Bone and Joint Diseases

Surgical treatment in lumbar disc protrusion

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Disorders of the lumbar intervertebral discs are a major source of disability and economic loss. They usually occur in the 35-45 age groups, men being affected marginally more than women. They are less often seen in adolescence, when there is an increased incidence in boys, and the condition tends to run a more protracted course.

Analysis of numerous reports indicates that injury is a prime factor in the onset of lumbar disc prolapse in only 12-14% of patients. Injury is usually only a precipitating factor, as a biochemical defect is the underlying basic cause on which mechanical stresses are superimposed. Thus many closed methods of treatment are likely to be beneficial in view of the self-limiting nature and expected propensity of the lesion to resolve spontaneously if additional stress or strains on the lumbar spine are removed or minimised. These may take the form of bed rest, an efficient method if applied seriously, or immobilisation of the lumbar spine in a plaster jacket or Goldthwait type of belt. Alternatively, the stress on the lumbar spine may be relieved by traction, especially if combined with continuous bed rest. Epidural hydrocortisone also helps.

Goldthwait in 1911¹ first described the syndrome of lumbar disc herniation, diagnosing the presence of a disc protrusion to account for the development of paraplegia in a patient undergoing manipulative treatment for sciatica. No operation was performed, and the diagnosis was confirmed at necropsy.

Belated recognition of this important lesion followed the description by Mixter and Barr² of the results of surgery for lumbar disc prolapse. As the diagnosis was made with increasing frequency, surgical intervention became extensively and often unnecessarily employed, but with further experience of the spontaneous resolution that occurs in the syndrome in most cases and the relief produced by conservative measures in many patients, there is now a more balanced view of the need for surgical treatment.

There is a wide variation of symptoms and signs from minor degrees of backache to the fully developed picture of lumbosacral nerve root radiation, with neurological and orthopaedic signs (see figure). In many cases, the disc disorder is "contained within the annulus"—that is, there is a disturbance in the nucleus, biochemical in nature, which results in an increased intradisc pressure or minor incomplete annular ruptures, and these produce defective function of the disc and its segmental spinal joint. This is associated with backache, which may radiate to the buttock and as far distally as the greater trochanter of the femur. This limited radiation of pain posterolaterally should

Prolapse of lumbosacral disc: transverse section through L5-S1 disc. (a) intraforaminal prolapse. (Myelogram frequently negative. Prolapse often overlooked at operation.) (b) lateral prolapse. (Common type.) (c) Lateral prolapse in spondylitic spine. (Many roots affected, some by prolapse, some by thickened enlarged inferior articular facets (I) of L5 and superior articular facet (S) of sacrum. A small prolapse will produce severe nerve root deficiency. Myelogram shows lateral displacement of myodil column.) (d) Central disc prolapse.

not be confused with that of nerve root distribution as surgery in the form of disc enucleation has no place in this type of disc disorder. The condition responds satisfactorily to the many conservative measures already enumerated, but it will recur in most cases and might progress ultimately to rupture of the annulus, with herniation of the nucleus through this defect and involvement of a related nerve root, giving sciatica.

Sequestration of the nucleus is the only variant when enucleation is indicated in a "closed" disc disorder. In this condition the nucleus has undergone extensive fibrosis with loss of its high fluid content, and a free sequestered fragment develops, which has some mobility inside the disc within the annulus. Sudden attacks of backache followed by severe spasm, which are relieved equally dramatically, characterise this syndrome. Recurrences develop with increasing ease and frequency. Surgical removal of the loose, sequestered fragment permanently relieves the symptoms.

A nuclear protrusion may be lateral or central. The former herniates through the posterolateral aspect of the annulus, lateral to the posterior longitudinal ligament where the annulus is devoid of its protection, and affects the nerve root by producing pressure on its dural sheath and traction on the root, and by interfering with its vascular supply. A large prolapse, or one less laterally placed, could affect one nerve root outside the dural sheath of the cauda equina, together with the next more caudal segmental nerve root as it lies within the dural canal. Pain, which is always unilateral, is then experienced along the distribution of the affected nerve root. A central disc prolapse produces loss of integrity of the posterior longitudinal ligament, its symptoms being extremely variable and often insidious. The patient has severe pain in the lumbar area in the fully developed condition, while root pain is not so noticeable. Motor and sphincter disturbance are usual in the more severe degrees. Thus its presence is often overlooked or misdiagnosed initially, especially as it produces more peripheral motor disturbance than a lateral herniation.

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Why operate?

In assessing the value of any particular treatment, the surgeon must be certain that it offers considerable advantages over other methods and that there are fewer disadvantages. In view of the good results of conservative measures in treating lumbar disc prolapse, surgical intervention is reserved only for specific indications. Thus careful selection of cases is a prime factor in determining its results.

A study of long-term results shows that, if used where specifically indicated, surgical intervention offers rapid and more lasting relief of pain—that is, the risk of recurrence of the prolapse is minimal as compared with the definite known risk of recurrence after conservative measures. It allows early rehabilitation of the patient and early restoration of back function, resulting in a more rapid return to work and normal activity than with most non-operative measures.

Thus surgical enucleation for the prolapsed lumbar intervertebral disc is reserved for those cases that are associated with nerve root pain or a sequestered contained fragment in the following instances.

ABSOLUTE INDICATIONS

Failure of closed treatment

Before operating one must consider what is adequate closed treatment. Most patients referred to an orthopaedic clinic have usually had some non-operative closed treatment in the form of bed rest. The latter has often been extremely variable, inadequate and incomplete in both time and effective immobilisation. Control over the quality of bed rest and instruction in its use are seldom given. So the surgeon therefore needs to establish a baseline of carefully controlled closed treatment before considering surgery. Simple bed rest on a firm mattress, which must be absolute and continuous for two to three weeks, will relieve most cases. Alternatively, immobilisation of the lumbar spine in a plaster jacket may be equally effective, but one must not be misled by improvement in symptoms. The most reliable criteria of improvement are: (1) the greater facility with which the straight leg can be raised without producing pain—that is, the angle obtained by the straight leg to the horizontal is increased; (2) improvement in neurological signs; and (3) improved spinal mobility.

If simple bed rest or immobilisation in a plaster jacket fails to produce improvement within two to three weeks, bed rest with traction will relieve many of those with persisting evidence of a prolapse. Failure to improve the angle of leg raising or neurological state after a further three weeks—that is, six weeks of controlled conservative treatment—suggests that continuing such treatment is unlikely to help, and surgery is then advised. Prolonged delay beyond this period produces no worthwhile improvement and may produce a less satisfactory end result after operation because of persistence of paraesthesiae and numbness due to prolonged nerve root involvement by the prolapse. Strictly controlled closed treatment will result in successful relief of symptoms in 90% of patients with a severe prolapse seen in the average orthopaedic clinic. A difficult decision arises with those patients who progress with the conservative regimen up to a point and then fail to maintain the improvement. This improvement should continue until complete resolution of all signs and symptoms is evident.

How long should one persist with non-operative measures when initial progression and improvement has ceased and not resulted in complete relief? Studies of patients 10-20 years after surgery for lumbar disc prolapse have shown that procrastination beyond three months from the onset of closed treatment is likely to be followed by residual sequelae in the form of paraesthesiae and numbness despite surgery, while return to work is invariably delayed far in excess of that expected from early surgical intervention.

Age is not a contraindication to surgery—old people withstand this well. The risk of pulmonary embolism is no greater than with any other operation below the diaphragm. Deep venous thrombosis may develop as a postoperative complication, but this may accompany treatment by closed methods, particularly when bed rest is combined with traction.

Lumbar disc prolapse in a young person resolves slowly as the nucleus is more liquid than in older people. While backache alone will ultimately be resolved by prolonged immobilisation, extended closed treatment in the presence of root pain is likely to have a

residuum of nerve root deficiency. Surgery is therefore more likely to be necessary in the younger age groups, particularly adolescents.

Central disc prolapse

When the disc prolapse is central, backache is severe and pain experienced in the peripheral parts of both limbs, motor signs being more often observed than in lateral prolapse. The leg-raising test invariably produces backache as opposed to pain in the leg. A central disc prolapse is apt to increase in size, and this may develop rapidly, resulting in a sudden massive central prolapse accompanied by sudden onset of paralysis in both legs, usually in the peripheral parts of the limbs and by sphincter involvement. The pain in the back and legs often reduces in severity or disappears with the onset of paralysis, and this might delay consideration of surgery still further.

In view of the risk of a massive prolapse developing and its subsequent dangers, and the incomplete recovery of nerve paralysis despite surgery, a central intervertebral disc prolapse needs surgery to prevent progression, while a massive central prolapse needs emergency admission and enucleation of the disc.

Neurological involvement of bladder or bowel

Bladder or bowel sphincters are rarely implicated in a lateral prolapse. A central protrusion is more likely to disturb bladder function, this being an invariable accompaniment of a massive central protrusion. The vesical dysfunction, which may be present with minimal leg and back signs initially, may be: (a) temporary—that is that relieved by treating the disc prolapse by closed means, or developing after operation. It is usually transient; (b) of occult type due to the insensitive bladder, with minimal back or leg signs; or (c) permanent, due to preoperative bladder dysfunction, persisting despite removal of the prolapse.

With a massive central prolapse some sphincter dysfunction is apt to be permanent, despite resolution of pain and other signs of prolapse when enucleation has been undertaken.

Increase in neurological deficit despite closed treatment

The onset of paralysis during closed treatment, indicating a progressively increasing prolapse, needs urgent surgery. The presence of some neurological deficiency as exhibited by weakness of dorsiflexion of the hallux does not, in itself, indicate an operation. Recovery of this may coincide with improvement of the other signs of prolapse, but prolonged paralysis before operation—that is, procrastination and indecision leading to undue prolongation of closed treatment without improvement—is apt to be followed by ultimate incomplete recovery.

RELATIVE INDICATIONS

Sciatica

Frequent disabling attacks of sciatica due to a lumbar disc protrusion, particularly when this interferes with the patient's enjoyment and mode of life and seriously interferes with his normal occupation, are an indication for surgery. The need will vary with the patient's work, the strain he puts upon the lumbar spine, together with the severity and frequency of symptoms, which in the past may have been controlled satisfactorily by closed methods.

Adhesion of the nerve root

Resolution of disc protrusion after conservative treatment, which has resulted in shrinkage of the prolapse, may still leave paraesthesiae, noted particularly when walking, owing to adhesion of the nerve root to the prolapse. Neurolysis accompanied by enucleation of the affected disc may give relief.

Psychological factors in selecting cases for surgery

All who have operated on lumbar disc protrusions have at times been disillusioned by symptoms persisting in some patients

despite satisfactory removal of a large prolapse. Most are now familiar with the important part psychological factors have in the successful outcome of surgery in disc disorders. Preoperative psychological assessment of the patients' suitability for surgery is important in reducing the incidence of such complications and is particularly helpful when the indication for surgery is relative, as opposed to absolute, and when there is usually a long history of recurrent backache and sciatica.

Assessment by the Minnesota Multiphasic Personality Index (when the patient's index of hypochondriasis and hysteria can be measured) is helpful but is time-consuming. A high hysteria and hypochondriacal score in such an assessment indicates disappointment or failure of surgery despite removal of an anatomical lesion, but the association of a high index of depression with a low hysteria and hypochondriacal score often does not preclude a good surgical prognosis, especially if the patient is given antidepressants. Poor results are more often encountered if a compensation factor is present. A simple assessment can often be made by asking the patient to draw a "pain diagram." They should be provided with the diagram of the anteroposterior projections of the body and asked to indicate the areas of pain, numbness, and paraesthesiae, and to add special features and observations about their symptoms. From this one can deduce the degree of over-reaction by the patient to their symptoms.

Results of surgery

Surgical treatment of a lumbar disc prolapse in selected cases with the specific indications already outlined provides excellent results in 70-80% of patients—that is, they have no further residual complaints. A further 18% will show considerable improvement, such as relief of their major symptoms with perhaps some residual paraesthesiae or numbness or late backache, which may or may not require additional treatment.³⁻⁵ For backache this may not be necessary for many years after the operation. When a disc prolapse develops there is a permanent mechanical spinal defect and whether surgery or closed methods of treatment are undertaken this mechanical deficiency will persist, with the risk of subsequent backache. The patient should be warned of this event before surgery is undertaken and told that surgical intervention will not increase this risk.

To the question "does surgery give lasting freedom from symptoms?" one can promise a high chance of permanent freedom from root pain. A recurrence of true root pain is usually the result of a prolapse at another level, commonly the one above that enucleated. This, therefore, is not a true recurrence of the original prolapse as the symptoms arise from a new prolapse at another segmental level. The results of conservative measures for relief of lumbar disc prolapse are enhanced by the excellent recovery of those suffering from very mild symptoms. Prolonged closed treatment may result in persisting symptoms, and the delayed operation then undertaken will not give complete relief. The incomplete relief will then be attributable and quoted as a bad result of operation, but in reality it results from procrastination in deciding to undertake surgery.

When surgery is contemplated it should be undertaken as soon as possible after the decision is made. The patient should not be put on a waiting list as this results in prolongation of pressure and traction on the nerve roots and increases the incidence of persisting minor symptoms such as paraesthesiae and discomfort in the limb. The known pathology of the condition suggests that recurrences of symptoms are to be expected after conservative measures, the intervals of freedom being extremely variable. Of those treated by closed methods, 57% have recurrence of lumbar disc prolapse within five years of treatment being started.

Hakalius⁶ reported a long-term follow-up of a group of patients with sciatica treated by operation and compared these with a similar group treated by non-operative measures. In both the neurological and clinical appearances were similar. A

seven-year review showed no difference between the two groups at examination but surgery was shown to relieve pain more quickly and give better back function, with lowered incidence of backache and infrequent recurrences of symptoms. A larger percentage of the conservatively managed group than those operated on had to register as unfit for work.

Backache and surgery for lumbar disc prolapse

The most frequent symptom needing medical attention, and often regarded as failure of surgical intervention for lumbar disc prolapse, is the subsequent development of low back pain. This incidence may be as high as 17% of cases subject to disc enucleation for sciatic pain.³ Analysis of long-term results of lumbar disc prolapse has shown that the chance of developing backache after subsequent surgery is no greater than that likely to occur with closed methods and depends on the degree of degeneration before the operation and its subsequent development, often at other levels than that of the disc operated on. It is the consequence of the natural progression of the basic biochemical disc disorder of which the prolapse is one element.

Operation for lumbar disc prolapse is a pain-relieving procedure on a patient whose spine is already mechanically defective, and this mechanical deficit will still be present after operation. A carefully performed operation does not increase this deficiency. Of the patients who develop subsequent backache, most have often insufficient trouble to warrant medical attention, but more severe discomfort is often adequately controlled by wearing a lumbosacral corset. Surgery in the form of lumbosacral fusion is rarely needed. Simultaneous fusion of the affected segment at the time of disc enucleation is not usually practised in Britain. The combined procedure gives a 20% higher chance of total relief from sciatica and subsequent backache in the long term, but the small incidence of severe backache that would require fusion indicates that simultaneous fusion and enucleation are not necessary in most cases subject to surgery and adds unnecessarily to the simple enucleation procedure and increases the period of absence from work.

In conclusion, surgery for lumbar disc prolapse should be considered only in patients where the nerve root is affected by the prolapse and not for backache alone with the exception of a "contained," sequestered nucleus. It should be used only when there are specific indications, but should be undertaken as soon as advised, and the patient should not be placed on a waiting list.

Preoperative psychological assessment is essential to avoid operation in those patients where the prognosis is adversely affected by the superimposed psychological factors.

References

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- ⁶ Hakalius, *Acta Orthopaedica Scandinavica*, 1970, suppl 127.

Is ergotamine contraindicated for a long-term migraine sufferer who has recently developed symptoms of mild coronary ischaemia?

Ergotamine causes coronary vasoconstriction, electrocardiographic changes, and even angina in susceptible people. Dihydro compounds of ergotamine and ergotamine have less vasoconstrictor activity but are also less effective therapeutically and may be effective only if given by injection. The short answer is that ergotamine is contraindicated.