The natural history of lumbar disc herniation

Clinical evolution. It is extremely difficult to study clinically the natural history of a condition causing pain, since patients almost inevitably undergo some form of treatment. This may explain the paucity of information on the natural evolution of the clinical symptoms and signs of disc herniation.

In a multicentre prospective study, Weber, Holme and Anmie 1 analysed 208 patients who presented with the clinical features of lumbar radiculopathy probably due to disc herniation. In no case was herniation diagnosed by imaging studies. All the patients were examined between two and four weeks after the onset of symptoms and a questionnaire was used to evaluate their clinical status at three and 12 months. All were instructed to observe complete bed rest for one week. Some were treated with piroxicam, whereas the others were given a placebo. No significant difference in the evolution of signs and symptoms was observed between the two groups. During the first four weeks after the onset of the symptoms, 70% of patients had a considerable decrease in pain and almost 60% had resumed work. By one year, some 30% complained of back pain, decreased working ability and limitation in recreational activities; 19.5% had not resumed work. Four patients had been treated by operation.

In a prospective, randomised double-blind study by Fraser, 2 30 patients had chymopapain chemonucleolysis and 30 were injected with saline. Disc herniation was diagnosed by myelography in all patients. At six weeks, only 37% of patients in the placebo group had a satisfactory clinical result. This increased to 57% at six months but had decreased to 47% by two years. 3 Operation had been undertaken in 40% of patients. The results of this study are not consistent with those reported by Weber et al. 1 but, in the latter trial, the diagnosis of disc herniation had been made solely on clinical grounds by non-specialists. Fraser’s 2 patients had been referred to a specialist centre, probably after failure of conservative management, and the clinical diagnosis of disc herniation had been confirmed by myelography.

Pathomorphological evolution. In recent years, numerous studies 4-7 have shown that a disc herniation may decrease in size or disappear in the course of a few months, no matter whether it is contained, extruded or migrated, or of a small or large size (Fig. 1). In a prospective study, 4 111 patients with disc herniation or annular bulging diagnosed by CT, had a second CT one year later after one or more epidural injections of steroids. Of the patients with disc herniation, 76% showed a decrease in size, with one-fifth of those demonstrating disappearance of the protrusion, on control CT scans. Only 29% of patients with a bulging annulus fibrosus showed such shrinkage. Deterioration was observed on CT scans in only four patients (5%). Similar findings were observed by Maigne et al 6; of 48 patients who had a further CT scan one to 48 months after the initial examination, 64% showed a decrease of over 75% in the size of the herniation with shrinkage of between 50% and 75% in 17% of the cases.

Large herniations tend to decrease in size to a greater extent, 3-7 but extruded protrusions of small size show less tendency to spontaneous resolution. A decrease in size may occur in the course of a few weeks before complete resolution of the symptoms. A retrospective study 8 has shown that after a mean period of 262 days, most extruded herniations had become smaller or had disappeared after conservative management, but few of the contained protrusions showed any significant change.

Little is known about the mechanisms leading to these changes. In contained protrusions, the main mechanism is likely to be dehydration of the herniated nucleus pulposus. This may account for the higher frequency with which young subjects present a decrease in size of their herniation. 4 In extruded or migrated discs, phagocytosis of herniated tissue by macrophages probably plays the primary role.

Results of conservative treatment

In a large proportion of patients conservative treatment relieves pain in a few days to several months. Resolution of symptoms may occur in the presence of herniations of any type or size.
In a retrospective study, 58 patients with disc herniation treated conservatively by analgesics, anti-inflammatory medication (NSAIDs), epidural injection of steroids, at a low back school or by exercises, were followed for a mean period of 31 months. Surgery was necessary in 10% because of inadequate resolution of the symptoms. Of the remaining 52, 50 had an excellent or good clinical result and 48 resumed work after a mean period of 3.8 months. Of the patients with extruded herniation (26%), 87% obtained satisfactory results and all returned to work irrespective of the presence of a neurological deficit. In another series of 114 cases, 14% of patients required surgery because of failure of conservative treatment; in the remainder, non-surgical treatment, such as epidural or paraforaminal injections of anaesthetics and steroids, led to satisfactory results. Similar outcomes with 90% of satisfactory results have been reported by Maigne et al using a combination of several treatments such as bed rest, NSAIDs, epidural injections of steroids or corsets.

Conservative versus surgical management. Hakelius analysed retrospectively 417 patients treated conservatively by bed rest, a corset and physiotherapy and 166 who had surgery. The patients were assessed monthly for the first six months after the beginning of treatment or operation and most were followed for a mean of 7.4 years. In the first month, 76% of patients managed conservatively had “benefited” from treatment, compared with 97% of the operated patients, but at six months the percentages were similar (93% and 99%, respectively). The mean time away from work was only slightly longer in patients treated conservatively. At six months, the percentage of patients still away from work was 37% in the group with disc herniation demonstrated by myelography and treated conservatively and 7% in the surgical group. In the long term the results were only slightly better in the patients treated surgically. The incidence of recurrences of radicular pain in the years after conservative treatment was 20% compared with 10% in patients undergoing operation. The limitation of this study is that the choice of treatment was not randomised and thus the two groups of patients are not comparable.

In a prospective study by Weber, 280 patients with disc herniation demonstrated by myelography were assigned to three groups. Group I included 87 with mild symptoms who were treated conservatively. The 67 patients in group II in whom there were absolute indications for surgery, had an operation. The 126 patients in group III in whom the need for operation was not so obvious were randomly assigned to conservative (81 cases) or surgical (73 cases) management. All patients in group III were followed up for one, four and ten years after treatment. At one year the percentage of satisfactory results was significantly lower in the conservative (61%) than in the surgical (80%) group. After four years it was still lower in the conservative group, but the difference was no longer statistically significant. Comparable results were observed at ten years. Of the 66 patients in the conservative group, 25% had had surgery during the first year because of the persistence or worsening of symptoms. Neurological deficits improved or disappeared in comparable proportions in the two treatment groups. The main defect of this study is that only the patients with uncertain indications for surgery were randomised for treatment.

A recent investigation evaluated retrospectively 55 truck drivers, 30 of whom had had prolonged conservative management and 25 an operation. The results of treatment were analysed, as was the cost of health care in the five years after initial presentation. In both groups, 80% of patients had a satisfactory outcome. There were no sig-

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Fig. 1a  Spontaneous disappearance of L4/L5 disc herniation in a patient with herniation at the two lowermost lumbar discs. Figure 1a – Sagittal MRI showing disc herniation at the L4/L5 and L5/S1 levels. The L5/S1 herniation was responsible for severe compression of the left S1 nerve root; surgery was performed at this level with complete resolution of symptoms, whereas the L4/L5 disc herniation (arrowhead) was not excised. Figure 1b – MR image obtained 13 months after surgery. The L4/L5 disc herniation has disappeared (arrowhead).
significant differences in the costs of treatment between the two. In this study, only patients with uncertain indications for conservative or surgical management were included.

Percutaneous treatment

Chemonucleolysis. Chemonucleolysis with chymopapain is a technically simple procedure for the L4/L5 and L5/S1 discs and has given the highest rate of satisfactory results of all the percutaneous procedures. In the most recent randomised, double-blind studies, the mean rate of success in the short term was 74% with chymopapain and 48% with a placebo (Table I), and in 12 retrospective studies in which the long-term results were assessed, a successful outcome was achieved in 77% (Table II). The high therapeutic efficacy of nucleolysis is probably due to the enzyme being carried in a liquid agent which is able to reach any area of the disc into which the injection solution can penetrate.

Compared with the other percutaneous procedures chemonucleolysis has a higher risk of severe complications, particularly when used indiscriminately in inexperienced hands. Experienced physicians, however, have never reported serious neurological complications or anaphylactic reactions leaving permanent sequelae. None the less, nucleolysis with chymopapain should not be considered as a minor therapeutic procedure representing the last stage of conservative management, but as having clear-cut indications when it is performed on account of its intrinsic advantages.

Chemonucleolysis requires careful selection of the patient. Good candidates are those presenting with a small or medium-sized herniation, mild or moderate neurological deficit, no marked narrowing of the disc, radicular symptoms of less than eight months duration, and no evidence of nerve-root canal stenosis. This does not imply that patients with a large contained herniation, subligamentous extrusion or severe radicular deficits may not also have satisfactory results, but in these cases the chances of success are considerably less. The procedure then becomes, to a certain extent, a therapeutic attempt merely aimed at avoiding surgical treatment. Those undergoing chemonucleolysis have similar chances of recurrence of the herniation compared with patients submitted to surgery.

Collagenase does not offer any significant advantages compared with chymopapain. The absence of major allergic reactions is balanced by a lower therapeutic efficacy and a comparable or higher rate of neurological complications. Enzymes still under investigation, such as chondroitinase ABC, cathepsins B and G and calpain I, do not appear to compete with chymopapain.

Percutaneous automated nucleotomy (PAN). This is a simple technique at the L4/L5 and more cranial levels, but the L5/S1 disc may be difficult or impossible to approach. Infection of the disc is the only real complication, although, exceptionally, neurological damage has been reported. The ease of the technique and the low rate of complications made the procedure very attractive, until serious doubts arose concerning its therapeutic efficacy. The proportion of satisfactory results was high in some studies, but did not improve on those obtained with an intradiscal placebo in other series (Table I and III). This suggests that

<table>
<thead>
<tr>
<th>Author/s</th>
<th>Number of patients</th>
<th>Follow-up (yr)</th>
<th>Success (%)</th>
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<tr>
<td>Dubuc et al</td>
<td>842</td>
<td>5 to 12</td>
<td>81.0</td>
</tr>
<tr>
<td>Sutton</td>
<td>208</td>
<td>6 to 11</td>
<td>79.0</td>
</tr>
<tr>
<td>Jabaay</td>
<td>130</td>
<td>8 to 10</td>
<td>71.5</td>
</tr>
<tr>
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<td>94</td>
<td>8 to 12</td>
<td>80.6</td>
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<tr>
<td>Nordby</td>
<td>739</td>
<td>8 to 13</td>
<td>76.0</td>
</tr>
<tr>
<td>Thomas et al</td>
<td>42</td>
<td>9 to 13</td>
<td>81.0</td>
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<tr>
<td>Maciunas and Onofrio</td>
<td>268</td>
<td>10</td>
<td>80.1</td>
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<td>146</td>
<td>10 to 14</td>
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<td>Flanagan and Smith</td>
<td>357</td>
<td>10 to 20</td>
<td>74.0</td>
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<tr>
<td>Gogan and Fraser</td>
<td>30</td>
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<td>Postacchini and Perugia</td>
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<td>5 to 10</td>
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<td>Wilson and Mulholland</td>
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<td>5 to 13</td>
<td>71.0</td>
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<table>
<thead>
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<th>Follow-up (mth)</th>
<th>Success (%)</th>
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<td>Davis and Onik</td>
<td>200</td>
<td>6</td>
<td>77.5</td>
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<td>Onik et al</td>
<td>495</td>
<td>12 (minimum)</td>
<td>66.4</td>
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<td>Bocchi et al</td>
<td>500</td>
<td>6 to 29</td>
<td>71.0</td>
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<td>Bonaldi et al</td>
<td>237</td>
<td>11 to 40</td>
<td>75.0</td>
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<td>Gill and Blumenthal</td>
<td>109</td>
<td>15 to 60</td>
<td>79.0</td>
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<td>Kahanovitz et al</td>
<td>38</td>
<td>16</td>
<td>55.0</td>
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<tr>
<td>Revel et al</td>
<td>69</td>
<td>12</td>
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<td>Dullerud et al</td>
<td>142</td>
<td>21</td>
<td>56.0</td>
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<td>Grevitt et al</td>
<td>115</td>
<td>55</td>
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<tr>
<td>Shapiro</td>
<td>57</td>
<td>27</td>
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Table I. Recent prospective, randomised double-blind studies on chymopapain

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of patients</th>
<th>Mean age (yr)</th>
<th>Dose (mg)</th>
<th>Placebo</th>
<th>Follow-up (mth)</th>
<th>Success chymopapain (%)</th>
<th>Success placebo (%)</th>
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<td>1982</td>
<td>60 (30*, 30†)</td>
<td>37.1*, 37.2†</td>
<td>8</td>
<td>Saline</td>
<td>1.5 to 6</td>
<td>80</td>
<td>57</td>
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<tr>
<td>1983</td>
<td>108 (55*, 53†)</td>
<td>37.9*, 39.9†</td>
<td>8</td>
<td>Saline</td>
<td>1.5 to 6</td>
<td>73</td>
<td>42</td>
</tr>
<tr>
<td>1988</td>
<td>159 (78*, 81†)</td>
<td>37.2*, 38.7†</td>
<td>8</td>
<td>CEI†</td>
<td>1.5 to 6</td>
<td>71</td>
<td>45</td>
</tr>
</tbody>
</table>

Table II. Long-term and very long-term results of chemonucleolysis with chymopapain

Table III. Results of percutaneous automated nucleotomy in ten clinical series
PAN may not be truly effective, the successful outcomes being due in many cases to spontaneous resolution of the symptoms. Studies using serial CT showed that after a mean period of six months the size of the herniation was not modified or had increased in some 75% of patients submitted to PAN. The indications for this form of treatment are so limited, however, that only a small proportion of patients with disc herniation are good candidates for it and in these patients conservative management has a good chance of relieving the symptoms. Little is known concerning the mechanism of this technique and the few available studies suggest that PAN may increase rather than reduce the bulging of the disc in the spinal canal.

**Manual percutaneous discectomy.** This includes the technique performed without the use of an endoscope, percutaneous discectomy (PD), and that carried out with endoscopic control (PED).  

PD usually allows removal of the nucleus pulposus to a similar extent as PED and the results are comparable with those obtained by endoscopic discectomy. The endoscope, however, enables the operator to check the completeness of the discectomy, particularly in the posterior portion of the disc and should be preferred.

If strict scientific criteria are applied in the evaluation of the results of manual percutaneous discectomy, the therapeutic efficacy of this method remains to be shown. The number of patients assessed under prospective, randomised and controlled conditions is too small to draw definitive conclusions. A few clinical trials support the impression that removal of the nucleus pulposus under endoscopic control can lead to a clinical success rate of about 70% in patients with a contained or small extruded herniation, but if one considers that patients in these circumstances often undergo spontaneous resolution of the clinical symptoms, PD or PED seems to be an adequate procedure in less than 15% of patients needing surgery.

**Laser discectomy.** Numerous experimental studies indicate that various laser systems are able to coagulate, shrink, carbonise, vaporise or ablate the nucleus pulposus, but only a few have been used for clinical purposes.

In endoscopic disc surgery, the laser, if correctly used, appears to be as safe as manual instruments with no complications related to its use reported so far. Flexible forceps for manual discectomy, however, are as effective as the laser in the removal of the posterior portion of the nucleus pulposus. Moreover, the use of a laser does not reduce the operating time and is not technically simpler but the cost is considerably higher. The clinical results appear comparable with those obtained with manual or automated percutaneous discectomy. At present, the laser appears to be a tool that is neither necessary nor particularly useful in endoscopic disc surgery, and this may explain why so far its use has been very limited.

**Conclusions.** In the 1980s, there was an explosion of interest in percutaneous techniques, but in the last few years, this has decreased considerably since it has been recognised that most of these procedures give a proportion of satisfactory results which is only slightly higher than that obtained with conservative treatment or no treatment. Only chymopapain chemonucleolysis continues to have a good reputation in terms of clinical results, but its complications and the advent of microdiscectomy have led to a progressive decrease in the popularity of the procedure. Percutaneous procedures, particularly chemonucleolysis, still have a role in the treatment of a limited proportion of patients with lumbar disc herniation, provided that the indications are based on strict criteria for selection and that they are carried out by experienced surgeons in patients who accept that the chances of success do not exceed 80%.

**Surgical treatment**

**Indications.** The indications are absolute in those rare patients with a cauda equina syndrome and in the presence of severe motor deficits of recent onset and/or intractable pain. In patients with a cauda equina syndrome, surgical management should always be performed early to increase the chances of satisfactory neurological recovery. It is also necessary in the presence of severe sensory and motor deficits if the type and size of herniation make spontaneous regression of the symptoms unlikely. In patients with intractable radicular pain, conservative management should be attempted but abandoned if it appears to be ineffective. In all other cases, the indications for operation are relative and depend on four factors:

1) The duration of the radicular symptoms. The chances of resolving symptoms with conservative care decrease progressively with increasing time. After three months of continuous or almost continuous lumbaradicular pain, the chances of improvement are slight and decrease further after six months.

2) The type and size of the herniation. It is more likely that the symptoms will decrease in severity or disappear when the herniation is contained and small than in the presence of a large extruded or migrated fragment of disc.

3) The presence of stenosis of the nerve-root canal or the central spinal canal. The neural structures may escape compression by a herniated disc less easily in the presence of a decreased reserve space in the spinal canal, as occurs when the latter is stenotic.

4) The quality and severity of symptoms. Surgery is more often indicated in patients with severe, exclusively radicular, pain than in those with moderate low back and leg pain, since in the former the symptoms are less likely to resolve spontaneously and the results of surgery tend to be better.

The presence of a mild or moderate motor deficit does not necessarily affect the indication for surgery or conservative management.

Surgery should be performed in all patients with a relative indication when no significant improvement has been obtained with conservative care. The duration of the
latter is not well defined but should rarely be less than two
months, since it is in this interval that an improvement in
symptoms usually occurs. Patients who do not improve
considerably after this period have fewer chances of ach-
ieving an adequate resolution of symptoms with increasing
time.

Contraindications. The only absolute contraindication is a
disc herniation discovered incidentally in asymptomatic
subjects. The other contraindications are relative.

Discectomy is generally contraindicated in five situations:
1) When the only clinical abnormality is a mild or moderate
motor loss. Even when weakness is severe, however, sur-
gery is rarely indicated. The same considerations apply to
sensory deficits, which usually disappear spontaneously
with time.
2) In patients with psychological disorders or involved in
legal controversy, unless a clear-cut organic pathological
condition is present. Even then the result may not be
satisfactory.
3) In bulging of the annulus fibrosus. This rarely requires
discectomy unless a narrow or stenotic spinal canal con-
tributes to cause severe nerve-root compression.
4) In the presence of vague radicular symptoms, or symp-
toms in a different dermatome than expected. Based on the
level of herniation further investigations should be per-
fomed and discectomy should be considered with caution.
5) In patients whose radiated pain is confined to the
buttock, who are usually not good candidates for dis-
cectomy. It is rarely indicated in patients complaining only
of low back pain, in whom fusion of the motion segment
should be considered if operation is undertaken.

Conventional discectomy

Conventional discectomy is indicated in any patient with a
herniated disc. It is also the current procedure when an
arthrodesis of the motion segment is performed in associa-
tion with discectomy or when, in the presence of lumbar
stenosis, bilateral laminectomy is carried out before exci-
sion of the disc. It may be the procedure of choice in
patients with disc herniation at multiple levels or after a
recurrent prolapse. It may then be necessary to start the
operation under normal vision and use the operating micro-
scope only when the neural structures are visualised. This
allows overall assessment of the field of operation. The
conventional operation does not necessarily imply a large
exposure with a major laminoarthrectomy.

Microdiscectomy

Use of the microscope. The main drawback of discectomy
under normal vision is the lack of adequate illumination of
the deep surgical field. The degree of lighting is related to
the extent of exposure of the spine, but even an extensive
exposure may not ensure adequate illumination of the
spinal canal. The surgeon may be forced to operate without
adequate visualisation of the anatomical structures.

The operating microscope ensures excellent lighting, regard-
less of the extent of the surgical exposure and the
depth of the anatomical structures. It gives a magnified
view, allowing the deep structures to be seen clearly (Fig.
2). The operation may then be performed with greater
precision, the causes of compression of the neural struc-
tures may be more easily identified and there are fewer
risks of causing undue trauma to the emerging nerve root or
thecal sac. Use of the microscope allows limitation of both
the surgical approach and the extent of the lamino-
arthrectomy.

There are no unequivocal data as to whether better
clinical results are obtained after microdiscectomy com-
pared with the conventional procedure. A more limited
cutaneous, fascial and muscular access, however, involves
fewer risks of complications in healing and less local
pain in the early postoperative period.⁴⁷,⁴⁹ The arthrectomy
preserves better vertebral stability and tends to decrease the severity of postoperative low back pain. Patients undergoing microdiscectomy are able to resume their everyday activities more rapidly.

These advantages are not such as to make the use of the microscope indispensable, but they do facilitate the work of the surgeon and may improve the quality of the result. This may explain why microdiscectomy has become a popular technique.

Indications. Microdiscectomy is indicated in all patients with a herniated disc at a single level. Use of the microscope is also indicated in recurrent disc herniation, provided that the surgeon has adequate experience in microsurgery. Otherwise, it should be used only at the time of excision of the disc. The presence of stenosis of the root canal in association with a herniated disc at the same level does not affect the indications for the use of the microscope. In patients with two-level herniations the surgical exposure is necessarily extensive and allows good lighting of the surgical field. In these cases the microscope enables the surgeon to operate with greater precision.

Results of surgical treatment

After operation, the results are satisfactory in two to three months in approximately 85% of patients. In the short term, the percentage of satisfactory results ranges in most studies from 75% to 95%. The results in the medium term are similar. In the long term, the outcome after operation tends to deteriorate in a limited number of cases because of recurrence of radicular pain or exacerbation or recurrence of low back pain. By then, approximately 10% of patients have undergone further operation at the same or different levels to the previous procedure. In the very long term less than half of the patients are asymptomatic. The remainder complain of some symptoms, usually in the low back, the presence and severity of which seem to be related to degenerative changes independent of the operation.

With microdiscectomy, the stay in hospital after operation may be 24 hours or less. Reduced back pain allows a more rapid functional recovery and a faster return to sedentary work. After eight to 12 weeks, the results of microdiscectomy are similar to those of conventional surgery, provided the arthrectomy is only slightly wider than that currently performed when using the microscope.

Elderly patients have the same probability of surgical success as those who are younger.

Motor or sensory deficits of slight or moderate severity usually recover completely after surgery. Those which are severe may recover only partially or remain unchanged; the probability of recovery is inversely proportional to the severity and duration of impairment. In those which have lasted longer than one month, the longer the time which has elapsed from their onset, the lower the chances of complete recovery.

Approximately 60% of the patients with a cauda equina syndrome who present with paralysis of the bladder obtain incomplete recovery of function. Patients with partial dysfunction nearly always achieve a good functional recovery. The interval between the onset of the syndrome and surgical treatment does not affect the outcome. Nevertheless, in the presence of a cauda equina syndrome, it is advisable to carry out the operation rapidly to avoid the risk that partial sphincter, motor or sensory dysfunction may worsen, thus decreasing the chances of a complete postoperative recovery.

Most patients return to their preoperative work or to a lighter job, usually by eight to ten weeks after surgery, but earlier for sedentary rather than manual workers.

Three factors have a significant effect on the result of surgery, namely the preoperative duration of the clinical syndrome, the surgical findings, and the degree of tension on the nerve root. Patients with pain for more than six months before surgery and those with annular bulging or...
contained disc herniation tend to obtain less satisfactory results than those with a shorter duration of pain and/or a migrated disc herniation. A satisfactory result is associated more often with markedly positive nerve-root tension tests. A clear-cut prevalence of low back pain over leg pain implies a high risk of an unsatisfactory outcome.

### Lateral herniations

Lateral intraforaminal or extraforaminal herniations can be excised through the usual interlaminar technique or through approaches which lead to the outer aspect of the intervertebral foramen without passing through the vertebral canal (Fig. 3). Para-articular, paraspinal, and paralateral extravertebral approaches have also been described (Fig. 4).

Excision of an extruded intraforaminal herniation or a fragment of disc which has migrated into the root canal may be a demanding procedure under normal vision, particularly if the fragment is small or attempts are made to preserve much of the articular processes. Complete arthrectomy, however, which makes the removal of the herniation easier, may decrease the stability of the involved motion segment. These drawbacks are avoided when using the operating microscope (Fig. 3).

All extravertebral approaches can be carried out under normal vision, but it may be difficult to identify the anatomical structures in the intervertebral foramen and handle the nerve root without trauma in order to visualise and excise the herniated disc. It is thus preferable to use the operating microscope or at least a frontal source of light.

### Recurrent herniation

**Definition of terms.** The term ‘recurrent’ indicates a disc herniation occurring at the same level and side as the primary protrusion and ‘new herniation’ describes a contralateral lesion at the same level or a fresh herniation at a different site. A herniation may be considered as a recur-
rence if the radicular pain has entirely receded or considerably decreased for at least a few months after primary discectomy. If this is not the case it should be regarded as a failure of surgery. The time interval for a disc herniation to be considered as a recurrence may arbitrarily be estimated at three months. Before then it is unlikely that the newly-formed tissue within the disc is the source of a prolapse causing nerve-root compression. Early recurrent herniations are those which occur between the third and the twelfth months after operation and late recurrences are those developing thereafter.

**Conservative treatment.** The natural history of recurrent disc herniation is unknown and there is little information regarding the effectiveness of conservative management. Hakelius and Naylor reported that 5% and 8%, respectively, of their patients who had undergone operation had complained of recurrent radicular pain which resolved with conservative treatments, but in both series the diagnosis was based on clinical evaluation.

In my experience, patients with a small recurrent herniation tend to have a spontaneous resolution of lumbar-radicular symptoms, which may be hastened by conservative management for at least four months before further operation is considered. In these patients the result of further surgery is unpredictable. In patients with a medium or large recurrent herniation causing severe nerve-root compression, disappearance of the radicular pain is less likely to occur than in those with a primary herniation. This is due to the characteristics of the herniated tissue, which shows little tendency to decrease in size as a result of dehydration, and to the presence of epidural fibrosis which reduces the mobility of the affected nerve root. If lumbar-radicular symptoms persist after one to two months in these patients, conservative treatment should be withdrawn. This is particularly so in those who have obtained a satisfactory result after the primary discectomy followed by a long period free from pain.

**Results of surgery.** The proportion of satisfactory results after repeat discectomy is not certain, since in most of the studies, patients with a recurrence have been evaluated along with those presenting with a new herniation. In numerous series the proportion of satisfactory outcomes ranged between 77% and 85%. Finnegan et al reported 92% of satisfactory results in patients with recurrent or new herniation, but in another study, only 64% of patients who had a further operation at the same level achieved a satisfactory result. In the past it was difficult to differentiate between epidural fibrosis and recurrent herniation but now the latter can usually be diagnosed easily by MRI with gadolinium (Fig. 5).

Two factors seem to play a role in predicting the surgical outcome, namely, the quality of the result after primary discectomy, and the preoperative diagnosis and/or the intraoperative findings. Patients with satisfactory results after primary discectomy have a high chance of obtaining a good outcome after reoperation, but the quality of the result tends to be slightly worse after this latter procedure due to the persistence of low back pain and/or radicular symptoms.

Small recurrent herniations and epidural fibrosis are more often associated with unsatisfactory results than medium-sized or large herniation. Unsatisfactory results are more likely to occur when the time interval between primary discectomy and reoperation is less than one year.

**References**


