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Lumbar Disc Herniation in Patients Up to 25 Years of Age

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Abstract

Retrospective analysis of 165 patients (105 males, 60 females) with a mean age of 21.2 years (range 14 to 25 years) of 6933 surgically treated patients from January 1987 to May 1999 focused on age and sex distribution, body mass, familial predisposition, trauma, histology, and clinical course. The incidence of herniated lumbar discs was 2.3% in patients aged up to 25 years. A valid family history was obtained in 121 patients and a positive history was found in 82 of these patients (67.8%). The patients had a higher body mass index compared to a group of individuals with a similar age structure. Radiography demonstrated bony changes in 124 patients (75.2%), primarily attributable to postural deformities such as scoliosis. The condition of the bony structures seems to be more important than the condition of the disc tissue in the occurrence of this disease in young patients.

Key words: low back pain, adolescent

Introduction

Lumbar disc herniation requiring surgical management is a rather rare event in patients up to 25 years of age. The incidence is 5.5 cases per 100,000 person years compared to an incidence of 128.3 per 100,000 person years in the age group between 40 and 45 years and an overall incidence of 72.3 across all age groups.[7] A surgical series of 3946 patients with lumbar disc herniation included only 11 (0.27%) patients younger than 19 years.[22] Similar rates have been reported for the United States, Europe, and Japan.[4,7,18]

No differences have been found in the course of lumbar disc herniation between adult and young patients,[6,9,12] although age-related differences in clinical manifestations were identified.[2,10,19,21,24] There is general agreement that there is a rather long delay between the onset of symptoms and surgical treatment in young patients as compared to older ones.[2,6,9,10,12,19,21,24] Traumatic events appear to be a crucial factor in the occurrence of lumbar disc herniation in younger patients in contrast to adults,[2,6,8,12] whereas the involvement of a familial predisposition is controversial.[1,2,4,5,14,17-19]

The current study tried to identify shared features and peculiarities of lumbar disc herniation in young patients by analyzing 165 cases in a total population of 6933 surgically treated patients.

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Patients and Methods

The retrospective analysis included 165 patients (105 males, 60 females) with a mean age of 21.2 years (range 14 to 25 years) at the time of surgical treatment for lumbar disc herniation at one neurosurgical unit from January 1987 to May 1999. The study included only those patients who had not undergone lumbar disc surgery before, and in whom disc herniation was confirmed at surgery.

The indication for surgery was established on the basis of clinical findings and confirmation of lumbar disc herniation by diagnostic imaging after failure of conservative treatment. The surgical approach in all patients consisted of interlaminar fenestration with extensive removal of the nucleus pulposus and the disc sequestra. Postoperatively, the patients were mobilized under physiotherapeutic care on the first postoperative day and usually discharged for further outpatient management after about one week.

Documentation included recording of the factors subjectively identified by the patients as having triggered disc herniation and the symptoms that led the patients to seek medical advice.

A positive family history was assumed when at least one first-degree relative suffered from sciatica.[21] The following clinical findings were evaluated and recorded: body mass index, sensory abnormalities and motor deficits, abnormal reflex responses, and positive straight leg raising sign.

All patients underwent conventional preoperative biplane radiography and computed tomography of the lumbar spine focused on the symptomatic level. Additional radiography of the lumbar spine was performed in ante- and retroflexion in eight patients (4.8%). Further diagnostic procedures were magnetic resonance imaging in 25 patients (15.2%), lumbar myelography in 28 (16.9%), and bone scintigraphy in one (0.6%). The clinical and surgical findings were analyzed with respect to the degree of intervertebral disc herniation.

Subjective complaints and neurological findings were recorded one day before surgery and on the day of discharge (4–18 days following surgery, mean 7.4 days). The further postoperative course was monitored by follow-up examinations on an outpatient basis in 49 patients (25–358 days postoperatively, mean 78 days) and by questionnaire or telephone interview in 104 patients (180–887 days after surgery, mean 389 days). Twelve patients were lost to follow-up.

Results

I. Patient characteristics

The ratio of male to female patients was 1.75:1. The incidence of herniated lumbar discs treated surgically in patients aged up to 25 years was 2.3% in this series of 6933 operations for lumbar disc herniation performed during the study period.

Both females and males undergoing lumbar disc surgery between 14 and 25 years of age had a significantly higher body mass index compared to a patient population of similar age from four cities in Switzerland.[4] The mean difference was 1.65 kg/m^2 (range 0.9 to 2.4 kg/m^2) for females and 1.35 kg/m^2 (range 0.6 to 2.1 kg/m^2) for males.

A valid family history was available in 121 patients and was positive in 82 (67.8%). Close relatives of eight of the 82 patients (9.8%) had undergone disc surgery. Two of the patients were siblings, both of whom underwent surgery.

Thirty-two patients (19%) identified load-lifting activities as the triggering event (Fig. 1). Ten patients (6%) ascribed disc herniation to an accident. One patient (1%) attributed intervertebral disc herniation to his height (207 cm). Altogether, 72 patients (43.6%) stated that the job they held before surgery was physically demanding.

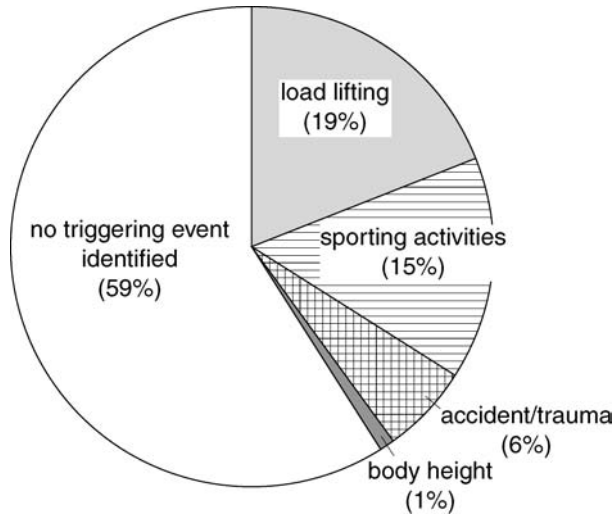

Fig. 1 Factors supposedly triggering lumbar disc herniation in 165 patients below 25 years of age.

Histological work-up of the disc material removed at surgery was performed in 120 patients (72.7%). Examination showed severe degeneration in 78 patients (65%) and mild degeneration in 42 (35%). The histologically determined degree of degeneration of the nucleus pulposus did not correlate with the duration or severity of lumbar pain or radicular symptoms.

II. Clinical course

Nearly all patients (161 of 165, 97.5%) complained of radicular pain before surgery, and radicular pain was not preceded by lumbar pain in 42 (25.4%). The mean preoperative duration of lumbar pain was 2.5 years. Radicular symptoms had been present for 5.5 months. Straight leg raising sign was tested in 154 patients (93.3%) and could not be tested in 11 (6.7%) because pain was too severe. This sign was positive above 30° in 94 (61.0%) and negative in only 11 (7.1%) patients. Sensation was normal in 55 patients (33.3%) before surgery, but 110 (66.7%) complained about corresponding segmental hypesthesia and hypalgesia in the respective dermatomic areas. Reflex differences were identified in 102 patients (61.8%), but 83 (50.3%) showed motor deficits.

Surgery was performed at L5-S1 intervertebral space in 96 patients (58.1%), at L4-5 in 64 (38.8%), and at L3-4 in five (3%).

On the day of discharge (range 4–18 days, mean 7.4 days), 65 patients (39.4%) were free of complaints. Altogether, 135 of the 165 patients (81.8%) reported relief at discharge. Three patients (1.8%) were operated on twice since symptoms recurred

only a few days after the first intervention and neuroradiological findings suggested early recurrence or residual disc herniation. Renewed symptoms of disc herniation occurred in a total of 12 patients (7.2%). Two patients were successfully managed by conservative treatment comprising bed rest, anti-inflammatory agents, and analgesics. The other 10 patients (6.1%) underwent repeat operation for lumbar disc herniation. Eight of these were re-operated once, three (1.8%) at the same level and five (3.0%) at a different level. One patient (0.6%) had two further operations at the same level, and another patient (0.6%) four operations, the last of which was posterior spinal fusion for proven instability.

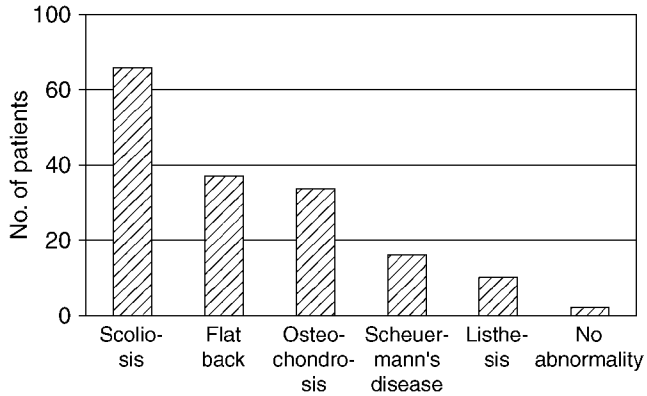

Fig. 2 Findings of lumbar spine radiography in 165 patients aged up to 25 years with lumbar disc herniation.

Discussion

Previous studies of patients with lumbar disc herniation demonstrated a preponderance of females in the age group of up to 16 years with a reversal of this ratio in patients aged 17 years or older.[14,22,25] This sex distribution is presumably due to the earlier occurrence of periods of rapid increase in growth, height, and weight in girls than in boys, which might make girls more susceptible to stress-induced and traumatic damage to the intervertebral discs. In this series, no such female preponderance was observed. The majority of patients younger than 25 years operated on for a herniated lumbar disc were male.

The patients in this study had a higher body mass index compared to a randomly selected group of individuals of similar age. This finding suggests that a patient's physical constitution is an important factor, as increasing body weight and height result in increased loading of the vertebral column. Such overloads translate directly or indirectly via postural deformities into an overstraining of the intervertebral discs. The impact of chronic lumbar postural deformities and overstraining is also reflected by radiographic changes in such patients (Fig. 2). Radiography demonstrated osseous changes in 124 patients (75.2%) of the present series. A study of lumbar disc herniation in a group of 29 young patients and 50 elderly individuals found the incidence of asymmetries of the facet joints was five times higher in younger patients compared to the adult group.[16]

There is a familial predisposition for lumbar disc herniation. A study of 63 patients under 21 operated on for a herniated lumbar disc found a positive family history in terms of lumbar pain, sciatic symptoms, or disc herniation in 81% as compared to 37% in a control group ($p < 0.01$).[26] A 12-year-old girl with multilevel disc herniation was treated conservatively, and the patient's asymptomatic twin sister had herniated discs at several levels, corroborating the idea of a genetic predisposition.[20] A study of 40 patients with intervertebral disc herniation requiring surgical management and their parents compared them to a control group, finding a familial predisposition with an odds ratio of 5.61 as compared to the controls.[18] The present study identified a valid family history in 121 patients (73.3%) and a positive history in 82 of these (67.8%).

Lumbar disc herniation is generally regarded as a multifactorial process.[7] Physical activity is one factor that appears to be associated with an increased incidence of lumbar disc herniation in males of all age groups. Trauma as a precipitating event is controversial.[6,8,12,14] Trauma was identified as the triggering factor in 44%[25] and 36% of patients,[22] and a correlation was found between trauma and intervertebral disc herniation in 50% of cases.[2] In this context, it is important to distinguish between repetitive microtraumatic injuries inflicted, for instance, by sports activities from a single traumatic event as the immediate trigger of disc herniation. Trauma, mostly during sporting activities, was involved in 17 of 29 patients (58.6%).[14] Traumatic mechanisms seem to differ between young and adult patients. Whereas sports accidents are the most common cause in younger patients, adults typically strain themselves when lifting heavy objects.

In one study, 50% of the patients reported back injury, nine patients (30%) had trauma and six (20%) load-lifting activities.[6] About half of 43 patients investigated had a traumatic event occurring during sporting activities or while lifting an excessive load involved in the occurrence of vertebral disc herniation.[12] In this series, a traumatic event was identified as the immediate trigger of herniation in 20 of the patients (12.1%). Lumbar disc herniation in individuals with healthy, intact intervertebral discs

can only be caused by a very violent trauma, and has occurred in only one patient who had fallen off a trampoline.[9]

No correlation was found in the present material between histological degeneration and the duration or severity of lumbar pain or radicular symptoms. The results of a previous study[15] also support the hypothesis that the primary cause of intervertebral disc herniation in young patients is a postural anomaly and the resulting spinal overstraining rather than disk degeneration. That magnetic resonance study of 1419 patients found a relationship between Scheuermann's disease and disc herniation, which was primarily seen in younger individuals (81% younger than 40 and 9% younger than 21).

The hypothesis that static rather than degenerative problems are involved in disc herniation is also supported by a study of the relationship between degenerative changes of the lumbar spine, the height of the intervertebral space, and histological disc changes in 23 patients aged up to 40 years.[3] No correlation was found between the degree of nucleus pulposus degeneration and the height of the intervertebral space. This finding favors the assumption that bony changes occur before secondary damage of the discs. Another study found a causal relationship between the early evolution of a degenerative process of the lower lumbar spine and recurrent low back pain.[23]

The postoperative outcome 9 months after surgery was good or excellent in 95% of 74 patients aged up to 17 years with lumbar disc herniation.[11] However, 16 patients with an initially favorable result subsequently required a second operation. Following conservative and surgical treatment in this subgroup, the results were excellent in 57%, good in 38%, and poor in only 4%. Early lumbar disc surgery is recommended in young patients because of the good results achieved in this age group.[13] In the present series, 58 patients (35.1%) needed no further therapy whereas 41 (24.8%) had to undergo conservative treatment for persisting lumbar pain. Lumbar pain was present long before the onset of radicular symptoms in our patients.

The condition of the bony structures and ligaments is the major predisposing factor leading to intervertebral disc herniation in the young. Most patients had an elevated body mass index and appreciable radiological bony changes. Such changes are rarely degenerative alone, and may be attributed to postural deformities such as scoliosis. The present study shows that low back pain develops long before radicular symptoms leading to surgery in most young patients. Low back disorders in young individuals are rarely treated conservatively, although very good results are achieved in many cases.[27] The present study also suggests that early and extensive physical therapy should be initiated as soon as possible to prevent intervertebral disc herniation in young patients.

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Commentary

Dr. Pietilä et al. have presented an interesting study of lumbar disk herniations in a young population, aged 14–25 years at the time of surgical treatment. This is an important population to follow. This study supported the contention that the two primary factors predisposing to HLD in this young population are bone abnormalities, which were present 5 times more frequently, and a positive family history, which was present in 67% of the patients. There has been no question that a significant number of patients with herniated lumbar disks have a positive family history but the exact incidence of familial predisposition to this in the general population is not known, nor is the defect that predisposes to this fully understood. With more studies like this we will begin to understand the various bony abnormalities that predispose to the disk herniations. I hope these authors will be able to follow these patients for several decades to find out the natural history such as who in this group and how many will require a fusion. Studies like this are arduous to complete, but they help all of us understand the illness better.

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This paper clearly demonstrated that lumbar disc herniation in the younger age group is related with a higher body mass and a familial predisposition. Weight control in the young is one of the major issues in Japan, since obesity due to westernized eating habits causes various medical problems. In the present medical standard, a routine dynamic radiograph including lateral films on flexion and extension and oblique views as well as MRI is essential for the diagnosis of lumbar disorders to evaluate instability and spondylolytic spondylolisthesis. As to the surgical method, endoscopic discectomy has recently been introduced as a minimally invasive surgery, especially in the younger age group, in which the interlaminar space is wide and endoscopic discectomy is relatively easily carried out.

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