SCIATICA

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A notable advance in surgery was made when Mixter and Barr (1934) showed that sciatica is frequently caused by backward protrusion of the nucleus pulposus of the fourth or fifth lumbar intervertebral discs. Since then many patients with sciatica have been referred to orthopaedic and neurological surgeons; this account is based on the case records of a neurosurgical centre.

Protruded lumbar disc is encountered in all the adult decades, and is the commonest cause of pain in the distribution of the sciatic nerve. The onset may be precipitated by trauma, often of a trivial nature, or it may occur spontaneously. Pain in the lumbar region usually, but not invariably, precedes or accompanies the pain in the lower limb. The pain radiates down the back of the thigh to the back or outer side of the calf and frequently into the ankle and outer side of the foot. It is made worse by flexion of the back and the patient often suffers less when sitting upright on a hard chair than when sitting in an easy chair. The pain is aggravated by coughing and sneezing. Remissions may occur lasting months or even years; in some cases the pain subsides completely and never returns. Patients seldom complain of muscular weakness or sphincter disturbances, although very occasionally a complete cauda equina lesion is caused by a disc protrusion.

Examination often shows flattening of the normal lumbar lordosis. Scoliosis is common but the concavity may be directed towards or away from the side of the protrusion. Forward flexion of the spine is limited but lateral flexion is normal. Firm pressure in the back over the site of the protrusion will in many cases cause severe pain to shoot down the leg. This is a most valuable sign for it both establishes the diagnosis and localization of the protrusion. The lumbo-sacral disc is more often involved than the disc between the fourth and fifth lumbar vertebrae; higher lumbar discs are rarely affected. Passive flexion of the hip with the knee extended is painful and limited, especially on the affected side. *There is usually some weakness of flexion of the knee*, and frequently also of plantar flexion of the ankle. The ankle jerk may be absent, diminished or unaffected. There is loss of tone of the hamstring and calf muscles.

The gluteal fold may lack definition owing to diminished tone of the underlying muscles. Objective sensory changes are slight and never absolute; the most to be expected is hypalgesia of the outer aspect of the calf and the lateral border or dorsal surface of the foot.

Radiographs of the lumbar spine and sacroiliac joints are always taken to exclude other more serious causes of sciatic pain; in the majority of cases of disc protrusion there is no radiological abnormality. The normal disc space between the fifth lumbar vertebra and the sacrum is different in shape and depth from those above, and is frequently reported as diminished when it is normal. However, sometimes with disc protrusions there is 'lipping' of contiguous vertebrae, associated with marked diminution of the disc space. Lumbar puncture may show a slight increase in the protein content of the cerebrospinal fluid. When the diagnosis is uncertain myelography may be employed, although a negative result does not exclude a disc protrusion. Myodil (3 ml.) is injected by lumbar puncture and the patient is examined under the fluorescent screen on a tilting table. Myodil is said to be less irritating than lipiodol, but nevertheless it should only be used if operation is being seriously considered; at operation the contrast medium should be removed.

A lumbar disc protrusion may be diagnosed with the utmost confidence if the following syndrome is found:—(a) *Severe* pain in the lumbar region radiating to the calf or beyond. (b) Grossly restricted and painful straight leg raising. (c) Paresis of flexion of the knee and sometimes plantar flexion of the ankle. (d) An absent or diminished ankle jerk; this is an excellent positive sign but frequently the ankle jerk is unaffected by a protruded disc.

If patients with fewer objective signs are submitted to operation a disc protrusion may not be found. On the other hand, if marked paresis, extensive sensory loss and a disturbance of the sphincters are present, one of the more serious causes of sciatic pain should be suspected.

Treatment. Whenever possible the effect of conservative treatment should be tried; the

FIG. 1.—Exposure of a left lumbo-sacral disc protrusion. First sacral nerve root, in its dural sheath, displaced medially by the operator and seen between the ends of the two forceps. The disc protrusion is thus clearly exposed immediately above the tip of the right hand forceps.

patient is provided with a poroplast or other suitable jacket designed to immobilize the lumbar spine. It should be noted, however, that at the present time two months must be allowed for delivery of these jackets. Operation is indicated as follows:—(a) If conservative treatment fails. (b) If the pain is intolerable. (c) If the economic or domestic circumstances of the patient do not permit a prolonged period of restricted activity. Manipulation of the spine is not recommended, as it has been known to produce permanent paralysis of the legs.

The operation. A postero-anterior X-ray is taken with a small metal marker strapped over one of the lower lumbar spines, and a few drops of methylene blue are injected intradermally at this point so that accurate orientation is obtained during operation. If pressure in one of the interlaminar spaces reproduces the pain, the relation of the space to the marked spine is noted.

The operation is performed under general anaesthesia and the patient lies with the painful side uppermost and with the back flexed. The incision extends from the spine of the third lumbar vertebra to the second spine of the sacrum. The muscles are separated from the spines and laminae, and they are held apart with self-retaining retractors. Haemostasis is secured with diathermy and the field is kept clear by irrigation and suction. The spines of the fourth and fifth lumbar vertebrae and of the first piece of the sacrum are removed. The ligamentum flavum over the suspected site is excised and sufficient bone is nibbled away from the contiguous laminae to obtain a clear view of the disc region. Patties (small squares of lintine or cottonoid) are inserted between the dura mater and the bone to control bleeding from the extradural veins. Often at this stage the protrusion will be obvious, but sometimes a search will have to be made when it is central or in the extreme lateral

FIG. 2.—Spondylolisthesis—marked displacement forward of the fifth lumbar vertebra in relation to the first piece of the sacrum.

position. The nerve root, in its dural sheath, lies stretched over the protrusion, and great care must be taken to see that the nerve is completely retracted before the dome of the disc is incised (Fig. 1). When exposed in this way the protrusion has a glistening yellowish-white appearance. It is incised with the cutting edge of the knife directed away from the nerve root, and at once the disc material will begin to extrude itself. The best instrument for extracting the disc is a small pituitary rongeur which can be inserted between the vertebrae. Sometimes the disc tissue will be pulled out as a large mass, while at other times it is removed piecemeal. It is important that a very thorough removal should be carried out if recurrence is to be avoided. If, after careful search, a protrusion is not found in the lumbo-sacral space, the space above is investigated. The dura mater will sometimes have to be opened for the removal of a midline protrusion or for exploration when no protrusion has been found and an intradural tumour is therefore suspected.

In a small proportion of cases a protrusion will not be found but instead the dural sheath of the nerve is firmly bound to the posterior longitudinal ligament by strong adhesions. This lesion may be found in patients giving a long history of sciatica

without remissions. There is a good prospect of relief from pain if the nerve sheath is liberated. The adhesions may be so tough that they have to be divided with a knife. This condition is probably the aftermath of a protrusion.

Other Causes of Sciatica

In comparison with lumbar disc protrusion the conditions listed below are rare causes of sciatica, but they make a thorough investigation of each case a necessity.

1. Lesions of the Sacro-Iliac Joint

Subluxation and dislocation are rare injuries which may give rise to a typical sciatica syndrome.

Arthritis. Pain in the sacral region together with pain radiating down one or both legs may occur in Marie's spondylitis ankylopoietica and in Paget's osteitis deformans. In the former disease the sacro-iliac joint is frequently the first to be involved and X-rays show increased density of bone in the region of the joint, which has almost lost its definition. In the latter disease the X-ray appearances of the joint are similar, but the bones of the pelvis show the signs of Paget's disease.

Tuberculosis of the sacro-iliac joint is a rare cause of sciatic pain. The objective signs are likely to be more advanced than those found with a disc protrusion. Radiography shows irregular rarefaction of the bone and eventually destruction of the joint.

Metastatic carcinoma may be found in the bone in the neighbourhood of the sacro-iliac joint giving rise to sciatica. The primary growth is usually in one of the pelvic viscera, especially the prostate. The pain is likely to be severe and to require spinothalamic tractotomy for its relief.

Chordoma is a very rare tumour but when it occurs in the sacrum it produces pain and paralysis in the distribution of the sacral plexus. The tumour can be palpated through the rectum; it is of rubbery consistency and is fixed to the sacrum. X-ray shows destruction of the sacrum without bone reaction. The tumour is inoperable both on anatomical and pathological grounds. Pain may be relieved by spinothalamic tractotomy.

2. Lesions of the Lumbar Vertebrae

Spondylolisthesis. In this condition the fifth lumbar vertebra, together with the spinal column above it, is displaced forward in relation to the sacrum (Fig. 2). It is caused by a bilateral congenital or traumatic cleavage between the upper and lower articular facets of the fifth lumbar vertebra; the upper facets together with the vertebral body remain articulated with the vertebra above, and the lower facets, laminae and spinous process with the first piece of the sacrum below. There

is evidence that the sciatic pain which is sometimes associated with spondylolisthesis is caused by a disc protrusion (Meyerding, 1941), though not necessarily of the lumbo-sacral disc. The effect of conservative treatment should be tried first. If this does not succeed exploration for a disc protrusion should be undertaken. Fusion of the lower lumbar vertebrae and the sacrum may also be necessary.

Metastatic carcinoma is especially likely to arise from a primary tumour of the prostate. Radiography then shows increased density of the affected bones.

3. *Intrapelvic Disease*

Local infiltration of the sacral plexus may arise from carcinoma of the rectum or cervix and cause sciatic pain. Spinothalamic tractotomy should be performed.

4. *Cauda Equina Tumours*

The following tumours may be found in the cauda equina:—Ependymoma of the filum terminale or conus; neurofibroma; meningioma; cholesteatoma (epidermoid); dermoid; angioma; and extradural cyst. A cauda equina tumour may in the first place produce a syndrome indistinguishable from that of a lumbar disc, but later 'saddle' analgesia and retention of urine will be found. Large tumours of the cauda equina become inseparably attached to the many nerve roots in this situation and tend to produce irreversible paralysis, sensory loss and sphincter disturbance; an intracapsular removal is all that is possible if further damage to the cauda equina is to be avoided. It is therefore important to keep in mind the possibility of an early cauda equina tumour when sciatic pain is being investigated, or when exploration for a disc protrusion has proved negative (Fig. 3). In disc protrusions an increase in protein in the cerebrospinal fluid up to approximately 100 mg. per 100 ml. may be found; increases above this level and an obviously positive Queckenstedt test should lead to the suspicion of a tumour of the cauda equina.

5. *Sciatica of Unknown Origin*

It is easy to understand that an inexperienced surgeon may fail to find a disc at operation, especially when diathermy haemostasis is not employed. However, most neurosurgeons will admit to some completely negative explorations when no convincing lesion of any kind is found, even after

FIG. 3.—Cisternal injection of 3 ml. myodil held up by a meningioma of the cauda equina. Operation previously performed for an unconvincing disc protrusion in a patient with a typical syndrome. Recurrence, with onset of constipation, led to re-investigation.

an extensive intradural search. There may be an even higher percentage of these cases in the group that is not considered suitable for operation. The cause of the sciatica in these patients is at present unknown.

6. *Sciatica and Pregnancy*

Sciatica occurring in pregnancy was formerly thought to be due to pressure on the lumbo-sacral plexus by the foetal head, but it is now believed to be caused in most cases by a disc protrusion precipitated by the softening of the ligaments during pregnancy.

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