

“ Clinical recovery in Spontaneous lumbar disc resorption may alter the decision of lumbar disc surgery in the future.”

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ABSTRACT:

Background: Different processes have been proposed in the literature to explain the spontaneous resorption of herniated lumbar discs, and numerous studies have found numerous resorption-predictive features. The goal of this study was to assess the clinical improvement and correlation with radiological resorption of lumbar disc herniation (LDH) hence we can decide appropriate time for conservative management.

Materials and methods: 18 patients who had LDH on initial magnetic resonance imaging (MRI) were included in this retrospective analysis. The average age was 36.9 ± 7.2 years, with eleven cases predominantly male. A total of 100% of the patients had sciatica, and 55.6% had pain in their lower backs. Since none of the patients underwent surgery, they were all given conservative care. For 8 to 11 months, patients were followed up clinically and radiologically (using an MRI) in the outpatient clinic.

Results: 44.4% of patients had L5-S1 disc prolapse whereas 55.6% had L4-5 level affected. Sequestration affected 66.7% while Extruded disc was seen in 33.3%. Conservative management revealed that 66.11 % underwent spontaneous resorption of the ruptured disc in a mean time of 9.2 ± 1.1 months as seen radiologically in the MRI. Clinical improvement occurred in all patients in a mean of 5.9 ± 1.2 .

Conclusion: Spontaneous resorption of a herniated lumbar disc, which can happen due to retraction, dehydration, or an inflammatory-mediated mechanism, has become a more common event in lumbar disc prolapse. Clinical recovery typically occurred prior to LDH radiological improvement. The clinical resolution of symptoms and the radiological resolution of LDH were not shown to be significantly correlated.

Key words:

Lumbar disc, Spontaneous resorption.

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Introduction:

It is crucial to make an accurate diagnosis of lumbar disc herniation to receive a tailored course of treatment. Radiographic examination by magnetic resonance imaging (MRI) are the primary procedures used to diagnose lumbar disc herniation LDH [1].

Surgical and conservative treatment are the two types of LDH treatment options. For most individuals with a newly diagnosed LDH, conservative treatment is the initial option. The typical course of treatment lasts at least six weeks and mostly consists of bed rest, medication therapy, exercise therapy, epidural injections, lumbar traction, and treatment with traditional Chinese medicine [2]. Several studies have indicated that the majority of LDH cases could improve with conservative treatment, even though surgery is usually considered to be an effective therapy for LDH [3].

Our research investigates the processes and mechanism of spontaneous disc resorption together with the risk factors the window of opportunity for conservative therapy, and the timing of medical and radiological spontaneous resorption of the lumbar discs without surgery.

Material and Methods

This observational retrospective investigation was carried out in the department of neurosurgery. 18 patients at Tanta University Hospitals between November 2016 and May 2023. Except for two patients whose clinical status had improved just prior to surgery, all the patients had radiologically demonstrated lumbar disc prolapse with no cauda equina symptoms.

Inclusion criteria included all the patients received surgical discectomy recommendations; however, surgery was declined. Consequently, the surgeon decided not to do surgery and to proceed with clinical and radiological management instead. The clinical and radiological progress of the eighteen patients was collected and analyzed to evaluate the process of spontaneous disc regression and absorption. All patients got conservative care, which included resting in bed, taking painkillers, nonsteroidal anti-inflammatory drugs, and getting physical therapy.

For the first two months, all patients were clinically followed every two weeks at outpatient clinics; after that, they were followed monthly for a year. After six months, a 1.5 Tesla MRI of the lumbosacral spine was used for radiological follow-up, pending the patient's financial situation and insurance acceptance. The spontaneous disc regression was identified using a variety of radiological indicators. The most frequently employed technique is the reduction of the size of the nucleus pulposus herniation in magnetic resonance imaging. In addition, the presence of an enhanced rim in the MRI in conjunction with the decrease in the volume of the sequestered herniation.

Exclusion Standards were Individuals who had prior lumbar disc surgery and experienced a recurrence at the same level. Individuals suffering from various disc levels, facet hypertrophy, and lumbar canal stenosis. Additionally excluded were patients with Cauda equine syndrome who required immediate surgery.

Statistical Analysis

Data were expressed as mean \pm SD. Statistical analysis was done using Student t test with IBM SPSS Statistics for Windows, Version 21 (IBM Corp., Armonk, New York, USA). The tests were statistically significant if $P < 0.05$

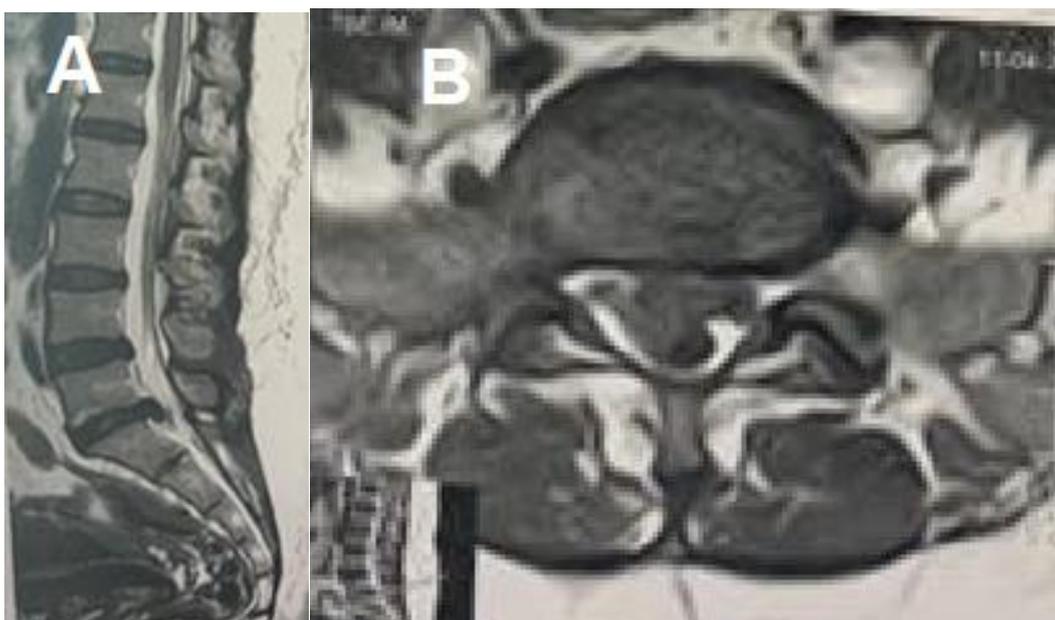
RESULTS

The mean age of the patients was 36.9 ± 7.2 years. There were 11 (61.1%) males and 7 (38.9%) females. Patient was resented with different forms of symptoms. The most common symptom was sciatica which was encountered in 100 % of the patients. Lower back pain constitutes 10 patients (55.6%).

Disc herniation of various types were observed. 12 (66.7%) had sequestered discs, while 6 (33.3%) had extruded discs. Ten patients (55.6%) had a central disc herniation, and eight (44.4%) had a paracentral one. Just two patients (11.1%) had modic changes, compared to 16 (88.9%) who had non-modic changes.

In our research, patients' mean time to clinical recovery was 5.9 ± 1.2 weeks. 100% of patients with a herniated lumbar disc who did not have a neurologic deficit recovered from their clinical symptoms in an average of 4 to 8 weeks. Sixty-one percent of the patients experienced radiological recovery, and the mean duration of spontaneous radiological resorption in these patients was 9.2 ± 1.1 . Despite having no symptoms, 39% of the patients did not exhibit full radiological remission. They showed a partial regression in the size of the nucleus pulposus herniated disc, which could account for their symptom relief.

We were unable to find any evidence of a meaningful correlation between the radiological resolution of LDH and the clinical recovery of symptoms. We reach the conclusion that there is no clear correlation between the lapse of time, clinical improvement, and radiographic proof of spontaneous disc prolapse. Thirty-nine percent of the patients did not exhibit significant identifiable radiological alterations, but they nevertheless exhibited satisfactory clinical symptoms. Of the patients, sixty-one percent had both clinical and radiological recovery. Furthermore, there was no relationship found between the size of a lumbar disc herniation and the likelihood that a patient will require surgery after all other treatments failed.



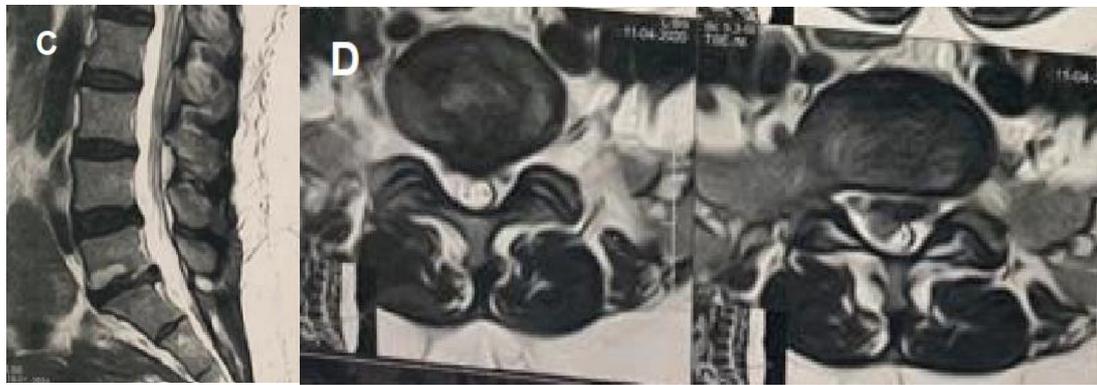


Figure 1. L5-S1 disc prolapse is seen in (A) sagittal T2 and (B) axial T1 first magnetic resonance imaging (MRI). After six months, a follow-up axial T2 and sagittal T2 MRI (images C and D) revealed partial disc resorption.

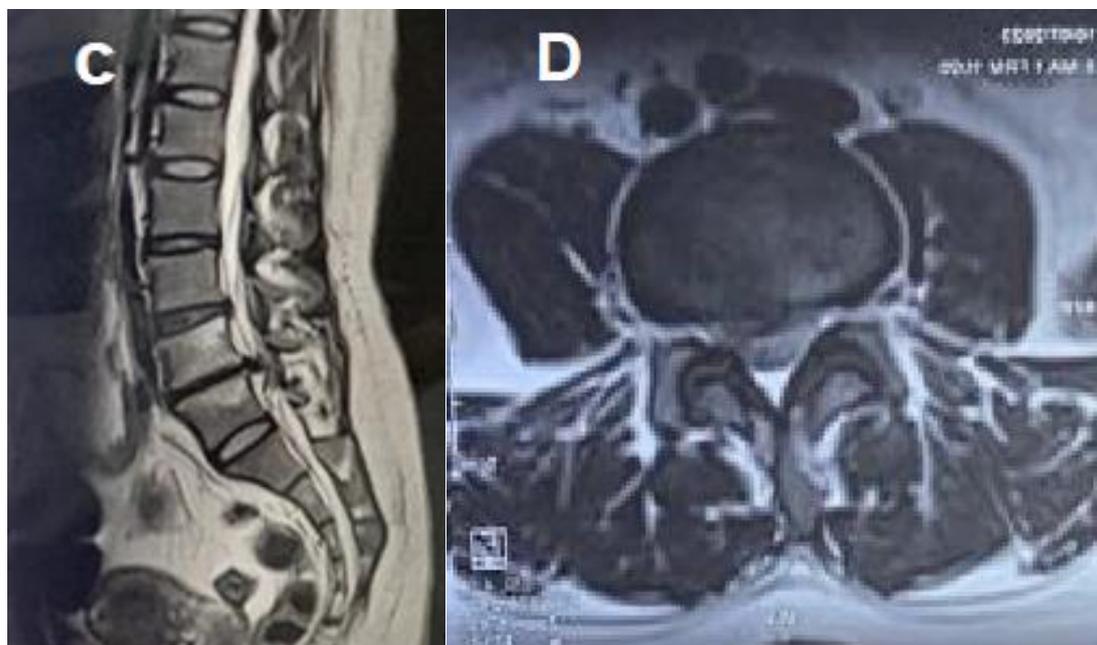
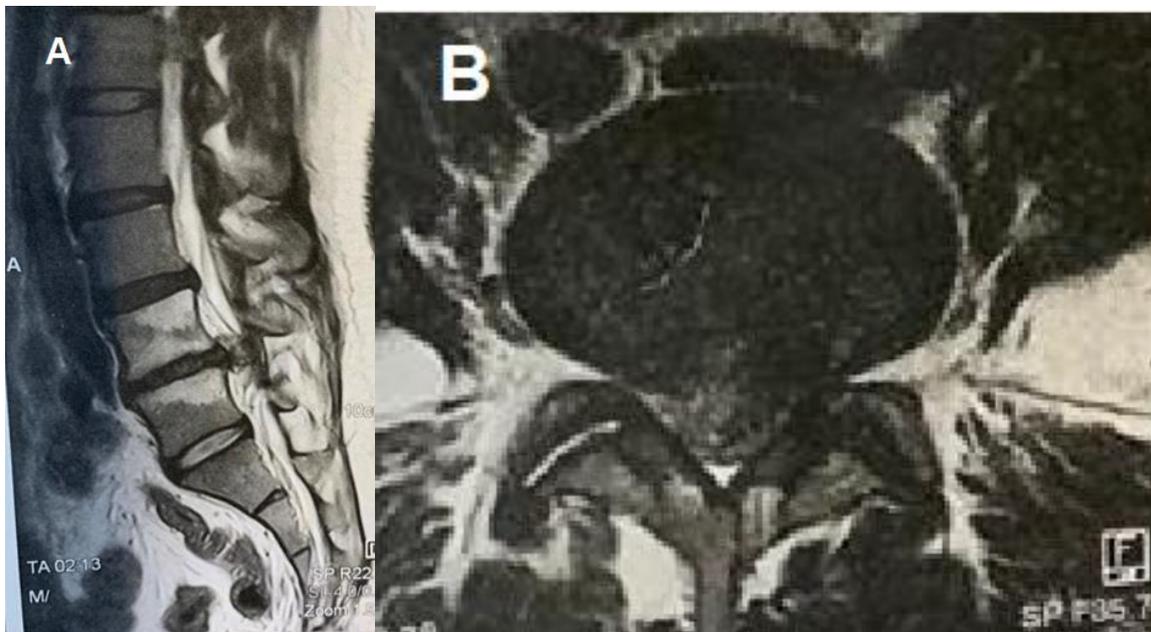


Figure 2. First magnetic resonance imaging (MRI) with (A) sagittal T2 and (B) axial T1 demonstrating extruded L4-5 disc. Partially resolved disc was seen in (C) sagittal T2 and (D) axial T2 after 6 months follow-up.

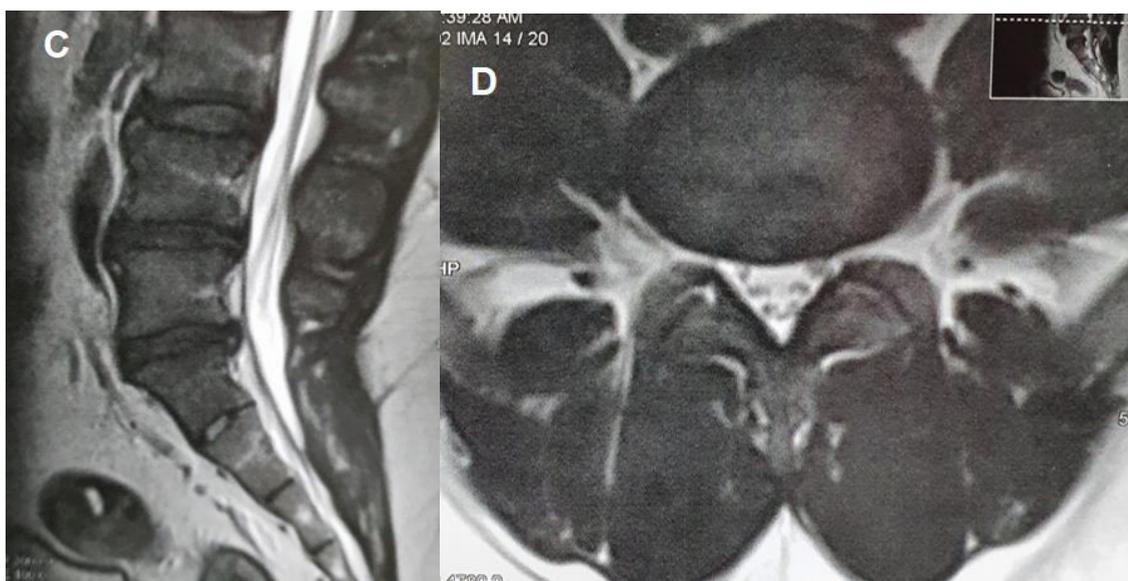
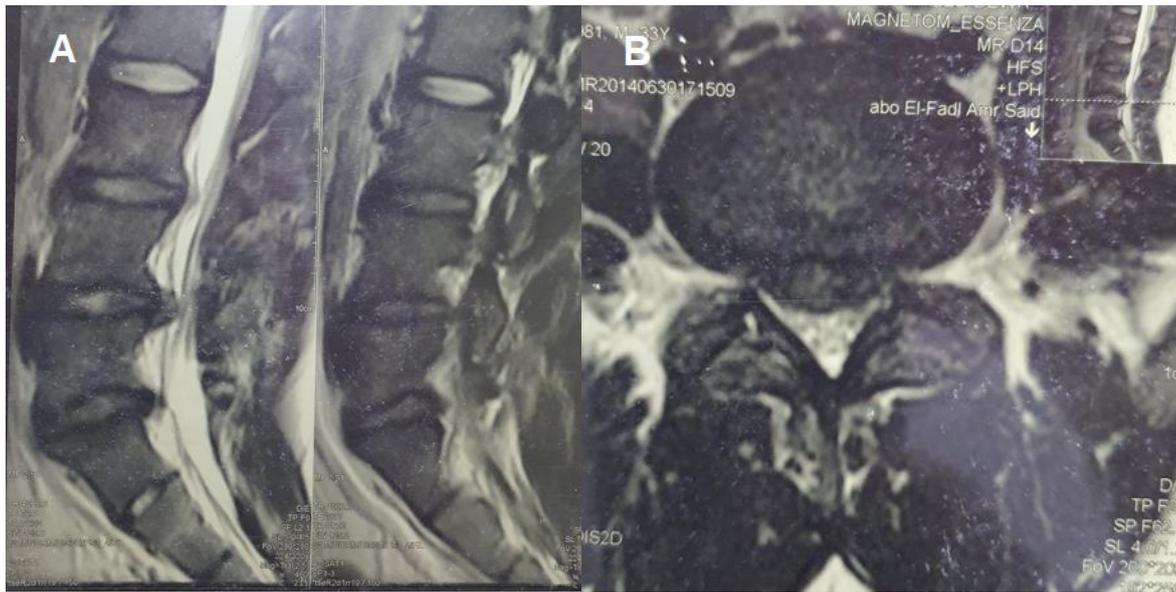


Figure 3. Huge prolapsed L4-5 disc prolapse is visible in (A) sagittal T2 and (B) axial T2 initial magnetic resonance imaging (MRI). Complete disc resorption is seen in (C) sagittal T2 and (D) axial T2 follow-up MRI 6 months after the first one.

Data	Description Total: 18 patients
Age (year): min-max mean \pm SD	25-50 36.9 \pm 7.2
Sex: (n%) <ul style="list-style-type: none"> • Male • Female 	11 (61.1%) 7 (38.9%)
Clinical presentations: (n%) <ul style="list-style-type: none"> • Low back pain • Sciatica: <ul style="list-style-type: none"> RT LT Bilateral • Hypothesia • Motor deficit • +ve Straight leg raising test 	10 (55.6%) 18 (100%) 4 (22.2%) 4 (22.2%) 10 (55.6%) 6 (33.3%) 0 18 (100%)
Disc level: (n%) <ul style="list-style-type: none"> • L4-L5 • L5-S1 	10 (55.6%) 8 (44.4%)
Type of disc herniation: <ul style="list-style-type: none"> • Sequestered • Extruded 	12 (66.7%) 6 (33.3%)
Site of disc herniation: (n%) <ul style="list-style-type: none"> • Central • Paracentral 	10 (55.6%) 8 (44.4%)
Modic change: (n%) <ul style="list-style-type: none"> • Non • Type-1 	16 (88.9%) 2 (11.1%)
Clinical recovery duration (week): min-max mean \pm SD Radiological recovery duration (month): min-max mean \pm SD	4-8 5.9 \pm 1.2 8-11 9.2 \pm 1.1
Visual analogue score (VAS): min-max mean \pm SD	4-7 5.3 \pm 0.8

DISCUSSION

Keyet al [4] was the first to document the spontaneous resorption of material from an extruded ruptured disc in 1945. Others who showed similar occurrences in numerous spine locations after his publication were published. Since Guinto et al 1984 reported the first instance of spontaneous resorption of a lumbar herniated disc shown by computed tomography (CT), an increasing number of related cases have been reported [5]. Despite much research on the subject, the precise mechanism underlying intervertebral disc herniation's spontaneous resolution is still unknown [6].

Saal et al 1990 investigated the natural course of LDH. They chose 11 patients who had been given a CT diagnosis of LDH for conservative treatment. The findings revealed that 0–50% of the protrusions were absorbed in 2 individuals, 50–75% in 4, and 75–100% in 5. Additionally, the reabsorption ratios of the two smallest protrusions were the lowest, whilst the reabsorption ratios of the largest protrusions were the highest. According to Saal, reabsorption frequently takes place in the edema of nerve tissue, and the bigger the protrusion, the more visible the reabsorption [7].

Komori H et al [14] states that the disc's size has a significant influence on spontaneous resorption. Compared to tiny LDHs, large LDHs typically degenerate more quickly. The disc material in the epidural space is exposed to the systemic circulation during infiltration of the annulus fibrosus or posterior longitudinal ligament, promoting cell-mediated inflammatory reactions. The likelihood of a disc shrinking in size is higher for larger discs than for smaller discs, while smaller discs may also grow. The results of our study show that there is no relationship between a patient's likelihood of eventually requiring surgery after trying conservative therapy and the degree of a lumbar disc herniation. This is in line with research by Benson et al [15] that found that severe disc herniations can be managed effectively conservatively but contradicts findings by Elkholy et al [16] and Autio RA et al [17] who demonstrated that larger herniated discs spontaneously resorbed more quickly than smaller discs.

The mechanisms of LDH resorption are well documented in a big number of published papers. In Saal et al 1996 literature, the authors reviewed and analyzed pertinent clinical research reports on the reabsorption of LDH following non-surgical intervention, and they discussed the effects of different LDH types and locations, anatomical and histochemical factors, clinical traits, and individual factors on the natural history of LDH [8]. With the progression of the natural history, the herniated LDH in most patients can naturally shrink or degenerate, according to the North American Spine Society's (NASS) Evidence-Based Clinical Guideline for the Diagnosis and Treatment of Lumbar Disc Herniation with Radiculopathy [9]. There have been three potential mechanisms to account for a role in the resolution and elimination of LDH. Retraction of the protrusion is the first mechanism. The protrusion of the lumbar disc is a ruptured fibrous layer annulus fibrosus followed by the herniation of the soft tissue of the nucleus pulposus. The nucleus pulposus might not detach from the annulus fibrosus and can stay linked. This nucleus's retraction may be the first step in spontaneous disc resorption, and it can happen even in the absence of separation between the protrusion and annulus fibrosus [10]. The second mechanism involves the herniated nucleus pulposus gradually losing moisture and contracting, which in turn forces the protrusions to retract into the annulus fibrosus [11]. A third mechanism, which has garnered a lot of attention, contends that LDH fragments reach the epidural region and set off an immunological reaction that results in inflammatory cell infiltration and neovascularization. The autoimmune system perceives LDH protrusions as "foreigners" in the vertebral epidural vascular space, which in turn sets off a series of inflammatory reactions, including neovascularization, matrix protease activation, elevated levels of inflammatory mediators, phagocytosis of inflammatory cells, and enzymatic degradation [12]. Our findings suggest that those three pathways are responsible for the spontaneous resorption of ruptured discs in our patients. Rapid reabsorption of large and/or sequestered disc material can be explained by the mechanism of inflammatory response. The dehydration process explained the resorption of the large, herniated disc with a substantial water content, and the final retraction mechanism might have explained the resorption of the extruded disc.

Although long-term use of these drugs may hinder reabsorption, today's commonly recommended NSAIDs or intraspinal steroids alleviate pain by lowering local inflammation. Yu PF et al [13] prospective research indicates that anti-inflammatory drugs inhibit the absorption of LDH. Clinical symptoms can subside with medical treatment alone, and repeated MRI scans may show that a ruptured disc has regressed morphologically. Whenever progressive motor weakness or cauda equina syndrome is absent in the acute stage of the lumbar herniated disc, conservative treatment can be considered. In cases when

conservative treatment fails to relieve persistent low back and leg discomfort or neurological impairments, surgery should be considered [18]. A mean of 5.9 ± 1.2 weeks was the clinical recovery length in our investigation. In patients with a herniated lumbar disc who do not have a neurologic deficit, we concur with the findings of Rothoerl et al [28] and Alentado et al [29] that conservative treatment should be considered for two months before surgical surgery is suggested. In our study, non-steroidal anti-inflammatory medicines (NSAIDs) were routinely tried on our patients for a two-week course. Opioids, tramadol, and/or corticosteroids were administered for more severe pain. Our primary focus during therapy was symptomatic; we did not investigate the relationship between medicine and disc resorption in depth and it was one of the limitation of the study.

Relation between clinical and radiological resolution mandated the use of MRI as an excellent tool for following up of the patients with LDH who undergo conservative treatment. In most studies, patients were followed up with MRI because of persisting symptoms after conservative treatment [19]. The relationship between a spontaneous radiological disc regression in MRI and clinical consequences is a complicated one. The percentage of complete spontaneous radiological disc regression in our sample was 61.11%, with a mean of 9.2 ± 1.1 and an average duration of 8-11 months. Iwabuchi M et al [24] study showed that the average follow-up period for LDH resorption was 10.5 months, with a range of 8.5 to 12.9 months which nearly runs with our recommendation for radiological follow up. This was consistent with the incidence of 66.66% that was reported in a prior review of 11 studies by Zhong M et al [20]. These numbers can be viewed as quantitative information that can guide surgical decisions regarding LDH.

Multiple studies had demonstrated the relationship between clinical and radiological outcome. Hong et al [30] discovered that individuals whose disc herniation does not improve radiologically can also show amelioration of symptoms, Oktay et al [31] shown that a drop in the herniation ratio of above 20% is related with clinical improvement. Nevertheless, additional research [32] has demonstrated that symptoms of lumbar disc herniation may recur or that the condition may go away following therapy with only painkillers. We agreed in our analysis that in every case, the clinical symptoms had subsided before the ruptured disc underwent resorption.

Lee et al [21] reported the highest LDH resorption (96%) with an average follow-up of 341 days, indicating that we should take the likelihood of LDH regression seriously. Delauche-Cavallier [22] reported a resorption rate of 67% with an average follow-up time of 12.5 months. Matsubara [23] reported a rate of 62% with an average follow-up time of 9.7 months. Longer follow-up periods were reported in another research. A resorption rate of 73% was reported by Fagerlund et al [25] with a follow-up of 24 months, a rate of 57% was reported by Yukawa et al [26] with an average follow-up of 30 months, and a rate of 58% was reported by Shin et al [27] with a follow-up of 3 years. We were unable to find any evidence of a meaningful correlation in our investigation between the radiological resolution of LDH and the clinical recovery of symptoms.

Our study was limited by our exclusion criteria, which excluded patients with facet hypertrophy, multiple disc levels, lumbar canal stenosis, and patients in urgent need of surgery due to Cauda equine syndrome. It also excluded patients who had previously undergone lumbar disc surgery and experienced recurrence at the same level. We did not thoroughly examine the connection between medication and disc resorption.

CONCLUSION

The well-known process of spontaneous resorption of a herniated lumbar disc prolapse may influence the promptness of urgent spinal disc surgery. When radiculopathy and pain are tolerable and there is no neurological deficit, a non-surgical care can be put into consideration as the main treatment option, even in patients with significant lumbar disc extrusion. Clinical recovery usually occurred before radiological resolution of LDH. In our study, we Did not manage to establish significant relationship between clinical

recovery of symptoms which happened within weeks and radiological resolution of LDH which usually happened after months.

Abbreviations:

LDH: Lumbar disc herniation, MRI: Magnetic Resonance Image

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