15 TRANSFORAMINAL ENDOSCOPIC FORAMINOTOMY IN LUMBAR SPINAL STENOSIS

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Congenital Lumbar spinal stenosis (LSS) defined first by Dr. Sarpyener in 1940's[17], and degenerative LSS was defined by Verbiest in 1950's.[19] Degenerative LSS can be classified as simple or complex LSS, depending on the presence or absence of attendant pathologies. LSS can also be classified on axial plane as central, lateral, or foraminal. LSS may result inneurogenic claucation or radiculopathy depending on localization of stenosis. % 8-10 of LSS is located at lateral or foramen levels, and cause radiculopathy.[12,16,18]

There is no complete consensus about the treatment of LSS. Although, the best alternative is applying surgical intervention in case of failing the conservative treatment, standard surgical interventions include total laminectomy, hemipartial laminectomy, flavectomy bilateral decompression by unilateral approach. At the same time in recent years, microendoscopic decompressions, which made from midline and endoscopic decompression made by posterolateral and transforaminal approaches.[1-3,8.10,11,14,15]

Basically, posterolateral endoscopic approach has been started for discectomy. Kambin and Gellman [7] in 1973, Hijikata [5] in 1975 has been a Pioneer in the field of percutaneous discectomy by the way of posterolateral approach. In time, lots of Lumbar discectomy and foraminotomy methods were developed depending on the development of endoscopic systems. In later years, using Holmium YAG laser has provided ablation of soft tissue and osseous tissue. [10,11,20,21]

Endoscopic laser applications and also foraminotomy applications have increased in last 10 years.

In 2003, Hoogland[6] and Ahn[1] reported the foraminotomy technique by using reamer (rasp) by approach posterolateral. Recently foraminotomy using drill has been popular.

Indications and Contraindications

Basically, cases with foraminal stenosis and lateraş stenosis unresponsive to conservative treatment are suitable for transforaminal endoscopic foraminotomy.

But cases with central LSS, cauda equina syndrome, infection, instability and scoliosis are not suitable cases for transforaminal endoscopic foraminotomy. Also; use of endoscopic laser is not recommended for cases with bilateral and mlti-level LSS.

In diagnosis, the axial and sagittal sections of MR, which pass through the foramen, are so important.[13] In suspicious cases, in order to clarify the origin of pain diagnostic transforaminal nerve root blocking may be used.

Transforaminal Foraminotomy Techniques

Basically, bone and ligamentous structures can be taken by reamer, trephine and drill, as well as by using laser.

Anaesthesia

In general, transforaminal endoscopic foraminotomy operation is performed under the good sedoanalgesia. The depth of sedoanalgesia is so important.

Position

Process is made in lateral or prone position. The surgeon's preference is important in certain extent. Because; in lateral position expanding of foramen can be provided, and the procedure may be faciliated. However, in prone position surgeons can work more comfortable in terms of orientation. After giving position to the patient the needle entry site should be checked in AP and later as position.

Placement of working cannula

In general the entry of working cannula is located in 10-14 cm lateral to the midline. with a very fat people and the patients who has got facet hypertrophy, a more lateral approach may be needed. Though the destination is the foramen, a lot of doctor makes firstly discography and then makes foraminotomy, some of the doctors' only focus on to a foramen and not to do foraminotomy. The target point in AP radiography is mid-pedicle line. But in lateral radiography destination is caudal part, close to the Kambin triangle. After placing the working cannula, foraminotomy is made with the laser, reamer, trephine or drill.

I- Foraminotomy With Laser

In this method; using laser under the endoscopic imaging widens foramen. Taking of the lower part of the facet, which is not articular and soft tissues, expands foramen by ''side firing'' Holmium YAG laser. In laser foraminotomy, the power of laser is set to 80 watt and maximum of 120 minutes (9,600 per session) while laser is cleaning the soft tissues, and 2-3 mm of bone tissue.

Dr. Martin Knight developed this technique.[10] This technique provides advantage for taking desired degree of bone by entering from a small hole. 2 mm of the tip of the laser is used for processing. Vertebral body and facet osteophytes, ligamentous flavum, superior foraminal ligaments and epidural scar are ablated. Under surface of the facet joint and the annulus is interrupted until the epidural space is seen.

In laser application, thermal damage is prevented by more irrigation. Nevertheless, root damage depending on the laser heat has been reported in 1,6% of applications.

Many authors have reported good results with endoscopic laser foraminotomy.[1,3,11,21]

Ahn and Ark reviewed the results of foraminal exit stenosis. They have decompressed the superior facet and ligamentum flavum by bone rasps, endoscopic forceps and laser. They reported 88% good and excellent results after 13 month follow-up.[1] Chiu reported % 94 successful outcomes by using transforaminal endoscopic laser application in cases with scar lateral recess, foraminal stenosis, spondylolisthesis.[3]

II- Foraminotomy by drill and rasp

II-A- Transforaminal Foraminotomy Technique by Using Rasp:

Foraminotomy can be done by using rasp (reamer) or trephine with trimming. Procedure is performed under fluoroscopic control. For this procedure, the different sizes of rasps (in the range of 2-7 mm) are used, which allows trimming, In general, one start with the smallest rasps and pass to the biggest. In foraminotomy method, the non-articular part of the superior articular facet is taken.

II-B- Transforaminal Foraminotomy Technique by Using Drill:

This operation is performed under endoscopic visualization. In this process 3,0-3,5 mm round, diamond tip drill is inserted into working cannula, and capsular ligament and superior articular facet is taken. Because process is performed under endoscopy, risk of neural damage is less. However, process spreads heat.

Cold irrigation during drilling can contribute to the haemostasis. However, for avoiding the heat injury during drilling, intermittent drilling should be performed.

In foraminotomy, the width and orientation of the procedure are determined with respect to relation of stenosis and herniated disc's localization.

Haufe and Ark reported pain relief in 59% of 64 patients with foraminal stenosis, using endoscopic laminoforaminotomy.[4] Kambin reported 82% success in 40 cases with lateral recess stenosis by the endoscopic decompression.[8]

Morganstein evaluated the patients who applied endoscopic stenosis surgery in two groups.[14]

He applied laser to the patients in 120 patients in the first group, and made foraminotomy with the reamer in 91 patients in second group. Morganstein reported in first laser group 72% excellent, 16% good results, and in second group 67% excellent, 27% good results. In this study, process took 50 minutes, and 30 minutes in the first and second groups, respectively.[14]

In 2010, Nellestejin and Ark searched the literature and determined that there was no evidence-based study about the transforaminal foraminotomy in LSS (15). Nellestejin and Ark reported the success rate of 69-83%, complication rate of 0-8,3% and re-operation rate of 0-20% after endoscopic foraminotomy.[15]

As a result, transforaminal approach in LSS has got important advantages as, allowing daily surgery under sedoanalgesia, small incision, minimal muscle and soft tissue damage, less scar tissue, quickly discharged and rapid return to work. Naturally, known some disadvantages such, as it needs the endoscopic equipment, and the high learning curve.

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