11 LUMBAR INTERLAMINAR VE FORAMINAL MICRODISCECTOMY

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Introduction and Historical View

The goal of surgical treatment of lumbar disc herniations is the removal of the disc fragment compressing the nerve root. Surgical technique is advanced and changed over the years. Open interlaminar approach in spinal surgery has been first described in the beginning of the 20th century.[26,29] For nearly 30 years later, alternative methods had been developed to operate disk pathologies and towards the end of 1940's the posterolateral approach have been described for vertebrae corpus biopsies.[35] In the early 1970's, percutaneous procedures had been started [8,11,14] and in the late 1970s, by the development of microsurgery, Yasargil and Caspar adapted the original laminectomy to microdiscectomy.[2,8,38] In the early 1980's, endoscopes were used in checking of the disc space after open surgical procedures.Immediately afterwards posterolateral full endoscopic transfotaminal approach has been developed.[21,23,24] The first endoscopic interlaminar approaches have been reported in the late 1990's and the full endosopic interlaminar approaches had been started afterwards.[30-32]

Over the years with increasing surgical experience smaller incisions and less invasive procedures had become standart operating procedures while using double-sided large incisions in the treatment of single-sided disk herniation before. Today, lumbar microdiscectomy is accepted to be the gold standart when compared to other techniques such as open interlaminar approach and full endoscopy.[28] In this chapter, lumbar microdiscectomy (LM) techniques will be explained and the results of this technique will be compared with other procedures in discussion part.

Lumbar *Interlaminar* Microdiscectomy

The microdiscectomy procedure is the conventional method of todays practice. It had been developed to remove the median and paramedian soft disc herniations located in spinal canal in patients who have normal spinal canal. Skin incicion is generally made in midline. (Figure1) Far lateral foraminal discectomy may be more suitable for far lateral disc herniations just because of the need of wide laminectomy or even facet resection in midline procedures.

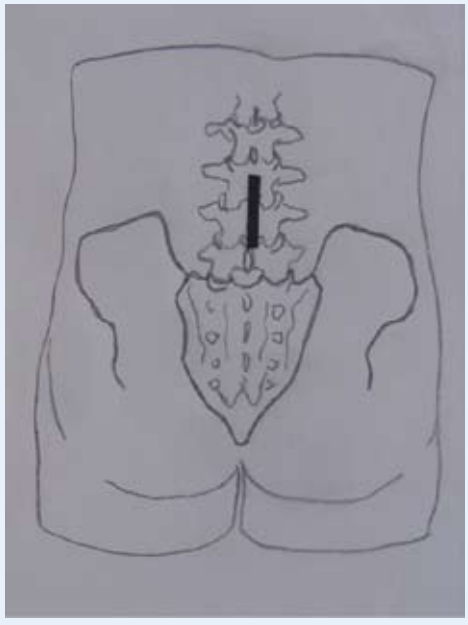

Figure 1: *Midline incision in lumbar disc herniation*

Primarily the terminology has to be understood correctly. The terms of lumbar microdiscectomy and microsurgical lumbar discectomy are different from the microlumbar discectomy which had been decribed by Williams in 1970's.[37] Microdiscectomy and microsurgical lumbar discectomy are characterized by the use of microscope and microsurgical tools, but never rule the surgeon for some surgical norms. Even though MLD is a certain and total microsurgical procedure. In MLD procedure technical parameters have been planned to avoid *'failed back surgery'*.

These are:

1- Minimal midline skin incision determined radiologically,

2- No muscle incision,

3- Minimal laminectomy and flavectomy,

4- Keep all the epidural fat tissue,

5- Root have to be exposed continously,

6- No incision on annulus,

7- No curetage in disk space,

8- No epidural electrocoagulation,

9- No foreign object left in the spinal canal.

In case of any variation of the reported technique of this real MLD approach, similar long-term results cannot be expected. In daily practice, many surgeons do not prefer real MLD approach. Hence, lomber microdiscectomy will be discussed in this chapter.

Lumbar *Transforaminal* Microdiscectomy

This is the conventional microsurgical discectomy method today. Far lateral disc herniations establish the %10 of overall lumbar disc herniations, and are mostly seen in L4-5 and then L3-4 levels. Lateral foraminal approach can be selected in infraforaminal or extraforaminal disc herniations.[5] (Figure 2) The definition of far lateral disc herniation is used for the herniations located laterally to the line between two adjecent pedincles. It is important to notice this syndrome. In this case, routine lumbar discectomy must have been modified for lumbar transforaminal microdiscectomy. The goal is to make decompression of the nerve exiting under the upper pedincle instead of decompression of the nerve passing through our exposure in the standart approach. Therefore, a herniation located in the upper outer corner

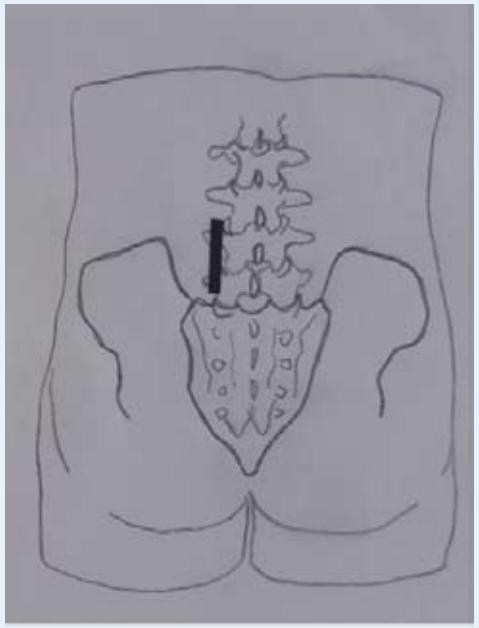

Figure 2: *Paramedian incision is made 5 cm laterally from midline and approximately 5 cm long in lumbar disc herniation*

of the posterior intervertebral disc compresses the upper root titled by the upper pedincle, so this root must be decompressed for treatment. (Figure 3) Myelography is not a sufficient and a favorite diagnosic instrument to demonstrate a far lateral disc herniation. Magnetic resonance imaging and computerized tomography with discography may be helpful for diagnosis.

The surgical approaches in far lateral disc herniations are:

1- Midline approach with median fasetectomy,

2- Midline approach with total fasetectomy,

3- Endoscopic foraminal discectomy,

4- Retroperitoneal discectomy[5].

Midline approaches have beneficial effects in giving access to central disc herniations and in handling lateral recess stenosis; although it has disadvantages such as instability, wide incision, muscle ecartation and inadequate exposure of far lateral disc. Paramedian approach has advantages such as minimal muscle dissection, keeping the faset joint, and good exposure of the ganglion, but has disadvantages like making impossible to access to an

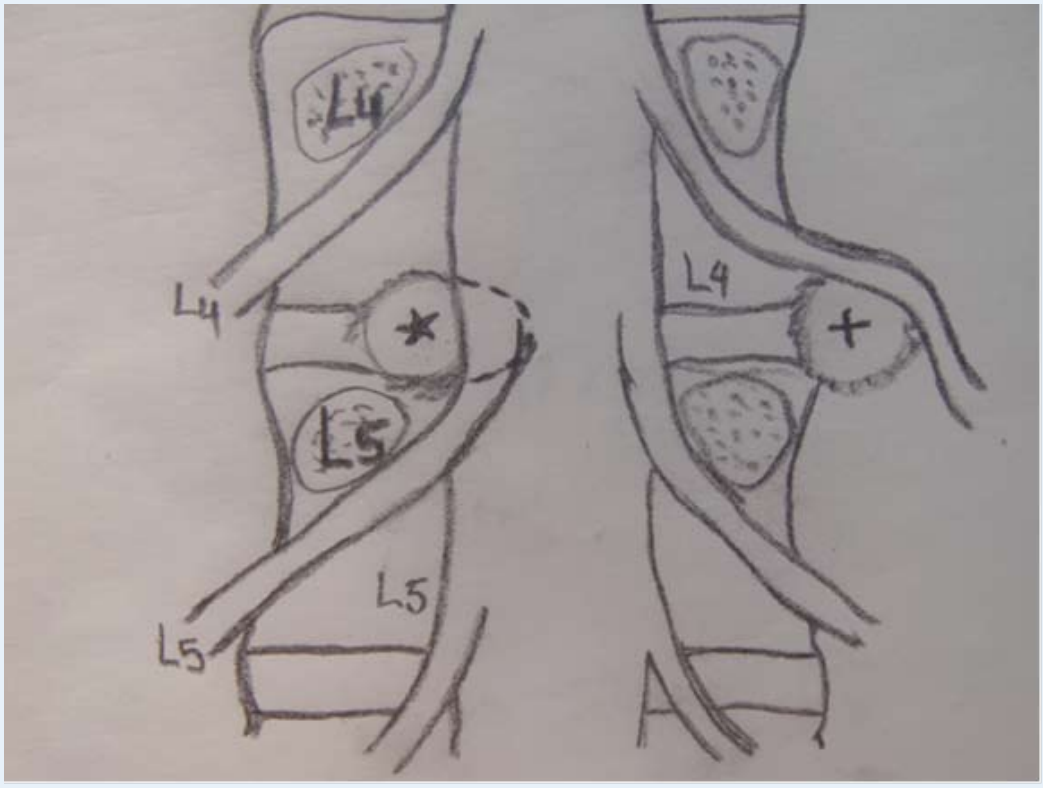

Figure 3: *In posterior view of lumbar vertebrate, pedincle, root and disc relations are seen. The root passing through inferior of the pedincle is named by that pedincle's number. Median and paramedian disc herniation (*) compresses that passing root. So L4-5 compresses L5 root. Foraminal and far lateral disc herniation (+) compresses the upper root. So L4-L5 far lateral disc compresses L4 root.*

accompanying central disc herniation and to treat the lateral recess stenosis. There may be technical problems in surgical approach of L5-S1 far lateral disc herniations due to the anatomic properties. Kotil and colleagues have demonstrated the efficiancy of intermusculer approach to overcome this trouble.[16] Whereas endoscopic approach has benefits because of local anaesthesia and microincision, it has disadvantages such as insufficient decompression of the discc space, technical difficulties and the need of special equipment and education.

Skin incision is made 5 cm long and 5 cm lateral to the midline in paramedian approach. A blunt dissection is made between multifidus and longissimus muscles. Superior transverse process, lateral wall of faset joint and inferior transverse process are palpated. (Figure 4) After the level is assigned radiologically, the intertransverse ligament is seen and it is dissected from inferior and superior transverse processes so that the root can be exposed. Angled Kerrison without damage resects lateral edge o the facet joint. Now it is possible to access the disk and to make fragmantectomy. (Figure 5) Ganglion irritation is very common in far lateral syndrome. Even a small fragment can cause severe pain.

Endoscopic Lumbar Microdiscectomy

Full endoscopic lumbar foraminal microdiscectomy is one of the common used methods in lumbar disc herniation.[13,21,23,24] It is possible to remove intraforaminal or extraforaminal sequestered material in this technique.[19,21] Resection of sequestered nucleus pulposes in the spinal canal has been described as retrograde

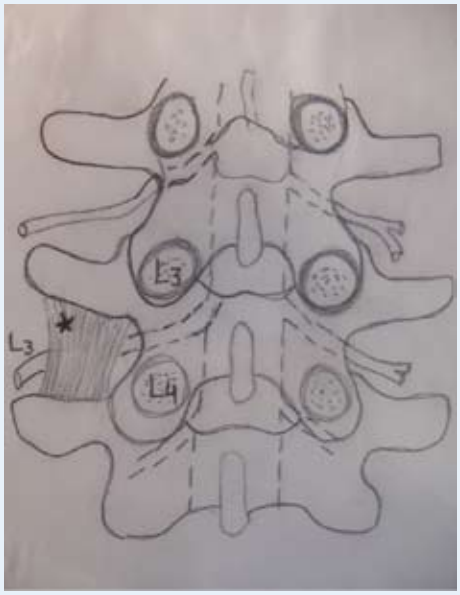

Figure 4: *Posterior view of lumbar vertebrate, transverse process, root and intertransverse ligament (*) are seen. In paramedian approach superior transverse process, lateral wall of facet joint and inferior transverse process are seen.*

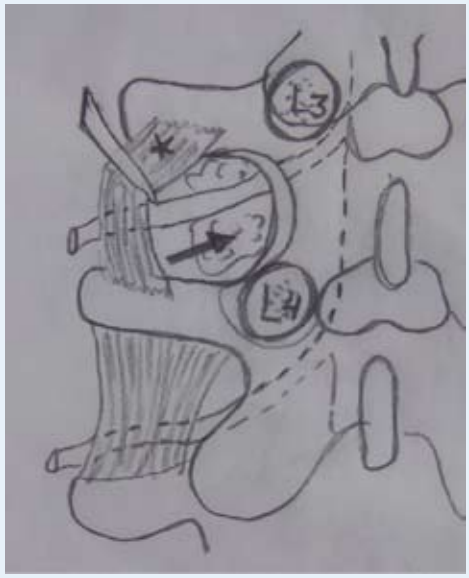

Figure 5: *Posterior view of lumbar vertebrate, when intertransverse ligament (*) is dissected between transverse processes, the root can be seen. When lateral edge o the facet joint is resected by an angled Kerrison without damage, it is possible to access the disk and to make fragment (arrow).*

intradiscal resection through annuler defect.[13,39] However it may be difficult resection of sufficient herniated disc in the spinal canal. Spinal canal may be accessed more adequately by lateral approach and with a continious visualization, but the bone edges of the foramen may limit access to the exiting nerve root and make it difficult to remove herniated disk.[15,30] Also it may be difficult to reach foramina because of pelvis and abdominal structures.

Full endoscopic interlaminar microdiscectomy has been developed to remove the disc herniations that cannot be removed by transforaminal way.[31,32] In this procedure, a dilatator is inserted bluntly to the lateral edge of the interlaminar window directed toward to open the ligamantum flavum. Therefore the procedure is performed under constant irrigation and direct visualisation. A lateral incision of approximately 3-5 mm is made in the ligamentum flavum. If the anatomical osseous diameter of the interlaminar window doesn't allow directing access through ligamentum flavum, the laminar opening is expanded. Then sequestrectomy or/and discectomy is performed.

Discussion

The clinical outcomes of the classical surgical methods for lumbar disc herniation are rather good.[3,4,10] However the most important surgical result is the epidural scar formation.[6] Approximately %10 of epidural scars are symptommatic and they can be diagnosed on magnetic resonans imaging, and the scar formation may complicate surgery for revision.[1,6] Also stabilisatiom may be impaired as a result of resection of spinal canal structures.[17] And this may cause bad outcomes for revision surgery. Tissue damage and problems as a result of this are decreased with the use of microsurgical techniques.[34,36] The goal of new developing minimal invasive procedures is to minimise tissue damage and to avoid long term negative outcomes.[22]

Standart open interlaminar approach, microdiscectomy and endoscopic surgical techniques are performed in lumbar disc herniation surgery. Comparing with standart open surgery some surgeons defend microsurgery is superior but this superiority is not clearly proven today. Mc Culloch reported 80-96%

good outcomes in lumbar disc herniation surgery in a review and showed that it is independent of surgical techniques.[25] According to this study, the most important factor in determining the success in lumbar disc surgery is patient selection The complications rates are similar in standart open surgery and lumbar microsurgery.[9,18] Also Gibson and colleagues reported that the outcomes in microdiscectomy are not superior to those in standart open surgery.[7]

In a prospective, randomized controlled study, Ruetten and colleagues compared microdiscectomy (interlaminar and transforaminal) with full endoscopic (interlaminar and transforaminal) methods and 178 patients were followed up for two years.[33] They could not find any difference between lumbar microdiscectomy and full endoscopic discectomy in clinical outcomes. Leg pains were gone completely in 82% of patients in both groups and there was a recurrence rate of 6%. Lee and colleagues compared microdiscectomy with endoscopic discectomy in 30 operated patients in each group. And they found out that clinical outcomes were similar and satisfying in each group, however, percutan endoscopic discectomy was less invasive.[20]

Hoogland and colleagues reported that there was no need to pass through the scar tissue when endoscopic transforaminal technique was performed in recurrent disc surgery and they followed up 262 patients for two years to find out the outcomes and complications of endoscopic transforaminal discectomy.[12] The complication rate was 3.8% and recurrence rate was 4.6%. They reported that endoscopic transforaminal discectomy was an effective surgical method with low complication rates when compared with lumbar microdiscectomy. Nellesteijn and colleagues reported in their review that endoscopic surgery's efficiency depended on poor evidences and it was not possible neither to support nor to refuse this method.[27] They also reported it was needed high quality randomized controlled trials with large sample numbers to demosntrate the effectiveness of this method and to compare with lumbar microsurgery.

In conclusion, may methods are performed in the surgical treatment of lumbar disk surgery. Most of these methods are highly effective and safe. For good outcomes an appropriate patient selection is important as well as the surgical method.

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