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**Research Paper**

# Pre_and Postoperative Evaluation of 1000 Patients with Lumbosacral Disc Herniation (L4L5, L5S1) by Neurophysiological, Radiological and Clinical Assessment

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## ABSTRACT:

### BACKGROUND:

Lumbosacral disc herniation, particularly at the L4-L5 and L5-S1 levels, is a leading cause of lower back and radicular leg pain. While many patients respond to conservative treatment, those with persistent symptoms or neurological deficits often require surgical intervention.

### OBJECTIVE:

Pre and postoperative evaluation of patients with lumbosacral disc herniation by neurophysiological, radiological and clinical assessment.

### PATIENTS AND METHODS:

This retrospective cohort study was conducted at Saad Al-Witry neuroscience teaching hospital in Baghdad in the period extended from January 2017 to October 2023. The study included a total number of 1000 cases gathered from a neurosurgical team specialized in spine cases handling. The selection of cases was based on clinical and neurological examination. In whom medical therapy failed to control patients' symptoms.

The patients were observed during their initial visit to the clinic, the day of the procedure, 2 weeks postoperatively then 5 years following intervention to check response {pain, motor, sensory, autonomic, electrophysiology (EMG/ NCS)}.

### RESULTS:

About 660 patient became pain free within one week, while the remaining 72 improved within less than a month. However, 20 patient of those who were presented with saddle paresthesia showed improvement within 1 week. But none of the patients who presented with L5 radiculopathy showed improvement within 12 weeks of surgery.

We observed that 54 patients had an improvement in foot drop within one week.

Regarding urinary incontinence, the duration of symptoms before surgery had a significant correlation with improvement.

Preoperative and Postoperative electrodiagnostic studies did not show significant improvement

### CONCLUSION:

Single or multiple level discectomy for herniated lumbar discs is an effective surgical method to decrease pain and improve quality of life of patients suffering from pain non responding to conservative management or presenting with sensory or motor deficit.

**KEYWORDS:** Lumbar disc disease, lumbar stenosis, laminectomy.

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## INTRODUCTION:

The intervertebral disk is a complex cartilaginous structure that plays a central role in the biomechanics of the spine. When the intervertebral disk loses its native structure, its biomechanics become altered, it becomes a potential pain generator, and it is said to undergo degeneration. Intervertebral disk degeneration is very common in the adult population, to the extent that asymptomatic intervertebral disk degeneration may be considered a feature of aging rather than a pathologic state. Whereas some cases of intervertebral disk degeneration are asymptomatic, others may occur early in adult life or in association with significant axial low back pain (LBP), and these cases may be considered pathologic Due to its high prevalence and significant contribution to disability, LBP incurs an annual cost exceeding $100 billion in the USA [(1,2)]. Within the vast differential of LBP, the most common source is intervertebral degeneration

leading to degenerative disc disease and lumbar disc herniation (LDH) [2]. Thus, an effective understanding of LDH, its origins, and how to appropriately treat LDH is of substantial importance.

**Epidemiology**

Intervertebral disk degeneration is an aging process that affects a large portion of the adult population. Since it is sometimes asymptomatic, and requires magnetic resonance imaging (MRI) for detailed evaluation thus, it is difficult to study epidemiologically. As a result, estimates of the prevalence of radiographic features of intervertebral disk degeneration in adults vary widely, ranging from 9% to 85% for decreased T2 signal intensity and 3% to 56% for loss of height.[3] Intervertebral disk degeneration is only clinically significant when it results in morbidity, but it is estimated to account for 39% of axial low back pain [4]. Axial low back pain has an estimated economic impact of over $100 billion in the United States annually [5].

## AIM OF THE STUDY:

1. To assess the clinical presentation, Electromyography ( EMG), Nerve Conduction Study (NCS) on outcome of lumber surgeries (laminectomy,discectomy).
2. to study the EMG and NCS finding pre and postoperative and their clinical relevance.
3.To assess the Radiological finding pre and postoperative.

## PATIENTS AND METHODS:

This retrospective cohort study was conducted at Saad Al-Witry neuroscience Teaching Hospital in Baghdad in the period extended from January 2017 to october 2023. The study included a total number of 1000 cases gathered from a neurosurgical team specialized in spine cases handling. The selection of cases was based on clinical and neurological examination. In whom medical therapy failed to control patients' symptoms.

The patients were observed during their initial visit to the clinic, the day of the procedure, 2 weeks postoperatively, then 5 years following intervention to check the response (pain, motor, sensory, autonomic, radiology, EMG and NCS).

The parameters involved in this study includes the patients' demographic data, clinical presentation, neurological examination imaging findings, NCS and EMG at time of intervention then during follow up visits.

**Case selection:**

One thousand cases (355 females, 645 males) ages between (20 - 50) of prolapsed intervertebral disc over five years between January 2017 to October 2023, they were selected from the outpatient clinic in Saad Al-Witry Neuroscience Teaching Hospital and private clinic They were not responding to medical therapy after a period of conservative treatment.

**Patient preparation:**

Patients were admitted to Dr. Saad Al-Witry Neuroscience Hospital, prior to surgery. History and physical examination done. The laboratory investigations done to all patients, which included complete blood count (CBC), renal function test (RFT), liver function test (LFT), serum electrolytes, bleeding profile, viral screen, chest x ray, lumbosacral x ray {AP and lateral (flexion, extension) views}, lumbosacral MRI done, EMG, NCS blood preparation.

**Procedure:**

Patients were admitted to the hospital two to three days before the operation. Preoperative evaluation undertaken and consent to surgery is taken. Patients should have stopped all anticoagulant medications at the appropriate time frame but kept on drugs for chronic illnesses. We have consulted physicians for all patients with chronic illnesses especially in cases of controlling diabetes and hypertension. Patients were instructed to stop smoking at least 4 weeks before surgery. Advised the patients to refrain from drinking or eating any food 6 hours prior to surgery.

At morning of surgery, prophylactic antibiotics are given to the patient one hour before commencing the surgery (usually a third-generation cephalosporin if no drug allergy).

Patients are wheeled to the operating theatre and anaesthetized. Positioning the patient in prone position on a support frame with a foam pads for nipples and anterior superior iliac spine (ASIS), leaving the abdomen free, avoiding abdominal pressure decreases epidural venous pressure and, therefore, surgical site bleeding.

Skin is marked for incision {(either by using anatomical landmark) or (using C arm to identify the correct level). An X-ray is taken to allow us to place a small incision directly over the pathological level)}.

The surgeon first cuts through the skin. The fascia is then incised, the muscles are separated and held in place with retractors. Laminectomy is performed at the level of disc prolapse, the pathological disc is removed using pituitary rongeurs of different angles and sizes, after good hemostasis a drain-tube is placed at the surgical bed before closing the wound. The patient is awakened from anaesthesia, and discharged to neurosurgical room.

**Postoperatively:**

Routine post-operative observations will be taken and charted, including temperature and blood

pressure. The wound is checked for redness, swelling and signs of infection. Muscle spasms are not uncommon following laminectomy. Pain relief and antispasmodic medication are given regularly. The ability to pass urine is recorded, as sometimes this may be affected immediately following surgery. The drain-tube placed during surgery, which is taken out after one or two days. Patients are kept on injectable antibiotics for few days.

The patients are allowed to roll over in bed and are taught the proper method of rolling in order to maintain proper body alignment. This is most important for the first 48 hours. The patients are encouraged to walk, stand and sit for short periods and are taught how to prevent twisting, flexing or hyper-extending the back while moving around. Patients may be referred for inpatient or outpatient rehabilitation. The patient is discharged on (Day 3 to Day 5) postoperatively if no complications arose.

## RESULT:

A total of 1000 cases of with lumbosacral disc prolapse were treated with laminectomy and discectomy and followed up over a period of 5 years. Of the total number of cases 645 (64.5%) were females and 355 were males (35.5%). Age of the patients range from 20 to 50 years. As shown in table (1)

**Table1: Sex distribution of the study subjects.**

| Sex(gender) | Male | Female | total |
|---|---|---|---|
| | 645(64.5%) | 355(35.5%) | 1000 |

### Pain / 880 Patient:

Out of the 1000 cases included in the study, only 880 cases returned for follow up, 800 patients showed total improvement in pain, with time frame of improvement as following: 660 patients reported improvement during the initial 1-week visit, 72 patients during first 1-4 weeks, and 68 after 4 weeks, only 80 patients no improvement. As shown in Table (2) and table (3).

**Table 2: Postoperative pain improvement.**

| Clinical scenario | Improved | Not improved | total |
|---|---|---|---|
| Number of patients | 800 (91%) | 80(9%) | 880 |

**Table 3: Time frame of improvement of pain.**

| Improved/time frame | 1 week Postoperative | 1_4week postoperative | >4week postoperative | Total of improvement |
|---|---|---|---|---|
| Number cases improved over indicated time frame | 660 (82.5%) | 72 (9%) | 68 (8.5%) | 800 |

### Foot drop / 168 patient:

A total of one hundred sixty-eight out of 1000 cases included in this study, only 168 presented with foot drop preoperatively, 80 (47.6%) patients had a total clinical improvement in their motor function, as shown in table (4)

**Table 4: Results of patients who presented with foot drop preoperatively.**

| Clinical scenario | Total number improved | Total number not improved | Follow up Lost contct | Total number of cases |
|---|---|---|---|---|
| number of patients | 80 (47.6%) | 10 (5.9%) | 78(46.4%) | 168 |

Fifty-four of patients (67.5%) improved clinically within the first week, twenty-two of patients (27.5%) patients before 4 weeks and four patients (5%) improved during four weeks postoperatively, as shown in table (5).

**Table 5: Results of patients who improved with foot drop preoperatively.**

| Improved/time frame | < 1 week post op | 1-4 weeks post op | >4 weeks postop | Total improved |
|---|---|---|---|---|
| Number of cases improved over indicated time frame | 54 (67.5%) | 22 (27.5%) | 4 (5%) | 80 |

**Anaesthesia 720 saddle 38 cases:**
Out of 1000 cases included in this study, only 720 presented with paresthesia, 38 of them had saddle paresthesia, 32(84%) patients clinically improvement, only 6(15.7%) patients did not improve. As shown in table (6).

**Table 6: Postoperative result in patients who presented with saddle paresthesia.**

| Clinical scenario | improved | not improved | Total number of cases |
|---|---|---|---|
| number of patients | 32 (84.3%) | 6 (15.7%) | 38 (100%) |

Of those 32(84%) patients; 20(62.5%) patients show an improvement with in first week, and 12(37.5%) patients show an improvement with in four weeks. Shown in table (7).

**Table 7: Time frame of improvement of saddle anaesthesia.**

| **Improved/time frame** | **1 week** | **1-4 weeks** | **Total improved** |
|---|---|---|---|
| **Saddle (Number of cases improved over indicated time frame)** | **20(62.5%)** | **12 (37.5%)** | **32** |

**Table 8: Postoperative improvement of paresthesia (dermatomes distribution).**

| Clinical scenario | Improved | Not improved | Lost contact | Total |
|---|---|---|---|---|
| Number of cases | 354 (51.9%) | 152 (22.2%) | 176 (25.8%) | 682 |

**Paranesthesia 720 patient:**
Out of 720 patients, 682 patients had a dermatome distribution, only 354 had a clinical improvement, 152 didn't show any clinical improvement, and the reminder patients 176 we lost contact to them, showed in table (8).
Of those 354 patients, no one show clinical improvement with first twelve week, eighty two patients (23.1%) show clinically improvement between 12 to 24 week, eighty patients (22.5%) show clinical improvement of period between 24 to 48 week, one hundred ninety two (54.2%) show clinical improvement of period between 1 to 5 year, as shown in table (9).

**Table 9: Time frame of improvement of dermatomes distribution.**

| Improved/time frame | 1-12 week | 12-24 week | 24-48 week | 1-5 years | Total improved |
|---|---|---|---|---|---|
| dermatome (Number of cases improved over indicated time frame) | No improvement | 82 (23.1%) | 80 (22.5%) | 192 (54.2%) | 354 |

**Urinary incontinence 68 cases**:
Sixty eight patients presented with preoperarive urinary incontinence, of those 48 patients presented to us within 48 hours of the start of the complaint; postoperativle 30(62.5%) of patients showed clinical improvement, but 18(37.5%)didn't show any improvement, as shown in table (10).

**Table 10: Results of patients who presented with in 48 hour of the start of urinary incontinence.**

| Improved / time frame | Within 48hr | Not improved | total |
|---|---|---|---|
| Urinary incontinence (Number of cases improved over indicated time frame) | 30 (62.5%) | 18 (37.5%) | 48 |

Twenty patients presented with urinary incontinence for more than 48 hours before surgery. Postoperatively; 6 patients (30%) of them showed clinical improvement 14 patients (70%) didn't show any improvement, details shown in table (11).

**Table 11: Postoperative results of patients who presented more than 48 hr of urinary incontinence.**

| Improved/time frame | Improved | Not improved | total |
|---|---|---|---|
| Urinary incontinence (Number of cases improved over indicated time frame) | 6 (30%) | 14(70%) | 20 |

**MRI WITH CONTRAST:**

Out of 1000 cases included in this study, MRI was done for 315 patients One hundred and fifty-five (49.2%) of cases did new MRI within a period between 6 weeks to 6 months and one hundred sixty patients did new MRI after 6 months, as shown in table (12)

**Table 12: Postoperative MRI with contrast in different period of time.**

| Time frame | 6 wks_6months | >6 months | total |
|---|---|---|---|
| MRI | 155 | 160 | 315 |

one hundred thirty one patients (84.5%) showed a marked contrast enhancement of paraspinal soft tissue, and only twenty four of patients (15.5%) didn't show contrast enhancement, as shown in table (13).

**Table 13: Patients who underwent contrast-enhanced MRI within 6 weeks to 6 months post-operatively.**

| Mri with C | Enhancement | not enhancement | total |
|---|---|---|---|
| | 131 (84.5%) | 24(15.5%) | 155 |

However, After 6 months of discectomy MRI was done for another 160 (50.8%)patients of whom only 26 patients had marked enhancement of the operation bed,of those 118 had only moderate enhancement and in 16 no clear enhancement was noted. Shown in table (14).

**Table 14: MRI results of patients who after 6 months.**

| Mri with C | Enhancement | Moderate enhancement | No enhancement | Total |
|---|---|---|---|---|
| | 26 (16.25%)) | 118 (73.75%) | 16 (10%) | 160 |

**NCS AND EMG 320 pateint:**

Out of 1000 cases included in this study 320 patients were sent for neurophysiological testing (EMG and NCS) by physician or neurosurgical team, all cases showed chronic moderate to severe (bilateral or unilateral) preganglionic L4-L5-S1 root lesion. Postoperatively 214 cases were followed by neurophysiological testing, of which only 32 cases showed improvement within 5 years of surgery.

**Table 15: Time frame of NCS/EMG more than 5 years.**

| Improved/ time frame | >5 years | Not improved | total |
|---|---|---|---|
| NCS/EMG | 32 (14.9%) | 182 (85%) | 214 |

## DISCUSSION:

Lumbar discectomy through laminectomy or laminotomy had been traditionally the mainstay surgical management for herniated lumbar discs causing severe pain not responding to conservative treatment and for patients presenting with neurological deficits. It had shown satisfactory results in pain relief and improving functional outcome and thus, this procedure had

been extensively performed in our local and national neurosurgical centers and to our knowledge; centers abroad.

Many studies worldwide had investigated functional outcome of patients undergoing single or multilevel discectomies and had generally shown acceptable results. For example:

Our study compares Pre_and postoperative electrodiagnostic studies (EMG/NCS) and clinical evaluation of patients with lumbosacral disc herniation

Our study tracks patients' outcome following lumbosacral discectomy after 5 years of intervention, as cases indicated for discectomy based on established guidelines for disc removal.

**The most common presented symptoms in our study were pain.**

Out of the eight hundred eighty of cases that were operated, 91% of patients showed clinical improvement in terms of reduction of pain after discectomy, our results were consistent with the literature that we have reviewed, these results were consistent with results by Morin et al. (6) where 64% of their patients showed improvement after lumbar discectomy

Also correlating with results of a meta-analysis done by Rushon et al. [7] Also, consistent with a review done by Mancuso et al. on 422 patients, Where they stated that 89% of their patients experienced improvement in pain after lumbar discectomy and they examined different variables affecting patients' response to surgery, which are beyond the scope of our discussion. [8]

Motor deficit as focused on Foot drop was present in 168 cases from 1000 patients, and improvement was observed in (47.6 %) of patients who presented with preoperative weakness; motor weakness was mainly focused on the presence of foot drop preoperatively because of its significant effect on the patient's quality of life and function. This improvement, in our opinion, is referred to as timely surgical intervention and good postoperative physical rehabilitation, unfortunately the remainder of patients were lost to contact in the later postoperative follow-up and thus we couldn't assess motor status in the long-term.

We have searched extensively for literature reviews on the postoperative prognosis of foot drop and found out there is a lack of, especially, recent literature review to compare our results, and what we found were mostly old literature.

However, we found our results to be less satisfactory than some other reported literature,

stated by Girardi et al. They had improvement in dorsiflexion of foot of 98% of their patients that were operated, their population had undergone operation for both disc herniation and lumbar stenosis. [9]

While other studies, such as one done by Andersson and Carlsson reported only 50% of improvement of foot drop which is quite close to ourresults.[10]

O'Connell on the other hand reported that 78% of their patients who had presented with foot drop and treated surgically had persistent motor weakness. [11]

**Autonomic disturbance**:

In our study we are focusing on urogenic bladder and the duration of symptoms before surgery had a significant outcome for improvement. The patients operated on within 48 hours showed an improved postoperative outcome. Among 48 patients operated on within 48 hours, 40 (62.5%) recovered normal bladder function.

our results were consistent with the literature that we have reviewed, these results were close to our results by Jeon, J. B., [12]

where (81%) of their patients showed improvement in bladder function after decompression.

**MRI with contrast enhancement:**

Out of 155 patients did Post operative MRI with contrast enhancement 131patients (84.5%) show Soft tissues and paraspinous muscle enhancement this due to postoperative scar tissues It is to be considered a normal finding 6 weeks after operation. Although the enhancement diminishes by 6 months, it remains visible in many patients. These results were consistent with results that show in **Van Goethem, J. W.,** (87%) of patient had contrast enhancement.[13]

**Paresthesia:**

Our patient population included 720 patients with paresthesia, 682 of whom presented with paresthesia at L5 dermatome, of those, a total of 354 (51.9%) showed improvement within 5 years after surgery with different time frames of improvement. And 152 (22.2%) did not experienced any improvement of the complaint.

We have looked up into literature on the outcome of patients in terms of improvement in paresthesia and found out that.

Huang and sangupta had 77.6% of their patients presented with paresthesia, improvement in paresthesia was progressive and plateaued after 3 months postoperatively after which no further improvement was recorded. [14]

In Chateen and colleague's study of 50 patients that had undergone lumbar discectomy, 64% presented with paresthesia, 28 patients (87.5%) of them recovered. [15]

Huang and colleagues did a retrospective study on 85 patients who were prepared for lumbar

radiculopathy, they studied the time frame of improvement of sensory symptoms including pain, numbness and paresthesia, and they stated that the sequence of improvement in pain first followed by numbness and then paresthesia that plateaued in improvement after 3 months.

**Electrodiagnostic studies (EDS)**

were done for only 320 patients preoperatively of which only 214 underwent EDS postoperatively. Five years postoperatively only 32(14.9%) patients had improvement after five years but 182(85%) patients showed no improvement.

Sankhla and colleagues concluded in their research on 60 patients that electrodiagnostic studies can be helpful in predicting patients who will respond well to surgery as their postoperative (Visual analog scale) VAS and Oswestry Low Back Pain Disability Questionnaire were significantly improved in the patients who had better EDS results postoperatively. [16]

Sarmat and colleagues prospectively investigated they saw that 50 of them with preoperative evidence of fibrillation potentials suggestive of root lesions (disc prolapse), 64% (32 patients) showed normal EMG after surgery (postoperative EMG was done 1–6 months after surgery. [17]

We observed that the sensory complaints of our patient population improved in pain and paresthesia respectively.

Within 1 week postoperatively 82.5% of patients became pain free, while the remaining 9% improved within less than a month and remained improved after more than 1 month. However, 62.5% of those patients who presented with saddle paresthesia showed improvement within 1 week post operatively, while the remaining improved within 1 month. But none of the patients who presented with L5 radiculopathy showed improvement in paresthesia within 12 weeks of surgery, but 23.1% improved within 12-24 weeks, 22.5% within 48 weeks and the remained within 5 years, we think the delay of improvement in L5 radicular paresthesia as compared to saddle paresthesia is the tolerance of patients to lower limb sensory disturbances more than to perineal and perianal region paresthesia and other sensory disturbances, and as it is a warning sign for possible cauda equina or conus medullaris syndrome and the fear of an imminent development of autonomic disturbances that leads surgeons to perform more urgent surgical interventions.

We observed that the most cases had improvement in foot drop within one week postoperatively 67.5%.

Regarding urinary incontinence, we observed that the duration of symptoms before surgery had a significant outcome for improvement.

MRI with contrast enhancement show Soft tissues and paraspinous muscle enhancement this due to postoperative scar tissues It is to be considered a normal finding 6 weeks after operation, Although the enhancement diminishes by 6 months.

**Electrodiagnostic study**

We observed that most of the cases did not show any improvement in electrodiagnostic study in correlating to their symptoms (most of the patients improved of their symptoms clinically but not correlating with postoperative EMG and NCS.

## CONCLUSION:

Single or multiple level discectomy for herniated lumbar discs is an effective surgical method to decrease pain and improve quality of life of the patients suffering from pain non responding to conservative management or presenting with sensory or motor deficit.

Patient in the study had excellent response to pain postoperatively. Satisfactory improvement in motor and autonomic deficit.

Preoperative and Postoperative electro diagnostic studies did not show significant difference and thus we have concluded that electro diagnostic studies doesn't prove reasonable adjuncts for postoperative follow-up.

**Recommendation**

1. Extend the study (for multiple spinal stenosis).
2. Urodynamic study before spinal decompression is recommended.
3.Good patient follow up to be documented.

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