Prognosis of Foot drop Due to Herniated Lumbar Disc after Surgical Treatment

Essay

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وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي ومَا أُوتِيتُم مِّنَ العِلْمِ إلاَّ قَلِيلاً

صدق الله العظيم

سورة الإسراء آية (85)

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Fady Khalaf Sayed Selim

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List of Abbreviations

AF	:	Annulus fibrosus
AFO	:	Artificial foot orthosis
ALL	:	Anterior longitudinal ligament
BMI	:	Body mass index
CAMP	:	Compound muscle action potential
CES	:	Cauda equine syndrome
CSF	:	Cerebrospinal fluid
CST	:	Cortico Spinal Tract
EDx	:	Electrodiagnostic testing
FES	:	Functional Electric Stimulation
HNP	:	Herniated nucleus puplosus
LDH	:	Lumbar disc herniation
LSS	:	Lumbar spine stenosis
LSTV	:	Lumbosacral transitional vertebra
MMT	:	Manual muscle test
MUP	:	Motor unit Potential
NP	:	Nucleus pulposus
PLL	:	Posterior longitudinal ligament
SNAP	:	Sensory nerve action potential

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Introduction

Drop foot is the name given to a particular style of walking or gait (steppage gait) which is often present in individuals with a neurological deficit in the nervous system. The neurological deficit in drop foot results from poor control of ankle and toe`s dorsiflexor muscles. ***(Horsley W, 2012).***

Walking becomes a challenge as while walking, people suffering this condition drag their toes along the ground or bends their knees to lift their foot higher than usual to avoid the dragging. This serves to raise the foot high enough to prevent the toe from dragging and prevents the slapping. To accommodate the toe drop, the patient may use a characteristic tiptoe walk on the opposite leg, raising the thigh excessively, as if walking upstairs, while letting the toe drop. ***(Benzel E, 2012).***

In consequence patients tend to develop a different and less stable gait which impacts on their mobility, speed and balance. ***(Iizuka Y et al., 2009).***

Drop foot or weakness of the tibialis anterior muscle is not a disease but a symptom of an underlying medical condition. Depending on the cause, drop foot may be temporary or permanent. Often drop foot is caused by injury to the peroneal nerve deep within the lumbar and sacral spine. The peroneal nerve is a division of the sciatic nerve. The peroneal nerve runs along the lateral side of the lower limb (below the knee) and branches off into each ankle, foot and first two toes. It innervates or transmits signals to muscle groups responsible for ankle, foot, toe movement and

sensation. That's why weakness, pain and numbness may accompany loss of function.

The peroneal nerve is susceptible to different types of injury, Such as nerve compression from lumbar disc herniation (e.g. L4, L5, and S1), trauma to the sciatic nerve, spondylolisthesis, spinal canal stenosis, spinal cord injury, bone fractures (leg, vertebrae), stroke, tumor, diabetes mellitus, lacerations, gunshot wounds or crush-type injuries in the lower limbs.***(Benzel E, 2012).***

However, foot drop due to Lumbar Disc Prolapse and Lumbar Canal Stenosis is relatively rare (a finding in 1.2-4% of patients with this condition), and although several studies have addressed this condition, its mechanism and prognostic factors have not yet been adequately elucidated. ***(Iizuka Y et al., 2009).***

Radiological investigation for Lumbar Disc Prolapse and Lumbar Canal Stenosis had relayed on Magnetic resonance imaging which has proven to be an indispensable tool for the spine neurosurgeon. Its value in assessing normal and pathological lumbar anatomy, internal disc chemistry and architecture, features of lumbar spine degeneration and in diagnosing herniated lumbar discs has been well documented. ***(Weiner B & Patel R, 2008).***

Spine MR images are assessed as follows. First, the presence or absence of eccentricity of the disc contour at the extraforaminal zone was evaluated. This included protrusion, extrusion and sequestrum of the discs. Second, the presence or absence of any changes in the diameter of the affected exiting nerve root i.e. compression. ***(Moon K et al., 2009).***

Proper diagnosis and early intervention is the aim for restoring full function, the primary rationale of any form of surgery for disc prolapse is to relieve nerve root irritation or compression due to herniated disc material. To relieve muscle weakness due to nerve pressure, surgery usually involves removing part or the entire damaged disc. This is called a discectomy. At our practice, this procedure can often be done utilizing open discectomy, performed with or without the use of an operating microscope; this is the most common minimally invasive techniques**. *(Gibson J &Waddell G, 2007).***

Surgery, physiotherapy, orthotic devices (AFO), medical therapy and electrical stimulation of the affected nerve. These options can be used alone or in combination with one another in the treatment of foot drop**. *(Horsley W, 2012).***

Aim of the work

The aim of this work is:

To review the literature for anatomy, pathophysiology, pathogenesis, diagnosis, management of Herniated lumbar disc disorders and the subsequent prognosis of foot drop after surgical treatment.

Gait Cycle

Normal and Pathological Gait

The gait cycle is defined from the initial contact of the heel to the following heel contact.

Limb motion during steady-state constant speed locomotion involves inter-segment and inter-limb interactions for both normal and abnormal walking. Each limb segment and joint undergoes a cyclic pattern of flexion, extension, rotation, abduction, and adduction during a stride. An injury or pathology that affects a lower limb segment disrupts the cyclic gait pattern and can result in asymmetric deviations during gait. An abnormal gait cycle affects the normal energy conserving characteristics of walking, resulting in increased energy expenditure. **(Alexander K, 2011).**

During normal gait, the ankle joint, shank, and foot play important roles in all aspects of locomotion including: motion control, shock absorption, stability, energy conservation. At the initiation of the gait cycle, impact forces are dissipated as energy is absorbed by the soft tissues at the heel as the foot comes into contact with the ground. **(Alexander K, 2011).**

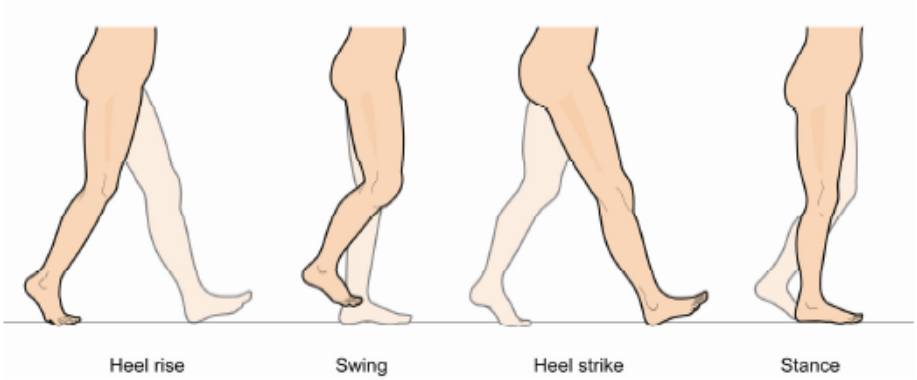

Fig. (1): Typical gait cycle showing heel rise and heel strike**. (Buyer, 2010).**

Weakness in the dorsiflexor and plantarflexor muscle groups is a key cause of impaired gait. The dorsiflexor muscle groups are situated anterior to the ankle joint and include the tibialis anterior, extensor digitorum longus, and extensor hallucius longus. Pathologies that affect the function of the ankle dorsiflexor muscles affect gait in both swing and initial stance phases. Swing is affected by insufficient toe clearance due to weak or absent dorsiflexor muscles and results in a steppage-type gait pattern that is commonly called foot drop. Steppage gait is a compensatory walking pattern characterized by increased knee and hip flexion during the swing phase to ensure that the toe clears the ground during walking. Weak or absent dorsiflexors may also prevent controlled deceleration of the foot shortly after initial contact that often presents as an audible foot slap. **(Alexander K, 2011).**

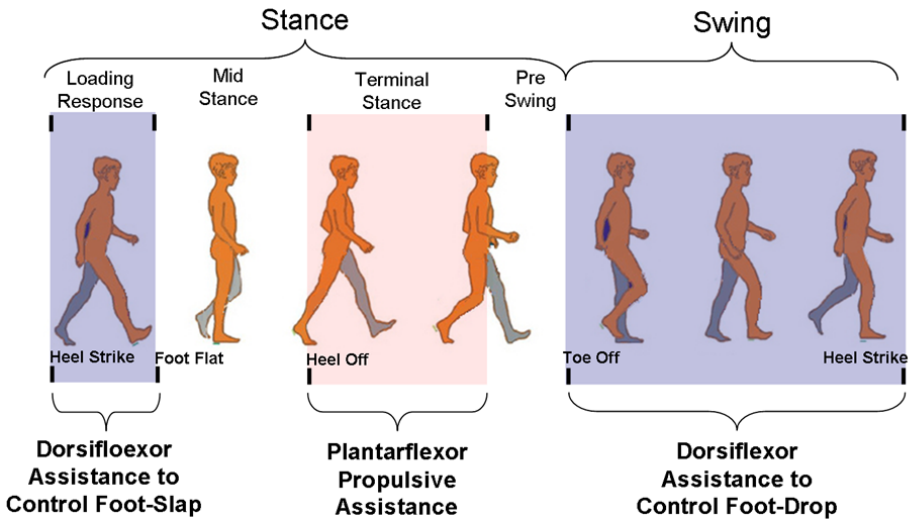

Fig. (2): A gait cycle is defined from heel strike to heel strike and further divided into multiple phases defined by functional tasks. Abnormal gait (Steppage gait). **(Alexander K, 2011).**