

STEN FRIBERG, STOCKHOLM:

### "PROTRUDING DISCS" IN THE LUMBAR REGION

Prolapse of intervertebral discs has long been known to the pathologists; probably the first description of this condition was given by Luschka. About the beginning of this century a few cases of this lesion, all with pronounced paraplegic symptoms, were reported by clinicians (Kocher 1896; Middleton and Teacher 1911; Goldthwait 1911). Later several observations of posterior disc prolapse were reported from Schmorl's institute, but in their comprehensive work of 1932, Schmorl and Junghans advance the view that these lesions do not give symptoms till they have reach a relatively considerable size. The finding of this lesion by the pathologists has been fairly common—Andrae, a pupil of Schmorl, observed the phenomenon in 15 % of 400 examined cases—and yet both pathologists and clinicians appear to have been inclined to underestimate it as a cause of clinical symptoms.

In the twenties, it is true, a few clinical observations were reported (Adson and Ott; Stookey; Dandy; Bucy; Alajouanine and Petit-Dutaillis), but they nearly all concerned the cervical region, where the pressure more readily results in compression of the spinal cord. Most of the disc prolapses that are located in the lumbar region and chiefly arise from the L4—5 and L5—S1 discs give merely funicular symptoms, and as a rule they remain undiagnosed. In recent years attention has been paid, in particular by American investigators, to the clinical and therapeutic aspects of the disc prolapses (Mixer and Barr; Mixer and Ayer; Hawk; Love and Camp).

The symptoms which may characterize a disc prolapse in the lumbar spine are:

1. Pain in the lumbar and lumbosacral regions, most often radiating down a lower extremity. The pain has the character of radicular pain, and its accentuated by coughing and sneezing.

2. Deviation, or scoliosis, of the lumbar part of the back, which is flattened, and rigid from pain.

3. Positive Lasègue.

4. More or less complete impairment of the superficial sensibility over the lateral surface of the lower limb, or thigh, on the side to which the pain is referred. In some cases, also a certain degree of muscular atrophy.

5. Impairment or absence of the Achilles tendon reflex on the same side. Less frequently the knee-jerk may show some disturbance.

6. Increase in the total protein content of the spinal fluid.

In more advanced cases and with higher localization of the lesion, of course, the symptoms may become more alarming, but a great majority of disc prolapses manifest their presence merely by the above-mentioned ordinary symptoms. Thus the clinical picture of the lesion present no characteristic feature; the symptoms are identical with those of "essential sciatica". Even when keeping the possibility of a disc prolapse in mind, as a rule one cannot by the clinical examination get farther than to a diagnosis of probability, and myelography is required in order to make the diagnosis with certainty. That the disc are not diagnosed more often, is associated with the requirement of myelography. We are still in want of a reliable and altogether non-irritating contrast substance for myelography. Myelography by means of gas is nor reliable. Myelography with lipiodol is not always free from irritation. If on myelography with lipiodol the diagnosis turns out negative as to disc prolapse or tumor, the patient not operated and the contrast substance consequently not removed, an adhesive meningitis may result from this measure. To what extent the remaining lipiodol may give trouble is yet unsettled. According to a verbal communication, this spring, from a neurosurgeon in the Mayo Clinic, there are at present in that clinic more than a hundred patients in

whom the lipiodol has not been evacuated, and none of them is said to have any inconvenience on that account.

In view of the diagnostic evidence that may be implied in the total protein content of the spinal fluid, all our patients suspected of disc prolapse are submitted to lumbar puncture, and the protein content of the fluid is determined. This analysis is carried out after the very exact method given by Dr. S. Izikowitz, who has been obliging enough to place his instrumentarium at our disposal for this purpose.

Our interest in the disc prolapses was aroused in the spring 1938. With a view to the discomfort that might arise from non-evacuated lipiodol, we have refrained from performing myelography on any patient in whom we did not feel sure of obtaining a positive result. Not until spring 1939 did we received such as a case for examination. In preceding cases with positive neurological findings, the complaints of the patients had been slight, or the total protein value had not been abnormally high, or vice versa. In spring 1939, however, we received a case in whom all the symptoms and signs were present, so that myelography could reasonable by expected to give a positive result—this was the first of the cases reported below.

CASE 1. (Vanförestalten in Stockholm, Reg. No. 1006/1939.)

Male, aged 36, foundry worker.

He states he has never suffered any traumatic injury. At the age of 33, in 1936, he began to get troubled with weakness and discomfort in the small of the back; at first there sometimes was a pain radiating down the lateral aspect of left lower extremity. By and by, the discomfort increased, the pain in the leg appeared more often, but still he was periodically free from symptoms. In the spring 1937 his discomfort became continuous, and he had to quit work on that account. In the period of 1937—39 he was hospitalized several times for physical therapy—always to no avail. He was in a particularly poor condition when he entered the Stockholm Vanförestalt, whereto he was referred by the Pension Council for a conclusive certificate with a view to premature pensioning.

Physical examination, in March 1939, showed a marked deviation of the lumbar spine to the right; here the back was flattened and rigid from pain, the lumbar muscles being greatly contracted. There was slight muscular atrophy of the left thigh and calf. The sensibility was lowered

to touch and pain over the lateral surface of the left leg. Left Achilles tendon reflex absent.

He had difficulty in sitting and lying down, and he could not turn



*Fig. 1.*

in bed without suffering distressing pain in the loins and the left limb. Severe pain radiating down the left limb on coughing and sneezing.

Total protein in spinal fluid: 100 mg. per 100 c.c.

Roentgenography (Dr. Folke Knutsson): Decrease in the height of the L4—5 intervertebral disc, also slight spondylitis deformans of this part; other parts of the lumbar spine apparently normal.

Myelography with lipiodol showed a filling defect, about the size of the end of a thumb, in the left side of the contrast shadow at the level of the L4—5 intervertebral disc. (Fig. 1).

CASE 2. (Vanförestalten in Stockholm, Reg. No. 4082/37.)

Male, aged 40, provision dealer, with a past history of good health.

In 1929, while carrying the carcass of a large butchered hog on his back, he stumbled and fell, with the hog on top, feeling instantaneously an intense pain in the lumbosacral region. After a while he was able to continue working, and he was not put on the sicklist at that time. Subsequently he was troubled with several, relatively short, attacks of sciatic-like pain, always referred to the posterior aspect of the left thigh and the lateral aspect of the leg. During the first years after this accident he had short periods of pain, between which he was free from symptoms. Later he was more disabled by the discomfort. Since autumn 1937 he has been completely disabled. The company physician made the diagnosis "neuritis, probably of alcoholic origin". In the Stockholm Vanförestalt, in 1938, was treated several times with physiotherapeutic and orthopaedic measures, but all to no avail whatever. On April 1, 1939, he returned to this clinic, broken down with pain and social hardship together. The pain kept him awake in the night, and he was unable to turn in bed by himself. He complained of pain and a sensation of numbness in both lower extremities, more pronounced in the left. The pain in the left limb was aggravated immediately by coughing and sneezing.

Physical examination: General condition relatively good. Pharynx, heart, lungs and abdomen: Normal findings. Urine: No abnormal elements.

No pelvic depression. No deviation of the spine. No tenderness on pressure over any of the vertebrae. Marked muscular rigidity from pain on attempt at movements in any direction in the lumbosacral and pelvic regions. On bending forward there appears a 10—15° deviation of the lumbar spine. Lasègue positive, 40° on both sides.

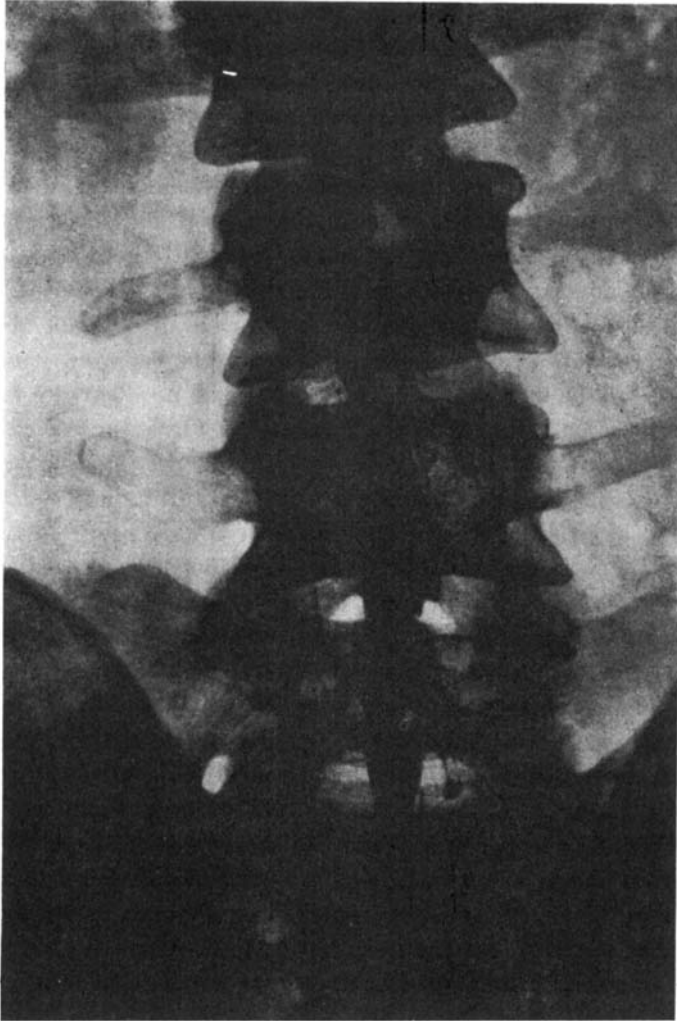
Total protein in the spinal fluid: 51.2 mg. per 100 c.c.

Sensibility to touch considerably lowered over the lateral surface of the left lower limb, from just above the knee-joint down to the malleolus. No objective impairment. Patellar reflexes normal on both sides. Achilles reflex distinctly weaker on the left side.

Roentgenography (Dr. Folke Knutsson) showed sacralization of the L5 vertebra with considerable hypertrophy of the right transverse process, and longitudinal asymmetry of the body of the L5 vertebra. The upper anterior margin of the L3 and L4 vertebrae is slightly projecting, with beak formation. Otherwise apparently no abnormality of the lumbar spine.

Myelography showed a filling defect as large as the end of a thumb

in the left side of the contrast shadow at the level of the L3—4 intervertebral disk, and a very flat defect in the shadow on the right side at the same level. The profile myelogram, taken with the patient lying



*Fig. 2.*

on his left side, showed a corresponding defect in the anterior aspect of the contrast shadow. No changes in the other examined parts of the dural coat. (Fig. 2).

These two patients—as well as the other six that are entered in Table 1— were submitted to operation shortly after myelography. In suitable cases laminectomy of one vertebra is sufficient. The resection is to be performed as close to the intervertebral articulations as possible, preferably sparing these joints.

After disclosure of the dura, the prolapse is often palpable as an unyielding protrusion. If the prolapse is located laterally, it can be laid free by pulling the dura over toward the other side and elevating the nerve root on the same side. In typical cases it is practicable to remove the protruding disc tissue by means of a Kocher forceps. After its removal there appears in the posterior aspect of the annulus fibrosus of the disc a little opening (about the size of a grain of rice, or a little larger) through which a little necrotic tissue may be removed from the interior of the disc. In older cases it may be necessary to loosen the prolapsing tissue from the surroundings by means of a sharp spoon or knife.

If the prolapse has taken place in the midline and not made its way out to the side of the posterior longitudinal ligament, it may be necessary to lay it free transdurally. We have not had to do so in any of our cases. Barr (1937), who has reported 40 cases of his own, uses the transdural way routinely, while in the Mayo Clinic, where the experience in this respect at present is greater, an effort is made primarily to reach the prolapse extradurally. Owing to the bleeding, the latter method is the more difficult, but it has the advantage of keeping outside the dura.

When all degenerated tissue has been removed from the site of the prolapse; the dura is opened by a longitudinal incision, 1—2 cm. in length, and the lipiodol is evacuated by water suction. After opening of the dura it can be demonstrated that the affected nerve root intradurally shows distinct phenomena of irritation. If some length of time has passed between myelography and the operation, the irritation appears diffuse. The dura is sutured with fine catgut, and is elevated by means of a suture in one corner to the musculature. A little tamponade in one corner for 24 hours. In cases where the intervertebral

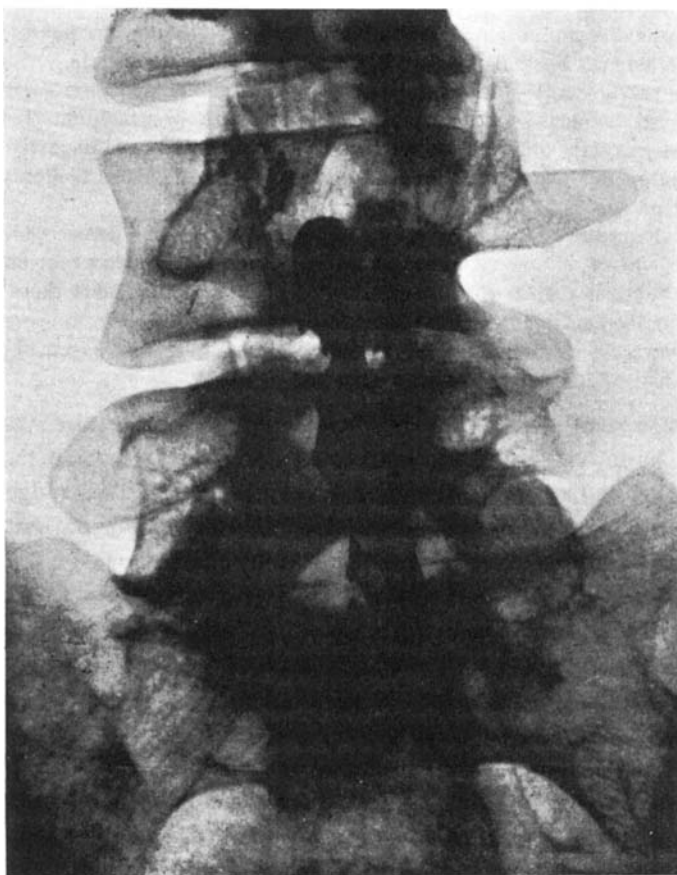
articulations have been opened, and the stability perhaps is injured, Barr finds it advisable to perform osteosynthesis at the same time or by a subsequent operation. We have not performed any such operation.

In the first four cases the lesion was a typical disc prolapse. In the fifth case the history of the patient and the findings on examination were in keeping with the cases described above.

CASE 3. (Vanförestalten in Stockholm, Reg. No. 1544/1939.)

Male, aged 46, docker.

On the whole, he has always been of good health and never suffered



*Fig. 3.*

any traumatic injury. In 1936 he gradually had some aching in the small of the back and in the right hip region together with a sensation of numbness in the right lower limb. By and by the ache extended down in the foot too, and at times the entire limb would feel limp and powerless. Confinement to bed for many months and physical treatment gave no favorable result, and from 1936 to spring 1939 he was mostly disabled altogether. Now and then there were aching and numbness of the right limb too. Subsequently he had difficulty in extending the right leg—there was a tightness of the posterior aspect of the limb. Through this protracted illness he became mentally depressed, and was troubled with insomnia. Finally he entered the Nynäs Sanatorium, where the nature of his illness was made out, and he was transferred to the Stockholm Vanförestalt.

Physical examination: General condition good. Pharynx, heart, lungs and abdomen: Normal finding. Urine: No abnormal elements.

No pelvic depression. Slight total kyphosis. Lumbar spine extremely rigid. No tenderness on palpation over the vertebral column. Lasègue positive on both sides (35°). Sensibility to touch and pain impaired over an area on the posterior surface of the right thigh. Achilles tendon reflex absent on the right side.

Myelography (Dr. Folke Knutsson) showed a filling defect (as large as the end of a finger), sharply defined above, in the contrast shadow at the level of the L4—5 intervertebral disc. At a higher level there were two longitudinal and parallel rarefactions in the shadow, representing two nerve fibers passing over the disc prolapse that was assumed to be the cause of the filling defect. (Fig. 3).

On operation no disc prolapse could be made out. On the other hand, the annulus fibrosus was projecting toward the medulla, extending like a transverse rounded ridge. This ridge was distinctly more pronounced on that side where the patient had his worst symptoms, and where the myelogram showed a definite lesion. We did not find any reason at this operation to remove any part of the annulus. In three additional cases, however, which in symptoms and clinical features were quite similar to the ones described above, the protrusion of the annulus was so marked as to cause a considerable reduction in the width of the spinal canal on one side. The corresponding nerve root was oedematous and distinctly dislocated through this protrusion. In the first of these three cases we decided, after some hesitation, to extirpate the protruding part of the annulus, and we have done so in all three cases, since the first patient became prac-

tically free from symptoms even within a few days after the operation. This effect was very striking.

The pain associated with the degeneration of the intervertebral disc is characterized by its marked resistance to all forms of treatment, and some clinicians have attributed this pain to pressure on the nerves in the foramina intervertebralia resulting from a reduction in height of the disc. The anatomical findings disprove this assumption, however, as the height of the foramina is sufficient to prevent compression. Perhaps in many cases a reasonable explanation is to be found in the not inconsiderable protrusion of the annulus we have been able to demonstrate in four operated cases. This is suggested by the immediate mitigation of the pain after the operation in the last three cases.

In Table 1 a survey is given of the eight cases operated so far, in which the observation period has been sufficiently long to allow of a preliminary estimation of the results obtained.

All these eight men are of the working age. The only collective material published so far, that of the Mayo Clinic, shows about 80 per cent men in the material. All our patients have been doing **hard and heavy work implying** a rather great risk of traumatic injury to the back, but only one gave a definite history of traumatism. In six cases the lesion was localized to the L4—5 intervertebral disc; in one to the lumbosacral disc; and in one to the L3—4 disc. The neurological signs of impairment have been somewhat more pronounced in the four cases of protrusion without prolapse, while the complaints by no means have been less severe in protrusion. Aggravation of the pain by coughing or sneezing is not pathognomonic of prolapse, but it is rarely absent in such cases, and it was present in all our four patients with prolapse. In Case 3, where the presence of this symptom is qualified by (+), the patient stated that this symptom was present now and then, and altogether absent between these periods.

As to the total protein content of the spinal fluid, the values obtained have been high in the cases with prolapse. The significance of these figures is limited, however, as the cases were selected for myelography partly after the amount of protein in



the spinal fluid. In three subsequent cases of disc prolapse, examined and verified in the clinic, the total protein content of the spinal fluid was respectively 67, 123, and 50 mg. per 100 c.c. The author will deal with these findings in another paper.

The observation period after the operation has been short—only 4 months for the oldest case, and hardly 2 months for the last. In Case 5, where the operation consisted merely in laminectomy, the appears to be only a very slight improvement, and the patient is not altogether free from radicular pain. In the other 7 cases the effect of the operation has been striking. Four patients are perfectly free from symptoms, and the remaining three are free from radicular pain. There remains only a slight inconvenience in the form a little impairment of the loins, and it has not kept the patients from resuming their work in part or to full extent. It is to be kept in mind that all these persons had been disabled most of the time throughout the duration of their illness, from 6 months to 10—11 years.

#### REFERENCES

- Adson, A. W. and Ott, W. O.*: Arch. Neurol. & Psychiat. 8: 520, 1922.  
*Alajouanine, Th. and Petit-Dutaillis, D.*: Presse méd. 38, 2: 1657, 1930.  
*Barr, J. S.*: J. Bone & Joint Surg. 35: 323, 1937.  
*Bucy, P. C.*: J. A. M. A. 94: 1552, 1930.  
*Camp, J. D.*: Am. J. Roentgenol. 36: 775, 1936.  
*Dandy, W. E.*: Arch. Surg. 19: 660, 1929.  
*Goldthwait, J. E.*: Boston Med. & Surg. J. 164: 365, 1911.  
*Hampton, A. O. and Robinson, J. M.*: Am. J. Roentgenol. 36: 782, 1936.  
*Hawk, W. A.*: Brain, 59: 204, 1936.  
*Love, J. G.*: J. Bone & Joint Surg. 35: 776, 1937.  
*Mixter, W. J. and Ayer, J. B.*, cited from Love.  
*Mixter, W. J. and Barr, J. S.*, cited from Love.  
*Müller, Walther*: Patologische Physiologie der Wirbelsäule. J. A. Barth, Leipzig 1932.  
*Schmorl, Georg and Junghans, Herbert*: Die gesunde und kranke Wirbelsäule im Röntgenbild. Georg Thieme, Leipzig 1932.  
*Sorrel, E. and Maurice, G.*: L. Ombredanne & P. Mathieu's "Traite de Chirurgie Orthopedique", vol. 2, p. 1815. Masson & Cie, Paris 1937.  
*Stookey, B.*: Arch. Neurol. & Psychiat. 20: 275, 1928.

## DISCUSSION:

*Smith-Petersen*, Boston:

Our experience with ruptured intervertebral disc dates back several years, due to the work of Dr. Joseph Barr & Dr. Jason Mixter of the Massachusetts General Hospital.

A new method of diagnosis, or of treatment, is always followed by a period of excessive enthusiasm. It is an instructive period, but also a very dangerous one, and those of us who see the dangers must persist in pointing them out even though we by so doing may earn the name of "obstructionists".

"Ruptured intervertebral disc" is established as a new clinical entity; it unquestionably accounts for many of the cases of chronic back pain accompanied by peripheral pain referred to various parts of the lower extremity. This peripheral pain is most common over the distribution of the first and second sacral nerves in spite of the fact that the most common lesion is between the 4th and 5th lumbar, putting the 5th lumbar nerve under tension. There is then a certain amount of discrepancy between the site of the lesion and the distribution of pain, and this discrepancy has as yet not been satisfactorily accounted for by the neurologist.

One of the benefits derived from this instructive period is that the orthopædic surgeon now routinely includes at least a superficial neurological examination, and the neurologist an orthopædic examination, even though the latter is usually confined to the test of "straight leg raising".

Lumbar puncture is now routinely performed in any case of back pain not responding to the conservative orthopædic measures. If the spinal fluid show a high total protein value, hospitalization and complete neurological and other investigations are carried out.

Lipiodol studies are no longer carried out indiscriminately—only when symptoms are such that operation is definitely indicated, offering an opportunity for the removal of the lipiodol. If operation is undertaken shortly after lipiodol injection, arachnoiditis is commonly observed, evidence that lipiodol is a distinct irritant.

I have had a patient with constant pain referred to the lower extremities, probably caused by lipiodol injected ten years ago. We also have two patients with persistent headache; X-ray examination shows globules of lipiodol at the base of the brain; it must have gravitated to this region at the time of operation—the head being low. We cannot prove definite relationship between the distribution of the headache and the distribution of the lipiodol, but the onset of headache following lipiodol injection is at least suggestive.

Lipiodol is not an innocent means of investigation.

*Sten Friberg:*

Dr. Smith-Petersen has remarked that when a new clinical entity is established, operative treatment is often employed too much during the first spell of enthusiasm, and Dr. Silfverskiöld has pointed out the value of conservative measures also in cases of disc prolapse. It may be that I did not express myself quite plainly enough, but from the table presented in my paper it is evident that two of our patients had been troubled with their affection over 10 years, four patients for more than 3 years, and one for 1½ years. They have all been submitted to protracted conservative treatment; they were all more or less disabled; and prior to the operation some of them had become a public charge. After the operation they have all become able to work.

During the period in which we have made the diagnosis “disc prolapse” about 500 patients have been treated in the Stockholm Vanförestalt under the diagnosis “lumbago” or “lumbosciatic complex”. That 8 patients have been operated under such conditions cannot be said to indicate an excessive operative activity.

Dr. Smith-Petersen has emphasized the dangers of lipiodol injection. Even though the Mayo Clinic has reported absence of inconvenience from remaining lipiodol, we have been very cautious as to its employment, and our total number of myelographed patients is only 10. So, in this respect we have tightened the reins very strongly.

Dr. Silfverskiöld has pointed out the frequency of disc pro-

lapses as observed by the pathologists—a frequency of up to 15 % of examined cases—and that thus the demonstrated presence of a disc prolapse needs not necessarily be the cause of the complaints of the patient. I wish therefore once more to emphasize that operation should be performed only in those cases where the neurological findings are in harmony with the location of the disc prolapse.