



**Case Report**

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## Quadriceps weakness due to disc protrusion causing nerve root compression. A case report and literature review

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### Abstract

Most common presentation of spinal disc herniation is pain. Next common presentation is pain associated with neurological symptoms [1]. It is relatively unusual to present muscular weakness purely due to disc herniation in the absence of lower back or neuropathic pain and can be a diagnostic challenge. A male patient of 45 presented to his family physician with five days history of weakness in the left quadriceps. There was no pain in the back or leg or any sensory symptoms at this stage. There was no other significant past medical history apart of history of spontaneous disc prolapse when he was 26. (radiating pain to the left leg but no neurological symptoms at that time). Clinical examination revealed motor deficit of 4/5 in the left quadriceps and diminished knee reflex. There was no sensory deficit elicited at this stage. Patient was referred to neurologist (by this time patient had developed sensory deficit at medial lower leg) who arranged nerve conduction studies which revealed L4 radiculopathy. Patient was referred to spinal surgeon who after consultation arranged MRI of the lumbosacral spine which showed disc extrusion at L3-4 level causing root compression of L4 nerve root. Since the patient was active sportsman, it was decided to do discectomy. However, after case discussion in spinal team meeting, (and patient started to feel slight improvement in sensory symptoms after couple of weeks) it was decided to manage conservatively. Patient started physiotherapy for three months and gradually noticed complete resolution of sensory loss after a month and gradual improvement in motor weakness. Patient started light sporting activities after three months of orthopaedic consultation. Patient continued to recover and had complete resolution of motor symptoms within a year. Patient had a follow up MRI after about a year which showed subtle improvement of compression at the same level. Patient was discharged from outpatient follow up. This case illustrates diagnostic dilemma when symptoms are not typical. However, it is proven the 'common things are common' again. Conservative management seems to be way forward when neurological symptoms are mild especially in the absence of neuropathic pain, However, it needs to be decided on case-by-case basis.

**Keywords:** Painless Radiculopathy, Lumbar nerve root compression, Lumbar disc herniation, conservative management.

### INTRODUCTION

It is always a diagnostic challenge when a patient's presentation is atypical such as this case. It seems unusual to suspect nerve root compression the cause of muscle weakness in the absence of lower back pain or radiculopathy symptoms. As described in the discussion section that most common presentation of lumbar nerve root compression is radiating pain or/ and pain associated with neurological symptoms but in this case, presenting symptom was sudden onset of left quadriceps weakness. A detailed literature search was done using google scholar and Pubmed search engines.

Three cases of painless nerve root compression have been reported in the literature. However, these cases first presented with nerve root pain which was gradually resolved, but neurological symptoms started after the resolution of pain. It is suggested that disappearance of the pain is related to the perforation of the anulus fibrosus and posterior longitudinal ligament by the nucleus pulposus [2].

Although it is not uncommon to have disc herniation at L3-L4 level, but weakness without any pain ( lower back or radiculopathic) is uncommon [3].

No case has been reported of painless quadriceps weakness secondary to disc protrusion in literature. Therefore, this case adds diagnostic possibility of disc herniation as a cause in cases where a group of muscles weakness has been noted without pain as well as adds knowledge to the medical field. This case was a diagnostic challenge as in the absence of pain, there are other possibilities which come to the clinicians mind. That was the reason that the patient was first referred to neurologist rather than spinal surgeon.

### DESCRIPTION OF CASE

A 45 year of age active fit and well man who was involved in various sports woke up on one morning

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feeling 'stiffness' in the left anterior thigh muscle (Early Sep 2019). He had an aggressive session of badminton the day before and attributed this symptom to his sports session. He had to hold onto railing when coming downstairs in the morning because of his perceived muscle 'stiffness'. He also felt slight instability of walking but again attributed this to stiffness of thigh muscles. As the days progressed, there was no improvement in his symptoms which he thought was unusual especially in the absence of any injury. On fifth day of the symptoms, he saw his family physician. There was no significant past medical history apart from history of spontaneous disc prolapse at the age on 26. At that time, main symptom was left leg radiating pain without any neurological deficit. He had no residual symptoms after three years of conservative management. On examination, there was full range of back movements, no localised tenderness and there was no muscle wasting or fasciculations. Motor weakness of muscle power was noted in the left quadriceps which was of grade 4/5 and knee reflex on the left side was absent. There was no sensory deficit at this stage. Patient was referred to neurologist urgently.

Patient started to develop numbness in medial aspect of left leg after about a week. Patient was seen by neurologist in the secondary care after about 10 days, who found the same clinical findings except loss of touch at medial aspect of left leg. (L4 distribution). Nerve conduction studies were requested which were done after couple of days. It was reported as "electrophysiological evidence of acute left L3-4 radiculopathy". Patient was referred to spinal surgeon.

Patient was seen within a month of onset of symptoms by spinal surgeon who requested MRI of lumbosacral spine. An MRI scan (without contrast) was done (in the later half of Sep 2019) after a week of spinal consultation which showed L3-L4 disc herniation with disc protrusion compression L4 nerve root as seen in sagittal and coronal section. Please see



**Figure 1:** Sagittal section pre-physiotherapy – combination of hard and soft disc protrusion at L3/4 level



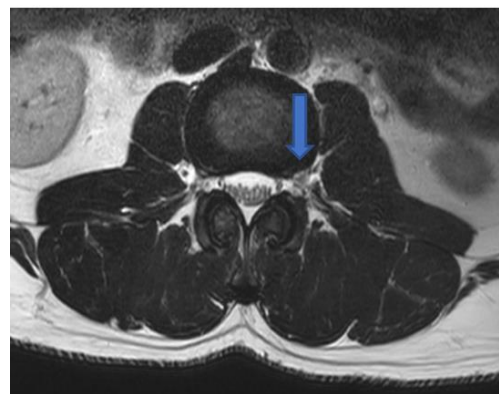
**Figure 2:** Coronal section pre-physiotherapy – Disc protrusion at L3/4 level on the left side completely obliterating the Left L3/4 Foramen

On follow up consultation, patient was re-examined, and same clinical findings were noted. Patient was keen to have surgical intervention so that he could return to his sporting activities. Patient was provisionally offered surgery. However, spinal unit discussed in their team meeting and majority opinion was in favour of conservative management and physiotherapy. After about 6 weeks of onset of first symptom, patient noticed slight improvement in his numbness in the leg. On follow up consultation, it was decided to refer the patient for physiotherapy (quadriceps strengthening exercises) along with open appointment for the clinic to report if any change in symptoms.

Leg numbness completely resolved within four months of onset of symptoms and patient started to feel improvement in his motor symptoms. After six months of onset of symptoms, he returned to sports (light) and over the time he continued to feel slow but gradual improvement. There was full resolution of his motor deficit within a year of onset of symptoms. A follow up MRI of Lumbosacral spine was done after a year. Subtle improvement was noted of root compression at the same level as seen in follow up MRI. As seen in Figure 3: Sagittal section post-physiotherapy- The disc is regressed and absorbed by the body on page 5 and Figure 4: Coronal section post-physiotherapy- Still some part of disc is there in the foramen however significantly reduced on page 5



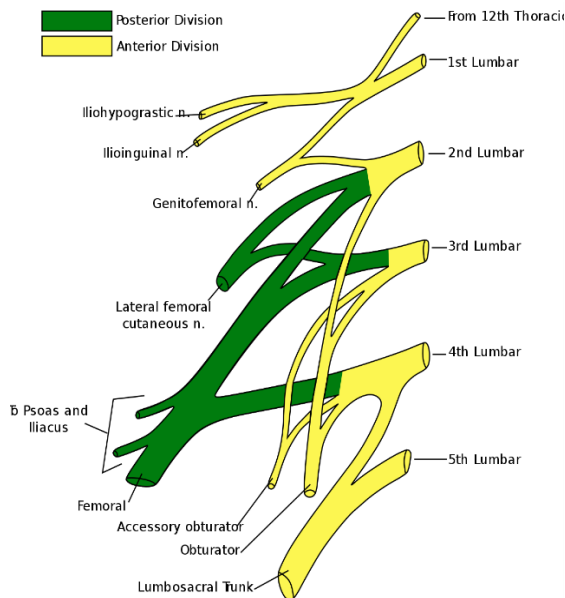
**Figure 3:** Sagittal section post-physiotherapy- The disc is regressed and absorbed by the body.



**Figure 4:** Coronal section post-physiotherapy- Still some part of disc is there in the foramen however significantly reduced.

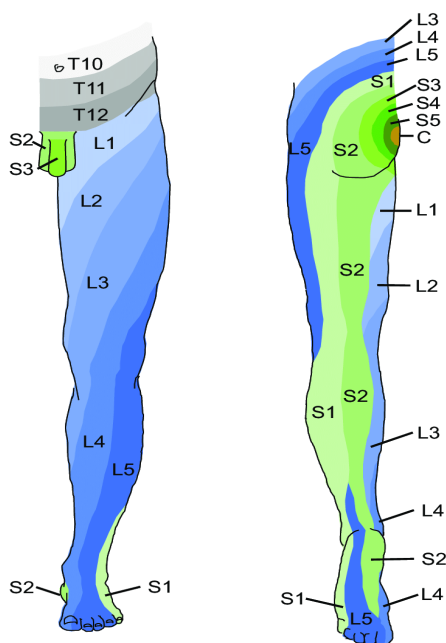
#### Discussion (detailed description of literature review)

The femoral nerve innervates the sartorius, pectineus, and quadriceps femoris, and iliopsoas muscle of the iliopsoas. It receives nerve supply by the nerve roots L2 through L4 of posterior division of lumbar plexus (Figure 5: Lumbar plexus and formation of femoral nerve containing posterior division of L4 nerve root on page 5), innervating both the hip flexor and quadriceps muscle groups. The femoral nerve is also responsible for anterior thigh and medial leg sensation.



**Figure 5:** Lumbar plexus and formation of femoral nerve containing posterior division of L4 nerve root.

Femoral nerve (L4 root) provides the sensory innervation to the medial aspect of the lower leg which was affected in the reported case (Figure 6: Lower limb dermatomes, patient had numbness in L4 area on page 6).



**Figure 6:** Lower limb dermatomes, patient had numbness in L4 area.

There are multiple causes of muscle weakness in general including quadriceps weakness such as neuromuscular disorders ( muscular dystrophies, multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS) motor neuron disease (MND)), autoimmune diseases, such as Graves' disease, myasthenia gravis, and Guillain-Barré syndrome, Neuropathies such as nerve injury etc. Quadriceps muscles extend the knees and are important for walking and balance. Knee buckling is the most common presentation of quadriceps weakness. Knee buckling is common in the elderly as it can also be caused by knee arthritis. Patients with quadriceps weakness often modify their lifestyle for years before they seek medical advice. Quadriceps muscles are very sensitive to immobility and they may lose 50% of their bulk within 2 weeks of immobility. On the other hand, they build mass quickly by exercises. Sometimes, quadriceps muscles are selectively and severely involved,

leading to an early disability. Severe thigh pain, if continued for a few weeks, may lead to disuse atrophy [4].

Lumbar disc herniation is the most common diagnosis among the degenerative abnormalities of the lumbar spine (affecting 2 to 3% of the population), and is the principal cause of spinal surgery among the adult population. The typical clinical picture includes initial lumbalgia, followed by progressive sciatica. The natural history of disc herniation is one of rapid resolution of the symptoms (four to six weeks). The initial treatment should be conservative, managed through medication and physiotherapy, sometimes associated with percutaneous nerve root block [5]. Surgical treatment is indicated if pain control is unsuccessful, if there is a motor deficit greater than grade 3, if there is radicular pain associated with foraminal stenosis, or if cauda equina syndrome is present. The latter represents a medical emergency. A refined surgical technique, with removal of the extruded fragment and preservation of the ligamentum flavum, resolves the sciatic symptoms and reduces the risk of recurrence over the long term [5]. The most common sites of nerve root compression are at levels of L4–5 and L5–S1 [6].

Lumbar radiculopathy is one of the most common complaints evaluated by a spine surgeon. Its prevalence has been estimated to be 3%-5% of the population, affecting both men and women. Age is a primary risk factor, as it occurs secondary to the degenerative process within the spinal column. Symptoms typically begin in midlife, with men often affected in the 40s while women are affected in the 50s and 60s [7]. Females have a higher risk in certain populations, with physically demanding careers such as service in the military. In the general population, there is a male preponderance. Degenerative spondyloarthropathies are the primary cause of lumbar radiculopathy. Patients commonly present with back pain that is associated with their radiculopathy. Radiculopathy is pain that radiates down the legs and is often described by patients as electric, burning, or sharp [7].

Lumbar disc degeneration is defined as the wear and tear of lumbar intervertebral disc, and it is mainly occurring at L3-L4 and L4-S1 vertebrae. Lumbar disc degeneration may lead to disc bulging, osteophytes, loss of disc space, and compression and irritation of the adjacent nerve root [8].

Management of quadriceps weakness depends upon the cause. There are various options such as conservative, physiotherapy and surgery for radiculopathy because of nerve root compression. Various success rates have been reported in literature [9, 10]. In relation to this case, it seems that physiotherapy with close observation might be reasonable and safe option.

In this case, L4 nerve root compression was associated with left quadriceps weakness (motor power loss of 4/5, Fig 5) and numbness in medial aspect of left leg which correspond to L4 sensory distribution [Fig 6]. There has been reports of other painless motor neuropathies such as painless foot drop secondary to lumbar disc prolapse at L5-S1 [11], level but quadriceps weakness is not common due to same cause. Absence of any type of pain was interesting fact about this case.

## SUMMARY AND CONCLUSION

Although commonly seen levels of disc herniation are L5-S1 and L4-L5 but can occur at other levels as it happened in this case. Most common symptoms of disc herniation are nerve root pain or and pain associated with neurological symptoms but as reported in this case, rarely it can present as pure neurological deficit. This could cause diagnostic uncertainty for clinicians as well anxiety to the patient. One possible explanation for absence of pain could have been related to history of spontaneous disc prolapse when he was 26. Management of an individual case will depend upon the cause. Therefore, it is important to keep common causes in mind and start the work up in systematic fashion. Although in this case, conservative management along with

physiotherapy was successful in resolution in symptoms but close watch is needed to consider surgical intervention if there is any deterioration or change in symptoms.

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