica is seldom less than a few weeks. In many cases it takes months and even years before the pain completely ceases, and the use of the leg becomes perfectly normal. In this respect the course often shows variations. The final issue of a simple sciatica (not due to any

constitutional disease) is generally favourable. It is worth notice, however, that the affection has a strong tendency to relapse."

Moritz' opinion is to the same effect: "Provided there be no malignant cause, tumour of the pelvis, disease of the spinal column, etc., the prognosis is generally quite favourable, even though the course of the disease seldom lasts less than a few weeks, often lasts months and even longer, and has a tendency to relapse."

Anglo-Saxon authors have an even still more favourable opinion. Herter, for instance, says: "As regards the ultimate disappearance of pain and the restoration of the function of the nerve, the prognosis of primary sciatic neuritis is good in every case. The duration of the symptoms is extremely variable, lasting in some cases for a few weeks only, in others for many months or a year. Relapses are common in severe cases, and may prolong the period of suffering to one or two years. In general, the more acute and severe the symptoms, the longer the duration of the period in which there is pain. Most cases last for several months. It is a good practical point to remember that in cases where the nerve-tenderness is such that the patient cannot get about the duration of the trouble will be several months at least."

Hammond estimates the ordinary duration of the affection to be about two to three months.

Gowers gives the following account of the course and duration: "The duration and the severity of the affection are extremely variable. They depend on its intensity, and on the amount of rest given the limb in the early stage, and on the constitutional state of the patient. The inflammation may be trifling in a degree, causing pain on movement only, which may pass away in the course of a few weeks. On the other hand, the spontaneous pain may be so continuous and intense, that sleep can be obtained only by the help of narcotics, and the disease may continue for many months, and even for a year. In most cases that last for more than a year there is partial recovery and relapse." . . . "The prognosis in sciatica, not secondary to disease outside the nerve, is good, but is very uncertain as regards severity and duration. As a general rule, these features are proportioned, but both are influenced by the practicability of adequate rest. Irritating exertion may lengthen

the duration of the disease by many months, and indeed relapse may follow each recovery for one or two years."

It may finally be of interest to mention that Valleix notes that he has never seen the affection last for more than nine months.

It is thus apparent to how great an extent opinions differ with regard to the prognosis of the disease. For my own part I must decidedly take the same standpoint as that expressed by Gowers, namely, that primary sciatica—leaving out secondary cases, the prognosis of which is determined by the primary affection—is a disease which may, with certainty, be expected to end in recovery. Very often it lasts for months. On this point all writers, without exception, agree. With regard to the duration, I am also in so far in agreement with Gowers, that as a rule it does not extend beyond a year, except in those cases where distinct remissions succeeded by relapses occur. From this it will be seen that I cannot accept the opinion expressed by some German writers of text-books that the affection is often chronic, lasting for years, at least not if treated in a reasonable way.

In order to get an estimation of the duration of the disease as influenced by the treatment here in use, I have made a summary of all cases of sciatica treated by me at the Medical Clinic during 1905-1908. At the outset, however, I may remark that no case of the *very severest* forms of sciatica occurred during that time. Fifteen cases, discharged as cured, and which were treated with massage amongst other things, were on an average thirty-seven days in the ward. Further, there were eleven cases, discharged as cured, which were not treated with massage; they were on an average nineteen days in hospital. This at first sight seems a rather striking difference, but it is explained by the fact that all pronounced cases of sciatica were, as a rule, treated with massage, the others having shown only slighter symptoms. Besides these, seven cases were discharged as merely improved. The conclusion should not be drawn, however, that these cases were not susceptible to treatment, and were thus chronic cases, as they were on an average treated for thirty-one days only. Their discharge before recovery was due either to want of room or to their own desire. Finally, we must point out that though no case belonging to the severest form occurred in the Clinic during these years, we have had many

with severe symptoms. Not a few of them showed marked signs of "lost function," such as absence of the Achilles-tendon reflex or atrophy of the muscles of the leg. On the other hand, it is true that the term "cured" at the time of discharge may perhaps not have been fully justified in every case; some, perhaps, ought to have been classified as "considerably improved," owing to the very slow disappearance of the last remaining symptoms. It is very difficult to fix exactly the time at which a patient may be regarded as "cured" of sciatica.

I stated above that primary sciatica is not a chronic affection, that an attack of sciatica properly treated does not probably last more than a year, but that on the other hand the history of the illness may, owing to relapses, extend over a longer period, several years in some instances. Sciatica may be called a chronic disease to this extent only, that certain slighter symptoms may remain even for some years. These symptoms are, as a rule, occasional pain in the leg, pricking along the course of the nerve, possibly paræsthesia also in the toes, a slight relative weakness of the leg, a certain degree of stiffness of the hip when the knee is kept straight (for example, on bending forward when standing upright). These symptoms, which, as a rule, are only now and then present, cannot, however, justly be called sciatica (considering the characteristic picture), but are rather to be considered as slight residuary symptoms. As an illustration the following history may be given:—

Case 2.—J. A., born in 1848, merchant from L. In the autumn of 1900 patient had severe left-sided sciatica. Had to take to bed in December. I was consulted in February 1901, while he was still in bed. The muscles of the leg were flabby and wasted; symptoms were otherwise typical of severe sciatica. In accordance with my advice, patient was allowed to get up, but was otherwise treated in the usual way with baths, massage, etc. He improved greatly during the spring. During the summer of 1901 I saw him again. He was slightly sensitive to pressure along the sciatic nerve. The left leg was 2 cm. smaller in circumference. Otherwise he complained chiefly of pain in the left leg after having walked a little, and of soon growing tired when walking. He was treated for a few weeks with mud-baths, massage, and faradisation, after which he improved. In February 1906 he had a return of sciatica in the same leg (he says that during the intervening years he had never been quite free from symptoms), and had to take to bed for two or three months. He improved later under treatment with baths.

In June 1908 he presented the following symptoms:—He does not complain of any pain, but of a feeling of stiffness in the leg when the weather is bad, and of a sensation of dragging in the lower extremity, and as of having a ring fastened round the leg. Lesègue's symptom is not present. No tenderness over the sciatic nerve nor over the gluteal region. Achilles-tendon reflex present, equal on both sides. In walking, patient drags, though but slightly, the point of the left foot, which, during the forward movement of the leg, hangs a little lower down than the right one. Power of extensors of the left ankle-joint is somewhat less than on the right side, but as regards plantar flexion no difference is noticeable. The muscles of the left leg are somewhat thinner than on the right side, but of normal consistency.

Patient was treated for some weeks with the faradic current and soap-massage baths. The motor disturbances in the left foot improved somewhat.

This case seems to me to be a typical illustration of the nature and degree of the residuary symptoms which may remain after a severe sciatica, which in this case had relapsed. To call this sciatica and classify the case as a chronic sciatica seems to me quite unjustifiable. On the other hand, it is by no means impossible that such residuary symptoms may remain permanently after the severest forms of sciatica. The writer of this paper ten years ago had a very painful and severe attack of sciatica, which gave rise amongst other complications to a distinct paresis of the leg. The duration of the attack, however, as far as the acute stage was concerned, was not very long. Although in every other respect I am, and have been for years, perfectly recovered, I periodically at long intervals feel pain along the nerve-trunk, not severe or troublesome, and coming on especially when the body is in certain positions, such as bending far forwards with the knees straight.

Among the cases of sciatica which I have observed and followed—many more than a hundred—there is only one which has seemed really like a chronic case.

Case 3.—A., 42 years of age, a widow, who for the last two or three years has complained of symptoms resembling sciatica in both legs, mostly in the left. The symptoms have varied in intensity, though they have at no time disappeared, and are always said by patient to be very troublesome. She has, however, during the six years I have observed her, constantly shown varying but distinct symptoms of hysteria: hysterical fits with fainting, partly with symptoms of neurosis of the heart; hysterical stigmata, left-sided,

slight paresis. In the region of the sciatic nerve there is no loss of function of any kind; Lasègue's symptom is but slightly indicated in the left leg. Patient has never limped, but a general feeling of fatigue is a very marked symptom. There is now some tenderness over the left sciatic nerve and over the gluteal muscles of both sides. On the other hand, she shows no typical stigmata on the lower extremities, nor in the region of the hips, neither cutaneous hyperæsthesiæ nor any kind of anæsthesiæ. (Since the above was written, a further examination has revealed new symptoms—weakness of the left leg and hypalgesia of the left knee.)

In a case like this it seems to me impossible to determine with certainty whether the diagnosis of sciatica is really justified or not. At all events the symptoms are but slightly prominent, and however severe the pain might be, it must unhesitatingly be explained chiefly as a manifestation of the hysteria. When sciatica appears in a patient suffering from a more marked form of hysteria, it easily happens that residuary symptoms of sciatica, slight in themselves, may, on account of the general psychical condition of the patient, give rise to pain which is felt as more or less marked or severe, and which may be of long duration. This unfavourable influence of hysteria on the prognosis of sciatica, as of other neuralgias, is a well-known fact.

On examining cases which present themselves as chronic sciatica, I think it of the greatest importance to *examine carefully the condition of the hip-joint.* I have found that a "*morbus coxæ senilis*" *in its initial stage* is the condition which may most easily lead to diagnosis of the "chronic sciatica." This is the more easy, inasmuch as the symptoms of sciatica may be associated with those of chronic deforming processes in the hip-joint, even in their earliest stages of development. As these forms of hip-joint disease are chronic, do not diminish in the majority of cases at least, and show a decided and usually constant tendency to grow worse, it is evident that in morbus coxæ senilis complicated with sciatica, we must in the first instance give our attention to the former affection, and regard it as being much the more important of the two.

It seems very probable that in such cases sciatica should be regarded as a secondary affection. It accords well with this that the symptoms of sciatica often remain and become chronic in these cases, whereas uncomplicated sciatica, in my experience and that of certain other writers, is an affection which, when suitably

treated, does not become chronic. Examination of the literature in which chronic cases of sciatica are quoted, shows that in a number of these cases a chronic, deforming process of the hip-joint was present. Levison, for instance, found this in one of two chronic cases (the other being of intermittent character), and Pers, in four cases out of eight, with a duration of five years longer.

The importance of carefully observing the condition of the hip-joint is pointed out by many writers. Gowers remarks that "senile rheumatic inflammation of the hip-joint" is a common cause of sciatica, and that consequently it is of the greatest importance always to examine the condition of the hip-joint. Strümpell notes as a diagnosing sign between coxitis and sciatica (besides the symptom of Lasègue) that abduction is painful in coxitis but not in sciatica. Hoffa also emphasises strongly the importance of examining the hip-joint with regard to abduction in all cases with symptoms of sciatica in order to discover early cases of morbus coxæ senilis. Eichhorst again points out that rotation of the leg is painful in coxitis but not in sciatica. Christiansen also draws attention to this, while specially indicating that affection of the hip-joint shows itself in the first place by a restriction in its abduction and outward rotation—flexion of the joint still being of the normal extent. (Christiansen proposes that mobility of the joint be tested in this way: the heel of the leg to be examined is placed on the other knee, after which, the pelvis being fixed, the knee of the leg under examination is pressed as far downwards and outwards as possible. Christiansen says that outward rotation is thus tested; evidently the power of abduction is also tested by this movement.) And, lastly, Schultze, in his paper given at the Congress for Internal Medicine, 1907, points out that the differential diagnosis of sciatica is important, especially in the initial stage of chronic inflammation of the hip-joint.

Although the importance of the differential diagnosis of sciatica from chronic inflammation of the hip-joint is by no means neglected in the literature, experience shows that in practice sufficient attention is not paid to this point. To what an extent examination for morbus coxæ senilis may be neglected, is proved by the fact that of fifty-eight cases of this kind which Stempel had the opportunity of observing, only four had been correctly

diagnosed, seventeen being sent to him with the diagnosis of sciatica. Later, Preiser, also from the surgical side, advocated the necessity of carefully examining the mobility of the hip-joint in every case presenting symptoms of sciatica, thus protecting oneself against overlooking a commencing morbus coxæ senilis. I have also received, sometimes from distinguished colleagues, not a small number of cases of "chronic sciatica" which, on closer examination, proved to be morbus coxæ senilis in an early stage of development. This was so in the following case:—

Case 4.—Miss A. N., 61 years of age, from F. Patient states that she has suffered from the present symptoms since 1903. These she says have gradually increased, though varying in severity.

Condition on June 6, 1906.—Patient complains of pains in the left hip, which extend down to the knee, sometimes even down into the leg. The pain is most severe after she has been walking for a time. She has limped for a year and a half. On examination, flexion as well as inward rotation of the left hip-joint can be passively performed to an absolutely normal extent, but outward rotation of the left hip-joint is abolished, and abduction greatly limited. There is tenderness to pressure anteriorily over the head of the femur, and to a knock on the great trochanter, and tenderness also over the gluteus medius. There are symptoms of a very slight mitral stenosis.

Patient was treated with mud-baths and powerful massage movements of the hip-joint. On June 12th of the same year there was much subjective improvement. Patient now limped only at times; outward rotation of the left hip-joint was improved, but abduction was still obviously limited.

In June 1907 I saw patient again. She thought the leg was "easier" than the year before. She had just had a herpes zoster on the trunk and left arm. Her general condition was still somewhat low and did not permit of more energetic treatment. The condition of the hip-joint was about the same as before.

During September 1907 patient was again treated with powerful massage movements of the hip-joint. During the winter, however, the hip-joint grew worse, and it troubled her very much during April 1908. During May 1908 treatment with passive movements was again followed by subjective improvement. Mr Lindell, M.K., director of gymnastics, who gave this treatment, kindly informs me that at the end of the last period of treatment, flexion as well as extension of the hip-joint took place to a normal extent, while abduction was considerably, and outward rotation moderately, limited, both, however, possibly to a greater degree than previously.

I saw patient again during the summer of 1908. She was not suffering greatly from her hip-disease, and the limp was very slight. I made no detailed notes as regards the mobility of the hip-joint.

This history is chiefly of interest as an illustration of a morbus coxæ senilis of five years' duration, which has not progressed during the last two years, but has, on the contrary, somewhat improved under proper treatment. It is further worthy of notice that after five years the disease has not developed further than to cause a slight limp, flexion of the joint taking place to the normal extent.

Here is another case which is of interest in this connection :—

Case 5.—N. M., born in 1854, peasant from O. Patient says he has suffered from pain in the right hip since about 1897. During the first years the pain subsided periodically, but later this has not been the case. Pain is most severe on starting to walk, especially on uneven ground, when he is in danger of taking a false step. He walks with a stick and limps considerably. The disease has been regarded by the doctors as sciatica.

Condition on June 27, 1907.—All movements of the right hip are limited. Flexion is only moderately restricted; outward rotation and abduction are greatly so; inward rotation only to a moderate degree. There is tenderness to pressure over the head of the femur in the inguinal region, but not over the sciatic nerve, nor, at least to any marked degree, over the gluteal region.

Patient was treated with mud baths, Roman baths, powerful passive movements, and with injections of fibrolysin. On July 26th of the same year it was noted that the mobility of the hip-joint had considerably improved, and that abduction especially had greatly increased.

In June 1908 I saw patient again. He stated that his condition has remained almost unchanged since the end of treatment the previous summer, though perhaps slightly improved. He has continued, as well as he could at home, the systematic movements, especially that of bending the knees while standing on the toes, trying to get as low down as possible. Examination of the hip-joint now showed that flexion was but slightly restricted, and that inward rotation is almost normal. Outward rotation and abduction are still, however, considerably limited.

Patient was treated in the same manner as the preceding year. The hip-joint improved still further, so that on July 21st mobility of the joint was only slightly reduced. Patient could now walk, at least on level ground, without limping, and did not require the aid of a stick.

This case shows in a surprising manner to what a degree improvement may be obtained in a case which had already lasted eleven years. To what extent the fibrolysin treatment was a contributing factor I cannot say for certain. I have

often seen considerable improvement of morbus coxæ senilis under treatment by very powerful passive movements, but I cannot remember ever having observed another case in which improvement under treatment reached so high a degree, and it therefore seems not improbable that the fibrolysin had, in some measure at least, contributed to the result. The following case may be briefly mentioned :—

Case 6.—E. J., merchant's wife, 53 years of age, from V. Patient had complained for the last five or six years of pain in the right hip. She limps. Flexion can be performed to a normal extent. Outward rotation is abolished. Abduction considerably diminished. Patient also complains of stiffness in the finger-joints coming on periodically.

This, as well as Case 5, serves to illustrate the fact that a morbus coxæ senilis, although not treated in any special way, may exist for years without restricting the mobility of the joint to any very great degree, and especially without limiting the extent of flexion.

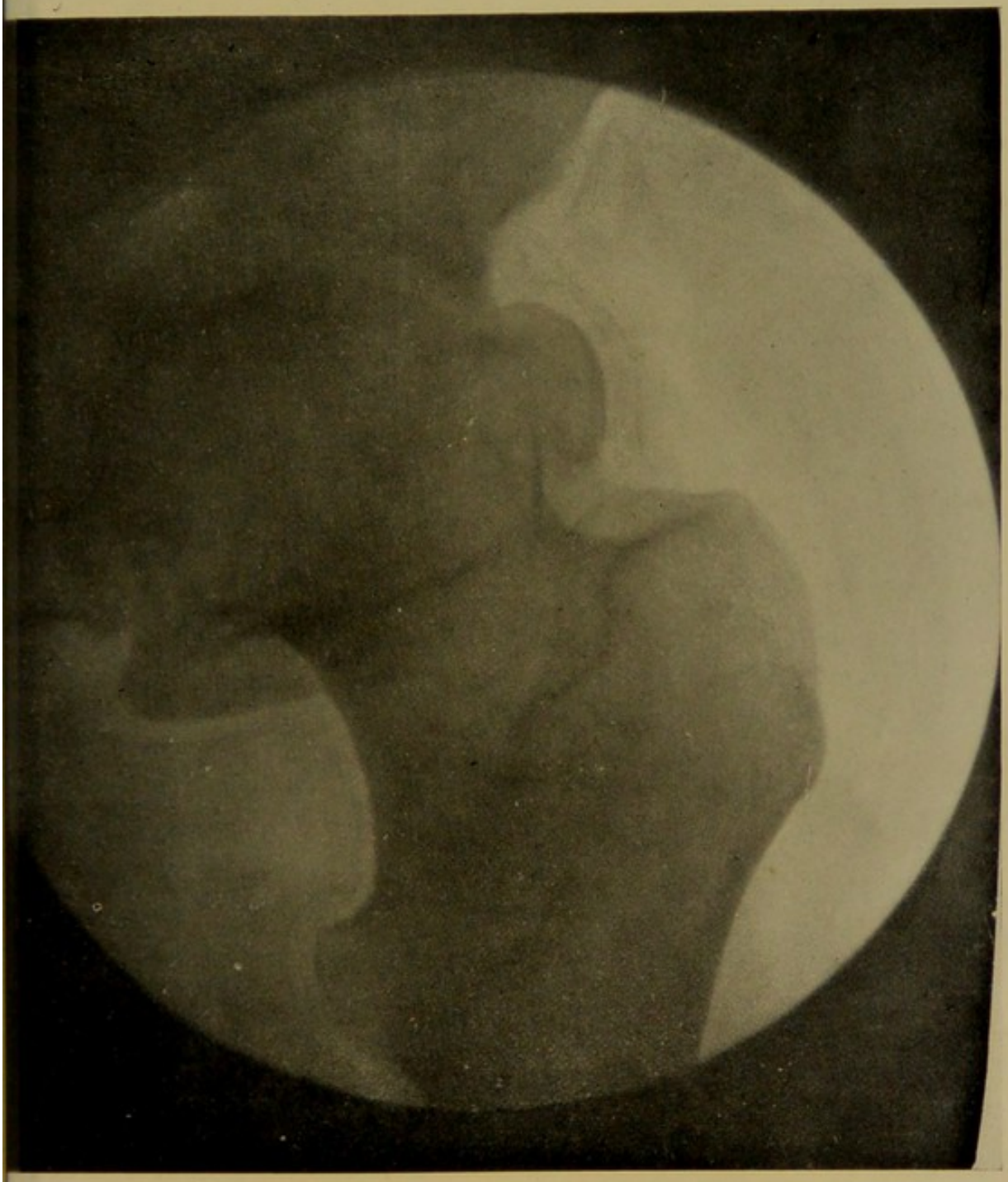
Another case may be related, which has been observed at the Medical Out-Patient Department of the University by Dr Bergmark, and kindly placed by him at my disposal.

Case 7.—S. P., a woman of 25 years of age, from A. After an injury ten years ago, patient occasionally suffered from pain in the right hip and thigh. This was troublesome on walking. Patient does not limp, however. On bending sideways she felt pain. She was able to walk immediately after the injury.

Examination of the hip-joint shows that flexion and adduction is normal, while outward rotation and abduction are limited. Lasègue's symptom is not present. The hip-joint is tender to pressure anteriorily. A Röntgen photograph shows a ring of new-formed bone round the edge of the head of the femur in the immediate proximity to the edge of the acetabulum. It is rather high, irregularly shaped, and narrower where it joins the edge of the head than further out. The *articulating surfaces* of the acetabulum and the head show no definite alterations of form.

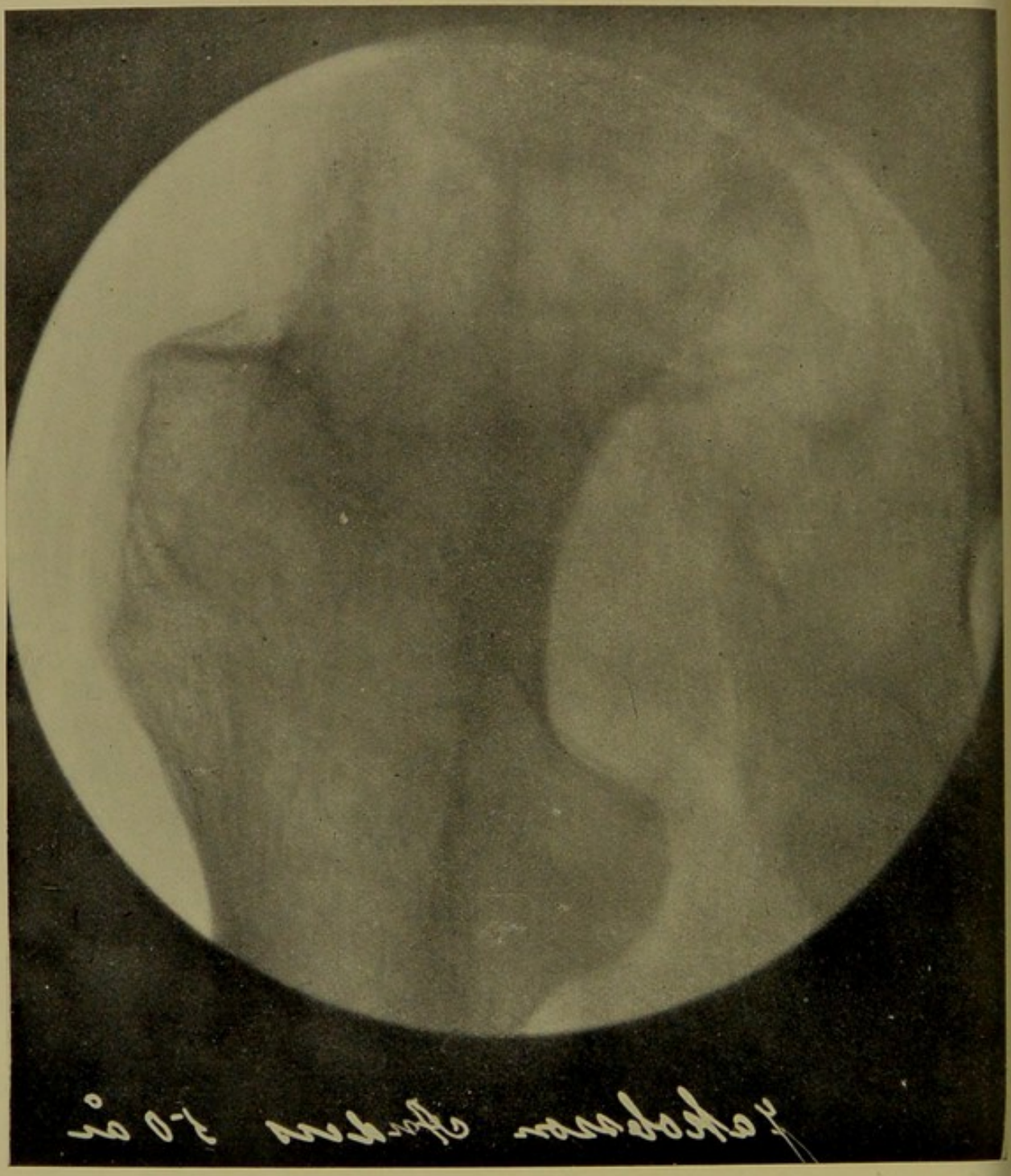
The X-ray picture shows that we are dealing with a deforming process. After the injury ten years ago patient is said never to have been unable to walk ; consequently there can have been no fracture or separation of the epiphysis, and the mass of new-formed bone present ten years after the injury shows that we have to do with a gradually progressive deforming process.

Considering the age of the patient, one is in doubt whether to class the case with ordinary morbus coxæ senilis. It shows,



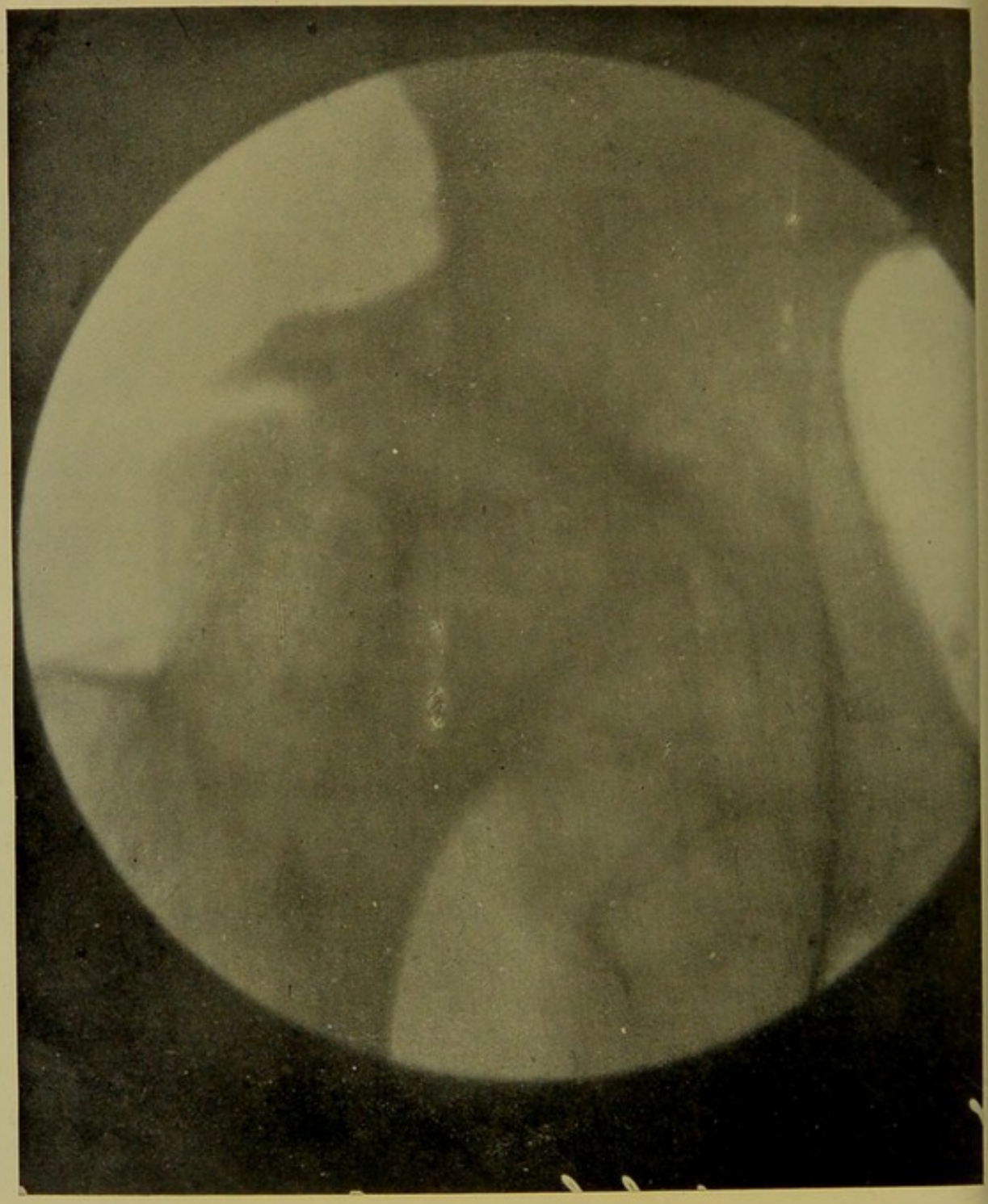
Case VII

To illustrate Dr Petrén's Paper.



Case VIII.

To illustrate Dr Petrén's Paper.



Case VIII.

To illustrate Dr Petrén's Paper.

however, that a deforming process of the hip-joint may exist for many years without giving rise to any great restriction of the mobility of the joint, especially as regards the extent of flexion.

As I conclude this paper, the following case comes under my observation :—

Case 8.—A. J., workman, aged 60, from K., admitted to the Medical Clinic on December 30, 1908. Twenty-two years ago patient fell from a considerable height (3-3½ m.) on to his right side, his left being struck by a heavy plank. During the next few days he was able to walk without any support. From this time there has been, he says, a feeling of uneasiness ("a burning sensation") and a certain degree of stiffness of the left hip. These troubles, however, seem only to have existed periodically, and the account of them is vague and uncertain. Patient seems to have limped only since the spring of 1908.

Examination on January 1909.—Flexion of the left hip-joint can be carried out barely to a right angle; rotation inward is but moderately restricted, but outward rotation is almost entirely abolished. Abduction and adduction are present only to a very small degree. Patient complains of pain, which to a great extent he localises in the leg. There is tenderness partly over the hip-joint when pressure is exerted from in front, partly over the gluteus medius, but not over the sciatic nerve. On admission patient limped, but after a short stay in hospital, where he was treated with rest in bed, salicylates and warm baths, there has been so much improvement in the spontaneous pain and in the gait that he no longer limps. He is able to walk quickly and with long steps. The X-ray plates show a considerable degree of roughness of the articulating surfaces of the head of the femur, as well as of the whole of the acetabulum.

This case is another illustration of how long the deforming process may be going on in a hip-joint without leading to very marked restrictions in the functional power of the joint. In this case at least, it seems probable that the disease has lasted since the accident twenty years ago. It also seems remarkable that the patient, in spite of the considerable deformity of the articulating surfaces shown by the X-ray plates, and of the considerable restrictions in the mobility of the joint, was yet able after a short period of rest in hospital (for it does not seem probable that the other constituents of the treatment were of any great account) to walk rapidly and without any sign of limping.

With the support of the case here cited and a number of others which I have observed, I should like to emphasise the fact that morbus coxæ senilis is a disease to be carefully sought

for as soon as we have to deal with pain in the hip or in the leg of any duration, even if the limitation in the movement of the hip-joint should not be at once striking. This affection may (and it is probable that it often does) have a long duration, extending over several years, without necessarily causing any very high degree of restriction in the movements of the joint. When examining the hip-joint in such cases it is absolutely necessary not to be contented with examining flexion only. It is equally necessary to remember that a normal hip-joint can be bent not only to an angle of 90°, but usually up to nearly 135° (Poirier), as this may be perfectly normal even though the symptoms of morbus coxæ senilis have existed for several or even many years. I cannot, therefore, agree in this point with Preiser, who considers that flexion will always be limited, even in the early stages. In my opinion the mobility of the hip-joint should be examined in all directions, abduction and adduction as well as inward and outward rotation. Rotation is, I believe, best tested in the following way: the patient being on his back, the hip and knee-joints are flexed each to about a right angle; the rotation of the hip-joint is then tested by lateral movements of the leg in the horizontal plane, without altering the position of the knee. The position thus attained by the leg plainly indicates the degree of rotation possible. Stempel has suggested that rotation may be tested with the knee bent. In order to test abduction without rotation it is probably most convenient to have the patient sitting on the edge of a chair. There is, of course, nothing to prevent adduction being investigated when the patient is on his back, but care should then be taken that there is no outward rotation of the joint at the same time. The methods here indicated have also this advantage that the extent of abduction and rotation are investigated with the hip-joint flexed, this being the position of the joint in which these movements can be carried out to a greater extent than in the extended position (Poirier). It is evidently an advantage to test the extent of a movement under those circumstances which normally permit of the greatest amount of movement.

That the mobility of the other hip-joint has to be controlled goes without saying. As regards the influence of age on mobility of the hip-joint, it seems to me remarkable that flexion, which nominally can be performed to such a great extent, is not as a

rule restricted, at least not to any marked degree. With regard to abduction, on the other hand, I have not infrequently found some reduction in its normal range, which is the case also with regard to rotation, though to a somewhat higher degree, even in cases where other modes of examination or continued observation have failed to give any support for the supposition of a deforming process or other disease of the hip-joint. Here, evidently, it is a question of a symmetrical restriction of the mobility of the joints. As is well known, morbus coxæ senilis not infrequently occurs as a bilateral disease, though as a rule it is more marked on one side than on the other. In diagnosing a bilateral trouble of this kind, attention must be paid to the normal limitation of mobility of the joint in old age (that is to say, in the real senile period).

As to the *differential diagnosis between sciatica and morbus coxæ senilis*, it may be simple enough. In the former case we have Lasègue's sign with normal mobility of the hip-joint during flexion of the knee ; in the latter the extent of movement of the hip-joint is limited to a greater or less degree. As a rule the diagnosis between these two affections may be made in accordance with the above rule ; it must, however, be remembered that a severe sciatica undoubtedly causes pain on larger movements of the hip-joint, although the knee is kept perfectly flexed. This circumstance has been completely overlooked by William Bruce, who, on this account, assumes the presence of coxitis in every case of sciatica in which movement of the hip-joint causes pain. On account of this erroneous assumption, the author has come to the conclusion, obviously absurd, that all cases of sciatica are due to coxitis. In slighter cases of sciatica this does not occur. The degree of limitation in the extent of movement of the hip-joint, the knee being flexed, which may be due to sciatica, thus stands in a definite relation to the intensity of the sciatica. If this fact be taken into consideration, the differential diagnosis between sciatica and morbus coxæ senilis should hardly offer any difficulty—that is to say, so long as they are uncomplicated.

The circumstances that both affections are so often present at the same time may, however, give rise to difficulty in diagnosis. It is not rare in my experience to find that in morbus coxæ senilis tenderness to pressure is present over the

usual point of pressure upon the gluteus medius, described above, but not over the nerve-trunk. The question whether in such cases we ought to speak of sciatica or not becomes optional—at least so far as our present knowledge goes.

The nature of the spontaneous pain cannot be a definite indication. As is well known, it does not usually extend further than the knee in affections of the hip, but it may extend right down into the leg, without enabling us to be quite certain as to the diagnosis of sciatica. The latter fact is emphasised by both Hoffa and Stempel.

The only way in which to decide whether sciatica is present or not is to test for Lasègue's sign—provided the restriction of the mobility of the hip-joint does not render this impossible.

Granting that the diagnosis of sciatica associated with morbus coxæ senilis may cause some difficulty, it must be remembered that the practical importance of such a diagnosis is not very great. It is ever so much more important not to interpret a commencing morbus coxæ senilis wrongly as a chronic sciatica, as effective treatment of the hip-disease (see further on) would be neglected through this mistake. If there be any suspicion of sciatica in a case of morbus coxæ senilis, or merely signs of myositis in the gluteal region, we should employ massage in the ordinary manner. Even if this might sometimes be given on account of a wrong diagnosis, it is evident that no danger would result. Pers has proposed to use neurolysis even in sciatica complicating morbus coxæ senilis. Should this opinion be supported by others, then the diagnosis of sciatica, combined with morbus coxæ senilis, would be of greater practical importance than it is at present. I cannot, however, find that the evidence on this point has hitherto tended to prove that the operation is indicated under these circumstances.

If we return to the differential diagnosis between the two affections, when not occurring simultaneously, closer analysis of the nature of the pain will aid the diagnosis. It is often characteristic of the pain of morbus coxæ senilis that it is most severe when the patient starts walking, and becomes less severe as he continues to walk. This is not usually the case in sciatica. Patients often clearly state that it is the stepping on the foot—that is, the transferring of the weight of the body on to the foot, that causes the pain. This is not the case in sciatica

where, at least in the more severe cases, every phase of movement of the leg causes pain.

Sometimes in morbus coxæ senilis, it is stated that stepping on uneven ground, or, for instance, on a stone which slips away, is painful in a very high degree. This phenomenon is not to be expected in the same characteristic way in sciatica. As regards tenderness to pressure of the hip-joint proper, the importance of this symptom for the diagnosis of morbus coxæ senilis is so universally acknowledged and observed that it need not be dwelt upon here.

Finally, with regard to the differential diagnosis, the importance of the course of the two affections deserves attention. Morbus coxæ senilis shows as a rule a steadily progressive course. This must not be taken to mean that the progress of the symptoms is uniform; on the contrary, it is most often irregular and sometimes even periodical, but it is still progressive in the sense that the symptoms do not subside (spontaneously at least), but as time passes on they increase. This is especially so as regards the functional limitation of the joint, the pain being more apt to show remissions. This contrasts sharply with the course of sciatica, especially of those cases in which there is a history of years' duration. Sciatica is a disease in which the symptoms as a rule reach their maximal intensity during the course of a couple of weeks or so, and nearly always during a period of a couple of months. If the patient does not get suitable treatment, the symptoms may undoubtedly remain at their height for a considerable time, a couple of months or so, but after that an abatement of the symptoms may be looked for. When the affection lasts for a longer time, it does so only as before mentioned, with distinctly pronounced remissions in its course.

Finally, a few words about the *treatment of morbus coxæ senilis*. All the different forms of baths mentioned here as useful in sciatica may be employed. Mud-baths may as a rule be used with advantage, provided the general condition of the patient does not counter-indicate this trying form of bath. Preiser recommends very hot sitz-baths (the patient sitting in the bath with the pelvis and thighs only in the water) of half an hour's duration, two or three times a day. Of this I have no personal experience, but the suggestion seems worthy of

attention. One must not, however, expect too much from this bath treatment *per se*. The same holds good as regards massage. I do not think that any *great* effect can be attained by this treatment, partly because the hip-joint is difficult to reach by massage, and partly because the anatomical changes are in this case of such a nature that no great result can be expected from massage. The most important method of treatment is probably, therefore, *energetic passive movements of the hip-joint.* The movements should be made in all directions, sufficient force being used to produce distinct pain. One must, however, be careful not to cause pain which will remain for a long time after the séance, or an increase of the painful symptoms during the intervals between each séance. There is, however, one movement against the use of which I ought to warn my readers. That is circumduction, *i.e.* the movement in which the foot describes a circle. This movement may be extremely painful to the patient, and can hardly be of any use, as one cannot "grind" the surfaces smooth again. In giving passive movements the intention is to enlarge the range of movement of the joint. Its functional capacity is increased, the gait is improved, and the pain is usually diminished. The range of movement is enlarged by energetic movements along the different axes as far as this can be done at the expenditure of a certain amount of force, and by methodical and frequent repetition of these movements. If we try to attain the same result by means of circumduction, it would, in any case, be possible only by exposing the patient to much greater pain.

It is natural that the advantage of the treatment here indicated should become apparent chiefly in those cases in which the deforming process has not advanced too far. If the hip-joint be nearly ankylosed, it is evident that but little can be done. We are sometimes warned against all treatment by movement in this affection (Mellbye), as it might make matters worse. I am convinced that this experience has been based upon advanced cases, and I do not deny that in such cases it may sometimes be wise to abstain from movement-treatment if it might tend to aggravate the symptoms. But if this conclusion were applied to *all* cases of morbus coxæ senilis, I feel certain that it could only be from making the mistake, which I have found to be not uncommon in practice, of recognising or admitting as morbus coxæ

senilis only such cases as are already very near the stage of ankylosis.

The less the limitation of movement the greater the prospect of gaining good from the treatment. On this account, knowledge of the fact I have here pointed out is of special importance, viz., that at the commencement of the disease there is often a prolonged stage during which flexion can be performed to a perfectly normal extent, the restriction having affected only the other movements. In such cases I consider that with energetic treatment the chances of improvement, and even of very great improvement, are very good. I have in every case which has not advanced too near the stage of ankylosis prescribed powerful passive movements. I have had the opportunity of gaining experience as to the effect of this treatment in a considerable number of cases, and have often witnessed considerable improvement. Treatment with powerful passive movements in this affection is also recommended by Christiansen. Preiser, likewise, highly recommends it. He thinks that by this method it will be possible in every case to prevent the disease from progressing, in most cases to improve the patient's condition, and in slight cases to cure them completely. This, however, is, in my opinion, too optimistic a view. It may be possible that in cases where the disease is not too far advanced, fibrolysin treatment will show itself to be an effective agent, but at present my experience is too small to enable me to express any decided opinion on this point.

LITERATURE.

Bechterew, W. v. "Über die Hervorrufung von Schmerzen bei Ischias durch Hyperextension der Extremität," *Neurol. Centralbl.*, T. 26, S. 1107, 1907.

Bernhardt, M. "Nothnagel's Handbuch," Bd. 11, 1895-98.

Brissaud, Sicard, Tanon. "Danger des Injections d'Alcool dans le Nerf Sciatique au cours des Névralgies Sciatiques," *Revue Neurol.*, T. xv., S. 633, 1907.

Bruce, William. "On Sciatica," *The Lancet*, 1903, ii., S. 511.

Christiansen, Viggo. "Kliniske Forelaesninger over Nervesygdomme," Bd. 1, Köpenhamn, 1905.

J. M. Clarke. "The Treatment of Sciatica," *The Lancet*, ii., S. 1083.

Edinger, L. "Penzoldt-Stintzings Handbuch," Bd. 5, 1898.

Eichhorst, H. "Handbuch der speciellen Pathol. u. Ther.," 1896.

Eulenburg. "Ebstein-Schwalbes Handbuch," Bd. 4, 1900.

Feddersen. "Ischias nach praktischen Erfahrungen," Berlin, 1903.

Fernet, Ch. "De la sciatique et de sa nature," *Archives générales de Médecine*, 1878, i., S. 385.

Gibson and Fleming. "Allbutt's System of Medicine," Vol. vi., S. 662, 1902.

Gierlich. "Ueber isolirte Erkrankungen der unteren Lumbal- und I Sacral Wurzeln," *Deutsche Zeits. f. Nervenhlk.*, Bd. 18, S. 322, 1900.

Goldscheider. "Beiträge zur physikalischen Therapie," *Deutsche medicinische Wochenschrift*, 1900, S. 272.

Gowers, W. R., and Taylor, J. "Diseases of the Nervous System," Vol. i., 1899.

J. Grasset et G. Rauzier. "Traité pratique des Maladies du Système nerveux," T. ii., Montpellier, Paris, 1894.

Gubb, A. S. *British Med. Journ.*, 1907, ii., 1297.

Hallion. "Traité de médecine," par Charcot, Bouchard et Brissaud, T. vi., 1894.

Hammond, W. A. "A Treatise on Diseases of the Nervous System," New York and London, 1873.

Harburn, J. E. "Some Points in the Treatment of Brachialgia and Sciatica," *British Med. Journ.*, 1905, i., S. 245.

Head, H., and Sherren, J. "The Consequences of Injury to the Peripheral Nerves in Man," *The Brain*, Vol. xxviii., S. 116, 1905.

Herter, C. A. "Dercum's Textbook of Nervous System," Philadelphia, 1895.

Hoffa, A. "Handbuch der praktischen Chirurgie," von v. Bergman, v. Bruns, und v. Mikulicz, Bd. 4, Stuttgart, 1901.

Homolle, G. "Dictionaire de médecine," par Jaccoud, T. 32, 1882.

Kernig, W. "Ueber die Beugekontraktur im Kniegelenk bei Meningitis," *Zeitschrift f. klin. Mediz.*, Bd. 64, S. 19, 1907.

Kleen, Emil A. G. "Handbok i massage och sjukgymnastik," Stockholm, 1906.

Landouzy, L. "De la sciatique et de l'atrophie musculaire qui peut la compliquer," *Arch. gén. de médec.*, 1875, i., S. 303.

Lange. "Verhandl. des Kongress. f. inn. Medizin," 1907.

Lasègue, Ch. "Considérations sur la sciatique," *Archives gén. de médec.*, 1864, ii., S. 558.

Lépine, Jean. "Etude sur les hématomyélies," Lyon et Paris, 1900.

Levison, F. "Om ischias, Hospitalstidende," 1901, S. 897.

Lloyd, J. H. "Twentieth Century Practice of Modern Medical Science," by Stedman, London, Vol. xi., S. 337.

Massalongo et G. Danio. "Les injections d'Oxygène dans le traitement de la sciatique," *Il Policlinico*, Vol. xiii., cit. after *Revue Neurol.*, T. 15, S. 37, 1907.

Mellbye, P. A. M. "Bidrag til Diskussion om Behandlingen af Ischias, Nordisk tidskrift för terapi," T. 7, S. 115, 1909.

Moritz, Fr. "J. v Merings Lehrbuch der inneren Mediqui," 1907.

Müller, L. "Untersuchungen über die Anatomie und Patologie des untersten Ruckenmarksabschnittes," *Deutsche Zeits. f. Nervenhlk.*, Bd. 14, S. 1, 1898.

Naegeli, Otto. "Therapie von Neuralgien und Neurosen, durch Handgriffe," Basel und Leipzig, 1894.

v. Noorden. "Verhandl. des Kongr. f. inn. Medizin," 1907, S. 76.

Oppenheim, H. "Lehrbuch der Nervenkrankheiten," 1908.

Pers, A. "Om operativ Behandling af Ischias, Hospitalstidende," 1908, s. 609.

Petrén, K. "Ein Beitrag zur Frage vom Verlaufe der Bahnen der Hautsinne im Rückenmarke," *Skandinav. Archiv f. Physiologie*, Bd. 13, S. 9, 1902.

Petrén, K., und Bergmark, G. "Ueber Sensibilitätsstörungen bei und nach Herpes zoster," Bd. 63, 1907.

Pitres, A., et Vaillard, L. "Maladies du système nerveux, Traité de médecine et de Thérapeutique," par Brouardel et Gilbert, T. 10, Paris, 1902.

Poirier, P., and Charpy, A. "Traité d'anatomie humaine," T. 1, 1899.

Preiser, Georg. "Die Artritis deformans coxae," Leipzig, 1907.

Rumpf. Th. "Ueber Rückenmarksblutung nach Nervendehnung," *Arch. für Psych.*, T. 15, 1883.

Schreiber, J. "Die verschiedenen Formen der Ischias und deren Behandlung," *Wien. mediz. Wochenschrift*, 1894, S. 1164.

Schmidt, C. "Zur Behandlung der Ischias, *Monatsschrift für Unfallhlk.*," cit. after *Jahresb. über d. Fortschritte d. Neurol.*, T. 10, S. 869, 1906.

Schultze, Fr. "Verh. d. Kongress. f. inn. Medizin," 1907.

Schultze, Fr. "Einige Erfahrungen über Ischias," *Zentralbl. f. inn. Medizin*, 1907, S. 609.

Sommer, Ernst. "Ueber Ischias," *Würzburger Abhandlungen*, 1906.

Stempel, W. "Das malum coxae senile als Berufskrankheit," *Deutsche Zeitschr. f. Chirurgie*, T. 60, S. 265, 1901.

Stertz, G. "Ueber eine isolierte einseitige Verletzung der XII Dorsal- bis IV Lumbalwurzel infolge einer atypischen Wirbelfraktur," *Mitteil. aus den Hamburgischen Staatskrankenanstalten*, T. 9.

Stintzing. "Verhandl. d. Kongresses für inn. Medizin," 1907, S. 77.

Strümpell, Ad. "Lehrbuch der spez. Pathologie," 1904.

Thorburn, Will. "A Contribution to the Surgery of the Spinal Cord," London, 1889.

Treupel. "Verhandl. des Kongresses für inn. Medizin," 1907, S. 79.

Umber. "Zur Behandlung hartnäckiger Ischiasfälle mit perineuraler Infiltration, Die Therapie der Gegenwart," 1906, S. 147.

Valleix, F. L. I. "Traité des néuralgies," Paris, 1841.

Wide, A. "Handbok i medicinsk gymnastik," Stockholm, 1896.

Winkler und Jockmann. "Zur Kenntniss der traumatischen Rückenmarksaffection," *Deutsche Zeitschr. f. Nervenhlk.*, T. 35, S. 222, 1908.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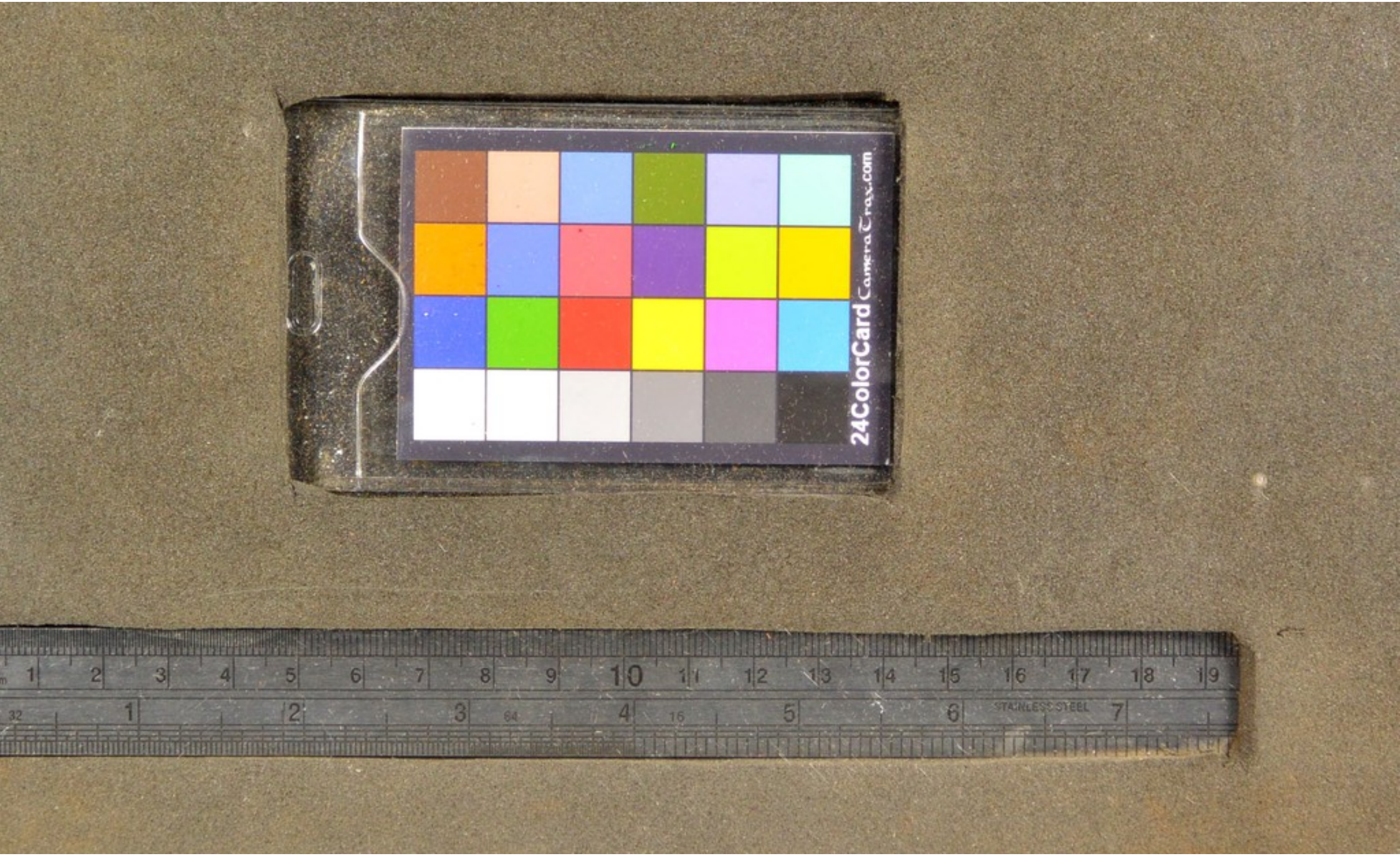
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