BALNEO RESEARCH Balneo and PRM Research Journal
English Edition
e ISSN 2734 - 8458 p ISSN 2734 - 844X ROMANIAN ASSOCIATION OF BALNEOLOGY

*Case report*

# Conservative therapeutic strategies in pediatric disc pathology: case report and clinical evolution

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**Citation:** Stavăr A.V., Bușilă C., Borș A.M., Verenca M.C. – Conservative therapeutic strategies in pediatric disc pathology: case report and clinical evolution
*Balneo and PRM Research Journal* ***2025****, 16(4): 929*

Academic Editor(s):
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Production Officer:
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Received: 07.11.2025
Published: 30.12.2025

**Reviewers:**
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**Publisher's Note:** Balneo and PRM Research Journal stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



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**Abstract:** Lumbar disc pathology is rare in children but can cause severe pain and significant functional limitations. We present the case of a 9-year-old female patient diagnosed via MRI with lumbar disc protrusions, treated conservatively through a functional rehabilitation protocol that included kinetotherapy exercises and Deep Oscillation® therapy. Following the application of the therapy and periodic reassessments, the patient reported marked clinical improvement with complete resolution of pain, and the follow-up MRI revealed improved lumbar morphology. This case supports the efficacy of in-dividualized conservative treatment, highlighting the significant role of combining kinetotherapy exercises with modern adjuvant therapies, such as Deep Oscillation, in pediatric disc pathology.

**Keywords:** disc protrusions, child, Deep Oscillation, kinetotherapy, functional rehabilitation

## 1. Introduction

The intervertebral disc is a fibrocartilaginous structure located between vertebral bodies, composed of the nucleus pulposus, annulus fibrosus, and endplate cartilage. Its primary role is to ensure segmental mobility and absorb mechanical stress. In children, intervertebral discs have a higher water content and increased elasticity, conferring superior biomechanical resistance compared to adults. However, these characteristics do not preclude the occurrence of disc pathology, although it is rare in young age groups [1,2,3].

Disc protrusions or herniations in children can cause low back pain, restricted mobility, and impaired daily activities, impacting development and quality of life. Optimal management remains under debate, but conservative treatments are the first-line approach, aimed at reducing symptoms and preventing recurrence.

The purpose of this paper is to present a clinical case of a pediatric patient with L4-L5 and L5-S1 lumbosacral disc protrusions, where a conservative approach using Deep Oscillation therapy and kinetotherapy led to complete symptom resolution and favorable imaging changes. The present case is notable through the manifestation of an adult-type degenerative lumbar disc condition in a 9 – year – old patient, who subsequently demonstrated complete remission of pain and favorable imaging evolution under exclusively conservative rehabilitation management. This presentation highlights both the atypical nature of early – onset degenerative disc changes in childhood and the potential for significant clinical recovery supported by the enhanced regenerative capacity characteristic of younger age groups.

## Case description

### Patient data

We report the case of a 9-year-old female patient who initially presented to the neurosurgery department with progressive low back pain, exacerbated by physical exertion and prolonged standing. Lumbar magnetic resonance imaging (MRI) revealed L4-L5 and L5-S1 disc protrusions without radicular compression, as well as lumbar spine straightening. Given these findings, surgical intervention was deemed unnecessary, and the patient was referred to the physical medicine and rehabilitation department.

### Clinical Findings

At the initial evaluation in the rehabilitation department, the patient presented with:

- Localized moderate lumbar pain, rated 4-5 on the Visual Analog Scale (VAS), worsened by prolonged standing and physical exertion
- Assessment of lumbar mobility revealed preserved range of motion for flexion, extension, lateral bending and rotation. painful trunk anteflexion
- Bilateral lumbar paravertebral muscle contracture
- Pain on palpation and percussion of the lumbar spine
- Neurodynamic assessment revealed mildly positive Slump and Straight Leg Raise tests, indicating minimal neural mechanosensitivity, in agreement with MRI findings showing slight dural sac impression without nerve roots compression.

### Paraclinical Assessment

The initial MRI demonstrated preserved vertebral alignment and normal disc height, with a shallow broad – based posterior disc bulge at L4-L5 and L5-S1. The bulge resulted in minimal ventral indentation of the dural sac, without canal stenosis, neural foraminal compromise or nerve root impingement. The conus medullaris showed normal position and signal characteristics and the paravertebral soft tissues appeared normal. (Fig.1, Fig.2).

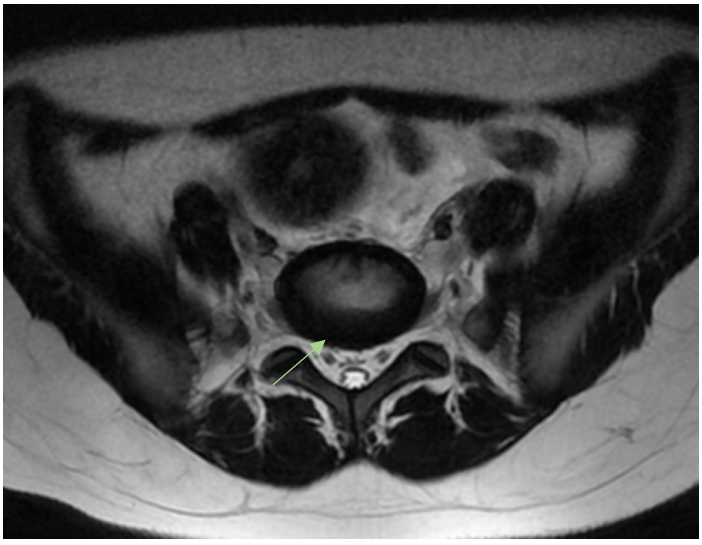

Fig. 1 - First MRI of the lumbar spine T2 AXIAL

Fig. 2 – First MRI of the lumbar spine T2 SAG

**Rehabilitation Program Objectives**

At the initial assessment, the patient's symptoms were dominated by persistent localized lumbar pain, rated 4-5 on the VAS, exacerbated by prolonged standing and physical exertion, associated with paravertebral muscle contracture.

Based on these findings, the objectives of the first rehabilitation phase were:

- Reduction of pain and muscle contracture
- Improvement of lumbar mobility
- Education of the patient and family regarding postural hygiene and prevention of mechanical overload

**Materials and Methods**

An initial 10-day treatment course was implemented, including postural kinetotherapy and Deep Oscillation therapy. The applied program was the "Low Back Pain" protocol, as follows:

- 170–200 Hz for 10 minutes
- 28–48 Hz for 5 minutes

Pulse duration (PD): Pause duration (PD) = 1:1

Deep oscillation therapy is optimally initiated at higher frequencies, which exert well-documented analgesic and myorelaxant effects. Subsequent progression to medium and lower frequencies facilitates enhancement of local microcirculation, increseas arterial perfusion of the muscular tissue, promotes reparative processes and supports the

restoration of muscular function. It is one of the electrotherapy procedures without objective condraindications; therefore, it was selected in this case, as it meets established safety requirements [4].

The Mckenzie Mechanical Diagnosis and Therapy (MDT) approach was integrated into the rehabilitation protocol, given its robust evidence base and its applicability in cases of non – complicated lumbar disc pathology. The method was selected due to its emphasis on a structured diagnostic algorithm, the identification of a directional preference, and the central role assigned to patient – driven symptom modulation. These characteristics render MDT particularly suitable for pediatric patients with preserved neurological status. Following detailed supervised instruction, the patient was advised to adhere to a structured home – based MDT exercise regimen, in accordance with current best – practice guidelines that emphasise the importance of self – management and repetition – based therapeutic strategies in consolidating clinical gains and preventin symptom recurrence [5,6].

The patient demonstrated a favorable clinical trajectory, characterized by a marked reduction in pain intensity and enhanced tolerance to physical effort. Beyond the supervised physiotherapy sessions, the patient was instructed to adhere to a structured home exercise program, aimed at sustaining, consolidating and further optimizing the therapeutic gains obtained durin the guided rehabilitation interventions.

Altough the patient's clinical status improved, it remains necessary to consider the inherent natural healing process, particularly in pediatric patients, where symptom resolution may occur independently as a result of the heightened regenerative capacity characteristic of this age group, yet the improved clinical progression was corroborated by the therapeutic benefits of physiotherapy and kinetotherapy. The exercises were carried out twice daily as a part of a daily routine.

**Evolution**

At the 3-month follow-up, the patient reported intermittent low back pain of reduced intensity compared to the initial presentation (2 points on the VAS scale), with no significant limitation of physical activities. In this phase, the rehabilitation program objectives were:

- Consolidation of lumbar mobility
- Strengthening of paravertebral and abdominal muscles
- Prevention of symptom recurrence

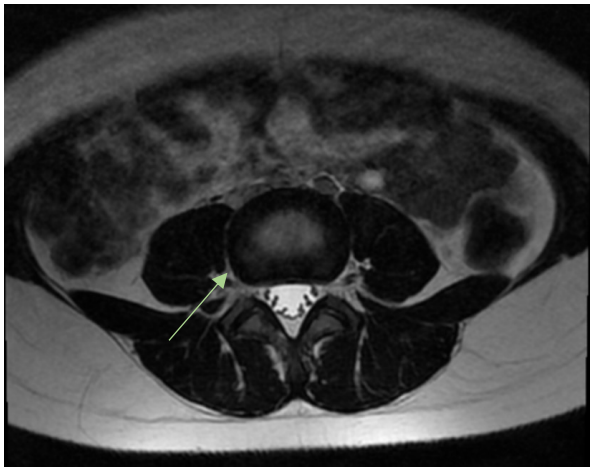

Fig. 3 - Second MRI of the lumbar spine T2 AXIAL

Fig. 4 – Second MRI of the lumbar spine T2 SAG

A second 10-day course, focused exclusively on kinetotherapy with an emphasis on lumbar stabilization exercises, was conducted. A follow-up lumbar MRI showed a stationary appearance (Fig.3, Fig.4). The patient was advised to continue the exercise program at home and adhere to postural hygiene principles.

At the third evaluation, 6 months after the initial presentation, the patient reported only occasional low-intensity pain with minimal functional impact. The objectives of the rehabilitation program in this phase were:

- Consolidation and maintenance of the results achieved in previous phases
- Prevention of recurrences and reduction of overload risk through postural education
- Promotion of compliance with an active and healthy lifestyle adapted to the patient's age

A third 10-day course, including Deep Oscillation therapy – „Low back pain" protocol – and kinetotherapy, was implemented, resulting in a favorable clinical trajectory. The patient achieved complete clinical remission, with full resolution of pain, a sustained positive clinical course and increased functional capacity. A follow-up MRI conducted at this time indicated favorable morphological changes at the lumbar level, although disc protrusions remained detectable (Fig.5, Fig.6).

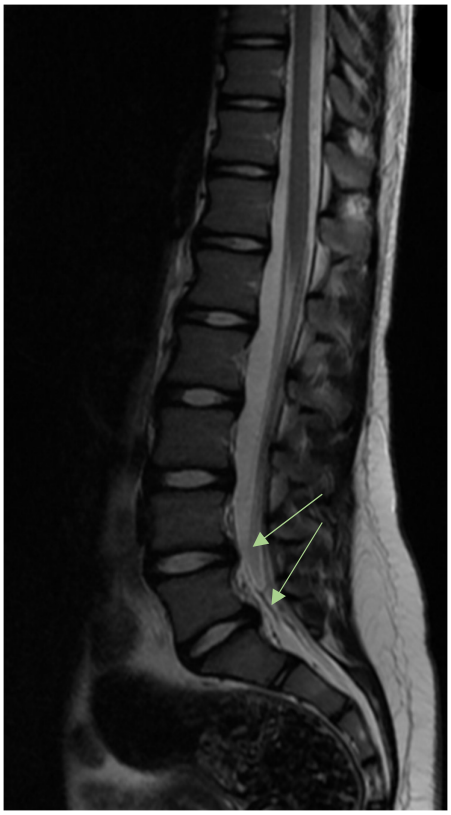

Fig. 5 – Third MRI of the lumbar spine T2 SAG

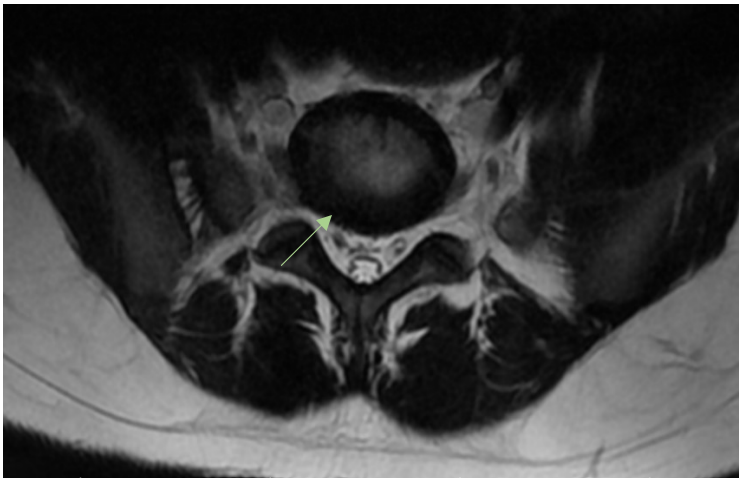

Fig.6 - Third MRI of the lumbar spine T2 AXIAL

## Results

### Clinical outcomes

At baseline, the patient presented intermitent moderate – intensity low back pain, without radicular symptom or neurological deficits. Following the initial two – week supervised rehabilitation program, pain intensity decreased substantially, and by the final follow – up, the patient achieved complete remission of pain with no symptoms recurrence.

Pain severity demonstrated a clear downward trajectory over successive evaluations, as reflected by the reduction in VAS scores from baseline to the 3 – month follow – up, with complete remission achieved by the 6 – month assessment, Table 1.

**Tabel 1. Visual Analogue Scale (VAS) Pain Scores at Baseline and Follow - up Intervals**

| Evaluation timepoint | VAS Score (0 – 10) |
|---|---|
| Baseline | 4 – 5/ 10 |
| 3 – month follow – up | 2/10 |
| 6 – month follow – up | 0/10 |

### Functional outcomes

Lumbar mobility was preserved at presentation, although anteflexion was painful. Over succssessive rehabilitation cycles, the patient demonstrated progressive improvement in activity tolerance and overall functional perfomance, returning to daily and school – related activities without limitations. Consistent adherence to the prescribed home exercise program contributed to the consolidation of these functional gains.

### Imaging outcomes

The initial MRI demonstrated posterior disc bulging at L4 – L5 and L5 – S1, associated with minimal ventral impression on the dural sac without neural compression or canal stenosis. At the three – month follow – up MRI findings remained stable, with persistent but unchanged posterior bulging. The final MRI demonstrated a modest improvement in disc morphology compared with the baseline scan, although residual posterior bulges were still evident. No imaging signs of nerve root impingement or pathological progression were observed throughout the evaluation period.

Given the wide spectrum of potential etiologies of low back pain in pediatric population, the differential diagnosis was determined predominantly on the basis of MRI findings, which offered high – resolution anatomical details and enabled exclusion of alternative etiologies such as infection, neoplasm, spondylolysis, congenital anomalies or other structural disorders.

## Discussion

Lumbar disc pathology in children is rare, but this age group is characterized by a high tissue regeneration capacity. In this case, the combination of kinetotherapy and Deep Oscillation therapy was associated with a favorable clinical progression and corresponding imaging improvements.

Given the degenerative nature of the pathology in a pediatric patient, we consider the short- and medium-term administration of a neuroprotective agent necessary. The concept of neuroprotection in the central nervous system (brain or spinal cord) involves the use of substances with nerve growth factor – like[7].

Deep Oscillation therapy has documented effects in reducing pain, promoting muscle relaxation, and stimulating microcirculation, potentially facilitating natural reparative processes, which are more active in pediatric ages. The achieved result confirms the role

of this method as a valuable adjuvant in the rehabilitation of children with degenerative disc pathology.

**Limitations**

This report presents several inherent limitations: as a single – patient case, the observations cannot be generalized to the broader pediatric population and should be interpreted within the context of an individualized clinical presentation. Furthermore, the current literature does not provide standardized pediatric parameters or evidence – based dosing guidelines for Deep oscillation therapy. Consequently, the intervention was applied conservatively and tailored to safety considerations, with therapeutic parameters adjusted according to the patient's clinical response. The absence of controlled comparative data also limits the ability to isolate the specific contribution of Deep oscillation from the natural healing trajectory and from the concurrent physiotherapy interventions.

Future research, ideally comprising larger pediatric cohorts, is required to clarify the safety profile, optimal dosing, and clinical efficacy of this modality in pediatric patients.

**Conclusions**

Rehabilitation through conservative therapy – Deep Oscillation combined with kinetotherapy – might lead to clinical improvement and resolution of imaging findings in pediatric disc pathology.

The superior regenerative capacity of tissues at young ages may explain the efficacy of conservative treatment.

Deep Oscillation might represent a promising adjuvant therapeutic option in pediatric disc pathology.

**Prognostic**

Given the uncommon nature of this pathology in pediatric patients and the current absence of standardized monitoring protocols, periodic clinical, functional and imaging follow – up is warranted to prevent the recurrence of painful episodes. We consider monthly clinical evaluations appropriate, with imaging reassessment at 3 moths and subsequently at 6 months, provided that clinical symptoms do not recur.

In the long term, the prognosis remains challenging to anticipate and is influenced by several factors, including the somatic development of the future adult, the nature of her occupational activities, and the patient's adherence to self – management strategies and a healthy lifestyle that incorporates daily kinetotherapy.

**Case Particularity**

The particularity of this case lies in the occurence of a tipically adult – type degenerative disc pathology in a pediatric patient, managed successfully through conservative treatment.

**Compliance with Ethics Requirements:**

*"The author declare no conflict of interest regarding this article."*

*"No funding for this study."*

*„I have acknowledged all the above aspects and as the first author, I am responsable for these aspects."*

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