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# MICRO LUMBAR DECOMPRESSION FOR LUMBAR SPINAL STENOSIS

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## 1. Introduction:

Spinal stenosis was described, for the first time, as one of the causes of neural compression by Bailey and Casamajor [1] in 1911. Later, in 1954, it was described by Verbiest [2] as the typical clinical presentation of bilateral neurogenic claudication, which is provoked by prolonged standing and lower back extension and relieved by sitting and flexing the lumbar spine. Degenerative lumbar spinal stenosis is a progressive spinal disease which is common in the elderly population and characterized by hypertrophy of the ligamentum flavum, degeneration of the intervertebral disc, and hypertrophy of the facet joint. Traditionally, the treatment of spinal stenosis has been wide laminectomy, which allows decompression of the neural structures by unroofing the spinal canal. The success rate of the procedure is between 62-70% due to postoperative iatrogenic spinal instability. Consequently, the minimally invasive approaches such as partial interspinous laminectomies, modifications of spinous process osteotomies, bilateral laminotomy, and unilateral laminotomy are described.

Young *et al.* [3] described unilateral laminotomy for bilateral micro decompression of lumbar spinal stenosis technique in 1988. Their approach was modified by McCulloch [4] in 1991 and described as microsurgical fenestration technique. The main purpose of this minimal invasive surgical technique is to maintain spinal stability by performing enough decompression of dural sack and effected nerve roots. In this surgical technique paraspinal multifidus muscles retract ipsilaterally and muscle structure of the opposite side is protected. Therefore, iatrogenic muscle trauma is kept in a minimal level. Similarly, inter-/supraspinous ligaments are protected; since unilateral micro decompression is performed in spinal canal facet joints and joint capsule of the opposite side is also protected. As a result, the risk of postoperative iatrogenic segmental instability is minimized. Other advantages of unilateral micro lumbar decompression include a reduced operative time, fewer intraoperative complications, minimal blood loss, short hospitalization and immediate recovery. In conclusion, unilateral micro lumbar decompression gives better surgical results.

## 2. Patient Selection and Indications:

Cases should be in a clinical table of degenerative lumbar stenosis. Lumbar spinal stenosis patients usually can walk less than 100m without the symptoms of neurogenic claudication and radiculopathy. Single- or multilevel central or lateral stenosis should be confirmed by CT or magnetic resonance imaging (MRI) evidence. Failure of conservative treatment for a minimum of 3 months is necessary for the admission. Such treatments include non-steroid antiinflammatory drugs, steroids, and physiotherapy. Patients should not have instability in their preoperative flexion/extension radiography.

## 3. Contraindications:

Segmental instability is a major counter indication for unilateral micro lumbar decompression.

## 4. Surgical Procedures:

### 4.a. Surgical Equipment:

Intraoperative fluoroscopy (C-handled) machine, operation microscope, high speed drill, monopolar and

bipolar coagulation, microsurgery and laminectomy set is required equipment for this surgery. Additionally, alcohol solution that is required for the sterilization before lumbar spinal surgery, Betadine, drape and sterile towels should be prepared.

### 4.b. Operating Room Set up:

C-handled and operation microscope should be placed opposite of the surgeon. A spinal surgeon would be on the clinical side of the patient in which unilateral micro lumbar decompression would be performed (right or the left side). Surgical assistant and operation technician are opposite of the surgeon. Aspirator should be under the surgeons left hand and high speed drill should be under his right hand (Figure 1a,b).

### 4.c. Patient positioning:

Prophylactic antibiotics (usually 2 gr cefamesine) are applied to patients 30 minutes before the operation. After intubating the patient, urine catheterization is performed using Foley's sounding-line. Moreover, anti-embolic stocking are worn to patient's both legs extending to inguinal area.

The patient is placed on an operation table in the prone position while under general endotracheal anesthesia. As in standard microdiscectomy position lower back flexion is ensured (Figure 2). In order to release the pressure that could occur on the chest and abdomen, patients both sides (shoulder and in between spina iliaca and anterior superior point) are supported with silicone pillows. Moreover, areas that could be under pressure in prone position (eyes, axillaries, inguinal and popliteal areas) are carefully controlled. The operational lumbar level of the patient is identified with C-handled. Operative area is cleaned with Betadine solution and just like all other operations' patient covered with a sterile sheet. At this stage patient is ready for the operation.

### 4.d. Surgical Technique:

The level of spinal stenosis, in a patient who is under general anesthesia and in prone position, is identified under lateral fluoroscopy using a spinal needle. 2-3 cm skin incision is planned approximately 1 cm lateral of the midline on symptomatic side for single level stenosis (Figure 3a). Local anesthetics with epinephrine is injected under the skin in order to help hemostasis. Skin incision is done as planned and standard intervertebral Paraspinous approach is performed with curvilinear paramedian fascia incision. After placing retractor operation is taken into the microscopy field and all the surgical procedures carried out under microsurgery. At this point, ipsilateral interlaminar space is clearly in view. Superior lamina and a part of the facet joints medial side is thinned using high speed drill. The remaining bone is removed by using a 2-mm-diameter Kerrison rongeur. Similarly, but limited laminotomy is performed to inferior lamina. Operative microscope is tilted toward subarticular area, at this point by directing the microscope up to add down ligamen-

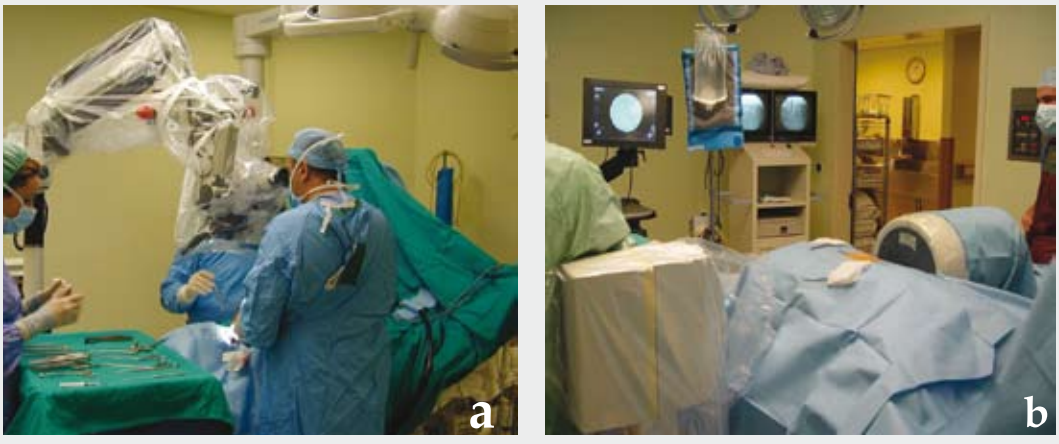


**Figure 1a,b:**
The general operating room set up and equipment is seen.

**Figure 2:**
The patient positioning is seen.

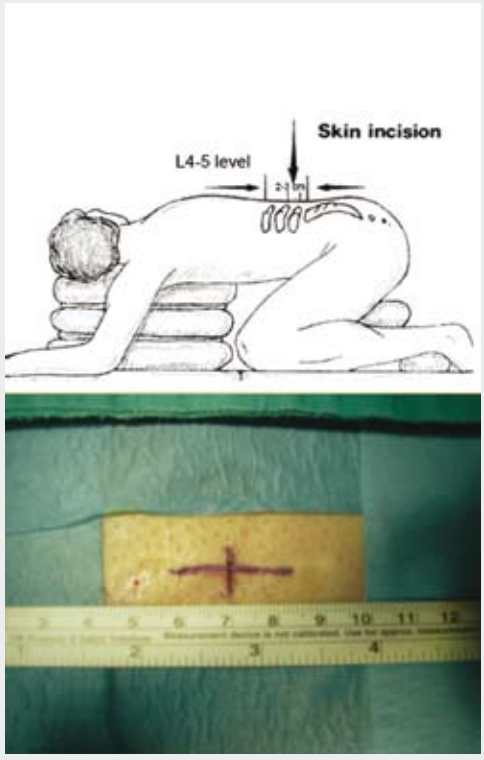


**Figure 3a:**
The skin incision is seen

tum flavum, soft tissues, lateral recess, and pathologies that cause stenosis at the bone excised using the Kerrison rongeurs. At this point, as a consequence of removing bone tissues and the ligamentum flavum the dural layer and midline are clearly in view and decompressing the ipsilateral radicular recess allow free nerve root in foramen to be seen. Cephalad and caudal nerve roots in operative area should be clearly visible to the opened interlaminar window. Maximum care should be given to protect pars interarticularis and facet joints during this process. After finishing ipsilateral micro decompression operation continuous in a contralateral side. The operating table is elevated, and the operative microscope is gradually tilted toward the opposite side, patient position is changed if necessary, allowing contralateral ligamentum flavum to be removed using the small Kerrison rongeurs.

Part of the spinous process is further drilled, and the inner portion of the contralateral facet is undercut until the contralateral spinal nerve root and du-

**Figure 3b:**
Bilateral decompression with unilateral approach is seen schematicaly.

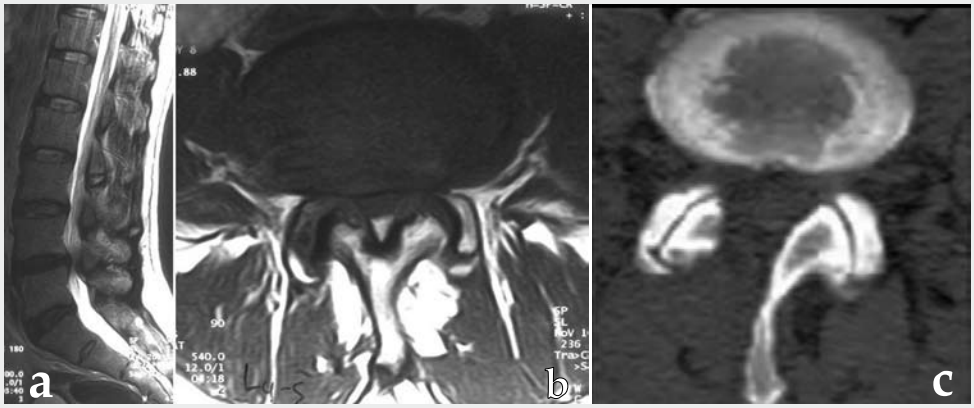


**Figure 4:**
**a,b)** The preoperative MRI (axial and sagittal images) is seen,
**c)** Postoperative decompression area is seen at postoperative axial CT scan.

ral border are visible. After this stage, if necessary, a contralateral foraminotomy can be performed since the contralateral nerve root can be easily identified. If there are tight adhesions to be dural, some small pieces of the ligamentum flavum can be left in place. After the surgery spinal canal should reach the normal sagittal and transversal diameters and all the soft tissue and bone tissue that was causing the stenosis should be resected (Figure 3b). In the closing stage of the operation wound is irrigated and homeostasis maintained. Usually a deep drain is placed and removed in postoperative 12$^{th}$ hour. Operation ends with closing fascia, sub skin tissues and skin respectively.

## 5. Postoperative Care:

Postoperative hospitalization time is one day. Patient is mobilized in first postoperative day. Patient is released in postoperative day one after nonsteroid antiinflammatory analgesic medications are systematically given. Patient can go back to work in postoperative day 15.

## 6. Complications and Avoidance:

The complications of this procedure are as follows: dural tears, increased radicular neuro deficit, epidural hematoma, superficial wound infection, and postoperative segmental instability [5, 6]. Intraoperative complications are more frequent in learning-curve; therefore, such operations should be performed by more experienced surgeons. In this surgical operation more serious complications that increase the morbidity are dural tears and CSF leakage. In order to prevent such complications a clear vision should be achieved under the operative microscope and dural adhesions should be carefully dissected using microsurgical techniques.

If dural wound occurred during the operation it should be fixed primarily when possible, and it should be closed water-tight using tissue adherents. In order to prevent neural tissue wounds it is advised to work gently using thin tipped Kerrison. A good hemostasis should be provided in order to prevent epidural hematoma. Usage of prophylactic antibiotics is important in preventing wound infections. There is a small incidence rate of postoperative segmental instability as a complication. In order to prevent postoperative segmental instability it is very important to protect pars interarticularis and facet joint during bone tissue excision., thus bone excision should be in specified limits [7,8].

## 7. Case Illustrations:

A 67 years old male patient was admitted to our neurosurgery department with complaint of leg pain. Patient had been suffering pain and numbness in both legs for two years. However, pain was increased in last two months and pain was more significant in his

right leg. Pain was increasing with prolonged walking and decreasing during relaxation. In his neurological examination neurogenic claudication was identified after walking 50m. In radiological examination (lumbar MRI) advanced spinal narrow canal was identified in L4-L5 level (Figure 4a,b). Since the patient had not responded to previous conservative treatments the operation was advised. Patient was taken into operation and micro lumbar decompression with right unilateral approach was performed. (Figure 4c). Patient was released from the hospital in postoperative day 2.

## 7. References:

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