

Lumbar Disc Herniation in Children & Adolescents: A Case Series

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Lumbar disc herniation is a rare but significant cause of pain and disability in children and adolescents. Lumbar minidisectomy although routinely performed in adults, has not been described in children and adolescents.

The objective of this study is to determine the surgical results of lumbar minidisectomy in children and adolescents. The emphasis has also been laid on the incidence, etiopathogenesis, radiological features, treatment modalities, operative findings and outcome.

This is a prospective study of 10 patients under 20 years of age who were operated for lumbar disc prolapse by minidisectomy between Jan 2004 and Jan 2012 at department of Neurosurgery, OM hospital and research centre. Overall outcome was measured using Prolo functional and economic scale at 3 months.

Out of 10 cases, 8 were male and 2 female of ages below 20 years. All patients presented with low backache and sciatica. However, only 6 patients had history of trauma or lifting of heavy weight. The commonest level involved was L4/L5 followed by L5/S1. High lumbar disc prolapse was found in one patient. About 90% patients had immediate improvement in radicular pain. Overall surgical complication included intraoperative dural tear in 1 patient. At 3 months, all patients had excellent outcomes and were able to return to their previous job. Recurrence was found in 1 patient.

Lumbar minidisectomy is a safe procedure in treatment of child and adolescent lumbar disc herniation with minimum resource and low operative complications. Longer follow up is mandatory because the chances of recurrence or another level involvement cannot be denied.

Key Words: adolescent, children, low back pain, lumbar disc herniation, lumbar minidisectomy

Lumbar disc herniation is traditionally a disease of middle aged adults and is assumed to be multifactorial process that represents the accumulation of environmental, occupational, and genetic influences¹. However its occurrence in children and adolescents is much less frequent mostly because they tend to have healthier lumbar spine as compared to adults. The reported incidence of disc protrusion in adolescents undergoing surgery is approximately 1-2% and 0.5% in patients younger than 16 years⁶. The standard surgical treatment has been microdisectomy but there has been trends towards minimally invasive procedures which require small incision, results in less soft tissue damage, low blood loss, less post-operative pain, early ambulation and early return to work. However these minimally invasive procedures are found to be costly and require specialized equipments. Thus we describe a simple technique of minidisectomy which has been practiced in our institution for last one decade in children, adolescents, and adults to provide excellent

results. The aim of this study is to evaluate the long term outcome of lumbar minidisectomy in children and adolescents. The emphasis has also been laid on the incidence, etiopathogenesis, radiological features, treatment modalities, operative findings and outcome.

Materials and Methods

This is a prospective study conducted at Department of Neurosurgery, OM Hospital and Research Centre, Kathmandu.

Ten patients below 20 years of age with prolapsed lumbar disc and failed treatment operated using a technique of lumbar minidisectomy from 2004 to 2012.

The exclusion criteria were

1. Patients of age 20 years or above
2. Patients who underwent laminectomy or bilateral fenestrations.

All patients' information was prospectively collected during the hospital stay in the proforma for lumbar disc herniation. Following discharge, the patients were followed up upto 3 months. Inquiry was made via telephone for those who didn't appear for follow up. The outcome was measured using Prolo Functional and Economic Scale¹⁵ (**Table 1**) at 3 months.

Operative technique

The procedure was carried out under general anaesthesia. The patient was positioned in prone with hip flexed. Marking of incision is carried out by identifying the landmark corresponding to the highest point of iliac crest as L4 spinous process. Paramedian incision of about 3cm is made to the side of disc prolapse. After skin incision, subcutaneous tissue and thoracolumbar fascia is incised and the edge of lumbar fascia is reflected medially with stay suture. Subperiosteal dissection of paraspinal muscle is carried out exposing the corresponding interlaminar space. Fenestration of interlaminar space is carried out and ligamentum flavum is excised exposing the dural fat and neural elements. The dura and nerve roots are retracted medially exposing the prolapsed disc. A small curette is used to pierce the annulus after which disc is removed. After proper hemostasis, the wound is closed in anatomical layers without a drain. Operating microscope is not required and an intraoperative c- arm is required occasionally only for high lumbar disc prolapsed. Diathermy, either monopolar or bipolar is not routinely used. The operative procedure is similar to microdiscectomy except for the use of operating microscope which is not required in minidiscectomy.

Results

Between Jan 2004 to Jan 2012, a total of 220 patients underwent surgery for lumbar disc herniation at our centre however we review only 10 patients among them who were below 20 years of age. There were 8 male and 2 female patients with age ranging from 16 to 19 years. All patients presented with low back pain and sciatica, however neurological deficit was present in 3 patients and 1 patient presented with features of cauda equine syndrome. 6 (60%) patients had history of sports injury, trauma or lifting heavy objects before the onset of symptoms. None of our patients had family history of lumbar disc diseases.

MRI was the diagnostic tool of choice in all patients. L4/L5 was the commonest level of disc prolapse in 6 patients (60%) followed by L5/S1 in 3 patients (30%). One patient (10%) had a high lumbar disc prolapsed, however none of our patients had multilevel disc prolapsed. All patients were initially offered a course of non operative treatment. Patients were asked to avoid aggravating physical activities including participation in sports. Oral medications such as analgesics and NSAID along with physiotherapy including spinal exercises were advised for at least six weeks.

The indications of surgical intervention included intractable pain and failure of conservative treatment for more than six weeks in 9 (90%) patients, whereas one patient was operated for neurological deficit due to Cauda

equina syndrome. All patients underwent lumbar minidiscectomy and the operative findings included sequestered disc in 6 (60%) patients, bulge disc in 3 (30%) patients and 1 (10%) patient had free fragment disc. The mean operative time was 30 minutes. 8 (80%) patients were ambulated on the first post-operative day and discharged on the same day or next morning. The remaining 2 patients, one with intraoperative dural tear and the other with cauda equina syndrome were ambulated and discharged after seventh post-operative day.

Intraoperative dural tear was the only complication in one patient which was managed non operatively. The outcome was measured using Prolo functional and Economic Scale¹⁵ (**Table 1**) at three months. All patients had good to excellent outcome and were able to join their previous job. Recurrence was found in one patient at different level, two years after initial surgery which was reoperated.

Discussion

Lumbar disc herniation leading to low back pain is relatively rare in children and adolescents^{5,9}. In 1934, Mixter and Barr³ identified the herniated lumbar disc as a cause of low back pain and sciatica. In 1945, Scandinavian author Wahren¹⁸ was the first to report successful surgical treatment of lumbar disc protrusion in a twelve year old child. Although the true frequency of lumbar disc herniation in children and adolescents is not precisely defined, it is generally believed to much lower than in adults. Various international series have reported the incidence varying from 1% - 5% in age 20 years or less^{2,7,9}, whereas an incidence of 4.5% was observed in current series.

The real cause of LDH in children and adolescents still requires clarification. Several factors have been identified as the potential cause of disc herniation. Trauma, mostly sports related or self related injury i.e. heavy lifting, extreme flexion-extension exercises, fall etc is commonly considered as the most likely cause because as many as 30 - 60 % of children and adolescents with symptomatic lumbar disc herniation have a history of trauma before the onset of pain⁵. However adults with LDH usually do not have any traumatic experiences. Ebersold et al.⁶ reported the history of trauma in about 58% cases, similarly Parisini et al.¹⁴ reported trauma in about 20%. However in our series about 60% has history of trauma before the onset of backpain.

In addition to trauma, many authors postulated familial predisposition to disc disease to be another etiological factor for LDH in children and adolescents. Varlotta et al.¹⁷ calculated the relative risk of lumbar disc herniation before the age of 21 years and found it to be approximately five times greater in patients who have a positive family history. Similarly Kumar et al.⁹ reported 24% and Duhram et al.⁵ reported 55% patients with familial history of LDH. However none of our patients had a first degree relative with the same disorder. Another important factor accounting for early onset of LDH is the association with vertebral deformity such as scoliosis, transitional defects

Status	Description
Economic (activity) grade	
1	Complete invalid (worse)
2	No gainful occupation (including housework or retirement activities)
3	Working/ active but not at premorbid level
4	Working/ active at previous level with limitation
5	Working/ active at previous level without limitation
Functional (pain) grade	
1	Total incapacity (worse)
2	Moderate to severe daily pain (no change)
3	Low level of daily pain (improved)
4	Occasional or episodic pain
5	No pain

Table 1: Prolo Functional and Economic Rating Scale [Prolo DJ, Oklund SA, Butcher M: Toward uniformity in evaluating results of lumbar spine operations. A paradigm applied to posterior lumbar interbody fusions. Spine 11:601-606, 1986.]

(lumbarization and sacralization), schisis and canal narrowing¹⁴, Parisini et al.¹⁴ reported 31% patients with associated spinal deformity in their series of 129 patients. However, no such abnormalities were detected in our patients; the reason might be due to less number of cases.

Clinical presentation of LDH in children and adolescents are generally similar to those observed in adults. One distinct feature is that upto 90% patients have a positive straight leg raising test which can be explained by the findings that children and adolescents tend to have a greater nerve root tension than adults. In addition, they cannot exactly describe their pain by themselves. Parisini et al.¹⁴ reported that for disc herniation in children and adolescents patients, it is difficult to evaluate the subjective symptoms and clinical signs.

The level of disc herniation seems to be consistent between children, adolescents and adults with the majority occurring at low lumbar levels or lumbosacral junctions. In our series, the commonly involved level was L4/L5 (60%) followed by L5/S1 (30%) which is comparable with international series^{5,6,9,14}. Kumar et al.⁹ and Durham et al.⁵ reported multilevel disc prolapse in 12% and 37% respectively. Similarly Ebersold et al.⁶ in their review of 74 patients found the incidence of multilevel disc prolapse to be 4%, however none of our patients had multilevel disc prolapse. High lumbar disc prolapse was noted in 10% in our series which is comparable with series of Durham et al.⁵ and Kumar et al.⁹ with incidence of 10% and 20% respectively.

The aim of treatment of LDH is to relieve symptoms and allow early return to routine life. Various treatment modalities have been described in literature ranging from conservative to different methods of disc removal. Zamani et al.¹⁹ favored conservative management which consisted of prolonged period of medications and activity restriction. They reported a favorable outcome in 40-50% of cases managed conservatively. Kurihara and Kataoka¹⁰ reviewed 70 adolescents with disc herniation and concluded that only 40% of patients responded to conservative treatment and recurrence of symptoms was common after they returned to normal activity. Kurth et al.¹¹ compared outcome

of conservative treatment with surgical treatment for 33 pediatric patients with a follow up period of 5.4 years and found no significant difference between the two groups. However De Luca et al.⁴ found that surgical treatment lead to a significant better outcome than conservative treatment by carrying out a similar study on 31 pediatric patients with a 6 years follow up. Regardless of the controversy, it has been widely agreed by most authors that surgical treatment has better outcome for HLD in children and adolescents after conservative treatment fails for about six weeks^{5,6,9,14}. The indications for surgery in our series were failed conservative treatment in 9 (90%) whereas only 1 (10%) patient who presented with cauda equine syndrome was operated urgently.

Discectomy remains the most widely used surgical procedure for LDH in children and adolescents as well as in adults with excellent results. More recently, microdiscectomy has also been used for the treatment of LDH with success rate ranging from 85% - 100%^{13,16}. However various minimally invasive procedures has been developed these days with primary aim directed towards the benefits in terms of small skin incision, less muscle and epidural scarring, low blood loss, less postoperative pain, early ambulation and early return to work.

Lumbar minidescectomy practiced at our institution for last one decade is among such minimally invasive procedure with an excellent result. The operative technique is similar to Microdiscectomy, the only difference being small skin incision and no use of operating microscope. Most of the patient undergoing minidescectomy were ambulated on the first post – operative day and discharged on the same day or next morning. In our series, 90% patients were pain free immediately after surgery however 100% pain free status was achieved at 3 months follow up with Prolo Functional and Economic Scale¹⁵ (Table 2) score of 8 – 10. Kuh et al.⁸ operated 94 patients using microdiscectomy and achieved success rate in 98%, similarly Silvers et al.¹⁶, Ozgen et al.¹³, achieved success rate of 85% and 100% respectively. Thus our result with minidescectomy is comparable with the results of microdiscectomy.

Total Score	Number of patients (%)
2	0
3	0
4	0
5	0
6	0
7	0
8	2 (20%)
9	1 (10%)
10	7 (70%)

Table 2: Outcome of patients as measured by the Prolo Functional and Economic Rating Scale.

The overall complication of disc surgery includes intra-operative dural tear and iliac vessels injury, post-operative wound infection, CSF leak and discitis. The complication rate in children and adolescents ranged from 2% - 6%^{3,6,9,14}. In our series, the only complication was intraoperative dural tear in 1 (10%) patient. Kumar et al.⁹, Cahill et al.³ reported intraoperative dural tear in 4% and 2.3% respectively. The other complications including discitis, wound infection, post-operative neurological deficit and post-operative CSF leak has been reported in literatures^{3,6,14} however we didn't encounter them.

As far as the rate of recurrence is considered, the incidence registered in the present study is 10% which is similar with various international series reported in literature^{3,5,6,14}. Cahill et al.³, Parisini et al.¹⁴, Ebersold et al.⁶ reported the recurrence rate of 6%, 10%, 21.6% respectively. However recurrence rate as high as 38% has been reported in literature with mean duration of 4.5 yrs⁵. Thus children and adolescents has very high tendency of recurrence hence longer follow up is mandatory because the chances of recurrence or another level involvement can't be denied.

Conclusions

Lumbar disc herniation is rare in children and adolescents. They usually present with low back pain with or without radiculopathy. Diagnosis is similar to that of adults. Conservative treatment is less effective even though it remains the first line of treatment. Minilumbar discectomy remains the procedure of choice for LDH in children and adolescents as its result compares favorably with that of standard microdiscectomy. It produces excellent result with minimum resources and less postoperative complications.

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