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Pediatric Lumbar Disc Herniation: A Review of Manifestations, Diagnosis and Management

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Abstract

Lumbar disc herniation (LDH) is a public complaint among adults with degenerated lumbar intervertebral discs. However, its incidence in childhood and adolescence is abundant. This dissimilarity designates that children are distant from being just little adults. Findings recommended that pediatric LDH is, in numerous ways, dissimilar from that in adults. The occurrence, the etiological and the diagnostic topographies of pediatric LDH have been entirely described in the text, while the features concerning the treatment have not been yet studied in details. It was confirmed that pediatric patients respond to conventional management less positively as matched with adults. Also, the consequences of the operation continued to be acceptable for at least 10 years after the first surgery, even though it seems to decline somewhat. The purpose of the current review is to offer a comparative view on the management of pediatric LDH.

Keywords: Children, Therapy, Outcome, Lumbar Disc Herniation

1. Context

Low back pain (LBP) is the most common cause of debility in individuals aged 45 years or younger and imposes a large socioeconomic burden on society. National economic losses resulting from LBP are assessed to surpass 100 billion dollars per year and are mostly secondary due to reduced productivity (1). Even yet, radiographic signs of degenerative disc disease (DDD) have been revealed in asymptomatic persons and the grade of degeneration is an indicator for length or harshness of symptoms related to DDD (2). Methods of restrictive disc degeneration or even encouraging disc regeneration are still wanted aims in its handling (3, 4).

The intervertebral disc deceits among contiguous vertebrae as a flat, round capsule, near 25 mm in diameter and around 6-mm thick and it is collected of the nucleus pulposus (NP) centrally, the annulus fibrosus (AF) peripherally, and the cartilaginous endplates cranially and caudally at the connection to the vertebral bodies. Inside the NP, a richness of proteoglycans permits absorption of water. This possessions of the NP is vital for the IVD's management of axial loads (5).

Whereas discs are gel-like throughout childhood, they initiate to harden as part of the usual ageing procedure, and the blood source to the disc finally stops. The soft inner material has begun to strengthen, and the disc is less elastic. In middle-aged adults, the discs are rough and quite inflexible, with the constancy of a portion of hard rubber. These variations associated to ageing make the outer defensive lining frail and the discs more disposed to damage. Biomechanical risk factors contain the occurrence of small intervertebral discs and short spinous processes. This could raise the compressive strain performing on the discs. The existence of defective collagen or proteoglycans could deteriorate spinal tissues, and make them more susceptible to damage (6, 7).

Patients with the lumbar disc disease frequently suffer from some symptoms, including continuous pain, radicular symptoms, and weakness. Low back pain might be aggravated by position and drive (8).

Flexion regularly deteriorates the symptoms, though extension will release them. A rise in pain by extension might show facet arthropathy. While examining patients with assumed lumbar DDD, it is vital to reject other possible recognized etiologies for their pain. Abdominal pathology including aortic aneurysms, pancreatic disease, and renal calculi must be excluded. Also, it is imperative that patients be interrogated concerning other symptoms such as fevers, chills, exhaustion, and weight loss, which may be indicative of other pathologies (9, 10). Upright plain radiographs in two planes are the first imaging training of choice. Magnetic resonance imaging (MRI) is a more sensitive imaging study for the assessment of degenerative disc disease (10). The aim of the current review is to offer a comparative view on the management of pediatric lumbar disc herniation (LDH).

2. Evidence Acquisition

The qualitative results from searching in international databases are presented here.

3. Results

3.1. Pediatric Lumbar Disc Herniation

It has lengthy been observed that LDH disturbs children and adolescents like adults (11). Exclusive biological landscapes of children award pediatric LDH by various characteristic structures. The amount of trainings in this observes remained on an increase, which ran to a yet cumulative considerate of this object (12). Since the popular belief, even in the doctors, discopathy has been a disease of adults and has not seen in the pediatric population, and with attention to the increased incidence of discopathy in young populations in the clinics this study is in response to these queries by rereading all the connected accessible trainings in the works.

3.2. Epidemiology

Overall topography of the LDH is a frequent complaint amongst adults, by an informed lifespan incidence of about 40% (12). While the accurate occurrence of this situation in children and adolescents is not completely clear, it is usually supposed to be abundant inferior to that in adults. It was stated that pediatric patients comprise 0.5% - 6.8% of entire patients hospitalized for LDH (13, 14), which was much lesser than the probable fraction of children and adolescent's population (27%) (6). Zitting et al. approved a training pointing at approximating the accurate occurrence (15). They followed-up 12,058 Finnish babies from birth till 28 years of age. Their consequences presented that none of their matters was hospitalized through long-established LDH until the age of 15 years, whereas this number augmented to the range of 0.1% - 0.2% while the subjects were 20 years old. From this fact beyond, the occurrence instigated to increase noticeably. Through the age of 28 years, 9.5% of males and 4.2% of females were admitted to hospitals with a diagnosis of LDH, respectively.

There have been little described cases of lumbar disc protrusions under the age of ten in the literature, and the youngest age reported was 13 months (16-18). Overall, less than 10% of pediatric low back pain cases are owing to disc herniation, and it has been described that fewer than half of these cases need surgery (19, 20). Thus, the clinical appearance of these patients has not been well-defined.

3.3. Etiology

Sources and numerous aspects have been recognized as the possible causes of pediatric LDH. Trauma (mostly sport injuries) is usually measured as the greatest probable reason because as many as 30% - 60% of children and adolescents with symptomatic LDH have a previous history of trauma prior to the beginning of pain (3). This is indistinguishable in adult patients who typically do not have any traumatic involvements before the signs happen. On the other hand, more new trainings propose that instead of being a main causal factor, trauma is expected to be a provocative occasion in the exacerbation of the prevailing lesion in the discs (21, 22). The additional commonly documented source is genetic factor. Educations have exposed that among 13% and 57% of adolescents with LDH have a first-degree relation by the similar complaint (22, 23). Vertebral abnormalities such as scoliosis, and transitional vertebra are recognized to be related with LDH in children and adolescents (24), even though their pressure has not been measured. Also, there were a few trainings representative of the connotation of epiphyseal ring division with pediatric LDH, with described simultaneous rate up to 40% (23, 24). Hence, no variance in clinical consequence was noticed among patients with or without slipped epiphysis (25).

3.4. Diagnosis

Clinical appearances of pediatric LDH are normally like those detected in adults (3, 26). One characteristic feature is that up to 90% of the patients have a positive straight leg raising test, which can be clarified by the reason that children and adolescents incline to have larger nerve root tightness than adults (25, 27). Though, neurological symptoms such as numbness and weakness are less frequently seen in children and adolescents (28, 29).

Magnetic resonance imaging (MRI) is a noninvasive method to evaluate LDH and exclude the different differential diagnosis in spine and other organs of the body (10).

3.5. Differential Diagnosis of Pediatric Back Pain

The main cases of back pain in child are sport's injuries, spondylolysis, disc herniation, discitis, pyelonephritis, Scheurman's kyphosis, and spondylolisthesis. Other causes of back pain are infrequent, nevertheless can comprise tumors, trauma, arthritis and other infections (osteomyelitis) (26, 30).

Also, for a young child contributing with low back pain and neurological complaint of lower limbs, extra considerations were desirable on differential diagnosis such as neoplasm, infection and deformities (2).

3.6. Treatment

3.6.1. Conservative Treatment

Traditional treatment methods of pediatric LDH comprise of rest, analgesic and anti-inflammatory agents, physical rehabilitation and restriction of actions (31). At the beginning or critical stage of the illness, 1 - 2 weeks, rest may be suggested for patients by severe discomfort, followed by the use of a support for a little weeks subsequently (29, 32, 33). Nonsteroidal anti-inflammatory drugs are constantly agreed as an assistant treatment.

There was similar information of effective fallouts from the usage of epidural steroid injections for pediatric LDH (28, 30). Results of the recent studies showed that the short to long-term victory rate of conservative treatment for pediatric LDH deprived of neurological discrepancies is different from 25% to 50% (34, 35).

There might be numerous clarifications for the unacceptable consequence of conservative treatment; 1, the herniated nucleus pulposus of children, as matched with adults, is fewer degenerated, more hydrated, lax and gelatinous (36, 37); 2, pediatric LDH is regularly linked with trauma wherever the annulus fibrosus can be harshly broken (38); 3, the epiphyseal cartilage of the vertebral body in children is not completely attached; therefore, severe trauma can rupture the epiphyseal ring founding a large implastic figure beside the herniated disc (39); 4, children and adolescents are dynamic and less probable to obey to strict bed rest. Conservative treatment is still usually optional as the first-line treatment for LDH in children and adolescents lacking neurological insufficiencies (21, 27, 40).

3.6.2. Intradiscal Therapy

Considering the recent literature on this topic, chemonucleolysis was the only method of intradiscal treatment used on children and adolescents. Even though FDA agreement for chymopapain use in humans has lengthy been reserved, it is still being contrived and in clinical usage in Korea, Canada, Australia, UK and three states in the US (41). In contrast by operation, chemonucleolysis is beneficial in that it is related with fewer disturbance and postoperative adhesion, smaller hospital stay, earlier remobilization and lower cost.

Drawbacks of chemonucleolysis are that it has an incomplete competence of nuclear elimination and unsure nerve root decompression result as likened through surgery; therefore, it is not appropriate for rigorously extruded discs (39).

3.6.3. Surgical Treatment

Indications for operating interference on pediatric LDH seem to be usually decided in the texts. These comprise: 1, severe pain intractable to 4 - 6 weeks of conventional treatment; 2, incapacitating pain distressing one's day-to-day actions; 3, cauda equina syndrome; 4, advanced neurological deficits; and 5, correlating spinal deformities (39, 42).

Similar to adults, modalities of invasive treatment for pediatric LDH contain percutaneous endoscopic discectomy (PED) and open discectomy containing microsurgical discectomy or microdiscectomy (MD), discectomy with laminotomy or laminectomy and spinal fusion with pedicular screw (43, 44).

Open discectomy remnants the frequently used operating process for LDH in children and adolescents. It is usually approved in the literature that posterior discectomy through partial laminotomy is specified for posterolateral disc herniation, while semilaminotomy or laminectomy is obligatory in cases of central disc herniation. There was similar information of the effective use of extra peritoneal anterolateral discectomy on the centrally protruded disc. Today, MD has much been used for the handling of pediatric LDH (39, 44) and acceptable results have been reported. The short-time success rate reached from 98% to 100% whereas the mid and long-term success rates fallen to 92% and 85%, respectively.

Extreme nucleus deletion can lead to stenosing alterations at the operated disc level and degenerative changes at contiguous disc levels (45). Ishihara et al. believe that all degenerated nucleus and ruptured annulus must be detached whereas the residual disc constructions being conserved (46). For children and adolescents, it is particularly significant to preserve the reliability of the inner part of the annulus wherever the proteoglycan synthesis is the maximum active (47). Ishihara's et al. study presented that performing a discectomy while separating the inner annulus intact might lead to regeneration of the intervertebral disc (46). This is constant with the results from adults (48). Finally, referring to some recent reports in this topic, LDH happens in children younger than 10 years and surgical management can dismiss the symptoms efficiently (2) (Figures 1 - 3).

Lumbar disc herniation is a rare disorder in children. In 1945, Wahren reported a LDH in a 12-year-old child (49).

In a report accessible in 1982 of the 9,991 discectomies done at the Mayo clinic, only 0.5% were children of the age 16 years and younger (12). In one more report from Japan out of 456 patients who had experienced a discectomy (15.4%) were 19 years and younger (50). From this report, the incidence of the juvenile disc herniation in Japanese patients seems to be much higher than in Caucasians. Zitting et al. carried out an epidemiological study with supposed disc herniation in the first 15 years of life. Though by 20 years of age there was an incidence of 0.1% - 0.2%. This increased to 4.2% female and 9.5% male aged 28 years. Trauma in the form of sports and the lifting of heavy objects has been reported to lead symptoms of LDH in 30% - 60% of children. Some studies have established the relationship between epiphyseal ring separation and LDH in children. A few reports suggest that trauma was a triggering event on preexisting disc degeneration in these children (15). This is in contrast with the adult population where the disc degeneration commonly precedes the onset of symptomatic disc herniation. A genetic cause is also suspected with 13% - 57% of exaggerated teenagers being reported as having a first-degree relation with the similar complaint (5, 8). Lumbar disc herniation in children has been associated with transitional vertebrae, scoliosis and other vertebrae anomalies even though these influences have not been quantified. More than 90% of children with LDH present with back pain and leg pain. On examination the majority of them will have loss of lumbar lordosis and listing with associated severe restriction of lumbar move-

ment as was the case in our patient. The straight leg raising test is positive in 90% of the children (37).

Magnetic resonance imaging is the optimal investigation to confirm the reason of lumbar disc prolapsed in children as is the case with adults. Care must be taken to assess and look for apophyseal separation which can be the herniated cartilage material instead of the actual disc material in children. The disc is usually well-hydrated as it was in this case. Nonoperative treatments in the form of resting, physiotherapy and nonsteroidal anti- inflammatory medication are generally recommended as the first line of management. There seems to be a low success rate of conservative treatment in children with a lumbar herniated disc compared to adults (9, 10). One of the reasons for the common failure of conservative management in children and adolescents is the well-hydrated disc, which does not resorb like the dehydrated adult disc. The traumatic cause commonly found in children may also result in severe rupture of the annulus fibrosis. Furthermore, with trauma, the epiphyseal cartilage may separate to form an implastic herniated material. Lastly, children are thought to be more active than adults and therefore less compliant than adults to bed rest (28). The indication for surgical treatment in children and adolescents with LDH is the same as in adults, namely cauda equina syndrome, progressive neurological deficit and disabling pain affecting the child's daily activity and refractory to 6 weeks of conservative treatment. While surgery is not the first line of treatment in children as it is in adults, it should not be delayed as the children have been reported to have good outcome even on long-term follow-up (15, 28). Just as in adults the immediate postoperative outcome is very good, but early good outcomes may decline a little over time. Poor outcomes have been associated with surgery performed very late following the onset of refractory symptoms. Open discectomy is the procedure performed most often in children as is the case with adults. Only the ruptured annulus and the prolapsed disc should be removed. A total removal of the disc is not advocated as that has been shown to lead to stenosis alterations at the operated level and degenerative deviations at the contiguous (14). Another reason for not taking away the whole disc is that Zitting et al. in their study showed that separation the inner annulus complete could lead to the regeneration of the disc (15). Fusion should not be performed routinely in children. Just as in adults it should be preserved for children where there is a clear indication of stability like congenital incompetent facet joints or severe spondylolisthesis. The complication of standard discectomy is postoperation hematoma collection, which is why it is important to use magnification and control the bleeders in these children. There is a 5% - 10% risk of recurrent disc herniation at the operated level. This tends to respond just as well to a repeat standard discectomy.

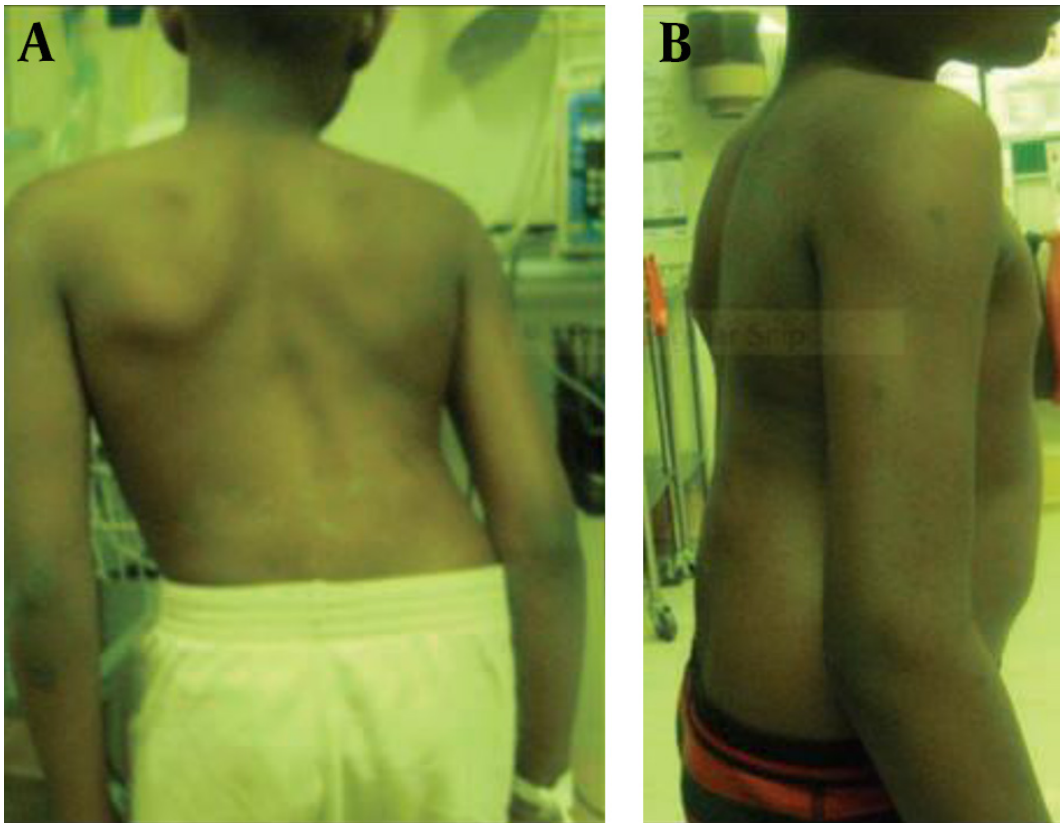

Figure 1. Showing the Listing to the Left and the Flat Lumbar Spine in a Nine-Year-Old Boy

Figure 2. T2 Sagittal MRI Showing a Well-Hydrated Disc at L4-L5 Where There Was a Prolapse on the Right Side

Figure 3. Twelve Weeks Postoperation Demonstrating Resolved Listing and a Normal Lumbar Lordosis

4. Conclusions

Pediatric LDH is an uncommon object leading to hospitalization of about 0.1% - 0.2% of children and adolescents. The cause of pediatric LDH is alike to that of adults. Traditional management is less practical for pediatric patients as matched with adults. Chemonucleolysis has been tried for the patients after conventional treatment fails. Operating management for pediatric LDH is related to the excellent short-term consequence irrespective of which modality is selected. Although the outcome initiates to worsen in the mid-term follow-up, it improves in the long course. Spinal fusion is not optional for children and adolescents with only little exclusions. Lumbar disk herniation occurs in children younger than 10 years and surgical treatment also offers effective resolution.

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