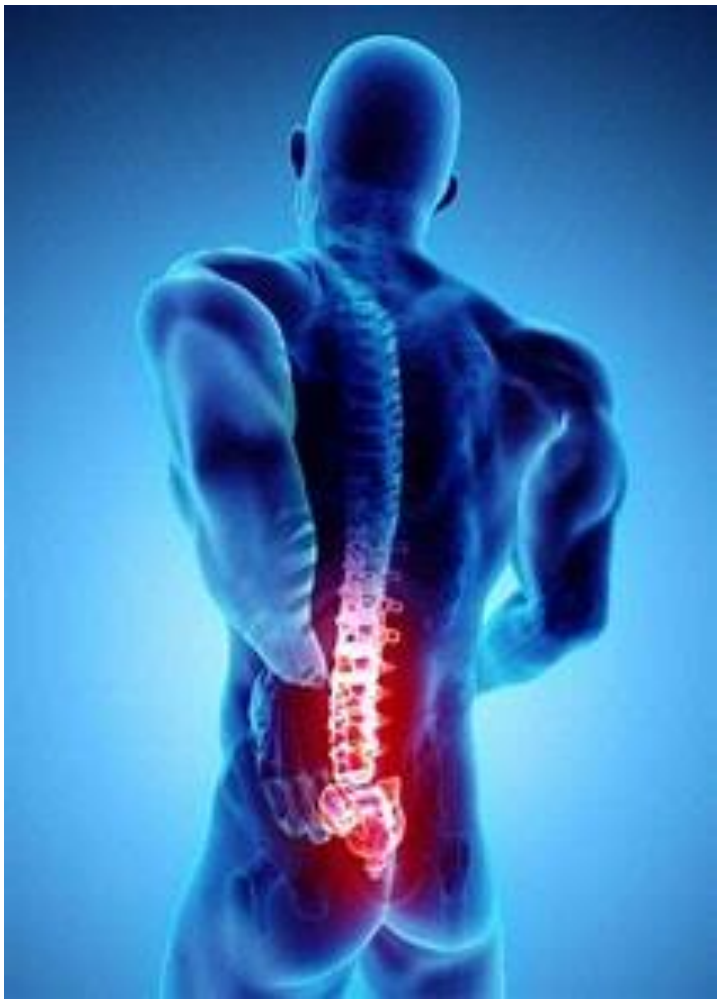
Lumbosacral Radiculopathy and Osteopathy



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Abstract

Lumbosacral radiculopathy is a condition, a disease process that causes functional impairment by compression (pinching), or irritation of one or more lumbosacral nerve roots at the L1- S4 levels which exit the spine. The compression can result in tingling, radiating pain, numbness, parenthesis, and occasional shooting pain in the lower back, hip, and down the leg. It is one of the most common musculoskeletal complaints encountered in clinical practice accounting for up to 3-5% percent.[1][2] This condition can be caused by a variety of factors, including herniated discs, spinal stenosis, and degenerative disc disease. While there are several treatment options available, osteopathy has gained popularity in recent years due to its non-invasive nature and potential to address underlying structural imbalances.

Osteopathy is a form of manual therapy that may be beneficial in treating lumbosacral radiculopathy by addressing structural imbalances and dysfunctions. This paper aims to provide an overview of lumbosacral radiculopathy and explore the role of osteopathy in its treatment

Keywords: lumbosacral. Lumbar, Sacrum, pain, vertebra, radiculopathy, osteopathy, nerve root, hip, low back.

Introduction

Lumbosacral radiculopathy is a condition, a disease process that causes functional impairment by compression (pinching), or irritation of one or more lumbosacral nerve roots at the L1- S4 levels which exit the spine. The compression can result in tingling, radiating pain, numbness, parenthesis, and occasional shooting pain in the lower back, hip, and down the leg. It is one of the most common musculoskeletal complaints encountered in clinical practice affecting 3%-5% of the population, both men and women.[1][2][43] This condition can be caused by a variety of factors, including herniated discs, spinal stenosis, and degenerative disc disease. While there are several treatment options available, osteopathy has gained popularity in recent years due to its non-invasive nature and potential to address underlying structural imbalances.

This paper will provide an overview of lumbosacral radiculopathy and explore the role of osteopathy in its treatment. Each divided section will focus on a different aspect of lumbosacral radiculopathy and osteopathy.

The first section will provide an in-depth overview of lumbosacral radiculopathy, including its causes, symptoms, and diagnosis. The second section will explore the various treatment options available, including medication, physical therapy, and surgery. The third section will introduce osteopathy as a potential treatment option for lumbosacral radiculopathy, discussing its underlying principles and how it may benefit patients with this condition. The fourth section will provide a review of the existing literature on osteopathy and lumbosacral radiculopathy, summarizing the current evidence and highlighting any gaps in knowledge. Finally, the fifth section will offer some practical recommendations for patients and health-care providers considering osteopathy for the treatment of lumbosacral radiculopathy.

Section One: An Overview of Lumbosacral Radiculopathy

Etiology and Epidemiology

Lumbosacral radiculopathy is a condition that occurs when the nerve roots in the lower back and hip become compressed, leading to pain, numbness, tingling, and muscle weakness in the legs or feet and difficulty walking or standing. Depending on the nerve root(s) affected, patients can present with these symptoms in predictable patterns affecting the corresponding dermatome or myotome.[3]
The most common cause of lumbosacral radiculopathy is a herniated disc, which occurs when the soft inner portion of a spinal disc protrudes through a tear in the outer portion and compresses a nerve root. [4]

The symptoms of lumbosacral radiculopathy can be classified into three stages:

Acute stage: This stage lasts for up to 6 weeks and is characterized by severe pain in the lower back and legs. The pain may be accompanied by muscle weakness, numbness, and tingling sensations.

Subacute stage: This stage lasts from 6 weeks to 3 months and is characterized by a reduction in pain intensity. However, the patient may still experience some pain and discomfort.

Chronic stage: This stage lasts for more than 3 months and is characterized by persistent pain and discomfort. The patient may also experience muscle weakness, numbness, and tingling sensations.

Other causes or differential diagnoses for lumbosacral radiculopathy also include bone spurs, various cancerous and noncancerous tumors, infections, and vascular conditions such as;

1. Degenerative Disk Disease (DDD)

- DDD is fairly common and is caused by the wear and tear of the spinal disc.
- It is estimated that at least 30% of people aged 30-50 years old will have some degree of disc space degeneration.[8]
- Approximately 40% of adults over age 40 have at least one degenerated vertebral disc.
- By age 80, 80% of them do. However, not all will have pain or ever receive a formal diagnosis.[8]
- This occurs due to the drying out of the discs over time making the discs lose their support and function.

- DDD can also be caused by an injury or overuse due to repetitive activities or sports. This may be due to bone spur formation

Risk factors include:

- Family history of musculoskeletal disorders
- Strain on lumbar discs due to wrong sitting posture for a prolonged period.
- Obesity
- Smoking

- **Herniated Disc** (most common cause)
- A condition that results from rupture of the disc between the bones of the spine and the
- soft inner portion of the disc (nucleus) protrudes outside through the hard outer ring (annulus).[8]
- Every year, up to **2%** of people get a herniated disk.
- This causes pain when a nerve is compressed.
- Pain in the back, arm, leg, and foot
- Recurrent back muscle spasm
- Numbness or tingling along the thigh
- Muscle weakness
- Burning in the shoulders, neck, or arm

Risk factors include:

- Overweight - excess weight puts stress on lower back disks
- Physically demanding jobs such as pushing, lifting
- Genetics - Family history may increase the risk

Degenerative Spondylolisthesis (slippery spine)
A condition that occurs as a consequence of the general aging process in which the bones, joints, and ligaments in the spine become weak and less able to hold the spinal column in alignment.[6] [7]

- A common consequence of osteoarthritis.
- This can lead to spinal stenosis
- Affects as many as 200,000 people in the United States per year.
- Approximately 5%-6% of males and 2%-3% of females have a spondylolisthesis.
- Severe progression of spondylolisthesis leads to a serious condition known as ***Cauda Equina Syndrome.***

Risk factors include:
- A family history of the condition increases the risk of acquiring it
- Sex - Males are more likely to develop symptoms due to more physical activity
- Age - elderly persons are more prone to spondylolisthesis

Spinal Stenosis (neurogenic claudication)
- A condition in which the spinal canal narrows and compresses the nerves and blood vessels at the level of the lumbar vertebrae.
- It is estimated that spinal stenosis affects between **1-2%** of adults over the age of 60. [10]
- Prevalence of the condition increases with age, and it is thought to affect up to 8% of adults over the age of 80.[10] [13]

Risk factors include:
- Obesity
- Smoking
- Genetics
- Elderly (due to the aging of the spine.)

- **Trauma**

- Lumbar radiculopathy can be caused by sudden injury, or anything that compresses or irritates the roots of your spinal nerves can cause radiculopathy. Structures surrounding the spine, such as ligaments or nerves, can also be injured.

Risk factors include:

- Falls
- Car accidents.
- Lifting heavy objects awkwardly

3 **Vertebral Spinal Tumors (Cancerous and Non-Cancerous)**

- Vertebral tumors, cancerous or non-cancerous can affect neurological function by pushing on the spinal cord or nerve roots nearby, and as these tumors grow within the bone, they may also cause pain, vertebral fractures, or spinal instability.

- Primary bone tumors are very rare and only up to 5% are located in the spine, with benign spinal tumors (80%) being more common than malignant spinal tumors (20%). These tumors are often incidental findings; however, they may present with local pain, symptoms of nerve root compression, neurological deficits, or deformity. In some cases, a biopsy is required to exclude the possibility of malignancy. If the tumor is locally aggressive, it may require surgical treatment based on its growth and aggressiveness. [22]

Cancerous Tumors

- Metastatic tumors (most common)
- Primary tumors
- Ependymoma
- Chordoma,
- Chondrosarcoma,
- Osteosarcoma
- Plasmacytoma

Non-Cancerous Tumors

- Schwannoma
- Enchondroma
- Chondroblastoma
- Osteoid osteoma
- Neurofibroma
- Lymphoma
- Lipomas
- Paraganglioma
- Ganglioneuroma
- Osteoblastoma
- Hemangiomas

4 Infection

- Infectious spondylitis is a rare but serious type of infection that is most common in older adults, people with weakened immune systems, or people who recently had surgery. Severe back pain is the most common symptom. [16]
- ***Spondylodiscitis*** infection affects the vertebrae and the disks between them.[16]
- Common in bone infections (osteomyelitis).[16]
- ***Pyogenic***: Most often involving bacterial infections that spread from another area of the body to your spine. Staphylococcus aureus (staph infections) and Escherichia coli (E. coli) are notable causes.[16]
- ***Tubercular:*** Also called Pott's disease, spinal tuberculosis is spread via the blood to
- the spine. Sometimes, you may have spinal tuberculosis for several years before getting a diagnosis.[16]
- ***Fungal***: Candida and other fungi can cause a spinal infection.[16]
- ***Parasitic***: Parasitic infections, such as toxoplasmosis, that affect the central nervous
- system may lead to a spinal infection[16]

The risk factors include:

- Advanced age
- Intravenous drug use
- Human immunodeficiency virus (HIV) infection
- Long-term systemic usage of steroids
- Diabetes mellitus
- Organ transplantation
- Malnutrition
- Cancer

5. Vascular Conditions

- In people with cardiovascular disease such as atherosclerosis (plaque build-up in the arteries), the blood supply is significantly decreased in the smaller arteries and therefore the discs are not obtaining as much nutrition and are more prone to degeneration. [18]

- ***Peripheral vascular disease (PVD)*** is a slow, progressive narrowing, blockage, or spasm in a blood vessel that can affect any blood vessel outside of the heart including arteries, veins, or lymphatic vessels. This hardening of the arteries most often affects the legs and feet, although it can affect any organ, including the brain.
- ***The most common cause is atherosclerosis***, which is the buildup of plaque inside the vessel wall that narrows the blood vessels in one or both legs. This depletes blood flow, and as a result, oxygen and nutrients can't easily reach their intended destination.

Section One: An Overview of Lumbosacral Radiculopathy

Nerve Root Involvement

The L5-S1 spinal motion segment, also called the lumbosacral joint, is the transition region between the lumbar spine and sacral spine. In this region, the curvature of the spine changes from lumbar lordosis (forward curve) to sacral kyphosis (backward curve). L5-S1 helps transfer loads from the spine into the pelvis and legs. Compression or inflammation of the L5 and/or S1 spinal nerve root may cause radiculopathy symptoms or sciatica-type pain, characterized a dull ache in the lower back, or a sharp, shooting, and/or searing feeling in the buttock, thigh, leg, foot, and/or toes, Numbness in the foot and/or toes, Weakness in the leg and/or foot muscles and an inability to lift the foot off the floor (foot drop). Discogenic pain is typically worsened by prolonged sitting, standing in one place, and repetitive lifting and bending activities.[44] It is also possible for a stabbing pain or ache to be isolated to any of these (dermatomal) areas. While these symptoms typically affect one leg, it can affect both legs[44]

To study the involvement of any nerve root involvement changes in sensory, motor, and reflex must be examined. Lumbosacral radiculopathy between L5- S1 will affect the S1 nerve root

L5 Nerve Root :
Sensory changes- L5 - Dorsum of the foot and leg (-L5 - Gluteus medius and minimus Trendelengburg gait- injury of L5 nerve root)
Motor changes- L5 - Big toe extension- Straight Leg Raise (SLR) test- can be positive when there's irritation of L5 nerve root)
Reflex changes- no reflex

S1 Nerve Root:
Sensory changes- S1- the lateral plantar aspect of the foot
Motor changes- S1- Hip extension- (Gluteus Maximus, Ankle-plantar flexion (gastro-soleus),
foot eversion (perouneus longus and brevis
Reflex changes- S1 ankle reflex

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by Jo Deluk

Section One: An Overview of Lumbosacral Radiculopathy

Diagnoses

Diagnosis of lumbosacral radiculopathy typically involves a physical examination, imaging studies such as X-rays or MRI scans, and nerve conduction tests.

Physical examination

A physical exam and physical tests may be used to check muscle strength, sensation, and reflexes. If pain is associated with certain movements, this may help identify the affected nerve root.

A straight leg raise test may be used to assess for nerve root irritation. In this test, the patient lies on their back, and the clinician raises the patient's leg while keeping the knee straight. If the patient experiences pain in the back or leg, it may indicate nerve root irritation. The clinician may also perform a ***motor examination*** to assess for muscle weakness and a ***sensory examination*** to assess for numbness or tingling. The results of these tests can help the clinician determine the location and severity of the nerve root compression.[40]

Radiographic Imaging

Imaging tests, such as rays are not the primary diagnostic tool for lumbosacral radiculopathy, but they can be used to rule out other conditions such as fractures, tumors, or infection. X-rays show the anatomy of the lower back, including the bones, joints, and cartilage; however, they cannot show other problems with your muscles, nerves, or discs. [40]

Magnetic Resonance Imaging (MRI)

MRI can detect alterations in both the anatomy (disc herniations and spinal canal stenosis) and tissue properties (disc desiccation and reactive marrow changes). It can help to determine the location and severity of the nerve root compression and identify other conditions such as tumors, infections, or fractures. The procedure is painless and non-invasive, but it can be noisy and take up to an hour to complete. During the MRI scan, the patient will lie on a table that slides into a tunnel-shaped machine. The machine uses a magnetic field and radio waves to create detailed images of the spine. [40]

Nerve Conduction Test

A nerve conduction study (NCS) diagnostic test is commonly used to evaluate the function, especially the ability of electrical conduction, of the motor and sensory nerves in patients with neuromuscular complaints of lumbosacral radiculopathy. [40]

Motor (NCS) is obtained by stimulating a nerve containing motor fibers and recording at the belly of a muscle innervated by that nerve. ***Sensory*** (NCS) is performed by electrical stimulation of a peripheral nerve while recording the transmitted potential at a different site along the same nerve.[41]

Section 2: Treatment Options for Lumbosacral Radiculopathy

There are several treatment options available for lumbosacral radiculopathy, depending on the severity and underlying cause of the condition. Non-surgical treatments may include pain medications, anti-inflammatory drugs, physical therapy, and spinal injections. Surgery may be necessary in severe cases of lumbosacral radiculopathy, such as when there is significant loss of bladder or bowel control or persistent weakness or numbness in the legs.

Non-Surgical Treatment

These treatments aim to reduce the pain and inflammation caused by the compressed or irritated nerve root and to improve the function and mobility of the affected area. However, not all patients respond to these conservative options, and some may require surgery if the symptoms are severe or persistent

- Medications, such as anti-inflammatory drugs, opioids, muscle relaxants, and corticosteroids for reducing pain and inflammation.
- Physical therapy such as electrotherapy, heat, traction, spinal manipulation, or exercises to improve posture, flexibility, and strength.
- Chiropractic treatment, such as manual adjustments or mobilization.
- Acupuncture, which may stimulate the release of endorphins and reduce inflammation
- Massage, which may relax the muscles and improve blood flow
- Weight loss strategies to reduce pressure on the affected area
- Steroid injections to relieve pain and inflammation
- Transcutaneous electrical nerve stimulation (TENS) to stimulate nerves and reduce pain
- Bracing may provide support and stability to the spine.

Surgical Treatment

The choice of the surgical procedure depends on the cause, location, and severity of the radiculopathy, as well as the patient's preference and overall health. Surgery is considered to be a last resort when nonsurgical treatments have failed or the symptoms are severe or progressive.

- ***Discectomy or microdiscectomy***: This involves removing part or all of the herniated disc that is compressing the nerve root.
- ***Laminectomy or laminotomy***: This involves removing part or all of the lamina, which is the bony arch that covers the spinal canal, to create more space for the nerve root.
- ***Foraminotomy***: This involves enlarging the foramen, which is the opening where the nerve root exits the spinal canal, to relieve the pressure on the nerve root.
- ***Fusion***: This involves joining two or more vertebrae together with bone grafts, screws, rods, or cages, to stabilize the spine and prevent further compression of the nerve root. Fusion can be done in different ways, such as posterior spinal fusion, transforaminal lumbar interbody fusion, lateral interbody fusion, or anterior interbody fusion.
- The success rate of surgery for lumbosacral radiculopathy varies, but it is generally high, ranging from 80% to 95%.[43]

Section 3: Osteopathy as a Treatment Option for Lumbosacral Radiculopathy

What is Osteopathy

Osteopathic manual therapy is a drug-free, non-invasive treatment that works off of the principles; the body is a unit, the body is self-healing and the body's structure governs its function. It aims to restore harmony in the body by restoring structural balance and body mechanics, nerve impulse, and circulation through the use of a variety of techniques to manipulate and mobilize the body's tissues such as; joints, muscles, ligaments, tendons, and fascia.

Patient History And Assessment

Patient History- this is where the patient with their consent shares their subjective information, (current symptoms or injury, medical history, any medications being taken, or other factors related to the health and well-being that may be related to the concerns.)

Sit-Down Interview -This is an objective dialogue between the patient and the practitioner. Open-ended questions are asked to the patient in order to gather a more in depth understanding of the patient complaint; and at ht e same time allows the patient to ask questions as well.

Full Assessment - includes; a postural exam, gait analysis, range of motion exam, static joint play articulation, muscle strength tests, and specific orthopedic tests to assess for restriction or dysfunction within the body. Findings are communicated to patient to make an informed decision to proceed with treatment or not.

Treatment plan – customized to address patient specific need

Estimated Time -how treatment will take and the cost to the patient.

Home Exercises – for maintenance

Osteopathic Treatment

After the completion of the examination of the lumbosacral region by the practitioner to establish the likely cause(s) of the complaint, at this point, the practitioner should have a good understanding of any previous injury, repetitive strain, surgery or illness that may have an impact on the biomechanics of the lumbosacral spine seeing that osteopathic treatment focuses o the root cause and not the symptoms only.
Treatment can include a wide range of manual therapeutic techniques, remedial exercises, and ergonomic advice. The following manual therapeutic techniques can be used to treat Lumbosacral radiculopathy but there are many other techniques that can be used as well.

- S**oft Tissue Therapy**-gentle soft tissue mobilization or manipulation can help to relax muscles and release compressed or pinched nerves, in the lumbosacral joint, whilst adjusting the position of the critical bones and joints. The aim is to reduce pain, improve joint mobility, and increase the range of motion.

- **Joint Mobilization-** joint mobilization is a manual therapy intervention, a type of straight-lined, passive movement on a joint. The practitioner stabilizes one segment of the joint while applying a gentle and controlled force to the adjoining body region. This helps to reduce pain, tension, stiffness, nerve compression, and inflammation, in a joint.

- **Muscle Energy Technique** (Stretching)-The main objective of this technique is to relax retired or shortened muscles. The patient performs a sustained muscle contraction while the therapist performs a muscle stretch.

- **Myofascial Release**-The fascia is a very fine tissue that surrounds the muscles. If this tissue limits the mobility of the surrounding muscle fibers, there is some discomfort, even pain. The main objective of this technique is to avoid adhesions on the muscle, thus improving the muscle/fascia ratio

- **Trigger Points-** In this case it is the pain points that radiate pain. The Jones technique consists of positioning an affected muscle in a comfortable position and while applying pressure to the trigger point, to reduce pain at this point.

- Overall Osteopathic techniques can increase spine range and decrease functional disability

Section 4: Review of Existing Literature on Osteopathy and Lumbosacral Radiculopathy

The existing literature on the use of osteopathy in the treatment of lumbosacral radiculopathy is limited but promising. A systematic review of the literature published in the Journal of Osteopathic Medicine found that osteopathic manipulative treatment (OMT) was associated with significant improvements in pain, disability, and quality of life in patients with acute and chronic low back pain, which often includes symptoms of lumbosacral radiculopathy. However, more high-quality studies are needed to fully understand the mechanisms underlying osteopathy's effects on lumbosacral radiculopathy and to determine its effectiveness compared to other treatments.

Section 5: Practical Recommendations for Patients and Healthcare Providers

For patients with lumbosacral radiculopathy, osteopathy may be a valuable addition to their treatment plan, particularly if they have not found relief with other treatments or wish to avoid surgery. Health-care providers may consider referring patients with lumbosacral radiculopathy to a qualified osteopath for evaluation and treatment. However, it is important to note that osteopathy should not be used as a substitute for medical care, and patients should always consult with their healthcare provider before pursuing any new treatments.

Conclusion:

Lumbosacral Radiculopathy is one of the most common musculoskeletal complaints encountered in clinical practice accounting for up to 3-5% percent.[1][2] This condition can be caused by a variety of factors, including herniated discs, spinal stenosis, and degenerative disc disease. While there are several treatment options available, osteopathy has gained popularity in recent years due to its non-invasive nature and potential to address underlying structural imbalances.

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