Minimally Invasive (Non Microscopically) Fenestration Lumbar Discectomy; Clinical Outcomes with a Minimum of Three Years Follow-up

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Abstract

Background: Different surgical techniques for lumbar discectomy are in vogue. This study to investigate the outcome for minimally invasive (nonmicroscopically) fenestration lumbar discectomy.

Patients and Methods: Seventy two patients who had single-level 'virgin' lumbar disc herniation with unilateral radicular symptoms were included had undergone minimally invasive (nonmicroscopically) fenestration lumbar discectomy between October 2007 to September 2010. Outcome were evaluated using the Mac Nab's criteria and Visual Analog Scale (VAS) and the improvement was measured using paired t-test.

Results: At final follow-up, patients were rated as 'excellent' (n=42), 'good' (n=18), and 'fair' (n=12) using the Mac Nab's criteria and Visual Analog Scale (VAS). The preoperative mean ± SD VAS score was 10.02 ± 0.78 which improved to 1.76 ± 0.78 postoperatively. These were statistically significant (p-value <0.001, paired t-test).

Conclusion: Minimally invasive (non microscopically) fenestration for the lumbar discectomy is an efficacious procedure provided early post operative mobilization, lesser morbidity and early return to job and this procedure can be well performed by surgeon with adequate experience in the field of disc surgery.

Key Words: Lumbar discectomy – Minimally invasive fenestration – Clinical outcome.

Introduction

LOW back pain due to lumbar disc prolapsed is the major cause of morbidity throughout the world affecting mainly the young adults. The degeneration of the disc results from many factors and can lead to prolapse into the intervertebral foramen, particularly at L4-L5 and L5-S1 level [1,2]. Sciatica, a myotomal pain radiating to either of the legs along the nerve, is the most characteristic symptom of a herniated intervertebral disc [3]. The pain is due to the irritation of the dura covering of nerve root by the protruded part of intervertebral disc. The recent advances in Computed Tomography (CT) and MRI and a better understanding of the causes of the leg pain make consistently accurate diagnosis of the patient's symptom producing disorders [4]. Lumbar discectomy as a treatment for herniated lumbar intervertebral discs was first reported in the 1920s. It is the most common surgical spine procedure to be performed in the USA [5]. The success rate for lumbar discectomy ranges between (49% and 90%) [6,7]. The technique of lumbar discectomy has undergone significant modifications. Originally, a wide laminectomy was performed in an attempt to remove as much disc material as possible [1,8]. In 1939, love described inter-laminar fenestration [9]. Micro-lumbar discectomy technique was described by Caspar [10]. This study was performed to assess the results of limited minimally invasive (non microscopically) lumbar disc excision through inter-laminar fenestration in patients fulfilling specific criteria.

Material and Methods

Seventy two patients who underwent limited minimally invasive (non microscopically) lumbar discectomy by fenestration technique from October 2007 to September 2010 in Al-Qadisiyah Teaching Hospital and private hospitals were presented with signs and symptoms of prolapsed lumbar intervertebral disc who failed to respond to conservative treatment of minimum 6 weeks duration. Presence of neurological impairment (paresthesia, motor/sensory deficit) along with at least three of the following clinical features formed the criteria for selection of patients for surgery. The criteria are position of comfort (flexion at hips/knees), positive...
straight leg raising test (was less than 45 degree), spinal tenderness, selective restriction of spinal movements, accentuation of symptoms with cough/sneeze). Collection of data were done by patient’s evaluation through proper history taking regarding the low back pain with or without sciatica and thorough clinical examination. Confirmation of the prolapsed lumbar intervertebral disc were done by MRI Figs. (1,2), (52 patients already they had MRI and 20 patients sent for MRI at time of presentation). Routine medical, hematological and urine examination were performed to evaluate the operative risk. A written informed consent was obtained from each patient. There were no restrictions on patient selection with regard to types of LDH and age. Patients with disc prolapsed other than L4-L5 and L5-S1, previous surgery, drug dependency, severe degenerative narrowing of the disc space at the index level, spinal canal stenosis, far lateral foraminal stenosis, patient of multiple level disc, bilateral involvement, quada equine syndrome and penetration of disc into the dura were excluded from the study.

Surgical technique: After induction the patient made knee-chest position. The part was painted and draped and a paramedian incision about 3cm in length (sometimes 1cm more in obese patient and some patients with L4-5 disc prolapsed), Fig. (3) was done over the affected level which is marked by using the iliac crest as anatomical landmark. Lumbar fascia was incised and paraspinal muscle dissected off from the spinous process of the symptomatic side only and right angled retractor inserted. Under direct vision dissection was done to reach the affected interlaminar space. We did interlaminar fenestration, the ligamentum flavum was removed piecemeal with kerrison’s rongeurs and if necessary upper 3rd of lower lamina or lower 3rd part of upper lamina was cut to enlarge a fenestration for clear view. The thecal sac and the nerve root was retracted with a nerve retractor. The sequestrated and extruded loose disc fragments were removed, and if the annulus intact incised usually in the shoulder of the nerve root and the disc material removed piecemeal with disc forceps. The exiting nerve roots were cleared of compression in all cases. No free fat graft used in all cases. The intervertebral space was rinsed with saline and gentamycin 80mg injected in the disc space. Incision was closed in layers without negative suction drain. The patient received standard pre-and post-operative management of the patient, including pain management, prevention of post-operative infection with a third generation cephalosporin. The operation time was 25-30 minutes. The patient was confined to bed 12 hours after surgery then the patient was made to stand up and gradual walking was encouraged, prolonged stopping and flexion was avoided. Sutures were removed after two weeks. Lifting and bending prohibited for 6 weeks. All patients were advised a regular postoperative back exercise program after 4 weeks. Patient is advised to return to original occupation after 6-12 weeks.

Fig. (1): Sagittal MRI shows L4-L5 prolapsed intervertebral disc.
Fig. (2): Axial MRI shows left posterolateral herniation of disc material.
Fig. (3): Incision of lumbar discectomy.
Visual Analog Scale (VAS) [11] was used to assess back and leg pain preoperatively and postoperatively. All patients were assessed after 2 weeks and at 6 weeks and there after three months, six months, one year and two years till three years postoperatively. Mac Nab’s criteria were used to evaluate the outcome.

**Mac Nab`s criteria [1] of outcome:**

A- Excellent is dropped.

B- Good:
1- Resumed preoperative function.
2- Occasional backache or leg pain.
3- No dependency inducing medication intake.
4- Appropriate activity.
5- No objective sign of nerve root irritation.

C- Fair:
1- Intermittent episodes of mild radicular or low back pain.
2- No dependency inducing medication intake.
3- Appropriate activity.
4- No objective sign of nerve root irritation.

D- Poor:
1- Inactive.
2- No productive occupation.
3- Continuing or worsening symptoms.
4- Abuse of drugs.
5- Objective sign of nerve root irritation.

**Results**

A total of 72 patients were studied. The mean (standard deviation) of age distribution was 39.42 years. The youngest in the group was 23 years and the oldest was 56 years. Out of the total, 58 patients (80.6%) were male. All patients were offered conservative management which included analgesics, bed rest. They presented with low backache and a radiating pain. Thirty patients (41.7%) of them had also sensory disturbance and only four patients (5.6%) with reduced power of extensor hallucis longus. Twelve patients (16.7%) had symptoms of more than 6 months duration and 10 patients (14%) of more than one year. Forty eight patients (66.7%) had left sided symptoms while twenty four patients (33.3%) had right sided symptoms. No patient had bladder and bowel involvement.

Forty-four patients (61.1%) their MRI showed protrusion of disc, 22 patients (30.6%) showed extrusion and six patients (8.3%) showed sequestration of the disc. Forty patients (55.6%) had a lesion at the L4-L5 level, and the rest 32 patients (44.6%) had a lesion at the L5-S 1 level. Paracentral and posterolateral position of the prolapsed disc was most common followed by central or posterocentral. Out of 72 patients only 12 patients (12.7%) they needed small inferior or superior laminotomy to access the dura and disc. Co morbid condition like hypertension was present in 17 patients (23.6%).

In this study the pain was assessed according to Visual Analog Scale (VAS). The preoperative mean ± SD VAS score was 10.02 ± 0.78 which improved to 1.76 ± 0.78 postoperatively on a scale of 10-0. A paired student t-test showed that the above changes were statistically significant (p < 0.001), which shows a significant reduction in patient's perception of pain and improved functional capacity after surgery.

The follow-up data were evaluated using Mac Nab’s criteria and patient based outcome studies using SF-36 [12], classified as excellent in 42 patients (58.3%), good in 18 patients (25%) and fair in 12 patients (16.7%). All patients were discharged from the hospital 14-18 hours postoperatively. Fortunately none of the known complications encountered in all patients.

**Discussion**

Low back pain due to lumbar disc prolapse is the major cause of morbidity throughout the world affecting mainly the young adults. Clinically significant sciatica due to lumbar disc prolapsed occurs in 4-6% of the population [1,2]. The surgical excision of the disc has been the standard treatment of lumber disc prolapsed after failure of conservative treatment, though the methods of discectomy vary. A review of literature reveals success rates for lumbar disc surgery ranging from 49-90% [6,7].

Discectomy via a laminectomy was the popular approach for a long time. However, this involved removal of a large amount of normal bone, muscle tissue and sometimes facet joints which resulted in iatrogenic instabilities to the spine, membrane formation resulting from laminectomy and failed back syndromes. Hence, conventional laminectomy and discectomy has been replaced by bone-sparing techniques.

Love devised inter-laminar fenestration [9]. Conventional fenestration technique involved longer incisions (average of 7cm), used bilateral paraspinous muscular elevation and larger incisions and retractor systems. Interlaminar approach was used to enter the epidural space. Refinement of fenestration technique was described by Caspar [10] in 1977 and Williams [13] in 1978 were described micro-lumbar discectomy technique. Ade-
quate illumination and magnification are achieved via the use of microscopes, operating loupes and head lamps or endoscopes, all these facilitate better visualization of dural sac, nerve roots and other inter-spi nal structures including the prolapsed disc.

Fenestration technique has certain distinct advantages over the more commonly used laminectomy technique of disc excision. Manish et al., compared laminectomy and fenestration for disc excision and concluded the superiority of later approach in respect to early postoperative mobilization, early return to work and low incidence of postoperative backache as it is less extensive [14].

In this study, there is small incision, paraspinal muscle elevation only on the symptomatic side, short time of surgery and minimum blood loss. This approach nearly similar to microdiscectomy. The disc removal per se in both is limited. Twelve patients (16.7%) required superior or inferior laminotomy, most of them done in the early phase of learning curve, which has the advantage of correcting lateral recess stenosis. No autogenously fat graft was used in all cases.

The advantages of this technique are decrease in the incidence of postoperative spinal instability, decreased manipulation of the neural elements and subsequent perineural fibrosis. In the present study, interlaminar disc excision was excellent in 58.3%, good results were 25% and 16.7% were fair results. No patient in this study deteriorated after surgery.

The operating time, in patient stay and success rates were comparable to the results of microdiscectomy reported in various studies. This might be due to close similarity of the two techniques. However microdiscectomy offers a better visual comfort and facilitates surgery.

The pain was assessed by VAS preoperatively and post operatively, the scores were statistically significant (p<0.001) by a paired student t-test, which show reduction in pain and improvement in functional capacity postoperatively. The aim of the present study is not to compare our own results with the previous series but to discuss the suitability of this technique in disc excision, where the recent techniques like Percutaneous Lumbar Disc Decompression (PLDD), Percutaneous Endoscopic Lumbar Discectomy (PELD) and Young Endoscopic Spine System (YESS) need lots of expertise, experience and expensive equipments which are not available at every center [15,16].

Generally the functional outcome results of this study, stated that the lumbar discectomy performed with a limited disc excision (non microscopically) by fenestration is a safe, simple, economic operation in comparison to microdiscectomy, effective and reliable method for treating selected patients with herniated lumbar discs, is free from spinal instability, and on clinical analysis it was found that almost all of them gave excellent to good results according to modified Macnab criteria.

Conclusion:

Minimally invasive (non microscopically) fenestration provided early post operative mobilization and early return to job and this procedure can be well performed by surgeon with adequate experience in the field of disc surgery.

References


الملخص العربي

هذه الدراسة هدفها تقييم النتائج على المرضى الذين أجريت لهم عملية رفع الغضروف القطني بجرح صغير بدون استعمال المجر، والتي أجريت على 72 مريض يعانون من الانزلاق الغضروف القطني من الفترة بين تشرين الأول لسنة 2007 وأيار لسنة 2010 وتمت متابعتهم لفترة ثلاث سنوات بعد إجراء العملية وأظهرت نتائج ممتازة لـ 42 مريضا وجدية لـ 18 مريضا ومتناوبة لـ 12 مريضا.

وقد أستنتجت من هذه الدراسة بأن هذه الطريقة الجراحية لرفع الغضروف القطني هي طريقة ممتازة تساعده في حركة المريض لفترة قصيرة بعد إجراء العملية ومعاناة مرضية أقل وعودته إلى العمل بعد فترة قصيرة. ومن الممكن إجراءها من قبل الجراحين الذين يملكون خبرة جيدة ويعملون في مراكز لا تتوفر فيها متطلبات الطريقة الحديثة لرفع الغضروف القطني المنزلق.