SCIATIC PAIN *

By H. LOVELL HOFFMAN, M.D., M.R.C.P.

Honorary Assistant Physician to the Royal United Hospital, and the Royal National Hospital for Rheumatic Diseases, Bath

There is no need for me to stress the chaotic state of our ideas in the past regarding sciatic pain. The fault lies undoubtedly with those who, from the depths of their armchairs, propounded theories based on inadequate pathological evidence, or succumbed to the almost overwhelming temptation to adopt a simple explanation for all cases. To the latter Walshe has tritely replied in discussing this particular subject, 'Nature is not interested in simplicity.'

Being faced with the task of producing for you some order out of this chaos, it is my aim to steer a course midway between the Scylla of dogmatism and the Charybdis of sheer vagueness. With regard to sciatic pain we need facts, and first I propose to mention briefly those which are incontrovertible.

Proved Causes of Sciatica

It is quite definite that sciatic pain may arise when the nerve or its central connections are affected by a pathological process such as herpes zoster, tabes, new growth or the neuritis of diabetes, alcohol or arsenic; disseminated sclerosis is a very rare cause. It may also be due to disease in the vicinity of the nerve's course or central connections, and the following conditions may be cited as examples. In the meninges, arachnoiditis, syphilis or meningioma. In the vertebral bodies, caries, osteomyelitis, Paget's disease and new growth. In the pelvis, inflammation or new growth either in the bones or viscera, or inflammatory changes in the sacro-iliac joint.

It is also certain that sciatic pain may be produced by herniation of the nucleus pulposus of a lumbar intervertebral disc. The lesion has now been verified at countless

operations, and its removal has relieved the symptoms. We also know that sciatica was just as common before the discovery of this condition, and that patients recovered without operation. The inference to be drawn from this fact is that healing or reduction of the lesion may in some cases occur without surgical intervention.

These are the causes of sciatic pain of which we have no doubt. We must now consider other possible causes based on less certain pathological grounds.

Less Certain Causes of Sciatica

Sciatic neuritis or interstitial neuritis

I have already mentioned that this may occur when due to diabetes, alcohol, or arsenic. We know also that interstitial neuritis of other nerves is not uncommon, and examples such as occipital or supra-orbital neuritis, and brachial neuritis may be mentioned. These conditions may arise, like other rheumatic manifestations, after exposure to damp or cold, and be part of what we have termed a local or general 'fibrositis,' although the pathological basis of this lesion is a rather vague one. Although I feel sure that a true brachial neuritis or neuralgia of this nature does exist, many cases of pain in the arm with definite root signs, have recently been proved to be caused by a cervical disc lesion, which need not necessarily cause signs of cord compression. Our ideas regarding the symptom are therefore falling more into line with our conception of sciatica. Spurling and Scoville (1944); Elliott and Kremer (1945).

It has been argued that an inflamed sciatic nerve has rarely been seen and examined; naturally there are few opportunities for this.

* A Postgraduate lecture delivered at the Royal National Hospital for Rheumatic Diseases, August, 1946.

One case was described by Denny Brown (1933) in a woman who died after oxygen had been therapeutically injected into the thigh. The author found exudate under the perineurium of the individual nerve fibres, but certain other changes which he discovered, may have been due to the oxygen injection.

More recently Holmes and Sworn (1946) have found evidence of what was termed 'radiculitis' at operation. This consisted either of swelling of a nerve root, or adhesions around it, for which they were unable to find a mechanical cause.

The general impression, with which I personally concur, is that sciatic 'neuritis' or radiculitis does exist, but is rare. It was responsible for only 3 per cent. of a series of cases collected by Jackson in 1943 (*vide infra*).

Referred sciatica and the role of fibrositis

Kellgren produced pain referred to the corresponding root distribution by injecting an irritant substance into the interspinous ligaments. It is certain that sciatic pain can be referred from disease of the sacro-iliac joint, as in early ankylosing spondylitis, or from osteoarthritis of the hip. Steindler (1940) states that similar pain may be referred from areas of trauma or 'fibrositis' in the back and gluteal muscles, which are in the territory of the posterior primary divisions of the spinal nerves, the anterior primary divisions of which go to form the sciatic trunk. He further states that relief is obtained by injecting novocaine into these myalgic areas. Elliott (1944), however, has pointed out that similar tender areas are

found in the upper gluteal region of cases with undoubted disc lesions, and I have confirmed this observation on several occasions. By electromyographic study of these spots he has found spontaneous motor activity in the muscle, and considers that they are due to involuntary spasm of small groups of muscle fibres, caused by irritation of the nerve root more centrally. He repeated Kellgren's experiment and in some cases found continuous motor discharge from muscles in the area of referred pain. He therefore suggests that localized spasm can be induced through a reflex path which involves the anterior horn cells, and that the source of excitation may be in, or outside the nerve root. He has recorded similar motor activity in the so-called fibrositis of the shoulder girdle associated with cervical osteoarthritis, and in the extensor muscles of the arm in brachial neuritis with or without root signs.

This work is of great interest and importance suggesting a new conception not only of referred pain, but also of that mysterious condition 'fibrositis.' As regards the latter, it is fascinating to postulate a vicious circle, initiated, perhaps, by cold or minor trauma, producing muscle spasm and pain. By reflex action through the cord, this pain may produce a motor impulse causing further muscle spasm in the affected segment, and so on. Such a reflex process could explain the sudden onset of fibrositis, so unlike an inflammation, and our treatment at once becomes rational, breaking the vicious circle at various points. Heat and immobilization tend to reduce muscle spasm,

and novocaine injection relieves pain. Later, massage and manipulation will further free the muscle fibres and encourage them to resume their normal activity. In a recent article which, *inter alia* describes myalgic areas secondary to visceral disease, Kelly (1946) favours a similar hypothesis, and suggests that '... nervous reflexes are instrumental in the causation of fibrositic lesions in general.'

It is not my intention to theorize further regarding the nature of fibrositis, in the absence of more definite pathological proof. It should be remembered that gout, gonorrhoea and focal sepsis may play a part in its causation. The condition has been said to produce sciatic pain in two ways, either by reference from remote areas, or by direct spread to the nerve itself. From what has already been stated it seems reasonable to assume that referred sciatica may be so caused, but the conception of fibrositis spreading directly to the nerve is more difficult to accept in the light of new theories.

The role of lumbar osteoarthritis

Harris (1933) and Putti (1927) describe cases where the nerve roots are compressed at the foramina by arthritis of the intervertebral joints. A spine, however, may bristle with osteophytes and yet produce no symptoms; further, in advanced ankylosing spondylitis sciatic pain is rare. Burt (1933) explained this fact by pointing out that the latter condition is a sclerosing arthritis, without effusion, which rapidly immobilizes the spine. It is probable that certain cases of sciatica are due to vertebral osteoarthritis, especially in older subjects, and that cold, damp and trauma play a part in initiating the symptoms; but it is generally agreed that the soft tissue changes of the arthritis, not the bony ones, are responsible for the pain. Great care is necessary in making this diagnosis, as radiological signs of spinal osteoarthritis are common in cases with proved disc lesions.

The following table is reproduced from an article by Jackson (1943). He states that, of the doubtful cases, seven were probably due to disc lesions, and the series gives a good idea of the relative frequency of the causes of sciatica in Service personnel.

Diagnosis.	Number
Doubtful	21
Fibrositis (local)	20
Ruptured intervertebral disc	18
Hysteria	10
Fibrositis and neurosis	8
Congenital bony abnormality	4
Fibrositis (generalized)	3
Sciatic neuritis	3
Malingering	2
Sacro-iliac strain	2
Lumbo-sacro strain	2
Spinal osteo-arthritis	1
Bony infection	1
Neoplasm of cauda equina	1
Polyradiculitis	1
Secondary carcinoma	1
Disseminated sclerosis	1
Spastic paraplegia (? aetiology)	1
	<hr/> 100

Sciatica Pain due to Protruded Intervertebral Disc

The intervertebral disc consists of the annulus fibrosus which is weaker posteriorly than anteriorly, a cartilaginous plate above and below, and the nucleus pulposus, which lies slightly more to the posterior part of the disc. As a result of trauma and degenerative changes, the annulus fibrosus may rupture partially, and the nucleus pulposus will herniate either in certain postures only, or permanently. If the annulus ruptures completely, the nucleus prolapses, and part or all of it will come to lie under the posterior longitudinal ligament. Owing to the position of the nucleus in the posterior part of the disc, and the relative weakness of the posterior part of the annulus, these protrusions tend to occur posteriorly, the nucleus being squeezed like a pea out of a pod when the spine is in flexion. Compression of a nerve root may result. The fifth lumbar root is most commonly compressed by the fourth disc, the first sacral root by the fifth disc and so on.

The clinical history and physical signs of the syndrome vary from case to case, and if certain possibilities are borne in mind it is easy to see how these variations may occur. I have already mentioned that the nucleus may herniate temporarily and only in certain postures. This accounts for the intermittent

character of the symptoms in some cases. The figure shows the possible anatomical relationship of the herniation to the nerve root. It is easy to see that the nerve may slip off the herniation; this explains the relief of symptoms, which is sometimes brought about by spinal manipulation or epidural injection of saline and novocaine, the root being 'floated off' the projection. Further, it may be that the three possible positions account for the variability of the scoliosis in these cases. Scoliosis may be either towards the affected side, away from it, or alternating. In many cases adhesions form between the nerve and the protrusion, in which case it would be reasonable to expect more intractable symptoms. Flexion of the spine or straight leg raising puts the theca on the stretch and will tend to aggravate pain by stretching the affected nerve root over the projection. Flexion, however, opens up the intervertebral foramina and may relieve pressure on an oedematous nerve root. Extension of the spine has precisely the opposite effect, and may aggravate pain by causing increased pressure on the root at the intervertebral foramen. Capener (1944).

Clinical History

A history of frank trauma initiating the symptoms was given by 23 per cent. of Macey's cases (1940). Bradford and Spurling (1941) give the figure as 50 per cent. The trauma may be an actual fall on the back, a strain caused by lifting a heavy weight with the spine flexed, a false swing at golf, or similar sudden movement. There may be no remembered history of injury, or the patient's occupation may suggest that he has suffered repeated small strains over a prolonged period. Pregnancy and labour are sometimes responsible for the lesion. Usually the first symptom is a fairly sudden onset of backache, and it is fair to assume that this is due to rupture of the annulus fibrosus. Sciatic pain may develop at the same time or be delayed for days or months, occurring, most probably, when actual protrusion of the nucleus takes place and compresses a nerve root. The distribution of the pain varies according to which root is compressed, and the areas affected may be summarized thus, Connell (1946):—

L.4 Anterior crural to medial malleolus.

L.5 Posterior crural to dorsum and medial margin of foot.

S.1 Posterior crural to sole and lateral margin of foot.

The pain is usually relieved only when the patient lies absolutely still. It is aggravated by movement and by sneezing or coughing. This aggravation is supposed to be due to a rise in cerebrospinal fluid tension with consequent pressure on the nerve root, and has been considered to be a diagnostic feature of root involvement. I cannot believe that this is true. On coughing, all the trunk and buttock muscles contract, and I am sure that it is contraction of the latter, including the pyramidalis in close relation to the sciatic nerve, which produces the exacerbation of pain. Paraesthesiae may be experienced in the same distribution as the pain, and consist of tingling, numbness, pins and needles or a burning sensation.

Physical Signs

These are orthopaedic and neurological, both being of importance in the recognition and localization of the lesion.

Orthopaedic. The normal lumbar lordosis may be lost or diminished. Sometimes a slight kyphosis is encountered in the lumbar region. Scoliosis is common, usually to the side of the lesion, but may be away from it, or even vary from time to time in the same patient. Sometimes the scoliosis is not present when standing erect, but becomes evident only when an attempt is made to flex the spine. Movements of the lumbar region are limited, especially flexion, which nearly always increases the pain. An important sign is the presence of tenderness, either in the mid line over the affected interspace, or just lateral to it, on the side of the lesion. This tenderness is best elicited by firm pressure with the thumb. If, in addition to local tenderness, there is an exacerbation of pain in the corresponding dermatome, the evidence is strongly in favour of root compression by a disc lesion, Little (1946).

Neurological. There may be slight wasting of the buttock, posterior thigh, or calf muscles on the affected side, but this is not usually very marked. Muscle weakness is most commonly found in the dorsiflexors of the ankle, but may

be present in any of the muscles supplied by the affected roots. Sometimes the only weakness discovered is in dorsiflexion of the great toe and this sign should always be sought in suspected cases of disc protrusion. Sensory loss is not always present. It is usually slight in degree, consisting of blunting to pin prick or loss of sense of light touch. In my experience it rarely involves the complete dermatome as illustrated in the text books. This is because there is considerable overlap and variation of the skin areas supplied by the spinal roots. Thus in a lesion of the fifth lumbar root, loss of sensation will occur in the area of skin supplied solely by this root. The picture is further complicated by the fact that two nerve roots may be involved by a single disc protrusion, Spurling and Grantham (1940). Moreover the lumbo-sacral plexus may be pre- or post-fixed, and it will thus be seen that a reliable localization of the disc lesion is not always possible from consideration of the sensory signs alone. The sciatic nerve is often tender at its exit from the pelvis and in the posterior thigh. Other tender areas may be found in the gluteal region, the significance of which has already been discussed. Straight leg raising, or extension of the knee with the hip flexed to a right angle (Laségue's sign) may be limited by pain on the affected side. If these manipulations are stopped just short of producing pain, neck flexion or dorsiflexion of the ankle may cause it to appear. Neck flexion carried out in this way acts by stretching the affected nerve root or the theca, and if pain results, it is good evidence that a root lesion exists. Laségue's sign itself, on the other hand, is often positive in cases of referred sciatica, and it seems reasonable to assume that this may be due, in part at least, to stretching of the spastic hamstring muscles. Naffziger's test for root involvement consists of bilateral jugular compression, and is positive when pain or paraesthesiae result in the affected area. The CSF pressure is raised, and further tension results in the compressed nerve root. If positive, the sign is of considerable diagnostic value.

In lesions of the fourth lumbar root the knee jerk will tend to be diminished or absent; with a lesion of the fifth lumbar root the ankle

jerk many be diminished or normal, while if the first sacral root is involved the ankle jerk is usually lost or at least diminished. As in the sensory supply of the limb, there is considerable overlap in the roots subserving the reflexes, and individual variations are responsible for inconstancy both of reflex and sensory signs. Occasionally a disc protrusion is so large that the cauda equina is compressed, in which case there will be signs as of a tumour in this region, with bladder disturbance and anaesthesia in the saddle area.

Special Investigations

CSF. This may show a raised protein, especially if lumbar puncture is performed below the level of the lesion, e.g. in the L.5-S.1 interspace. As the nuclear protrusion is relatively small, complete spinal block with a positive Queckenstedt's test and Froin's syndrome seldom occurs, but slight rise in protein up to 60 mgms. per cent. is a fairly common finding. The reversed Queckenstedt test is carried out with a manometer attached to a needle in the lumbar theca, while saline is injected into the epidural space at the sacral hiatus. If the pressure fails to rise in the manometer, a block may be assumed to exist between the two needles.

X-ray. Straight X-rays sometimes show narrowing of the intervertebral space corresponding to the affected disc, but this is not usual. Developmental anomalies of the lumbo-sacral region are sometimes seen in cases of disc protrusion; for example, there may be sacralization of the fifth lumbar vertebra, unilateral alteration of the plane of the articular facets, or spondylolithesis. These need not necessarily be the direct cause of sciatic pain, as has previously been supposed. It seems more likely that, by upsetting the spinal mechanics, they can predispose to degeneration of the annulus, and consequent nuclear protrusion. It is important to realize that the lumbar spine is an extremely complicated system of joints, liable to all the diseases and insults which may affect the other joints of the body, and that many different signs and symptoms may arise therefrom. It is also important to view disc lesions in their proper perspective. The disc is merely a part of the joint, comparable to the fibro-cartilage of other

joints; but it is also the focal point through which abnormalities of the spinal mechanics will most frequently produce actual nerve root compression, and so give rise to sciatica.

Myodil is now being used for myelography in place of lipiodol. It is a stable compound, causing little irritation and is slowly absorbed by the spinal canal. It is of low viscosity and can therefore be removed through a lumbar puncture needle. I have no experience of myelography in disc lesions; the technique and positioning is complicated and time consuming, but many consider that it is of great value in these cases. Personally I agree with those who hold that a disc lesion can be diagnosed and located on clinical grounds alone.

Differential Diagnosis.

Sciatic Neuritis. It is almost impossible to differentiate with certainty between this condition and a disc lesion. In neuritis one is more likely to see signs of involvement of the whole nerve than of its individual roots. Walshe (1946) states that single attacks of acute onset and relatively short duration are more likely to be due to this cause.

Root Compression from neoplasm. Here the signs are more insidious in onset and steady in progression. Weakness, wasting, and sensory loss are always more marked and bladder disturbance more common. If the growth is malignant, there are likely to be signs of cachexia.

Referred Sciatica. In referred pain there will be no signs of actual nerve involvement; thus, sensory loss, marked weakness or wasting, and absent tendon reflexes will not be found. The pain of root compression is always felt in the territory of that root, whereas referred pain is far more diffuse and vague in its distribution. Pain referred from osteoarthritis of the hip tends to radiate to the anterior part of the thigh, there will be limitation of movement of the joint, and percussion of the heel may cause pain. X-rays of the pelvis should always be examined carefully for lesions of the sacroiliac joint such as tuberculosis or early ankylosing spondylitis, which are important causes of referred sciatica.

Hysteria. Although sciatic pain or purely hysterical origin is rare, it is extremely common

to find a hysterical prolongation of a previous organic sciatica. Such cases are difficult to assess because there may be residual neurological signs as a legacy of the antecedent attack. It is most important in all such cases to look for positive signs of hysteria rather than for negative signs of organic disease, and to seek possible escapist motives, and unsettled compensation claims. These patients may show an exaggerated or even fantastic limp. They will, with great show of emotion, resist all movements of the limb, irrespective of those which should actually cause pain. Areas of anaesthesia may be typically hysterical, involving the patient's conception of a limb segment and bearing no relation to nerve or root distribution; such areas, moreover, may easily be suggested to the patient. Occasionally it will be found that bending forward from the erect posture or straight leg raising is bitterly resisted, as the patient has learnt from previous examinations that this should cause pain. Yet he may be induced, without complaint, to bend forward and touch his toes while sitting on a couch, showing that the movements, which are essentially the same in each case, are really not painful at all.

Treatment

In all cases of sciatica, unless there are sure signs of cord or cauda equina pressure, then conservative treatment should first be tried. Rest in bed is the first essential and should be maintained for four to six weeks if necessary. A pillow under the affected knee may give relief, or the leg may be immobilized with sandbags or a long Liston splint; weight extension is often useful. During this period local heat in the form of hot water bottles, electric pads, radiant heat and mud packs may be employed. Analgesic drugs are usually essential in the early stages, and aspirin, phenacetin, veganin, or sonalgin may be used. In some cases, however, only morphia will give relief. If, at the end of this time, pain is relieved, massage and exercises to the spine are carried out to correct faulty posture which may have been responsible for weakening of the annulus and consequent disc protrusion; these may, with advantage, be carried out in a hot pool.

If rest is not successful, it is the practice of our orthopaedic department, under Mr. John

Bastow, to give an epidural injection of 120 c.c.s of half per cent. procaine in saline under pentothal anaesthesia, followed by gentle rotatory manipulation of the spine, and straight leg raising. A plaster corset is then applied which is worn for three months. At the end

of this period, massage and exercises are carried out as above. Should these measures not give relief, and other signs point to the presence of a disc lesion, laminectomy, with removal of the prolapsed nucleus pulposus, is considered.

REFERENCES

- BRADFORD, F. K., and SPURLING, R. G. (1941) 'The Intervertebral Disc,' Springfield and Baltimore.
 BURT, J. BARNES (1933), *Proc. Roy. Soc. Med.*, **26**, 1396.
 CAPENER (1944), 'Annals of the Rheumatic Diseases,' **4**, 29.
 DENNY BROWN, D. (1933), *Proc. Roy. Soc. Med.*, **26**, 1399.
 ELLIOTT, F. A. (1944), *Lancet*, **1**, 47.
 ELLIOTT, F. A., and KREMER, M. (1945), *Lancet*, **1**, 4.
 HARRIS, W. (1933), *Proc. Roy. Soc. Med.*, **26**, 1389.
 HOLMES, J. MACD., and SWORN, B. R. (1946), *Brit. Med. J.*, **1**, 546.
 JACKSON, W. P. V. (1943), *Ibid.*, **1**, 776.

- LITTLE, N. (1946), *Med. Journ. of Australia*, **1**, 33.
 MACEY, H. B. (1940), *Arch. Surg.*, **40**, 433.
 O'CONNELL, J. E. A. (1946), *Brit. Med. J.*, **1**, 122.
 PUTTI, V. (1927), *Lancet*, **2**, 53.
 SPURLING, R. G., and GRANTHAM, E. G. (1940), *Arch. Surg.*, **40**, 375.
 SPURLING, R. G., and SCOVILLE, W. B. (1944), *Surg. Gynaec. Obstet.*, **78**, 350.
 STEINDLER, A. J. (1940), *J. Bone and Joint Surg.*, **22**, 28.
 WALSHE, F. M. R. (1946), 'Diseases of the Nervous System,' Edinburgh, E. and S. Livingstone.

THE PLACE OF CAESAREAN SECTION IN MODERN OBSTETRICS

By JOSEPHINE BARNES, M.A., D.M., M.R.C.P., F.R.C.S., M.R.C.O.G.

Assistant, Obstetric Unit, University College Hospital

One of the most striking developments in modern obstetrics has been the immense increase in the number of women delivered by Caesarean section. Two hundred years ago the Caesarean operation was regarded as the last resort in a desperate emergency when delivery was possible by no other means. The mortality was exceedingly high—in fact recovery from the operation was considered very remarkable. Smellie (eighth posthumous edition) wrote concerning the operation that it might be occasionally indicated 'because the mother and child have no other chance to be saved, and it is better to have recourse to an operation which has sometimes succeeded than to leave them both to inevitable death.'

Today the position is very different. It has become necessary for eminent obstetricians to warn their colleagues against the abuse of an operation which, thanks to the development of anaesthesia, of aseptic and antiseptic technique, and to a lesser extent of chemotherapeutic methods has become, in some hands, a means of avoiding even the slightest difficulty in labour. These warnings are timely since no other procedure is more open to abuse. No high degree of operative skill is needed, certainly not for the classical operation, but only wide obstetrical experience can give the

judgment needed to decide when delivery by the natural passages is likely to prove sufficiently dangerous to mother or child that operative delivery is to be preferred.

The Advantages of Caesarean Section

It must not be assumed that because the operation of Caesarean is so easily open to abuse that its wider employment is not, on the whole, a great advance in midwifery. The advantage of reasonably safe abdominal delivery in cases such as those of severely contracted pelvis where natural delivery would be hazardous, if not impossible, are self-evident. The advantages of abdominal delivery may be summed up under two main headings.

Firstly, it avoids the danger of delivery by the vagina and there are many circumstances, as will be seen, where it is inadvisable even to attempt such delivery, while in other cases the course of labour may be seen to be so unfavourable that it seems unwise to allow it to proceed further. Secondly, Caesarean section offers a rapid method of terminating pregnancy and may thus be considered as an alternative to induction of labour. The methods of induction in current use, admirable though they are in favourable cases, are all very uncertain