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***EVALUATION OF ENDOSCOPIC DECOMPRESSION IN SEGMENTAL
LUMBAR CANAL STENOSIS***

An Essay Submitted to

Department of General Surgery

In partial fulfillment of the requirements for Master degree
of General Surgery

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2008

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلْ
عَلَىٰ كُلِّ

صدق الله العظيم

سورة طه: الآية ١١٤

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Abstract

Review of literature was done evaluating the technique of endoscopic decompression in cases of segmental canal stenosis.

The procedures may be done under general anaesthesia, epidural or spinal anaesthesia. A small foraminotomy hole is made at a stenotic segment of the lumbar spine. Through this small foraminotomy hole, the stenotic spinal canal is enlarged bilaterally. The operation can be performed at single or multiple levels. Unlike conventional laminectomy surgery, the spinal integrity (including the anatomy and function) is preserved with this endoscopic surgery as it minimize bone resection. This functional lumbar stenosis surgery does not require bone fusion or metal plate implantation. It is less invasive because spinal decompression is accomplished with a small incision, minimal tissue dissection, and minimal bone removal when compared with conventional laminectomy technique. Thus, surgical recovery is fast and allows the patient to be more mobile immediately after surgery.

KEY WORDS: Lumbar canal stenosis, lumbar laminectomy, microscopic decompression, endoscopic decompression, minimally invasive techniques.

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LIST OF ABBREVIATIONS

AF : Annulus Fibrosus.
CSF : Cerebro-Spinal Fluid.
CT scan : Computerized Tomography Scan.
EMG : Electromyography.
ENG : Electroneurography.
IDP : Intra-Discal Pressure.
LBP : Low Back Pain.
LSS : Lumbo-Sacral Spine.
MEPs : Motor Evoked Potentials.
MRI : Magnetic Resonance Imaging.
NP : Nucleus Pulposus.
NSAIDs : Nonsteroidal Anti-inflammatory Drugs.
SEPs : Somatosensory Evoked Potentials.
TENS : Transcutaneous Electric Nerve Stimulation.

INTRODUCTION

Low back pain resulting from degenerative disease of the lumbosacral spine is a major cause of morbidity, disability and lost productivity. A potentially disabling cause of osteoarthritic pain of the lower back and legs is stenosis of the lumbar spinal canal. This treatable condition is often a major cause of inactivity, loss of productivity and, potentially, loss of independence in many persons, particularly older persons. **(Alvarez & Hardy, 1998)**

Lumbar vertebral canal is bounded anteriorly by the posterior edge of the vertebral body including the posterior longitudinal ligament, laterally by the facet joints and articular capsules and posteriorly by the lamina and ligamenta flava. **(Weinstein, 1992)** Lumbar spinal stenosis can be defined as 'narrowing of the lumbar canal in its central part, the lateral recess or the intervetebral foramen sufficient to impair one or more roots of the cauda, the impairment resulting in pain, unilateral or bilateral neurological deficit or neurogenic intermittent claudication'. Absolute spinal stenosis is present, by definition, if the dural sac area is less than 70-80 mm² and relative spinal stenosis at 90-100mm². The epidemiology of lumbar spinal stenosis has changed a great deal in the last few decades, it is the most frequent indication for spinal surgery in patients older than 65 years. It can be subdivided into congenital stenosis and acquired stenosis. **(Mazanec & Hsia, 2006)**

Congenital stenosis can occur with particular diseases; however, it can also occur in the general population (who do not have any particular disease conditions), some people are born with a relatively narrow spinal canal. They may remain asymptomatic until a minor degenerative process causes further narrowing of the spinal canal. **(Jho et al, 2002)**

Acquired stenosis is the most common type, which is due to degenerative changes, with degeneration of the disc, the height of the disc decreases while the width of the disc increases, accompanied by protusion of the disc and bone spur formation at the edge of the vertebrae, the facet joints, which are the two sliding articular joints at the posterior portion of the spinal motion unit, develop arthritic changes that consist of bone spur formation and overgrowth of the joint capsule. Narrowing of the spinal canal (lumbar canal stenosis) occurs with the combination of changes in the disc and facet joints. (**Jho et al, 2002**)

Morphologically the following forms of impingement of nervous structures occur either alone or in combination:

Central spinal stenosis.

Lateral recess stenosis.

Narrowing of the intervertebral foramen.

Non-osseous nerve root compression.

(Thamburaj,2004)

Most patients of degenerative lumbar canal stenosis complain of low back pain as their main symptom. The narrowing of the spinal canal can occur diffusely or focally. Focal stenosis can cause symptoms related to the nerve root that is compressed. It can cause severe sharp pain in the leg, or burning and numbing sensations in the leg. Diffuse stenosis can cause burning and numbing sensations or pain in the leg, difficulty in walking, weakness in the legs, muscle loss, and difficulty in bowel and bladder control. Patients develop those symptoms when they try to walk some distance (neurogenic claudication). When they sit down or bend forwards for a few minutes, they will note improvement of their symptoms, the symptoms improve in this position because their spinal canal opens up to some degree when the spine bends forward. (**Martin et al , 2002**)

The treatment has to be adapted to the patient, his age and aims. In the majority of patients a significant improvement or a relief of symptoms can be achieved. Radicular symptoms and neurogenic intermittent claudication are more likely to resolve with treatment than back pain, which persists in up to one third of patients. (*Thamburaj, 2004*)

Conservative treatment consists of analgesia and wearing a lumbar corset which by alleviating lumbar lordosis can lessen symptoms and increase the walking distance. A trial of three months duration is recommended as the initial form of treatment, unless motor deficit or progressive neurological deficit is present. Conservative therapy of lumbar spinal stenosis with permanent symptoms is rarely successful on a long term basis, in contrast to conservative therapy of a herniated disc. (*Thamburaj, 2004*)

Surgical treatment is indicated if conservative therapy fails, and in the presence of incapacitating permanent symptoms, especially a motor deficit. (*Thamburaj, 2004*)

The standard decompressive lumbar laminectomy involves a midline incision over the involved levels, dissection down to the spinous processes and progressive removal or "unroofing" of the posterior elements of the lumbar canal (spinous processes and laminae), as well as removal of thickened ligamenta flava. (*Alvarez & Hardy, 1998*)

In microscopic decompression, instead of removing lamina, multiple openings through the ligamentum flavum are created, through which decompression of the cauda equina & individual nerve roots can be performed. (*Alvarez & Hardy, 1998*)

Recently endoscopic decompression techniques became a new modality of surgical treatment of lumbar canal stenosis. The endoscopic decompression technique is characterized by a small skin incision, less invasion of paraspinal muscle, and a small dead space. The ipsilateral approach and contralateral endoscopic decompression can be performed under the midline posterior structures the same as microsurgical decompression. **(Dezawa, 2005)**

Endoscopic decompression for focal stenosis accomplishes release of compression by providing a wider passage route for the compressed nerve root. Endoscopic decompression of diffuse stenosis achieves widening of the narrowed spinal canal bilaterally through a small foraminotomy hole, by doing so, most bony anatomy is preserved (contrary to the conventional laminectomy technique). **(Jho et al, 2002)**.

Aim of work :

This essay aims to present a review of the literature and recent publications about the evaluation of the new modality of surgical treatment of single and double level segmental degenerative lumbar canal stenosis by endoscopic decompressive techniques according to symptoms, complications, morbidity and subsequent quality of life.

Anatomy of the Lumbar Spine

Lumbar Vertebra

In a normal individual, there are five lumbar vertebrae and five associated discs. In a small percentage of patients (13%), abnormal segmentation results in the form of either sacralization of the fifth lumbar vertebra or in lumbarization of the first sacral segment. **(Weinstein, 1992)**

Each lumbar vertebra consists of a vertebral body and a neural arch. The neural arch consists of two pedicles, the transverse processes, the superior and inferior articular facets, the laminae, and the spinous process. The lumbar vertebrae are attached to each other by the intervertebral discs, a variety of spinal ligaments, and the articular facet joints. In the upper lumbar spine, the facet joints are oriented in a vertical direction, the inferior facet faces laterally, and the superior facet faces somewhat medially. The effect of this anatomical arrangement is the limitation of axial rotation which permits flexion/extension. However, at the two lowest vertebrae, the facets are directed somewhat more horizontally, and this change permits greater axial rotation in the lower lumbar spine. Such increased mobility may explain the more common occurrence of disc herniation at L4-L5 and L5-S1 disc levels **(Weinstein, 1992)**

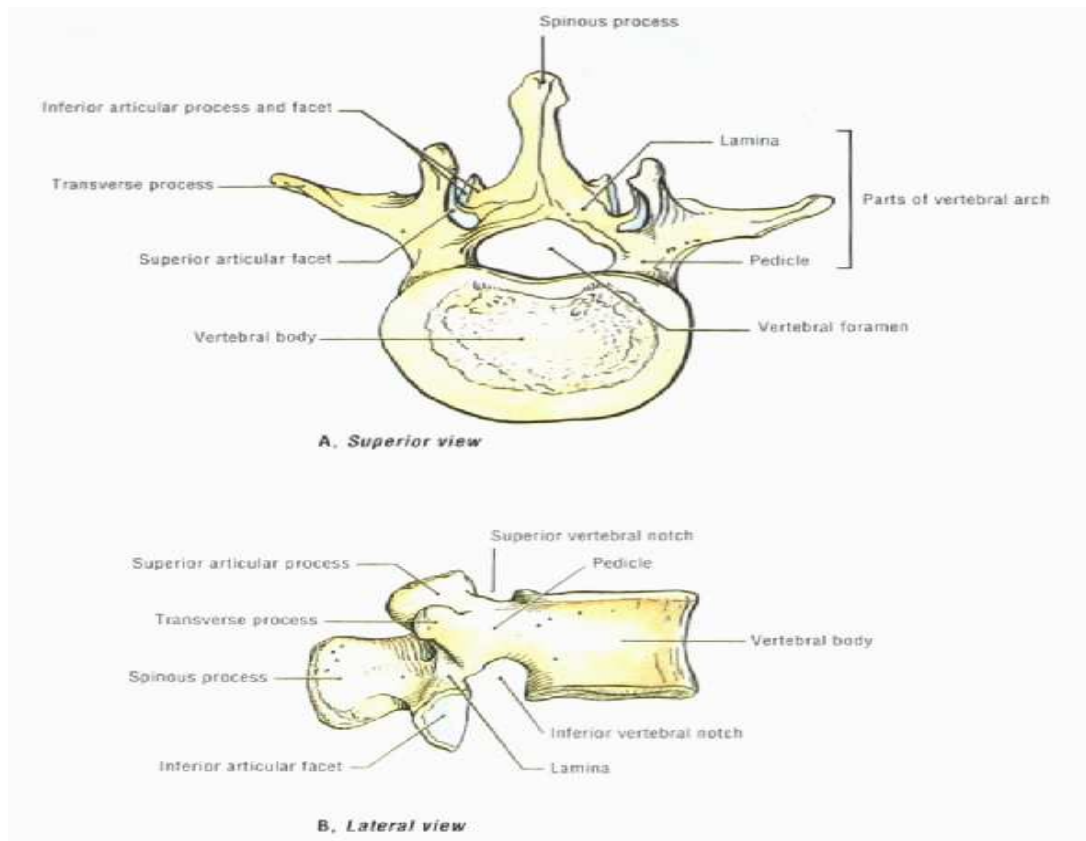


Fig.(1) Lumbar vertebra (Agur, 1996)

Ligaments of the Lumbar Region

The Anterior and Posterior Longitudinal Ligaments:

The anterior longitudinal ligament is attached closely to the anterior surface of the vertebral bodies but less tightly to the intervertebral discs. The anterior longitudinal ligament usually ends at S2 level, where it blends with the periosteum. Occasionally it proceeds further, until the S5 vertebra or the coccyx. The posterior longitudinal ligament is attached in a cruciate fashion to the lumbar discs and the adjacent margins of the vertebral bodies. It is less closely attached to the midportion of the vertebral bodies and tends to thin out laterally in its attachment to the intervertebral disc. At intervertebral level, therefore, the ligament displays a characteristic rhomboidal shape. The