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Research Article

**SURGICAL OUTCOME OF FOOT DROP IN LUMBER  
DEGENERATIVE DISEASE****Dr. Sher Hassan, Dr. Jahanzeb Kakar, Dr. Abdul Samad Panezai,  
Dr. Hina Khuda-i-dad Khan, Dr. Hayat Muhammad Kakar, Hazrat Ali,  
Mir Zaman Kasi, Dr. Farrukh Zulfiqar****Article Received:** January 2020 **Accepted:** February 2020 **Published:** March 2020**Abstract:*****Objective:** Surgical outcome of foot drop in lumber degenerative disease****Design:** Retrospective Cohort Study****Place and Duration Of Study:** This study was conducted in the Department of Neurosurgery, BMC/SPH Quetta from January 2016 to December 2017****Patients and Methods:** A total of 75 patients were enrolled in our study whose records fitted. The patient who suffered foot drop in lumber degenerative included in the study with a history.****Results:** A total of 100 cases were collected from 2 Hospitals in Quetta, out of this 75 people agreed to be a part of the research and compiled with inclusion criteria from past 10 years record. From 75, 42 were males and 33 were females. The median age set was 48 years with the range from 20 to 74 years. 64 patients had surgery for prolapsed intervertebral disc and 9 patients had surgery for lateral recess stenosis. The surgical procedure was commenced at L4-5 level in 59 (82%) and 14 patients were operated at L5 – S1 level.****Conclusion:** It was observed that adjusting the preoperative muscle strength and duration of the weakness is proportional to the recovery extent. Our study focuses on two main prognostic factors, preoperative strength, and duration of the weakness; however, the age was also discussed indirectly as per the observation by the authors. Although there is some limitation associated with the research conducted that includes the small sample size; this could lead to over or underestimation of the results as per the variables selected for evaluation.****Key words:** post-traumatic, cerebrospinal fluid, retrospective.***Corresponding author:****Dr. Sher Hassan,**

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**INTRODUCTION:**

Foot drop is a neurodegenerative disease resulting from the compression of the nerve or the inflammatory disorder due to stenosis. The deficiency of the fibular nerve causes the weakness of the anterior tibialis muscle; hence, causing the abnormality in the gait due to the drop of the toe(1). The damage associated can be either permanent or temporary depending upon the extent of the nerve damage(2). The damage can be associated with toxin compounds or through localised approach in damaging the nerve either on the central nerve or on the peripheral nerve(3). Anterior tibialis plays a major role in the dorsiflexion of the foot supported by a triad of muscles the fibularis tertius, extensor digitorum longus and the extensor hallucis longus(4).

A common incidence of the Foot drop is seen secondarily associated with the deficiency of the lumbar root nerve deficiency(5). Any damage to the main trunk leads to an extended effect on the branching nerves which supplies the end point of the leg. The branch that gets affected in this process is a sciatic nerve that numbs the deep fibular branch supplying the toes of the feet(6).

The lumbar degenerative include lumbar disc herniation (LDH) and lumbar spinal stenosis . as per the research trial, the LSS is the main source of the lower back pain and leg pain(2, 6). However, it was observed that LDD was mainly associated with the elderly aged group. These patient show severe intermittent symptoms like claudication and sensation defect of the lower limb. This diseases rarely shows any indication of the foot drop phenomena.

To identify the defect different imaging tools can be utilised such as CT scan, Xray, ultrasound, and MRI. Each imaging tool is specialised in identifying a different kind of structure, which helps in the diagnosis of the cause of the foot drop. Xrays and CT scan help to visualise the bony lesion while the ultra sound and the MRI aid in the diagnosis of the tumour, cyst and any swelling causing compression on the nerve. To assess the nerve damage and localise it, the best way is to use electromyography to determine the activity of the muscle although these electrical activities are uncomfortable for the patient(6).

There are several techniques which help in the correction of the foot drop that begin with conservative technique to surgical procedure. The surgeons often began with orthotics such as braces and splint along with electrical stimulation to the peroneal muscle(2, 3). Along with other therapies, physical therapy is accompanied to support the recovery of the patient from the foot drop. However, if the treatment fails or not applicable

then surgical option are opted by the surgeons to cure the disease.

However, in case of the lumbar degenerative disease, treatment begins with a conservative approach that is waiting for a spontaneous resolution of the pain as per the surgeons without any investigation within 1 -2 months(7). A patient who suffers a constant relapse of the symptoms is then investigated for further diagnosis of the root cause. During the conservative management, the patient is advised complete bed rest and physiotherapy; avoiding any stressful activities.

As per the literature, only about 2 % of patients undergo a surgical procedure that includes the acute cauda equina compression or significant acute motor deficit (e.g. foot drop)(2). The best surgical treatment option for the lumbar degenerative disease involves the disc prolapse that is microdiscectomy(2). In this procedure, the prolapsed disc is identified and undergoes subsequent discectomy. Moreover, on the other hand, the hypertrophic tissue, tumor, and swelling that cause the compression of the nerve are removed through the surgical decompression; hence, maintaining the stability of the disc. Furthermore, another procedure addressing the other causes such as laminectomy (removing the spinous process and bilateral lamina) and removal of the underlying ligamentum flavum, exposes and decompresses the cauda equina in the central thecal sac is performed accordingly(7, 8).

After the surgical procedures are performed, the patients are discharged after 24 to 48 hours and are advised to return back to their normal routine gradually. Prolonged stressful activities and movements are avoided. Patients are made aware of their condition and the progress of their recovery depending upon the care and indoor physical therapy.

80% of the patient reported as per the literature recovery within a year; however, few reported symptoms after 4 to 10 years period either through operation or conservatively treated(2, 4). Both the treatments, decompression or the discectomy have shown equally successful results. The risk of recurrence relate to the microdiscectomy is 5 to 12 %(8).

It sometimes leads to post operative complication such as CSF spinal leak; however, this manageable with complete horizontal immobility for 3 days whilst under reduced hydrostatic pressure, the durotomy alleviates the pressure and heals the leakage(8). Furthermore, during the surgery, there is always a risk of nerve damage associated or secondarily due to hematoma(2).

Another complication, which can rarely occur after the microdiscectomy is destabilisation while the rest procedure depends upon the stability of the facet joints. Nevertheless, laminectomy showed better results in the recovery of the patient in 87% of cases(5).

This paper is the discussion of the trial conducted to overview the effects of the surgical outcome of the foot drop due to lumbar degenerative disease. The research was conducted in a Quetta hospital over 75 people. This was a retrospective study conducted to assess the extent of the muscular recovery of the patient and factors that affect the surgical outcome on the foot drop associated with LDD.

### **METHODS:**

This is a retrospective cohort study conducted in Sandeman Provincial and Bolan Medical Complex Hospital Quetta on 75 patients who visited the outpatient department. These patients were tracked down from the medical record of the hospital and contacted accordingly. All the patients were interviewed individually and all their medical reports were collected and analysed using different tools. Those patients who underwent the surgery for the foot drop were evaluated and interviewed regarding their disease and experience. Before including these patients in the research they were given an informed consent so that they were included as per their will. 100 patients were tracked down, out of which 10 people were unreachable, 8 people refused to participate due to some reasons and 7 people were excluded because they didn't fulfil the criteria. At the hospital, each patient's case study file, radiological findings, lab reports, and operative findings were reviewed of all those patients who agreed to participate. Demographic details, pathological findings, neural involvement level, presence of apparent symptoms, involvement of gastrointestinal system, herniated disc size detected in MRI and muscle weakness recover, preoperative duration of foot drop or tibialis anterior weakness reported by the patient, preoperative tibialis anterior strength defined as per the Medical Research Council (MRC) Scale and last follow-ups. Before recruiting the patients an inclusion criterion was set and only those patients who fulfill the requirement of foot drop defined as weakness of tibialis anterior of MRC grade 3 or less were included. Any discrepancy noted in the recording the strength of the muscle was documented by the authors.

Those cases which had foot drop due to other reasons than a lumbar degenerative disease as well as those who had to follow up less than 2 months.

The extent of the muscle recovered was evaluated by understanding the difference between

preoperative muscle weakness and muscular strength with the last follow up. The results were analysed as complete recovery, some improvement, no change, and deterioration. The preoperative duration of symptoms was divided into < 4 weeks, 4 to 6 weeks and >6 weeks as these time category were reported by the surgeons to influence the outcome in previous studies. Statistical analysis was conducted using the SPSS 21.

### **RESULTS:**

A total of 100 cases were collected from 2 Hospitals in Quetta, out of this 75 people agreed to be a part of the research and compiled with inclusion criteria from past 10 years record. From 75, 42 were males and 33 were females. The median age set was 48 years with the range from 20 to 74 years. 64 patients had surgery for prolapsed intervertebral disc and 9 patients had surgery for lateral recess stenosis. The surgical procedure was commenced at L4-5 level in 59 (82%) and 14 patients were operated at L5 – S1 level. It was observed that none of the patient recruited did not have the two-level disease at one time. Eighty percent of the patients were with a moderate size prolapsed intervertebral disc with 25 – 50% of canal diameter. Around average of 70% of the patient had the duration of the symptoms for less than 4 weeks, from which 25 had acute symptoms. All patients presented with radicular symptoms. It was noted that the left side was involved in 39 patients, the right side in 31, and 3 patient had bilateral sciatica. 11 patients displayed with the symptoms of cauda equina compression at follow-ups. The choice to operate depends upon the neurological deficit with radicular pain in all patients after an informed consent between the patient and physician was made regarding alternative treatment. The presentation of the preoperative severity and foot drop duration in Microdiscectomy with or without laminectomy was undertaken, displaying the achievement in decompressing the nerve in all cases as per the treatment plan.

Furthermore, it was observed that post operatively 45 (61%) of the patient had recovered completely, 20 (27%) patients showed improvement in the activity, 10 (12%) patients showed no change in their condition. However, no patient indicated any further weakening of the muscle activity after the surgery. There was some deviation in age range. Only a few people were found to be above age 60 years and lumbar stenosis; hence, pathology and age became a limiting factor in the assessment. However, it as observed and comparison was made with other studies that indicated patients with lumbar stenosis displayed successful outcome after the surgery and patients were funds to be fully recovered.

**The improvement status of muscle strength of tibialis anterior at different period of follow-up.**

Time / Number	Muscle strength of tibialis anterior					
	0	1	2	3	4	5
Preoperation	18	34	59	24	0	0
2-week follow-up	12	23	60	37	3	0
3-month follow-up	0	28	24	71	10	2
6-month follow-up	0	28	24	62	15	6
1-year follow-up	0	28	24	62	13	8
2-year follow-up	0	28	24	62	13	8

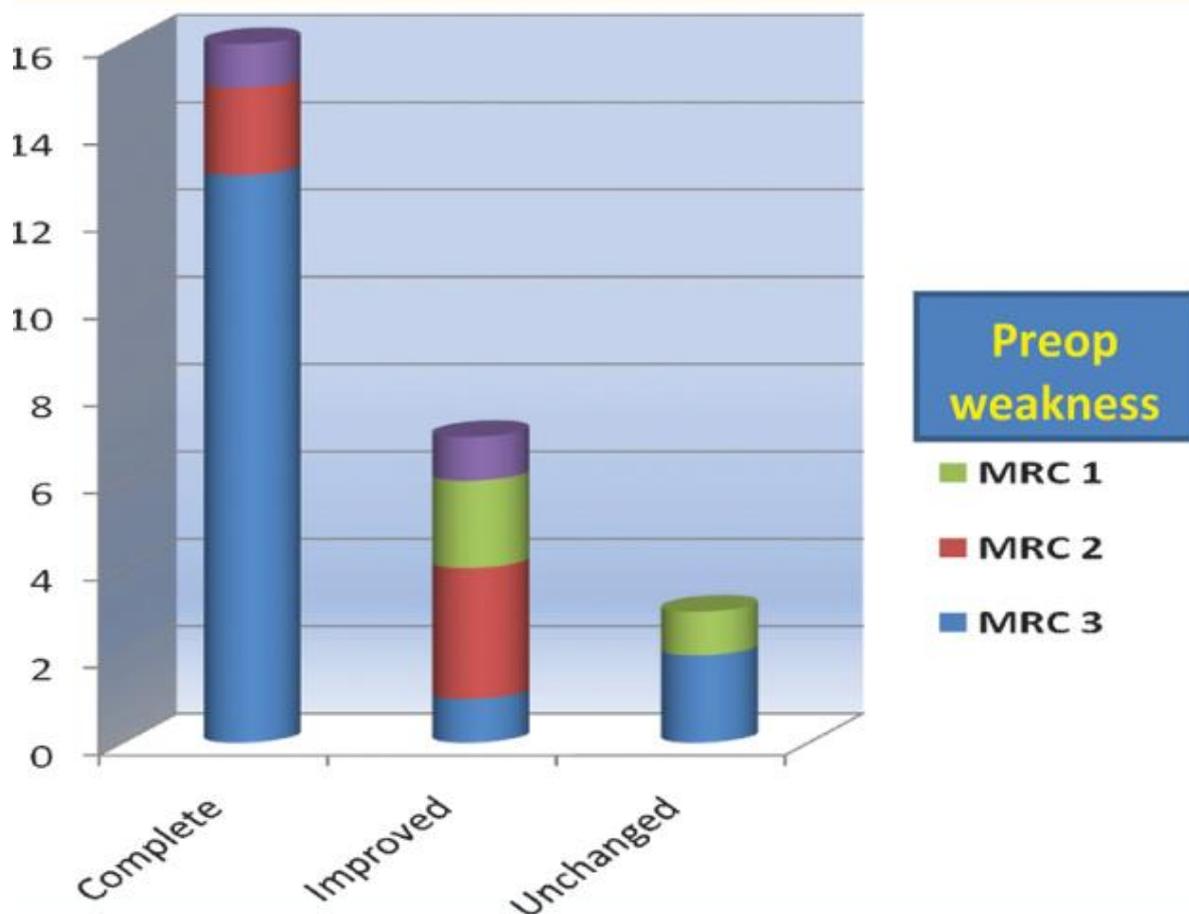


Figure 1 post-operative recovery

Analysing the data collected, the patients included in the study showed less 4 weeks of suffering from the weakness of tibialis anterior before the surgical procedure. As per the record collected the patient who had prolonged symptomatic period suffered complications after the surgery compared to patients who approached for early treatment. According to the study, the mean time period for recovery was 1.3 weeks while the minimum time for slight improvement was 5 – 6 weeks. With time, patient displaying quick recovery demonstrated better muscle strength; hence, shorter the duration of the symptoms better recovery.

Adjusting the factors, the p-value < 0.05 was observed that indicates its significance.

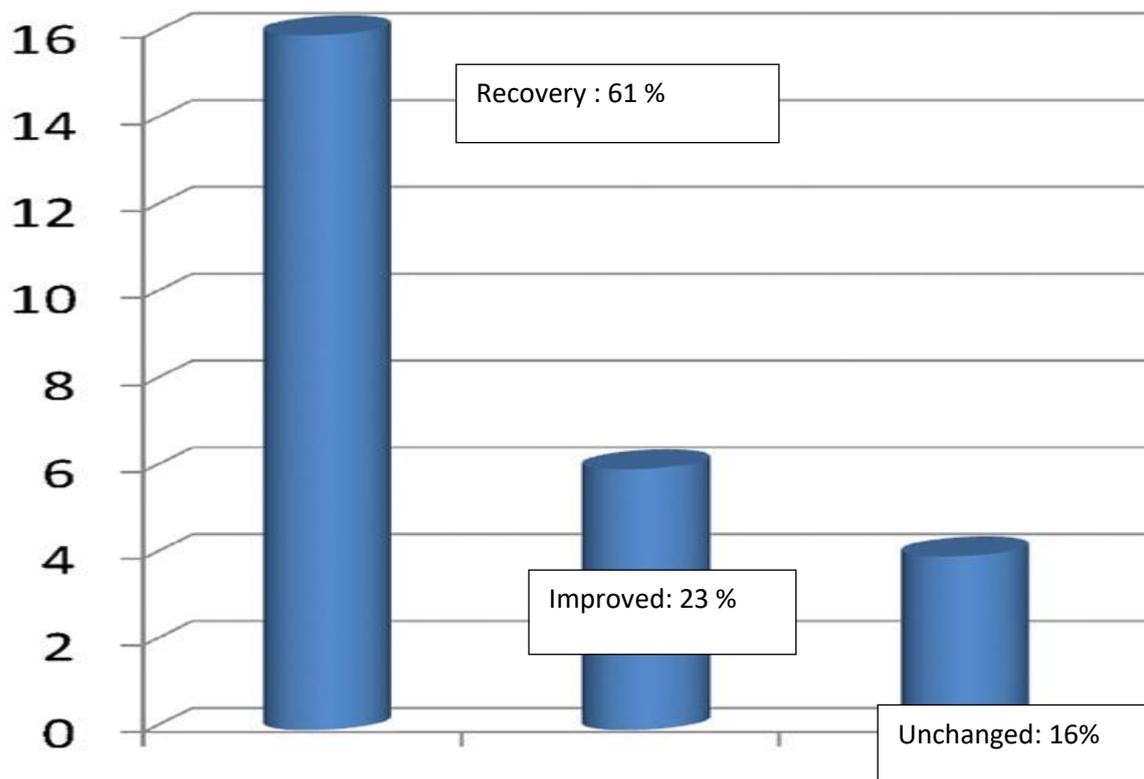


Figure 2 recovery rate of the foot drop

#### DISCUSSION:

The authors have commenced trials and discussed foot drop in association with the lumbar degenerative disease. However, these are replicated in each area to verify the authenticity and variation in different places. As per the trials, the results varied at different places and centers. As per our research, the recovery rate was found to be around more than 80% for those patients who focused on their treatment plan. Some of the patients were found to be neglecting the treatment planning and suffered a great loss in their recovery while in other cases, the cause was different. Other studies have reported similar results displaying the success rate of 61 to 84 % (1, 5). One of the main factor to promote the effectiveness of the treatment was evaluated.

Second aim was to identify the prognostic factors. However, the authors failed to identify any prognostic factors that were significant; nevertheless, one such author found an association between the preoperative weakness and duration of the foot drop relatable. At another place, a similar research article focused on the fact that there was a connection between age less than 65, diagnosis of monoradicular involvement, and duration < 6 weeks to be associated with better recovery; however, no association with muscular weakness identified. Moreover, another surgeon pointed out an association diagnosis and strength to be associated with recovery but not duration (8).

It is suggestive that any change in the surgical outcome between the patients also depends upon the pathogenesis of the disease. The decompressive study is often successful in treating foot drop in case of acute compression rather than inflamed nerve. According to the authors, the reversal foot drop occurs once the lesion is removed on time and the nerve completely recovers (2, 8). In this case, the duration of the presences of the lesion plays an important role and how quick the treatment is provided.

According to the authors, the patient factor is the utmost important factor hindering in the recovery and the treatment; however, these factors are similar in all the related researches (4). For the study, the variables, which were assessed include muscle paralysis, muscular strength, weakness grading, time interval chosen, age, gender, population, and pathology.

The grading system used muscular strength assessment was the MRC international grading system and the grade designated for muscle weakness was less 3 MRC grade. The time interval chosen were divided into three categories less than 4, 4 to 6 and more than 6 weeks. This time intervals have shown a significant interaction as a prognostic factor. As per the clinical trial, the recovery is seen maximum up to 6 month's time period during which follows ups are at least required. In the last followups, the data is compared with the initial

MRC grade to seem an apparent change in the condition. As per decided the age group cutoff is 60 year as only a few people are in this group. These factors were hindering with the data analyses; hence, they were adjusted and only to factors were focused during the data analysis: preoperative strength and duration of weakness. These two keen issues were calculated with the help of SPSS 21 and the effectiveness of the treatment was assessed through these two variables.

The time period for the muscular weakness was observed as the main predictor for the recovery in our research. From the other research, only one author was found to deny the importance of duration of weakness this was because the treatment in their study was rapid and mostly people resided in a particular time period. Hence, it could have cause discrepancy in the results.

Nevertheless, it is always recommended to assess the muscular strength before proceeding with the surgical procedure, as it has a major impact duration of the weakness. Therefore, its adjustment is required in the result for unbiasedness. However, some author does not support this because according to them, they assess the effectiveness of the treatment through the stages of recovery after the treatment, independent of the status of muscle strength preoperatively(2, 7).

Analysing the strength of the research, it was observed that the clinical, imaging data and the medical records were the highlights of the clinical research that clearly pointed out clinical symptoms

of the foot drop caused by the lumbar degenerative disease. In comparison to the literature, our research had covered almost all known factors; however, the unknown if present were not adjusted. The factors included were independently analysed to assess the association with the effectiveness of the surgical outcome.

Closely observing the causative factor related to the lumbar degenerative disease associated with drop foot, it was revealed that the L5 nerve root is the mostly affected nerve root. The result reflects that in 84 % of patients after the surgery the muscular strength was regained; however, it reached to grade strength more than 4 weeks in only a few patients (14 %). It was observed that when the preoperative duration of the drop foot remains short and younger the age of the patient the faster the recovery was observed as per the data collected. The author also suggested that the patient with better preoperative strength displayed quick to recover; however, there is controversy in literature by some authors who do not focus on the preoperative strength and believe that the effectiveness depends on the effective recovery. Similarly, as per the literature, observing the recovery in terms of age; it was seen that the young people have more tendency to heal and repair; hence, the younger people recover more quickly and better(2, 5). Moreover, the lumbar degenerative disease occurrence is often unilateral with L5 involvement. Double or triple root compression is the main condition observed in many patients in other studies.

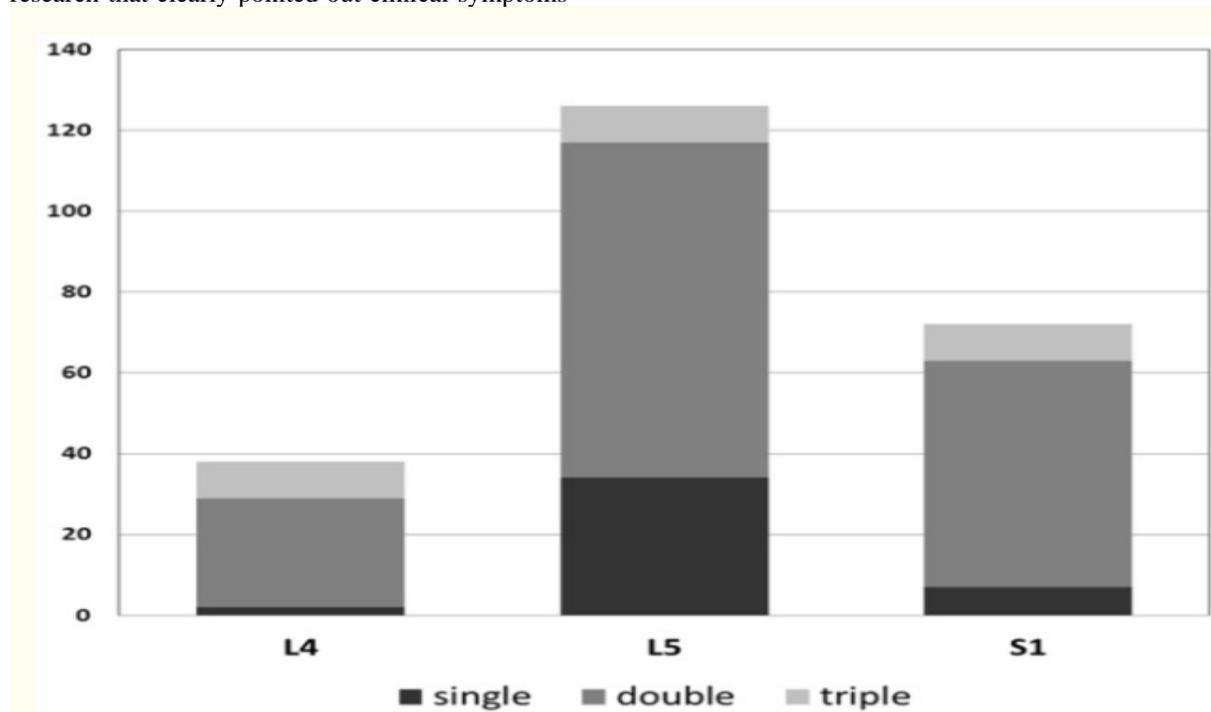


Figure 3 Rate of occurrence of nerve involvement

Although many studies describe the mechanism of the drop foot caused by the lumbar degenerative disease. However, data is still limited to this topic.

As per the observation, it was reported that the tibialis anterior is innervated by the L4 nerve root. However, one of the authors reported that the lesion is found between the L4 – 5 segments and suggested that the L5 is the main innervation for TA whose impairment causes the foot drop condition(1, 4). Other authors pointed out that L5 innervated TA and extensor hallucis longus but adjacent roots (L4 and S1) also innervated those muscles, based on the results of electrical stimulation studies(2, 3). However, at another place, the author claimed that double nerve root L5 impairment is the main cause for drop foot in lumbar disc herniation(8). However, in this research L5 and S1 compression was seen as the main cause for nerve impairment; (42%) patient was diagnosed for this reason. Nevertheless, L5 was the common nerve affected in the disease (94%). In only a few cases the L4 or S1 was affected; therefore, the authors stated that L5 is the main innervation for tibialis anterior while some branches of L4 and S1 also innervated the TA muscle. However, it was determined according to the literature, the peroneal nerve is the main nerve that carries the L4 – S1 branches(4).

Several studies in different locations were conducted and it was observed that surgical procedure was effective in treating the foot drop in lumbar degenerative disease; however, in previous time the complete recovery of the nerve through traditional method was not possible. In another study it was seen that 61% of the patients recovered from drop foot after the surgery that is muscular strength grading more than 4, from which 30 % completely recovered with grading equal to 5 and 28% did not show any improvement.

In another study, the authors displayed a similar result, in which 75 % of the patient showed improvement after the operation while 25% suffered lumbar stenosis. In this study, the patient reported satisfaction with the decompression treatment.

However, due to some limitations of the study at few points, the study differs from other studies due to the difference in the prognostic factors such as in the patient selection with various aetiology and study sample size. Hence, larger sample size is a more reliable way to assess effectiveness. For statistical analysis, two factors were mainly focused on muscular strength preoperatively and duration of the drop foot.

Another point noted in our study was that if the muscle becomes paralytic or damaged for a longer period, it causes difficulty in the recovery.

Therefore, preoperative muscle strength and duration of paralysis are two important prognostic factors to be diagnosed before the procedure. However, it was clinically difficult to collect data retrospectively and assess a small size.

### CONCLUSION:

As per the researches, our data collected revealed better recovery result after the surgical intervention of the foot drop secondary to lumbar disease. It was observed that adjusting the preoperative muscle strength and duration of the weakness is proportional to the recovery extent. Our study focuses on two main prognostic factors, preoperative strength, and duration of the weakness; however, the age was also discussed indirectly as per the observation by the authors. Although there is some limitation associated with the research conducted that includes the small sample size; this could lead to over or underestimation of the results as per the variables selected for evaluation.

The recording of the results of unoperated cases would lower any bias in the documentation; as per our current documentation, it is only extended to operated cases mostly.

With given limitation for conducting a Random Clinical Trial, we recommend meta-analysis of existing literature to provide for more informed decision making in this regard. Inclusion of historic controls and data reflecting outcomes of unoperated patients will form a valuable part of this meta-analysis. At our center, we are currently in the process of organizing the same.

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