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JUVENILE LUMBAR DISC HERNIATIONS

By

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Intervertebral disc herniation in children is of interest from an aetiological point of view and also because the clinical picture differs, to some degree, from that seen in adults.

Judging from the reports of operated cases, lumbar disc herniation in childhood is extremely rare. After *Wahren* (9) described one operated case of disc herniation in a 12 years old child in 1946, several single cases have been reported. Of greater significance are four publications (2, 5, 7, 10) which included more patients. The largest series is from the Mayo Clinic, with five cases below the age of 16 years, out of 6,500 operated for herniated lumbar disc.

In the Department of Neurosurgery, Rikshospitalet, Oslo, during the ten-year period from 1956 to 1965, 840 patients were operated upon for lumbar disc herniation. Seven of these patients were between 11 and 17 years of age.

REVIEW OF CASES

Of seven patients, four were boys, the rest girls. Table 1 describes the ages at the onset of clinical symptoms. In one boy, these began at the age of seven, documented not only by the parent's information but also by motion picture films taken at that time, which clearly demonstrates his "stiff back". Interestingly, the father and two cousins had been operated for herniated lumbar discs. The remaining material discloses one other instance in which there was a previous disc surgery in the family history.

Trauma was implicated as symptom-causative in two cases, both by the patient and the parents. One fell while running and experienced acute low-back pain of 2-3 days duration which then subsided until sudden sciatica occurred three months later. The other child sustained low back trauma from a fall on the buttocks and similiary had pain lasting only a few days with acute sciatica three months later.

There were striking similarities in the child's complaints, the parents' information, and the objective findings in our cases. All patients noticed the following: Walking

Table 1.

	Sex	Age at the onset of sciatica	Age at the time of operation	Duration of symptoms at the time of operation	Observation time after surgery
Case 1	♂	11 years 3 months	11 years 9 months	6 months	6 years
Case 2	♀	14 years 5 months	15 years	7 months	5 years 7 months
Case 3	♀	14 years 5 months	17 years	2 years 7 months	6 months
Case 4	♂	7 years	13 years 6 months	6 years 6 months	2 years
Case 5	♀	15 years 7 months	16 years 2 months	7 months	3 years 2 months
Case 6	♂	16 years 3 months	16 years 7 months	4 months	4 years 5 months
Case 7	♂	13 years 9 months	14 years 6 months	9 months	8 years 5 months



Figure 1. A boy with lumbar disc herniation (Case no. 4) demonstrates his inability to bend forwards.

difficulties, the scoliotic posture and the child's inability to bend forward. All of the seven children described low backache and sciatic pain, difficulty in placing one foot ahead of the other, and aggravation of the complaints in the sitting position and by coughing and sneezing. Each child was able to find relief from his pain by assuming a certain recumbent position. Further, they could control the pain by avoiding physical exertion and by using particular movement patterns during gait. This condition had necessitated refraining from participation in sports.

Clinical examination revealed essentially the same sign complex in all patients:

- 1) Spastic "guarding" scoliosis of the lumbar spine with the convexity toward the affected side.
- 2) Straightening of the lumbar lordosis or slight kyphosis.
- 3) Extreme restriction of the range of motion in the lumbar spine (Figure 1).
- 4) Lasegue's test was positive with minimal elevation of the legs. None required more than 30 degrees elevation ipsilaterally, while the crossed Lasegue's test was positive between 45 and 75 degrees.
- 5) Radicular pain could be produced by palpation in the paravertebral musculature corresponding to the affected nerve root.
- 6) Characteristic gait, due to the necessity of avoiding flexion of the hip on the affected side and movement in the lumbar spine. Two of the patients, with a prolapsed fourth lumbar disc, demonstrated a slight reduction of power in the extensor hallucis longus and a weakened Achilles reflex on the affected side. Reduced sensibility could not be verified.

Roentgenograms of the lumbar spine in two planes confirmed the clinical findings of altered lumbar column axis. In three cases the affected disc was reduced in height, and, in two bone reaction in the adjacent vertebral bodies was noticed (Table 2). Congenital anomalies were demonstrated in three cases, among which were two patients with six lumbar vertebrae and one with an asymmetrical sacralisation of the fifth lumbar vertebra.

Preoperative Abrodilmyelography (water soluble medium) was performed in all instances. This was negative in three cases although one of these had an earlier myelogram (five months previously) which suggested a prolapse (Table 2). In one

Table 2.

X-ray examination of the spine in 2 planes	Abrodilmyelography	Discography	Operative findings
Case 1. 6 lumbar vertebrae. Left-convex lumbar scoliosis, Straightened lumbar scoliosis.	Negative findings	Not performed	Extrusion of material from L ₆ disc, left side.
Case 2. Slight reduction in height of L ₅ disc. Left-convex lumbar scoliosis. Straightened lumbar scoliosis.	Possible herniation of L ₅ disc.	Not performed	Extrusion of material from L ₅ disc, left side.
Case 3. Slight reduction in the height of L ₃ and L ₄ disc, and slight bone-reaction from the adjacent vertebrae. Right-convex lumbar scoliosis. Straightened lumbar lordosis.	Possible herniation of L ₄ disc. Five months later, preoperatively: Negative findings	Not performed	Extrusion of material from L ₄ disc, right side.
Case 4. 6 lumbar vertebrae. Spina bifida L ₆ . Right-convex lumbar scoliosis. Straightened lumbar lordosis.	Negative findings	Protruding contrast from L ₄ disc. Sign of degeneration in L ₅ and L ₆ disc.	Extrusion of material from L ₄ and L ₅ disc, right side.
Case 5. Slight bone-reaction in vertebrae adjacent the L ₄ disc. Right-convex lumbar scoliosis. Straightened lumbar lordosis.	Herniation of L ₄ disc.	Not performed	Extrusion of material from L ₄ disc, right side.
Case 6. Slight reduction in height of L ₄ disc. Right-convex lumbar scoliosis. Nearly straightened lumbar scoliosis.	Probably herniation of L ₄ disc.	Not performed	Extrusion of material from L ₄ disc, right side.
Case 7. Asymmetrical sacralisation of L ₆ vertebra. Left-convex scoliosis. Straightened lumbar scoliosis.	Herniation of L ₄ disc.	Not performed	Extrusion of material from L ₄ disc, left side.

of the patients with a negative myelogram, a subsequent discography revealed protruding contrast from the suspected disc as well as degenerative changes in two other discs.

The duration of symptoms before surgical intervention, varied from four months to six years and a half. All patients had received conservative treatment before surgery, including physiotherapy and bedrest. Bedrest provided temporary symptomatic improvement in every patient. Postural realignment was attempted early during the course of symptoms in some of the patients but was wholly ineffective.

Surgical intervention was justified on the basis of the duration and intensity of symptoms and the failure of conservative therapy. Myelography was particularly important in establishing the level of disc involvement, because there were only a few other objective clinical findings which helped in this respect. In three patients the myelogram was negative before surgery, but in these discography provided valuable information.

The operative method employed was a subperiosteal loosening of the paravertebral musculature from the vertebral arch on the affected side, followed by arctomy. The interarticular joint was not resected. One herniated disc was found in six patients and one patient had two herniated discs. The fourth lumbar disc was involved in five patients, the fifth lumbar disc in two patients and the sixth lumbar disc in one patient (Table 2). Operative findings in these children did not differ from those normally seen in adults with similar lesions. The annulus fibrosus had ruptured and a sequestration, which could be extracted by forceps, was found in each case. The nucleus pulposus of the affected disc and all loose tissue was removed as completely as possible. Microscopic examinations of this tissue revealed a cartilagenous structure with degenerative changes.

The postoperative course was uncomplicated in all the patients, and they later received physical therapy which emphasized strengthening of the back muscles. Ambulation was started on the second postoperative day with gradual progression. By the time of dismissal 10-12 days after surgery, all the patients were improved in condition.

During the early months of 1966, six of the seven patients were re-investigated by the author, both clinically and with x-rays. The other patient returned a questionnaire. Observation time since surgery had varied from six months to eight and a-half years (Table 1). In none had there been recurrence of low-back pain or sciatica since the time of the surgery. Two patients reported some back stiffness, and one of these, unlike the other six, had taken some precautions in his physical activity. The six patients investigated clinically had a normal gait, were without evidence of muscular atrophy, and had no sensory-motor deficit. Two children still had the scoliosis that was present preoperatively. The later two patients had also a restriction of lumbar motion, especially for ventral flexion.

A-P and lateral x-rays of the spinal column were repeated during the follow-up studies in six patients. The degree of scoliosis was unchanged in one, and in another it had increased (Figure 2). No reason could be found in either of these two patients to attribute the scoliosis to a static cause. The three patients in whom x-rays showed a reduction of disc height before surgery demonstrated the same finding as control, but there was no reduction in any other disc. There was no increase in the bone reaction seen previously.

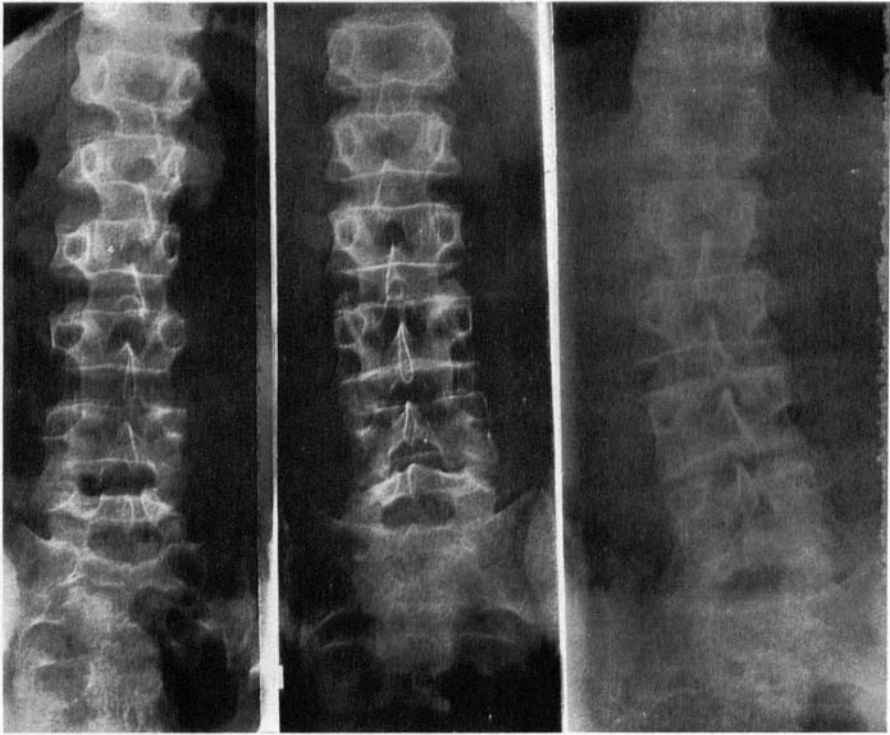


Figure 2. AP x-rays of lumbar column (Case no. 4). From left: 3 years prior to, just before, and 2 years after disc surgery. The increasing lumbar scoliosis will be evident.

DISCUSSION

It is generally accepted that the progressive alterations which occur in the disc with advancing age, makes it less resistant to mechanical strain, and therefore more disposed to herniation. According to *Inman & Saunders* (8) these changes may begin in the third decade of life or even earlier, if the disc has been weakened as a result of trauma or congenital defects. However, it is an open question whether the degenerative changes are an absolute cause of disc herniation. *Hyndman* (4) is of the opinion that a single trauma resulting in prolapse of a previously normal disc is unlikely, and loading experiments of the lumbar spine have established the fact that the intervertebral disc is not the weakest part (1, 3, 6). Therefore, disc herniations in children raise interesting problems.

Information concerning back-trauma followed by low back pain, is found in a high percentage of reported cases of disc herniation in children (2, 10). On the other hand, we have discovered only two published cases in which sciatica developed as the first symptom after trauma (9, 10). Our material includes two patients who had only transient low back pain after trauma but who, three months later, presented a picture of sciatica.

Neither the operative findings nor the histological examinations of herniated intervertebral discs in children, gave any significant information which allows us to presume that the pathogenesis of this disorder is different from that in adults. In this, we are in agreement with most authors. Key (5), however, reported four cases of operated disc in children, in whom no rupture of the annulus fibrosus was found, but a "dome-like bulging of the disc". Key also found no sequesters, but on incising the "dome-like bulging" a greyish-white, gelatinous material exuded. Microscopic examination of this material revealed normal disc tissue in three cases, while one showed, in addition, degenerated cartilage. It should be noted that in Key's four cases there was no rupture—only a bulging of the disc, which probably is an earlier stage of the herniation sequence. On the other hand when evaluating the microscopic findings from frankly prolapsed discs, one must remember to consider the time interval between herniation and operation, during which pathological-anatomical changes may have occurred.

Congenital abnormalities possibly important in the pathogenesis of disc prolapse in our seven patients were: Two who had six lumbar vertebrae and one patient with an asymmetrical sacralization of the fifth lumbar vertebrae.

Similar subjective symptoms and objective signs may be present in both children and adults with herniated lumbar disc, but it is important to point out some characteristic differences in the clinical pictures. Objective findings dominate in children, and their complaints are minor. In adults the opposite is most common. Other authors have had a similar impression (2, 7). Straightening of the lumbar lordosis and a guarding scoliosis are typically found in adults, but they are even more pronounced in children. As a result, Lasegue's test is positive at an unusually small angle of elevation and their difficulties in sitting and walking are more prominent. Regardless of these marked symptoms, neurological examination provided few objective signs of sensory-motor deficit in our cases. These differences in findings from those in adults may be explained by a greater ability in children to adapt the

spinal column in a manner which allows more protection to the involved nerve root.

The results of operative treatment of herniated lumbar disc in children are gratifying, both in our cases and in those of others (2, 10). Indications for surgical intervention are fundamentally the same for children and adults. In spite of the fact that young patients complain little of pain, and that the objective sensory-motor disturbances are mild, the presence of a marked guarding scoliosis and a strongly positive Lasegue's test justify surgery, if efforts at conservative therapy have been unrewarding. We would be reluctant to allow a child with a guarding scoliosis to go with this for months or years. Our two patients who had scoliosis for the longest period of time before operation, still had scoliosis at the time of the follow-up investigation, and in one, it had even increased (Figure 2). The other patients, all with complaints of less than nine months duration, demonstrated no persistent scoliosis.

SUMMARY

Seven patients, from 11 to 17 years of age, operated upon for lumbar disc herniation, were followed-up from $\frac{1}{2}$ to $8\frac{1}{2}$ years after operation.

Some differences in the clinical picture between children and adults are pointed out. Neither the operative findings nor the histological examination of material from the herniated discs permitted the conclusion that the pathogenesis of his disorder is different from that in adults. The result of the operative treatment was gratifying. In the authors' opinion the indication for surgical intervention is fundamentally the same in children as in adults, except that in growing individuals we have to pay special attention to the scoliosis.

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RESUME

Sept malades âgés de 11 à 17 ans, opérés pour hernie discale lombaire, ont été réexaminés $\frac{1}{2}$ à $8\frac{1}{2}$ ans après l'opération.

Quelques différences dans le tableau clinique chez les enfants et les adultes sont relevées. Ni les trouvailles opératoires, ni les disques herniés, permettent cependant de tirer la conclusion que la pathogénèse de

ce dérangement est différente de celle chez les adultes. Le résultat du traitement opératoire a été satisfaisant. De l'avis de l'auteur, l'indication d'une intervention chirurgicale es fondamentalement la même chez les enfants que chez les adultes, abstraction du fait que chez l'individu en période de croissance, il faut apporter une attention toute particulière à la scoliose.

ZUSAMMENFASSUNG

Sieben Patienten im Alter von 11 bis 17 Jahren, die wegen Lendenzwischenwirbelscheibenhernien operiert worden waren, wurden $\frac{1}{2}$ bis $8\frac{1}{2}$ Jahren nach der Operation nachuntersucht.

Einige Unterschiede in dem klinischen Bilde zwischen Kindern und Erwachsenen werden hervorgehoben. Weder der operative Befund, noch die vorgefallenen Scheibe gestattete die Schlussfolgerung, dass diese Erkrankung von der der Erwachsenen verschieden ist. Das Ergebnis der operativen Behandlung war befriedigend. Der Verfasser ist der Meinung, dass die Anzeige für den chirurgischen Eingriff wesentlich die gleiche bei Kindern wie bei Erwachsenen ist, abgesehen davon, dass man am wachsenden Organismus der Skoliose besondere Aufmerksamkeit widmen muss.

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