

Surgical Excision of the Lumbar Disc Herniation in Elementary School Age

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Study Design: A retrospective study.

Purpose: To assess the radiological, clinical features and surgical outcomes of six patients of elementary school age with lumbar disc herniation (LDH).

Overview of Literature: LDH is common in people in their fourth and fifth decades. However, the condition is extremely rare in children of elementary school age. Moreover, the clinical symptoms and treatments are different from those of adults.

Methods: We reviewed a series of 6 patients under the age of 12 years, who underwent surgery for LDH at our institution between 1992–2002. Initially, all patients were treated conservatively. The indications for surgery were failure of conservative treatment for 3 months, intractable pain and/or progressive neurological impairment.

Results: The surgical findings revealed a protruding disc in five cases and a ruptured disc in one. In addition, separation of the vertebral ring apophysis was observed in 3 cases. The symptoms had disappeared completely at the last follow-up. At the last follow-up, the Japanese Orthopaedic Association score was 10 points in 5 cases and 9 points in 1, and the Kirkaldy-Willis criteria was excellent in all patients. No intervertebral disc space narrowing was observed in any patient at last follow up. In addition, there were no degenerative changes in the vertebral endplate and facet joint.

Conclusions: Patients with symptoms that persist for more than 3 months or those with a progressive neurological deficit must be considered for surgical discectomy.

Key Words: Lumbar disc herniation, Elementary school age

Introduction

Lumbar disc herniation (LDH) is common in people in their fourth and fifth decades because the intervertebral disc undergoes degenerative changes with age. However, LDH in adolescents is uncommon and extremely rare in children of elementary school age¹⁻⁶. Therefore, the incidence, disease characteristics and treatment results for LDH in ele-

mentary school-aged children are unclear. The clinical manifestations and treatment methods for LDH in children of elementary school age might be different from LDH in adults. Although previous follow-up studies on surgically-managed LDH in adolescents have reported good outcomes, there are few reports focusing on LDH in children of elementary school age. This study assessed the radiological, clinical features and surgical outcomes of six patients of elementary school age with LDH.

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Materials and Methods

We reviewed a series of 6 patients under the age of 12 years, who underwent surgery for LDH at our institution between 1992-2002. Initially, all patients were treated conservatively. The indications for surgery were failure of conservative treatment for 3 months, intractable pain and/or progressive neurological impairment. The medical records, plain radiographs, CT scans and MRI were reviewed. The medical records were reviewed to confirm the clinical manifestation of LDH and the history of these patients. The plain radiographs, CT scans, and MRI were reviewed to determine the degree of disc herniation, extent of disc degeneration, ring apophysis fracture, and the presence of a congenital malformation. A telephone interview was conducted where needed. The average follow-up period was 63 months, ranging from 18 to 93 months. The results were analyzed using the Japanese Orthopaedic Association (JOA)

score (Table 1)⁷ and Kirkaldy-Willis criteria (Table 2)⁸.

Results

There were five boys and one girl with a mean age of 10.5 years (range, 9 years 11 months to 11 years 10 months). The symptoms developed spontaneously in 4 cases, as a result of a sport injury (Taekwondo) in one and a slip down in one. Disc herniation occurred at L4-L5 in 2 cases and L5-S1 and 4 cases. The direction of disc herniation was central in 4 cases (Fig. 1) and paracentral in 2 cases (Table 3). No patient had a congenital malformation or familial predisposition. All patients complained of radiating pain. Three, 2 and 2 patients complained of low back pain, buttock pain and an abnormal gait, respectively. The physical examination revealed a limitation of straight leg raising (SLR) in all cases, grade 4 great toe dorsiflexion in one case, hypesthesia in four, and a hyperactive ankle jerk

Table 1. The Japanese Orthopaedic Association's evaluation system for lower back pain syndrome (JOA Score)

Symptoms and signs	Evaluation	Score	
Subjective symptoms	Lower back pain	None	3
		Occasional mild pain	2
		Occasional severe pain	1
		Continuous severe pain	0
		Leg pain and/or tingling	None
	Occasional slight symptoms	2	
	Occasional severe symptoms	1	
	Continuous severe symptoms	0	
Clinical signs	Sensory disturbance	None	2
		Slight disturbance (not subjective)	1
		Marked disturbance	0
	Motor disturbance	None	2
		Slight disturbance (MMT 4)	1
	Marked disturbance (3 to 0)	0	

Table 2. The criteria of Kirkaldy-Willis et al for the functional outcome

Grade	Description
Excellent	The patient has returned to his normal work and other activities with little or no complaint
Good	The patient has returned to his normal work but may have some restriction in other activities and may on occasion after heavy work have recurrent back pain requiring a rest for a few days
Fair	The patient has to reduce his working capacity, taking a lighter job or work parttime, and may occasionally have recurrence of pain requiring absence from work for one to two weeks, once or twice a year
Poor	The patient does not return to work

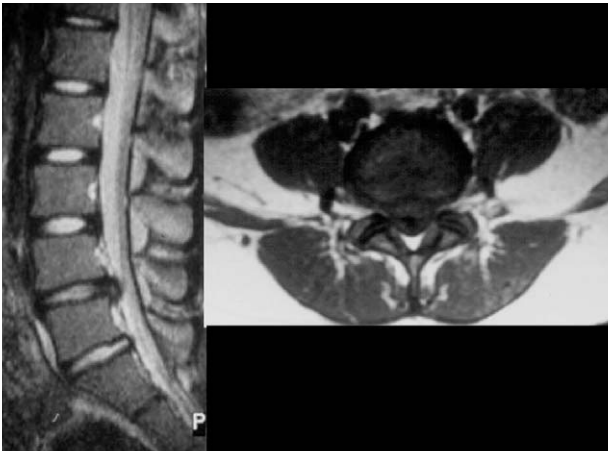


Fig. 1. T2 weighted MR images of an 11-year-old boy showing a central disc protrusion of the L4-5 with thecal sac compression.

in one. The mean symptom duration before visiting hospital was 12 weeks (Table 4).

Conservative treatments were performed initially. The patients were asked to avoid aggravating physical activity. Oral medication, such as analgesics, muscle relaxants and NSAIDs, were administered. Physical therapy was also started. Unfortunately, the treatment failed to relieve the symptoms. In 4 patients, conservative treatment for 3 months failed, and one patient had intractable pain. The remaining patient had progressive motor weakness. Therefore, surgery was performed on the six patients. The surgical findings revealed a protruding disc in five cases and a ruptured disc in one. In addition, separation of the vertebral ring apophysis was observed in 3 cases (Fig. 2). A partial

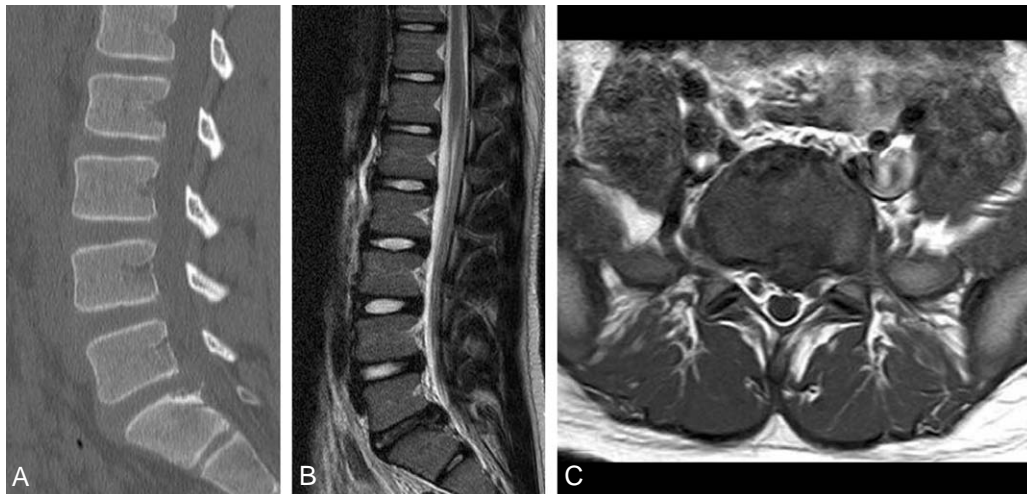


Fig. 2. The fracture of vertebral ring apophysis at the upper endplate of S1. (A) CT sagittal image, (B) T2 weighted MR sagittal images, and (C) T1 weighted MR axial images.

Table 3. Patient demographics

Case No.	Sex	Age (years)	Trauma history	Level and direction	Separation of VRA	Operation	Follow up	Results*
1	M	11	No	L45 central protruded	(+)	SL DC	93 months	10/excellent
2	F	9	No	L5S1 paracentral protruded	(+)	PHL DC	85 months	9/excellent
3	M	11	No	L5S1 central protruded	(+)	BPHL DC	90 months	10/excellent
4	M	11	Sport injury	L45 central extruded	(-)	SL DC	31 months	10/excellent
5	M	9	slip down	L5S1 central protruded	(-)	PHL DC	62 months	10/excellent
6	M	11	No	L5S1 paracentral protruded	(-)	PHL DC	18 months	10/excellent

M: male, F: female, LBP: low back pain, VRA: vertebral ring apophysis, SL: subtotal laminectomy, PHL: partial hemilaminectomy, BPHL: bilateral partial hemilaminectomy, DC: discectomy, *JOA score and Kirkaldy-Willis criteria.

Table 4. Clinical symptoms and signs

Case No.	Sex	Age (years)	Symptoms/ Signs	Duration of symptoms
1	M	11	Low back pain and both leg radiating pain, Limitation of straight leg raising	3 months
2	F	9	Right buttock radiating pain, Gait abnormality, Limitation of straight leg raising, Hypesthesia	3 months
3	M	11	Low back pain and both leg radiating pain, Limitation of straight leg raising, Hypesthesia, Hyperactive ankle jerk	4 months
4	M	11	Low back pain and both leg radiating pain, Limitation of straight leg raising, Hypesthesia, Great toe dorsiflexion weakness	10 days
5	M	9	Both leg radiating pain, Limitation of straight leg raising, Hypesthesia	1 month
6	M	11	Right buttock radiating pain, Gait abnormality, Limitation of straight leg raising, Hamstring tightness	6 months

hemilaminectomy and discectomy, subtotal laminectomy and discectomy, and bilateral hemilaminectomy and discectomy were performed in 3, 1 and 1 case, respectively. All fractured apophyseal fragments (3 cases) were removed concurrently when the discectomy was performed. The patients were followed-up for more than 1 year and the mean follow-up period was 63 months. The symptoms had disappeared completely at the last follow-up. The mean symptom duration after surgery was 16 weeks and the mean time until return to school was 5 weeks. There were no complications. The JOA score at the last follow-up was 10 points in 5 cases and 9 points in 1 case. All patients were excellent according to the Kirkaldy-Willis criteria (Table 3). No intervertebral disc space narrowing was observed at last follow up, and no degenerative changes in the vertebral endplate and facet joint were noted.

Discussion

When the upper age limit of 12 years is used, very few cases of LDH have been reported in the literature. The first case of a herniated disc in a child of twelve years was reported by Wahren⁹ in 1945. Patrizio et al.⁴ reported that only three out of 129 cases under the age of 12 underwent surgery for lumbar disc herniation. Therefore, the six cases in this study are believed to be significant.

The causes of LDH in elementary school age are still unclear. Several primary causative factors have been suggested, such as trauma, congenital malformation, familial

predisposition and vertebral slipping epiphysis. Trauma is frequently reported as the primary causative factor with variable incidence. In this study, 2 cases developed symptoms after trauma. However, 3 cases who had a separation of vertebral ring apophysis did not recall any traumatic history. Sovio et al.⁶ reported that a separation of vertebral ring apophysis was related to a series of minor trauma rather than an acute event. They reported that most patients did not recall any specific traumatic event. In addition to trauma, congenital malformation and familial predisposition have been suggested as etiologic factors, particularly in adolescents with lumbar disc herniation. Epstein and Lavine¹⁰ reported that 30% of juvenile lumbar herniation cases had congenital malformations, such as lumbarization, sacraization, lumbar Scheuermann's disease and spina bifida. Varlotta et al.¹¹ calculated the relative risk of LDH before the age of 21 years, and found it to be approximately five times higher in patients with a positive family history. However, no patient in this study had a congenital malformation or a positive family history. Therefore, trauma, either an acute episode or repeated minor traumatic episodes, is believed to be the most likely factor accounting for the development of LDH in these children of elementary school age.

Epstein and Lavine¹⁰ reported that the chief complaint of juvenile HNP was low back pain and radiating pain: neurological deficit is not a common finding at that age. However, Shilito⁵ reported that the initial symptom of patients under the age of 15 were either back pain only or painless kyphoscoliosis in 80% of cases; only 20% of patients com-

plained of sciatic pain. In our series, the most common symptom was radiating pain. Two patients had a gait abnormality. Hamstring tightness was observed on the physical examination in these two patients. Hamstring tightness is believed to be a characteristic symptom of juvenile LDH, particularly in children complaining of either radiating pain (sciatica) or low back pain^{6,12}. Neurological deficits are not uncommon in this series, which is in contrast to a previous report of children and adolescent LDH patients.

Only few reports discussed the efficacy of conservative treatment. A favorable outcome was reported in 40~50% of cases managed conservatively^{13,14}. In the absence of a neurological deficit, adolescent LDH can be safely managed non-surgically. DeOrio and Bianco¹⁵ recommended a discectomy in lumbar disc herniation in children and adolescents not responding well to conservative treatment or in patients with severe pain. The indications for surgery are a failure of conservative treatment for at least 3 months, intractable pain and/or progressive neurological impairment. The outcome of lumbar discectomy in children and adolescents is usually excellent immediately after surgery^{5,15}. Shillito⁵ reported the relief of symptoms in 96% of patients. Globler et al.¹⁶ reported an 88% success rate of lumbar discectomy in children younger than 15 years of age. Smorgick et al.¹⁷ indicated that surgical discectomy provides satisfactory clinical results in adolescents with disc herniation at the mid to long term follow up period. However, Patrizio et al.⁴ stated that the outcomes of lumbar discectomy in children and adolescents was excellent in 93% immediately after discectomy but this decreased to 87% at the 12 year follow-up examination. In this series, the results after an average 63 months follow-up was 10 points in 5 cases and 9 points in 1 according to the JOA score, and excellent in all patients according to the Kirkaldy-Willis criteria. There was no patient whose symptoms worsened with time.

Conclusions

Radiating pain was the dominant and constant symptom with a limitation of SLR. Separation of the vertebral ring apophysis was the common finding. The surgical decision must depend on the clinical symptoms instead of the radiologic findings. Patients with symptoms that persist for more than 3 months or those with a progressive neurological deficit must be considered for a surgical discectomy.

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