ORIGINAL ARTICLE

Lumbar Discectomy Using Lagenbech Retractor, A Cost Effective Minimally Invasive Technique. Study of 520 Cases

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ABSTRACT:

Background; *Lumbar discectomy through conventional techniques without magnification is generally performed through 5-6 cm incision. It results into considerable post-operative pain, long hospital stay (7.14 days) and surgery induced segment instability due to resection of ossary and ligamentary structures. Results of the same procedure through a much smaller (< 2.0 cm) skin incision using Lagenbech retractor, head light and magnifying loupes, are presented.*

Objective: *Conventional disc surgeries though have good results, may result in subsequent damage due to trauma to erector spinae, ligaments and bones. While this technique has the advantages both intraoperatively and postoperatively in rehabilitation. Overall objective was to achieve sufficient decompression, as well as the advantages of very low cost minimally invasive procedure.*

Setting; *Department of Neurosurgery, Combined Military Hospital Lahore (800-bedded tertiary care hospital), and Combined Military Hospital Rawalpindi (900 bedded tertiary care, teaching hospital), from May 2002 to Dec 2006.*

Materials & Methods: *A total of 520 patients who underwent lumbar discectomy were studied. 388 were male and 132 were female. The mean age in this study was 35 years. Only patients with symptomatic posterolateral disc prolapse were included in the study. All patients were investigated with MRI or CT scan of lumbar spine. Only ten patients were investigated with myelography. The followup period was up to two years. Oswestry Disability Index of low backpain disability was also used as specific parameter in some of the cases.*

Results: *Overall success rate for pain relief was 93.8%. Only 13% had occasional pain on exertion. The hospital stay was < 2 days. The most common complication was recurrent sciatica (5.7%), and these patients reported within six to eight months postoperatively. Other complications encountered were operation on wrong level (1.34%) discitis (0.76%), dural tear (0.19%), nerve root injury (0.19%) and failed back syndrome (2.30%).*

Conclusion: *Author concludes that lumbar discectomy performed through a small (< 2.0 cm) incision using manual retraction with Lagenbech retractor, headlight and magnifying loupes is a safe and cost effective procedure with distinct advantages such as reduced hospital stay, minimal post-operative pain, early mobilization and good alternative to conventional laminectomy/discectomy procedures. Moreover the results of this procedure are comparable to the sophisticated endoscopic procedures adopted for resection of lumbar discs in affluent setups, which require costly instruments and training in selected centres. In developing countries with economic constraints this procedure is highly recommended for selected cases of* ***posterolateral lumbar disc lesions****.*

Key Words: *Postolsteral disc Herniation Lumbar discectomy Minimally invasive Lagenbach Retactor.*

INTRODUCTION

Intervertebral disc lesions of lumbosacral spine are very commonly encountered in neurosurgical practice. The peak incidence is adulthood[13]. In armed forces the disease is common in serving soldiers. Disc herniations are more frequent at L4/5 and L5/S1 levels. Less than five percent of disc herniations occur at L1/2, L2/3 or L3/4 levels. Disc herniations at dorsal

spine level are even rarer[7]. Spontaneous recovery is anticipated in 80% of these patients, however the operative treatment is reserved for the patients with incapacitating pain, progressive neurological deficit, sphincter disturbances and who fail to respond to conservative treatment.

Since early 20th century, open interlaminar access has been used for removal of disc via bilateral laminectomy and hemilaminectomy.[23] Percutaneous intradiscal decompression or chemonucleosis have been applied since 1970's.[24] Microsurgery involving a microscope was developed to gain interlaminar access in late 1970's.[25] Endoscopy initially was used to inspect intervertebral space after completion of open surgery in early 1980's.[26] Full endoscopic interlaminar access procedure was, however employed in 1990's.[27]

Conventional discectomy is usually performed through a large 5-6 cm skin incision, requires lot of muscle dissection, retraction, access related osseous resection, blood loss and is done without magnification. The average hospital stay being 7.14 days and considerable quantities of post-operative analgesics are required after the procedure. The patient is ambulatory, usually after 3-4 days. Generally good results are achieved after this procedure.[21,22,28] One operative consequence is scarring of epidural space which becomes clinically symptomatic in 10% or more of cases.[29] The amount of scarring is directly proportional to extent of tissue dissection/resection. Revision of such scar is demanding and usually not completely possible. Moreover operation induced destabilization due to necessary resection of spinal canal structures is also likely to follow such procedures.[29,30]

Author carried out discectomies at lumbosacral spine through less than 2.0cm skin incision. The procedure, unlike microscopic disc surgery and Endoscopic procedures does not require courses of instruction to develop a learning curve[20] or costly setup and instruments.[27] Results, in terms of overall success rate and morbidity are found to be comparable to such sophisticated procedures and this simple technique causes very less blood loss, less tissue damage and only a day in the hospital.

MATERIAL AND METHODS

This study was conducted at the Department of Neurosurgery, Combined Military Hospital Lahore (800-bedded tertiary care hospital), and Combined Military Hospital Rawalpindi (900 bedded tertiary care, teaching hospital), from May 2002 to Dec 2006. A total of 520 patients who underwent lumbar discectomy were studied

Only patients with clinically symptomatic posterolateral disc prolapse were included in the study.

The patients with symptoms of neurogenic claudication, patients with multiple herniated discs and previously operated lumbar discs cases were excluded from this study. Obese patients, in whom small incision was not possible, were also not included in this study. The indication for surgery was defined according to present day standards based on radicular pain and existing neurological deficits.[31] 372 patients had received a mean of 8 weeks of conservative treatment.

Surgical Technique

Under general anesthesia, the patients were placed in **lateral position** with **painful side up** and hips and knees **flexed**. Before the induction of anesthesia, the patients were always asked to indicate the painful leg. All patients had their discs removed through a small (about 2.0 cm or less) skin incision at the appropriate level. Level of disc lesion was determined clinically by taking L5 spinous process and superior margin of sacroiliac joint as the reference points. Peroperatively fluoroscopy was used to confirm the level in doubtful cases. **Fibreoptic headlight** and 2.5x operating loupes were used in all the cases. The **fibreoptic lighting** was helpful not only in providing dependable illumination to the depths of the incision but also in eliminating the technical necessity for longer incision. The magnification provided by the operating loupes aided greatly in ensuring delicate handling of tissues and helped prevent nerve root damage. Retraction of paravertebral muscles was achieved with **Lagenbech retractor** hand-held by the **assistant** standing on opposite side. At L4/5 level (257 cases), excision of ligamentum flavum, a small inferior partial laminectomy and if necessary medial facetectomy (only in congenitally narrow spinal canals) were performed using Kerrison rongeurs, whereas at L5/S1 level, in majority of cases (209/250) only the lateral part of ligamentum flavum was excised. Reduced trauma to ligamentum flavum also has certain definite advantages.[38] The nerve root and disc space were identified and a window was cut in annulus fibrosis. Nerve root retraction was done by fine tipped low pressure suction. Discectomy was then performed using straight and angled pituitary rongeurs. An attempt was made to remove as much of disc material as possible.[15] A thorough search for loose disc fragments lying in disc space or in spinal canal was

conducted by cranial or caudal movement of tip of Lagenbeck .This maneuver facilitated visualization to a great extent. Disc space was then thoroughly irrigated with normal saline in an attempt not to miss any of such fragments. Lavage fluid in and outflow was almost 150 ml during all the procedures. Intraoperative conversion to a conventional procedure was not required in any case.

Post-operative pain was measured in terms of post-operative requirement for Analgesics. The patients were discharged from the hospital on second postop day. The patients were defined as cured (**successful** operation) who were completely symptom-free after the operation and were able to resume their routine work within four weeks of rest. In addition to general parameters, other information was obtained using Oswestry disability index for low back pain.[32]

RESULTS

A total of 520 patients who underwent lumbar discectomy by this technique were studied. Out of these, 388 were male and 132 were female (male to female ratio of 2.93 to 1). Other demographic characteristics of the patients are given in Table 1.

A total of 520 patients who underwent lumbar discectomy were studied.

Table 1: *Age wise distribution of cases (n = 520).*

Age	Number	%
21 to 30	190	36.5
31 to 40	217	41.7
41 to 50	82	15.7
51 to 60	31	5.9

Only patients with clinically symptomatic posterolateral disc prolapse were included in the study. The duration of pain ranged from 3 months to 2 years. 23 patients were bedridden because of the pain, all the rest were ambulant. 156 patients with uncontrollable pain symptoms or pronounced acute paralysis underwent surgery urgently. (Clinical features/presenting features are summarized in Table 2**.** All patients were investigated with MRI or CT scan of lumbar spine. Only ten patients (1.92%) were investigated with myelography. In 153 (29.42%) cases a CT scan was done whereas 357 (68.6%) patients were investigated with MRI scan. The findings of these investigations are given in Table 3).

Follow-up

After surgery the followup examinations were performed on day 1 (520 patients) and at months 3 (497 patients), 9 (470 patients), 12 (480 patients) and 24 (460 patients). Approximately 90% (88.46%) turned up for followup, most all of them were from Armed Forces, for whom health facilities are free in both the hospitals.

Table 2: *Clinical Presentation.*

Symptoms & Signs	No. of Patients	% Age
Backache	307	59.03
Leg pain	489	94.03
Numbness/hypoesthesia	148	28.4
Weakness/motor deficit	47	9.03
Straight leg raising	503	96.7
Depressed ankle jerk	207	39.80

Table 3: *Level and side of herniated disc.*

Level	N	%
L 3 – 4	13	2.5
L 4 – 5	257	49.42
L 5 - S1	250	48.07

Table 4: *Side.*

Left	281	54.03%
Right	239	45.09%

Peroperatively it was found that 51patients had sequestrated discs, 131 had ruptured discs and 334 patients had prolapsed discs. A hard disc was found in 4 cases. Overall success rate was 93.8%. 80%) required no post-operative analgesics. The hospital stay was 1-2 days.

Analysis of result showed no dependence on age, sex, height, weight or concomitant diseases. The operating time varied from 33 to 50 minutes. There was no measureable blood loss or serious complications as postop bleeding or operation relating deaths. Mobilization was immediate and no rehabilitation measures were required except in patients with preoperative paresis.

The most common complications was recurrent sciatica (5.0%) within six to eight months after a pain free interval. These were serving soldiers who became symptomatic probably because of exposure to physical exertion in Forces setup. These patients underwent reoperations with same technique. Other complications (Table 5) encountered were operation on wrong level (3.18%), discitis (1.7%), failed back syndrome (2.27%), nerve root injury (0.83%) and dural tear (0.83%). After one year of follow up, 484 (93.18%) patients out of 520 had shown good results and were back to their jobs. The **unsatisfied patients** were those with **failed back surgery syndrome** and patients who had motor deficit as presentation (47 patients). Out of these 47, weakness in 31 patients improved to a considerable extent with physiotherapy, but no improvement was noted in the remaining. Other series report a worthwhile postoperative result in 88 to 96% of patients.[3,6]

Table 5: *Complications.*

Complications	No. of Patients	% Age
Wrong level operated	7	1.34
Recurrence	29	5.57
Discitis	4	0.76
Dural tear	1	0.19
Failed back syndrome	12	2.30
Nerve root injury	1	0.19

DISCUSSION

Lumbar disc herniation is a major cause of morbidity, disability and limitation of activity in Armed Forces as it is in rest of society. It is a significant medical and social problem. Upto five percent of male population and about three percent of females in 3rd and 4th decades will at sometime during lifetime experience sciatica (9). Most of operative load of a neurosurgeon in Defense Forces is disc surgery especially of lumbosacral disc lesions. In this study, most patients were serving soldiers, their families and some civilians, in their 3rd and 4th decades of life. This age corresponds to other studies in literature[1].

According to Hardy and Davis[2], sex incidence is equal in both sexes but in this study male to female ratio was 2.9 to 1. This difference in sex incidence could be due to our peculiar social setup where women don't come to hospital for treatment and their illnesses are ignored. 257 (49.42%) of our patients had HIVD at L4/5 level and 250 (48.07%) had at L5/S1level. Only 13 patients (2.5%) had disc herniation at L3/4 level. This incidence is almost same as that reported by Richard et al[1] and Davis[3].

In symptomatic lumbar disc prolapse aim of treatment is a successful conservative procedure. However when this modality is exhausted surgery may deem necessary.

The goal of surgical treatment of herniated lumbar discs is sufficient decompression with minimization of operation–induced trauma and its after-effects.[19] This study shows that manual retraction with Lagenbeck is a minimally invasive alternate to conventional surgery with its results almost comparable to most modern endoscopic procedures. Resection of spinal canal structures is avoided or the extent is reduced, thus minimally traumatic disc resection, as by this procedure, appears capable of reducing op induced segmental instability.[33]

Operative time, tissue trauma and complications are reduced compared with conventional procedures.[34] A patient's preop activity level is regained.[35] There is no surgery induced aggravation of symptoms which is consistent with other minimally invasive procedures in vogue.[36]

Complications

One of complications in this study was **operating at wrong level**. This factor is not as trivial as it first appears, even with the best of intentions and care. This may be due to anomalies in the spine such as sacralization of 5th lumbar body or presence of eleven ribs. All 7 (1.34%) patients who were operated at wrong level did not have any relief from their pain and it was apparent immediately after the operation.

Elasticity of skin along with distortion caused by lumbar flexion during surgery was probably the contributing factor to surgery at wrong level. After confirmation of surgery at wrong level by CT scan of spine, all patients were re-operated at very next list and their pain was relieved. The incidence of this

complication has not been reported much in literature and can be prevented by confirming appropriate level by inserting a spinal needle placed near the tip of a spinous process and carrying out intra-operative lateral x-ray. Other measures are methylene blue injection at required operated site and preoperative x-rays. If a myelogram has been performed lumbar puncture mark on the skin can also be used as a landmark for spinal level. As the fluoroscope is now-a-days commonly available in good setups this error can easily be overcome by availing this facility.

Four of our patients (0.76%) developed **discitis**. All had fairly typical presentation i.e. severe low backache starting after 2-3 weeks of operation with raised erythrocyte sedimentation rate, C-reactive protein and destruction of bones on x-rays. They settled on conservative treatment with prolonged bed rest, antibiotics and analgesics. In most other series incidence of discitis reported is less than 1%, but in one series it was 3%.[4]

Proper illumination and visualization of the tissues and careful use of Kerrison rongeurs can prevent **dural tears and nerve root injury**. In this study there was one case of nerve root injury (0.19%) and one (0.19%) that of dural tear. The rate of nerve root injury in other series varies from 1 to 3.3%[6,7] and that of dural tear is 2.5% to 3.2%.[5,16]

Most common complication in this study was **recurrent symptoms** which developed in 29 (5.57%) of the patients. Others authors report this incidence to be about 10%[8,9] 14%[17] and 21%.[15] Four patients (0.07%) who developed symptoms in the same leg were treated conservatively and improved. Seven patients (0.13%) developed symptoms in the opposite leg, were re-investigated with MRI, discectomy performed at the same level on contra lateral side and the patients improved after the operation. Because of minimally invasive nature of initial surgery, during revision procedures only slight scarring was found in the spinal canal which was neither more difficult to excise nor required longer operative time.[37]

Twelve patients (2.30%) developed **failed back syndrome**. The patients with operation at wrong level, patients with recurrent symptoms who improved later on and patients with discitis were not included in this group. Probably the protruding dics was not the cause of symptoms in this group.

Failed back syndrome have been shown to be increased in compensation cases, in cigarette smokers and in above 40 patients.[12] In over 50% of cases a psychological or behavioral dysfunction can be noted. Other causes of this syndrome are lateral spinal stenosis, recurrent disc herniation, adhesive arachnoiditis, epidural fibrosis, chronic mechanical pain, nerve injury during surgery and extra foraminal HIVD.[10-12] A steep increase of number of performed spinal procedures has also led to an increase in the number of failed back syndrome .The exact incidence of this syndrome is unknown but available data indicates an occurrence rate in 5-50% of cases.[18] More recently Facet joint syndrome is being implicated as a cause of persistent low backache after discectomy. The tissue damage after surgery or inflammation is likely to cause release of the contents of the joint which affect the nerve endings in these joints.[39]

CONCLUSION

Rapid technical advancements of last two decades have made minimally invasive surgery possible. Core to the concept of this surgery is the reduction of iatrogenically induced injury while achieving the goals of procedure. For most minimally invasive surgeries, however, long term prospective controlled data are still lacking. Moreover use of new technology requires a new learning curve which may be discomforting for many surgeons. Special skills may be needed that are beyond those of traditional open surgery, putting aside the cost and availability of sophisticated instruments.

Keeping all these facts in mind, technique adopted in this study is very simple and requires no special instruments. It offers following advantages: cost effective procedure, good illumination, short operating time, reduced anatomical trauma, less bleeding, low rates of second surgery, facilitation of revision surgery, minimal hospitalization and quick rehabilitation time resulting into high patient satisfaction.

Proper patient selection is a key to successful surgical treatment in lumbar disc lesions.

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