Percutaneous Endoscopic Lumbar Discectomy

Conventional laminotomy/laminectomy, with or without the use of a microscope or surgical loupes, remains the usual method of surgical care for symptomatic lumbar disc disease. The development of an approach for percutaneous lumbar discectomy (PLD) began over 25 years ago. Since then, clinical investigations of manual and automated PLD techniques have recorded an average success rate of 50% to 70%. We present here our results of treating 89 patients with percutaneous lumbar endoscopic discectomy using either endoscopic thermodiscoplasty or endoscopy only. 65 patients (73%) were rated as excellent or good results. 16 patients as fair and 8 patients as poor. Two patients had complications, which were controlled. We consider this technique as a safe and efficacious in the treatment of selected cases of lumbar disc prolapse.

Introduction:

The most commonly performed spinal operation remains the simple discectomy. This procedure, first described in 1934 by Mixter and Barr. Success rates have been reported as high as 90% and as low as 10% for simple disc excision. However, many complications can occur as a result of surgical dissection. During exploration, trauma to the thecal sac and/or nerves can result in nerve root irritation, intraneural and perineural scar formation, and instability from excessive bone removal. Thus surgeons over the past few decades have focused research efforts on developing new techniques of minimally invasive surgery to alleviate potential complications. Vails (1948) Ottolenghi (1955) and Craig (1956) described posterolateral access to the lumbar and lower thoracic spine to obtain tissue for pathologic examination. Wutse (1968) described an open Para median approach to the lumbar spine for arthrodesis and the extraction of extraforaminal disc herniations (Kambin, 1988). In the 1980s the development of chymopapain for chemonucleolysis appeared to solve the age-old problem of alleviating disc pressure on the nerve without the potential complications of open surgery.

In chemonucleolysis, emphasis was placed on positioning the needle in the center of the intervertebral disc under fluoroscopic control without clear reference to the annular entry site. The skin entry point recommended for obtaining a bone biopsy was 6.5 cm - 8 cm from the midline. Hijikata used similar skin entry points for mechanical nuclear debulking. A recent innovation in treatment of disc pathology has been development of percutaneous discectomy, which was first reported in 1975 by Hijikata a percutaneous nucleotomy was performed using elongated and modified pituitary forceps to indirectly decompress the disc space. A 75% success rate was reported in 136 patients followed over a 12-year period. In 1985 Onik et al, modified that technique by using automated reciprocating suction cutters to perform percutaneous discectomies. A success rate of 78% was reported. A study of Kambin and Schaffer, reported 85% success rate. However, questions of reproducibility, mechanism of action, patient selection, lack of controlled studies, and actual effectiveness began to surface in subsequent literature. (Kambin 1998) This counter argument was clearly presented in 1989 by Kahanovitz, Viola, and Mc Collough, whose multicenter analysis of percutaneous discectomy revealed.
less than spectacular results. In their study only 55% of patients were able to return to work. (Regan 1995) Spinal endoscopy dates back to 1931 with the publication of the work of Bunnan, who was first to use an arthroscope in cadaveric spines in an attempt to recognize diseases of the cauda equina. In 1938, Pool, improved the technique by developing a hot-lamp system designed for intra-thecal observation. In 1983, Hausmann and Forst, described a nucleoscope that was used during open discectomy to ensure that loose intradiscal fragments were extracted adequately. Schreiber et al (1986), used dual portals for arthroscopic nucleotomy. This intradiscal approach did not require arthroscopic visualization of the triangular working zone, nor did it use articulating instrumentation to access the posterior herniated disc fragments. In 1983, Kambin used an arthroscope with a biportal access in an attempt to obtain interbody fusion. Flexible fiberoptics for epiduroscopy as an adjunct to open spine procedures was introduced in the late 1980s. In 1990, Kambin began a prospective study on the efficacy of endoscopic laser nuclear ablation for the management of the symptom producing herniated nucleus pulposus. In the early stages of development of Para median percutaneous approach to the lumbar disc, small-caliber instruments were used to ensure the protection of the exiting root. Hijikata (1975) used a 2.6 mm cannula, whereas Kambin (1983) used a 4 mm cannula. After Hijikata's nucleotomy technique, Onik (1985) described a suction probe having an outer diameter of 2.5 mm for removal of nuclear tissue. Researches performed a series of anatomic dissections. The results of these dissections indicated that a 6.5 mm outer diameter cannula could be inserted in the triangular working zone with relative safety. This larger diameter cannula permitted insertion of nuclear tissue from an area beneath the inner fibers of the posterior annulus and extraction of herniated fragments. In a recent cadaveric study, Mirkovic et al (1995) confirmed the safe use of a 7 mm cannula in the triangular working zone. (Kambin 1998) Four major advantages are cited to support Percutaneous Lumbar Discectomy as a treatment method in selected patients with lumbar herniated nucleus pulposus: (1) the technique requires only a small incision for introduction of the probe, which is thought to reduce epidural fibrosis at the operative site. (2) The technique can be performed with the use of local anesthesia on an outpatient basis, which theoretically contributes to a faster return to normal levels of activity and lower health costs. (3) The use of PLD does not preclude the patient from undergoing any of the alternative procedures if the operation fails. (4) The risk of major or life-threatening complications accompanying another less invasive procedure, chemonucleolysis is believed to be nonexistent. The aim of this study was to evaluate the results of endoscopic lumbar discectomy using either endoscopic discectomy or endoscopic thermodiscoplasty and to detect its efficacy and safety of this new technique in treating lumbar disc disease.

Patients and Methods:

During the period between April 1998 and January 2000, 89 patients underwent percutaneous endoscopic lumbar discectomies, all the operations done at Saudi German Hospital, Saudi Arabia, 61 patients (69%) were males 28 patients (31%) were females and . The age of the patients ranged from 20 to 60 years (mean age 35, ± S.D. 10.6) and the levels of herniation were L3-4 (6 patients) L4-5 (56 patients), L5-S1 (27 patients). All the patients in this prospective study fulfilled the following criteria, (1) A major complaint of acute unilateral leg pain localized to a single dermatome or a major complaint of acute back and leg pain consistent with a single herniation contained within the annulus of the disk. (2) Neurological signs or symptoms that are consistent with a single herniation contained within the annulus of the disk (e.g., sensory abnormalities, reflex alterations, positive straight leg-raising test, weakness). (3) Magnetic resonance Imaging, CT, or discography evidence of a single herniation that is contained within the annulus of the lumbar disk (L3-4 through L5-S1) and is consistent with the signs and symptoms. (4) Failure of a well-managed course of conservative therapy to relieve pain and other signs and symptoms. Patients with possible mechanical irritation and injury of the neural structures were excluded from the technique; the technique is contraindicated for patients who underwent previous surgery at the lumber spine and for individuals with psychological disorders or those who cannot cooperate during such procedure. The procedure was performed for either bulging disc or
The lumbar disc was diagnosed by discography performed before the procedure. Endoscopic thermodiscomy was performed for 38 (42.6%) patients and endoscopic laminectomy was performed for the rest 51 (57.4%) of the patients.

**Technique**

The lateral decubitus position was used, with the patient lying on his side on a beanbag placed under the thigh to prevent lateral spinal collapse. (Fig. 2) The lumbar disc was exposed and the skin and subcutaneous tissues at the lumbosacral level were infiltrated with 2% xylocaine, centered about 1.5 cm. lateral to the midline. (Fig. 3) An 18 gauge spinal needle was inserted under C-arm fluoroscopic control in line with the interlaminar space. The dural sac was expected to fall away due to gravity from the planned line of entry. As the needle was inserted, the spinal canal the stiletto was withdrawn so that any cerebrospinal fluid would escape if penetration of the dura and subarachnoid space occurred. When the disc surface was encountered and C-arm verification of proper placement was obtained, the needle was minimally advanced through the annulus. A slender guide wire was inserted through the needle to about the middle of the disc; and the needle was withdrawn, leaving the wire in place (Fig. 4). A 3-mm.-skin incision was then made. The tapered dilators were placed over the guide wire and advanced to the disc surface under C-arm control. (Fig. 5, 6, 7 and 8) Maintaining contact of the dilator with the annulus, the slender wire was replaced with the usual 18 gauge guide wire used for annulus placement. The dilator was replaced with a standard cannula (fig. 9). Once the annulus had been incised by a trephine cutter, the wire and the cannula were removed. Discoscopy were then performed in the usual manner for quick evacuation of the intradiscal space to create a central cavity (fig. 10). A fiberoptic scope is then introduced down the cannula (fig. 11). Various manual instruments including graspers, scissors and hooks, are passed and utilized in the working channel to complete the discectomy and decompress the nerve root. The photograph in fig. 13 shows a disc fragment removed via the cannula. When all disc material has been removed, the scope is withdrawn and a sterile dressing is applied. Skin suturing is typically not required. All patients received 2 g of cephalosporin and 20 mg of dexamethasone IV at the beginning of the operative procedure. Every case was able to be discharged home within the same day or the next day after completion of the procedure.

**Evaluation**

All patients underwent outpatient evaluation 3 to 6 weeks postoperatively. The outcome was categorized using the Macnab criteria:

1. Excellent, no pain and no restriction of activity;
2. Good, occasional back or leg pain;
3. Fair, intermittent pain of sufficient severity to interfere with work or activities, but improved functional capacity.
4. Poor, unimproved symptoms, insufficient improvement to allow increased activity, or requirement of reoperation at the same level.

**Results**

On an outpatient basis, all procedures were completed using the aforementioned endoscopic technique. Operative time ranged from 40 to 60 minutes. All patients were discharged to home within the same day the next day after completion of the procedure. The follow-up period ranged from 9 to 18 months, and the median period was 12 ± 2.5 months. 29 patients (32.6%) had excellent outcomes, 36 patients (40.4%) had good outcomes, 16 (17.9%) had fair outcomes, and 8 (8.9%) had poor outcomes, according to the Macnab criteria. Of 65 patients who had excellent or good outcomes, an overall success rate of 73%. In our study we have the following complications, one patient had prolonged L4 nerve root irritation, it took about two months to recover the quadriceps muscles from the injury of the nerve root. One patient had transient meningitis. This patient was operated at L5-S 1 and postoperatively she was discharged and 48 hours later she came back with the picture of meningitis. She was admitted to ICU and lumbar puncture was performed, culture was done & analysis of CSF showed no organism, elevated CSF puncture was performed, culture was done & analysis of CSF showed no organism, elevated CSF sugar, and so lumbar puncture was done daily for 3 days. Two cases were converted to open discectomy, one case was due to obesity of the patient & the disc could not be reached due to the improper positioning and inability to recognize the landmarks, for the second patient interlaminal space was narrow & the disc could not be reached.