Endoscopically assisted treatment of Lumbar disc prolapse-

Microendoscopic discectomy

Dissertation

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CERTIFICATE

This is to certify that the dissertation titled **"Endoscopically assisted treatment of Lumbar disc prolapse- Microendoscopic discectomy**" of **Dr. M. KODEESWARAN** in partial fulfillment of the requirements for **M.Ch. Branch – II (Neurosurgery)** Examination of the Tamilnadu Dr. M.G.R. Medical University to be held in August 2008. The period of study was from July 2003 to July 2008.

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DECLARATION

I, **Dr. M.KODEESWARAN** solemnly declare that dissertation titled, **"Endoscopically assisted treatment of Lumbar disc prolapse- Microendoscopic discectomy"** is a bonafide work done by me at Govt. Stanley Medical College & Hospital during July 2003- July 2008 under the guidance and supervision of **Prof. K. DEIVEEGAN, M.S., M.Ch. (Neuro)** Professor and Head, Department of Neurosurgery.

The dissertation is submitted to Tamilnadu, Dr. M.G.R. Medical University, towards partial fulfillment of requirement for the award of **M.Ch. Neurosurgery (Branch – II).**

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CONTENTS

Endoscopically assisted treatment of Lumbar disc prolapse- Microendoscopic discectomy

Aim:

To compare the results of Microendoscopic discectomy done at Stanley Medical College for the past 3 years with the other published series.

Introduction:

The first Surgery for lumbar disc herniation was performed by Oppenheim and Kruse (1909). Mixter and Barr performed laminectomy and removed the disc via the transdural approach. Love introduced the intralaminal–extradural approach for discectomy between 1937 and 1939. Caspar and Ya*s*argil introduced microsurgery for lumbar disc disease in 1977[(22)] .

Percutaneous lumbar nucleotomy as a minimally invasive procedure for lumbar disc herniation was first reported in 1975.Subsequently, percutaneous lumbar disc surgery evolved including percutaneous nucleotomy using automated disc removal devices, spinal endoscopy, and laser. These procedures used posterolateral or para-foraminal approach, and the indications for these procedures have been limited to contained lumbar disc herniations. Furthermore, they have not proven to be as effective as standard open lumbar discectomy, because of longer duration of surgery and

some technical problems in addressing all the different aspects of lumbar disc disease.

Microendoscopic discectomy was introduced by Smith and Foley in 1997[6]. This was done using tubular retractor system and endoscope. The muscle retracting posterior approach reduces the approach site comorbidity and the endoscope may yield visualization beyond the confines of the tubular retractor. Many surgeons prefer the METRx -MD system (Medtronic Sofamor Danek, Memphis TN) which allows the surgeons to operate under direct vision through the microscope. However, once this endoscopic technique is mastered, the modularity of the MED system allows for the development of expanded applications beyond lumbar nerve root decompression.

Microendoscopic discectomy is one of the minimally invasive procedures for lumbar disc surgery. This method is characterized by using a tubular retractor system and unique visualization through an endoscope. The tubular retractor system allows reduced tissue or muscle trauma, and the endoscope can provide a clear and wide visualization of the operative field beyond the confines of the tubular retractor. However, there is a steep

learning curve associated with using the endoscopic operating system efficiently and safely.

We have been doing regular laminectomy and discectomy for all kinds of lumbar disc prolapse, subsequently when the disc prolapse was on one side with the symptoms and signs presenting towards the same side our surgery was refined to one side muscle dissection and followed by hemilaminectomy and discectomy. Subsequent development in microneursurgery made our incision smaller in size followed by fenestration / microdiscectomy using microscope. With the advent of endoscope in surgical fields we were able to use this endoscope effectively in removing the disc.

The use of endoscope allows the same access port and the same surgical technique to be used on the vertebral canal and disc while at the same time reducing the skin incision and overall access port. The advantages of this technique are the same as those for microdiscectomy but early return to previous activity, reduced size of incision, reduced hospital stay are an added features.

We have done 40 cases of Microendoscopic discectomy and we have compared our results with the other published series.

Review of literature:

Wu X et al[1] conducted a retrospective review involving 873 consecutive cases of lumbar disc herniation treated by Microendoscopic discectomy (MED) with mean follow up of 28-months. In this study they have described the MED technique for lumbar disc herniation and reported long-term outcome and complications. A total of 873 consecutive patients with lumbar disc herniation were treated with the METRx system. Oswestry Disability Index (ODI) was used to quantify pain relief. The degree of pain and disability was also measured by visual analog scale (VAS) and modified Macnab's criteria. A control group of 358 patients treated with standard open discectomy was used for comparison. The average length of hospital stay for the MED group and control group was 4.8 and 7.3 days, including the time of short-term postoperative rehabilitation. The mean time to return to work or normal activities was 15 days for the MED group and 21 days for the control group ($P < 0.05$), except for those who still had leg or low back pain. The mean operative time for every level of MED procedure was 56 minutes, which was slightly shorter than the 66-minute mean operative time for the open control group ($P > 0.1$). The average operative blood loss per level operated on was 44 mL for the MED group and 135 mL for the control group ($P < 0.001$). No patients in the MED group required intraoperative or

postoperative blood transfusions; however, 4 patients in the control group received 1 Unit packed red blood cells each. A total of 157 (18%) MED patients and 132 (37%) control patients used analgesic medications mainly because of incision pain during the first one or two postoperative hospital stays.

With a mean follow-up of 28 months for the MED group and 31 months for the control group, 821 MED patients (94%) and 350 control patients (98%) were interviewed at that time. For the MED patients, sciatica had totally disappeared or markedly diminished in 649 (79%) patients. In 16 (2%) patients, sciatica had remained unchanged and worsened in 25 (3%) patients. Concurrently, low back pain recovered completely in 624 (76%) patients and markedly diminished in 112 (14%) patients. However, 57 (7%) patients still had leg and low back pain. Among the control patients, 72% reported complete or obvious resolution of sciatica, remained unchanged in 4%, and worsened in 5%. As to low back pain, 69% of the control patients recovered completely, 9% markedly diminished, and 8% remained unchanged.

Wu X et al, evaluated the pain relief by the VAS, during the follow-up which was statistically significant. For the MED group, the mean values of

the preoperative and postoperative VAS for all 821 patients were 78 ± 20 and 23 ± 19, respectively ($P < 0.005$). The postoperative VAS for patients having returned to work was 19 ± 12 and 74 ± 18 for patients having lost their ability to work. For the control group, the change of VAS was also statistically significant.

Wu X et al has reported that there was significant improvement in the mean preoperative and postoperative Oswestry score for the MED and open groups of patients. The mean postoperative ODI for all 821 MED patients was 23% ± 16%, compared with 48% ± 23% before surgery . The mean ODI for the patients having returned to work was 13% ± 12%, as compared with a significantly higher index 43% ± 25% for those having lost their ability to work. The mean postoperative ODI of open group was 21% ± 18%, compared with 52% ± 26% before surgery. The mean ODI for the patients having returned to work was 16% ± 12%, as compared with a significantly higher index 48% ± 24% for those having lost their ability to work. There was no statistical difference of the pain improvement measured with a visual analog scale, ODI between the two groups.

They have also reported that according to the modified Macnab's criteria, 74% of the MED patients had excellent outcomes, 19% good, 3%

fair, and 4% poor. For the control patients, 70% had excellent outcomes, 20% good, 5% fair, and 5% poor. If the excellent and good categories were regarded as success and fair and poor as failures, the total success rate of the MED group and open group was 93% and 90%, respectively. There was no difference between the two groups ($P > 0.05$). Those with successful result had significant higher ODI and VAS than those with failed result .

The authors reported that there were 35 (4.0%) cases of significant medical complications in the MED group and 19 (5.3%) cases of such complications in the control group. There were 3 acute hematomas of the sacrospinalis in MED group and 3 in the open group. There were 14 cases of dural tears in MED group and 8 cases in the open group. Two MED patients had acute gastritis. There were 7 cases in the MED group and 3 in the open group with acute urinary retention. Four MED patients and 2 open patients had superficial wound infection. There were 5 cases in the MED group and 3 in the open group with discitis.

The authors reported that during the follow-up period, 20 (2.4%) MED patients required reoperation. 6 patients returned with recurrent herniated discs, which were treated with a repeat MED procedure. In addition, 2 patients were operated on for a disc herniation at another level.

Ten patients were performed intervertebral fusion for segmental instability or displacement. Open surgery and intervertebral fusion were also required for 2 patients with lumbar stenosis involving several segments after MED procedure. The mean duration between the original operation and reoperation was 1.5 years (range, 5 months to 3 years).

Wu X et al , has reported that the operative time of early groups of 220 cases for every disc was 75 ± 26 minutes, whereas in late groups (653 cases) the operative time was 49 ± 21 minutes. The mean blood loss for the early groups was 72 ± 34 mL, compared with the mean blood loss for the late groups of 35 ± 18 mL. There were 15 complications in early groups, including 8 dural tears, 2 acute hematomas of the sacrospinalis, 2 acute urinary retentions, 1 superficial wound infections and 2 discitis. Twenty complications were found in late groups, including 6 dural tears, 1 acute hematoma of the sacrospinalis muscle, 2 acute gastritis, 5 acute urinary retention, 3 superficial wound infection, and 3 discitis. Postoperative mean VAS was 25 ± 19 for early the groups and 22 ± 17 for the late groups ($P > 0.05$). Postoperative mean ODI was 26% ± 18% for the early groups and 22% ± 15% for the late groups ($P > 0.05$)

Wu X et al, concluded that MED is an effective Microendoscopic system with fine long-term outcome in treating lumbar disc herniation. The endoscopic approach allows smaller incisions and less tissue trauma, compared with standard open microdiscectomy. Strict adherence to well-defined preoperative selection criteria could ensure optimal postoperative outcome.

Perez-Cruet MJ et al [(2)], Reported a series of 150 consecutive patients who underwent MED. MED is performed by a muscle-splitting approach using a series of tubular dilators with consecutively increasing diameters. A tubular retractor is then inserted over the final dilator, and a specially designed endoscope is placed inside the tubular retractor. The micro discectomy was performed endoscopically while the surgeon views the procedure on a video monitor.

They assessed the outcome using the modified Macnab's criteria, which revealed that 77% of patients had excellent, 17% had good, 3% had fair, and 3% had poor outcomes. The average hospital stay was 7.7 hours. The average return to work period was 17 days. Complications primarily included dural tears, which occurred in 8 patients (5%) and were seen in the early series. Complication rates diminished as the surgeon's experience with this technique increased.

They concluded that MED for lumbar herniated disc disease can be performed safely and effectively, resulting in a shortened hospital stay and faster return to work; however, there is a learning curve to this procedure.

Nakagawa H et al [3], reviewed 30 patients who underwent MED and compared their outcome with that of patients subjected to the conventional method. Laboratory data suggested that MED was a less invasive surgery. Moreover, MED allowed an early return to work. However, the difficulties of this endoscopic procedure were evident, because of the limited exposure and two-dimensional video display. The potential injury of the nerve root and prolonged surgical time remain as matters of serious concern. To overcome this problem, Nakagawa H et al, used an operative magnifying glass during surgery and this helped him to accomplish the procedure comfortably. Nakagawa H et al, recommend the use of an operative magnifying glass in the early stage of the introduction of MED, for it is quite useful to identify the three-dimensional relationships of the structures.

Nowitzke AM et al[4] has reported that an understanding of the learning curve of a new surgical procedure is essential for its safe clinical integration, teaching, and assessment. This knowledge is currently deficient for lumbar Microndoscopic discectomy (MED). His article aims to profile the learning curve for MED of an individual surgeon in a hospital not

previously exposed to this procedure. In his series the first 35 cases of MED for posterolateral lumbar disc prolapse causing radiculopathy performed at the Princess Alexandra Hospital, Brisbane, Australia, were studied prospectively. The learning curve was assessed using surgery time, conversion rate, complication rate, surgeon "comfort," and key learning steps. The duration of surgical operating time decreased over the course of the study, initially rapidly and then more gradually. There were three conversions to open discectomy in the first 7 cases and none in the next 28 cases. The complexity of cases increased over the series, and the complication rate decreased. The asymptote of the learning curve seems to be approximately 30 cases. The specific learning tasks of MED include lateral lamina radiology, scope vision, visuospatial orientation, smaller field of view, angle of approach and tube position, and care and handling of endoscope equipment.

They concluded that a learning curve for MED has been demonstrated. Further assessment of this curve for a population of surgeons is necessary before a clinical assessment of open discectomy versus MED can be embarked upon.

Ruetten S et al[5] conducted a prospective, randomized, controlled study of patients with lumbar disc herniations, operated either in a full-

endoscopic or microsurgical technique. They Compared the results of lumbar discectomies by endoscopic interlaminar and transforaminal technique with the conventional microsurgical technique. In their study one hundred seventy-eight patients with full-endoscopic or microsurgical discectomy underwent follow-up for 2 years. In addition to general and specific parameters, the following measuring instruments were used: VAS, German version North American Spine Society Instrument, Oswestry Low-Back Pain Disability Questionnaire. After surgery 82% of the patients no longer had leg pain, and 14% had occasional pain. The clinical results were the same in both groups. The recurrence rate was 6.2% with no difference between the groups. The endoscopic techniques brought significant advantages in the following areas: back pain, rehabilitation, complications, and traumatization. They concluded that the clinical results of the endoscopic technique are equal to those of the microsurgical technique. At the same time, there are advantages in the operating technique with reduced traumatization. With the surgical devices and the possibility of selecting an interlaminar or posterolateral to lateral transforaminal procedure, lumbar disc herniations outside and inside the spinal canal can be sufficiently removed using the endoscopic technique, when taking the appropriate criteria into account. Endoscopic surgery is a sufficient and safe

supplementation and alternative to microsurgical procedures.

Ranjan A et al[6], has reported that the technique, outcome and complications seen in 107 cases of prolapsed lumbar intervertebral disc who underwent MED and the data was collected prospectively between November 2002 and January 2006 .The METRx system (Medtronic Sofamor Danek, Memphis,TN) was used to perform MED. Outcome assessment was done by the modified Macnab's criteria. 107 patients (67 males, 40 females) underwent MED for prolapsed lumbar intervertebral disc. Follow up ranged from 2 to 40 months with a mean follow up of 12.9 months. Seventy six patients had an excellent outcome, 22 patients had a good outcome, 5 patients had a fair outcome and 3 patients had a poor outcome. One patient with a long dural tear required conversion to a standard microdiscectomy and was excluded from outcome assessment. Complications included dural puncture with K-wire (1), dural tear (2), superficial wound infection (1), discitis (1) and recurrent disc prolapse (2). The authors concluded Microendoscopic discectomy (MED) is a safe and effective procedure for the treatment of prolapsed lumbar intervertebral disc.

They reported some technical points in MED. They are

a.For a proper disc removal, it is imperative that the tubular retractor is placed parallel to the disc space. Hence if a two level discectomy is being

attempted, it is incorrect to angle the tubular retractor to reach the disc space. Instead the skin incision has to be extended to the appropriate level and the tubular retractor is placed parallel to the disc space being operated. That is the only way to enter the disc spaces to remove disc fragments.

b. It is possible to do a good ligamentous and bony decompression of the contralateral nerve root by angulating the tubular retractor. However, it is dangerous to approach the contralateral disc space as the contralateral nerve root can get injured.

c. A point dural puncture can be left alone as the muscle splitting technique allows the muscle to approximate and CSF leak is not a problem.

d. An intra-operative X-ray using the C-arm is mandatory. A lateral view of the lumbar spine is sufficient.

e. In the early stages of learning, it is helpful to use the operating microscope with a 350 mm lens to visualize the structures through the tubular retractor and even do the full surgery.

f. It is possible to remove a central disc prolapse by introducing two tubular retractors simultaneously, but is technically more demanding and time consuming. Standard microdiscectomy remains the standard for

treating a central disc herniation.

g. Fogging of the lens, especially if bipolar is being used and occasional blood stain over the lens, can impair the vision and requires frequent cleaning. Instead of removing it time and again for cleaning, a good result can be obtained by warm saline irrigation in the operating port.

h. The METRx set can be autoclaved. However, it is found that at times moisture enters the system from inside. This can be removed by focusing the endoscopic light source over the lens. The heat generated cleans the lens.

Nakagawa Y et al[(7)], reported a retrospective chart view in patients who underwent posterior MED from September 1998 to December 2003. A total of 402 consecutive patients (262 males and 140 females, mean age was 37.9±14.9 years) were included. There were 386 cases of lumbar disc herniations and 16 cases of posterior osseous endplate lesions. He assessed the clinical outcome using Japanese Orthopedic Association scoring system for lumbar disease (JOA score) [7] , with an average of 2-years follow-up after surgery. Perioperative complications, frequency of revision surgery, operation time and blood loss were also investigated.

Nakagawa Y et al has reported that JOA score in lumbar disc herniation patients improved from 13.4 ± 5.1 preoperatively to 26.3 ± 3.1 postoperatively, and 27.6 ± 2.2 at the final follow-up (mean 2 years). With regard to posterior osseous endplate lesions, JOA score also recuperated from 16.9 ± 3.6 preoperatively to 27.1 ± 2.3 postoperatively, and 28.2 ± 1.6 at the final follow-up. Mean operating time was 95.3 minutes and mean blood loss was 67.5 ml. There was no case of permanent neural injury, but perioperative complications occurred in 16 cases (4.0%), including 6 dural tears, 3 misjudgements of operative site (wrong level), 4 epidural hematomas, 1 pyogenic spondylitis and 2 transient muscle weaknesses. Revision surgeries were performed in 12 cases (3%) and consisted of 9 recurrences of disc herniations, 2 epidural hematomas and 1 inadequate decompression. They have reported that the surgical skill had been established after completing 30 cases . Furthermore, operating time and blood loss in the last 30 cases were significantly less than those of the first 30 cases.

Nakagawa Y et al has reported that MED is an excellent technique which could replace a conventional open procedure if the learning curve could be overcome. Minimally invasive surgery including MED provides manifold benefits such as a small skin incision, reduced postoperative pain,

shorter hospital stay, faster mobilization, shorter rehabilitation, reducing pain medication usage and antibiotics, quick recovery to daily life or work, and so on. Moreover, the endoscope allows the surgeon to obtain more wide visualization through the oblique lens, so it can be possible to operate in the field beyond the confines of the tubular retractor. Additionally, the ability to get the endoscope close to the neural tissue pathology provides the surgeon with a clearer view. The 3CCD camera head also contributes to the improvement of image quality, which allows surgeons to facilitate the MED technique to more difficult pathologies. The first generation MED system could not provide such a clear image due to its disposable, one-tip camera head. This fact is one of the reasons that many surgeons gave up the MED system, and the MED system had not been in widespread use. However, the progress of the image quality has changed the situation. The versatility of this technique was seen in its ability to treat various lumbar disc pathologies including far lateral disc herniations, concomitant lateral recess stenosis, and noncontained disc herniation. With regard to clinical outcomes, our mid-term results are equivalent to open procedures.

Nakagawa Y et al pointed out that the endoscopic procedure has a steep learning curve. Most complications in this series were encountered in the early learning period. MED procedure can be applied to other spine

pathology and decompression surgery such as far lateral disc herniation, spinal stenosis, cervical radiculopathy or cervical myelopathy. To achieve safe and effective operation, it is crucial to master the MED technique in the first place and then apply to other pathologies.

Nakagawa Y et al has concluded that the MED system is a safe and effective method for surgical management of lumbar disc diseases. However, because there is a learning curve, it is advisable to start with herniated free fragments in younger patients, and only later treat older patients with bony and ligamentous pathology associated with disc herniation. The MED procedure will be able to become the new gold standard for lumbar disc surgery in the near future.

Sasaoka R et al [8], has reported that Microendoscopic discectomy (MED) has been accepted as a minimally invasive procedure for lumbar discectomy because of the small skin incision and short hospital stay required for this surgery. However, there are few objective laboratory data to confirm the reduced systemic responses in the early phase after this procedure. In order to substantiate the reduced invasiveness of MED compared to microdiscectomy (MD) or procedures involved in one-level unilateral laminotomy, the invasiveness of each surgical procedure was

evaluated by measuring serum levels of biochemical parameters reflective of a post-operative inflammatory reaction and damage to the paravertebral muscles. Thirty-three patients who underwent lumbar discectomy or one-level unilateral laminotomy (MED in 15 cases, MD in 11 cases and one-level unilateral laminotomy in 7 cases with lumbar spinal canal stenosis) were included in this study. The serum levels of C-reactive protein (CRP) and creatine phosphokinase (CPK) were measured at 24 h after operation. Interleukin-6 (IL-6) and Interleukin-10 (IL-10) were measured at 2, 4, 8 and -24 h following the surgery to monitor the inflammatory response to the respective surgery. The post-operative serum CRP levels from both the MD and MED groups were significantly lower than those from the open laminotomy group. However, there was no significant difference in these serum levels between the MED and MD groups. The levels of IL-6 and IL-10 in the MED group during the first post-operative day were also significantly lower than those in the laminotomy group. When the MED and MD groups were compared, the IL-6 levels in the MED group were lower than in MD group at 2, 4 and 8 h after surgery, but the differences were not statistically significant. However, the level was significantly lower in the MED group at 24 h after surgery. In terms of IL-10, no significant difference was noted between the MED and MD groups over the study period. The

changes in serum levels of post-operative inflammatory: markers (CRP, IL-6 and IL-10) in the early phase indicated reduced inflammatory reactions in MED as well as in MD when compared with classical open unilateral laminotomy. These data draw a direct link between the lower level of the inflammatory response and reduced invasiveness of MED. However, an indicator for muscle damage (CPK) appeared not to be affected by the type of surgical procedure used to correct disc herniation.

Chao Z et al[9] , has investigated the change of serum levels of interleukin-6 (IL-6), C-reactive protein (CRP) and creatine kinase (CK) in patients undergoing Microendoscopic discectomy (MED) and open discectomy. Forty-four patients with single level lumbar disc herniation were treated, either by MED (Group A, n equal to 22) or open discectomy (Group B, n equal to 22). Peripheral venous blood samples were taken before surgery and at 24 and 48 hours postoperatively. The operating time, intraoperative blood loss, postoperative hospital stay were recorded. The pain severity of incision was evaluated by visual analog scale after operation and the clinical outcome was evaluated by Oswestry disability index. Statistical comparison was performed by the analysis of variance and Student's t test. The data showed that patients in Group A had a less intraoperative blood loss ($P < 0.05$), shorter operating length ($P < 0.05$),

shorter postoperative hospital stay (P < 0.05) and less postoperative pain of incision than those in Group B. Serum levels of IL-6 (mean, 31.60 ng/L +/- 9.88 ng/L vs 39.16 ng/L +/- 11.14 ng/L, P < 0.05) and CK (mean, 167.91 U/ L +/- 51.85 U/L vs 401.55 U/L +/- 108.86 U/L, P < 0.05) all get to the peak at 24 hours after operation and Group A with the response statistically less than Group B. Serum level of CRP peaked at 24 hours in Group A (mean, 12.68 mg/L +/- 7.10 mg/L vs 20.82 mg/L +/- 8.79 mg/L, P less than 0.05)and peaked at 48 hours after surgery in Group B (mean, 10.77 mg/L +/- 5.25 mg/L vs 29.95 mg/L +/- 14.85 mg/L, P < 0.05). The clinical outcomes of both groups were the same at 6 months after surgery. They concluded that both MED and open discectomy have made good clinical outcomes, however, the less change of IL-6, CRP and CK after surgery proves that MED procedure is less traumatic to patients than open discectomy.

Zhang C et al [(10)] ,compared the traumatic responses following Microendoscopic discectomy (MED) and open discectomy. Forty-four patients with single level lumbar disc herniation underwent MED (Group A, n = 22) or open discectomy (Group B, n = 22). The intra-operative blood loss, duration of surgery, intra-operative blood loss, and post-operational hospital stay were noted and the pain severity of incision was evaluated by visual analog scale (VAS). Serum levels of IL-6, C-reactive protein (CRP)

and creatine kinase (CK) were measured before operation and 24 h and 48 h after operation. The clinical outcomes were evaluated by Oswestry disability index (ODI) before operation and 6 months after operation. The intra-operative blood loss of Group A was 47.50 +/- 11.62 ml, significantly less than that of Group B (129.11 +/- 71.75 ml, $P < 0.01$), the duration of operation of Group A was 64.77 +/- 17.83, significantly shorter than that of Group B (78.18 +/- 24.32, $P < 0.05$). The postoperative hospital stay of Group A was 6.09 +/- 2.22 days, significantly shorter than that of Group B (8.73 +/- 3.53, $P < 0.01$). The scores of VAS 1, 2, and 3 days after the operation were all significantly lower than those of Group B (all $P < 0.001$). The rate of remarkable symptomatic improvement of Group A was 94.7%, not significantly different from that of Group B (94.4%, $P > 0.05$) The serum IL-6 showed no significant difference between these 2 groups pre-operationally, and peaked 24 h after operation and decreased 48 h after operation in both groups, returning to the pre-operational level in Group A. The IL-6 level 24 h and 48 h post-operatively of Group A was 31.6 +/- 9.88 pg/ml and 26.25 +/- 9.30 pg/ml respectively, both significantly lower than those of Group B (39.16 +/- 11.14 pg/ml and 32.55 +/- 8.83 pg/ml respectively, both $P < 0.05$) The serum CK showed no significant difference between these 2 groups pre-operatively, and peaked 24 h after operation and

decreased 48 h after operation, but still higher than those before operation, in both groups. The serum CK 24 h and 48 h after operation of Group A were 167.91 +/- 51.85 and 131.50 +/- 52.70 U/L respectively, both significantly lower than those of Group B (401.55 +/- 108.86 and 260.32 +/- 64.98 U/L, both $P < 0.01$). The serum CRP level showed no significant difference between these 2 groups pre-operationally, and increased post-operationally, peaked 24 h after operation and then decreased in Group A, however, continued to increase in Group B. The serum levels of CRP 24 h and 48 h post-operationally of Group A were 12.68 +/- 7.10 and 10.77 +/- 5.25 pg/ml, both significantly lower than those of Group B (20.82 +/- 8.79 and 29.95 +/- 14.85 pg/ml, both $P < 0.01$). The clinical outcomes 6 months after operation of these two groups were all satisfying. They concluded that both MED and open discectomy show good clinical outcomes in treatment of single level lumbar disk herniation, however, the less responses of serum IL-6, CRP, and CK show that the MED procedure is less traumatic.

Huang TJ et al [11] ,has reported the magnitude of the tissue damage from surgery. This is proportional to the severity of surgical stress. Systemic cytokines are recognized as markers of postoperative tissue trauma. Microendoscopic discectomy (MED) recently has become popular for treating lumbar disc herniations, and is associated with favorable clinical

outcomes compared with open discectomy (OD). This study postulates that MED is a less traumatic procedure, and therefore has a lower surgical stress response compared to OD. In this study, a quantitative comparison of the overall effects of surgical trauma resulting from MED and OD was performed through analyzing patient systemic cytokines response. From April, 2002 to June, 2003, 22 consecutive patients who had symptomatic lumbar disc herniations were prospectively randomized to undergo either intracanalicular MED (N=10) or OD (N=12). In this study, the Vertebroscope System (Zeppelin, Pullach, Germany) was used to perform the endoscopic discectomy procedure in all MED patients. Serum levels of tumor necrosis factor-alpha (TNF-alpha), Interleukin-1beta (IL-1beta), Interleukin-6 (IL-6), and Interleukin-8 (IL-8) were measured before surgery and at 1, 2, 4, 8 and 24h after surgery using an enzyme-linked immunosorbent assay. Serum C-reactive protein (CRP) was measured at the same time interval. The results showed the MED patients had shorter postoperative hospital stay (mean, 3.57+/-0.98 vs. 5.92+/-2.39 days, p=0.025) and less intraoperative blood loss (mean, 87.5+/-69.4 vs. 190+/-115 ml, p=0.042). The operating length, including the set-up time, was longer in the MED group (mean, 109+/-35.9 vs. 72.1+/-17.8 min, p=0.01). The mean size of skin incision made for the MED patients was

1.86+/-0.13 cm (range 1.7-2.0 cm); and 6.3+/-0.98 cm for the OD patients (range 5.5-8 cm), p=0.001. The patients' pain severity of the involved limbs on 10-point Visual Analog Scale before operation in MED group was 7.5+/-0.3 (range 6-9) and 8+/-0.2 (range 7-9) in OD group, p=0.17; and after surgery, 1.5+/-0.2 (range 1-2) in MED group and 1.4+/-0.1 (range 1-3) in OD group, p=0.91. CRP levels peaked at 24h in both groups, and OD patients displayed a significantly greater postoperative rise in serum CRP (mean, 27.78+/-15.02 vs. 13.84+/-6.25mg/l, p=0.026). Concentrations of TNF-alpha, IL-1beta, and IL-8 were detected only sporadically. Serum IL-6 increased less significantly following MED than after OD. In the MED group, IL-6 level peaked 8h after surgery, with the response statistically less than in the open group (mean, 6.27+/-5.96 vs. 17.18+/-11.60 pg/ml, p=0.025). A statistically significant correlation was identified between IL-6 and CRP values (r=0.79). Using the modified MacNab criteria, the clinical outcomes were 90% satisfactory (9/10) in MED patients and 91.6% satisfactory (11/12) in OD patients at a mean 18.9 months (range 10-25) follow-up. Based on the current data, surgical trauma, as reflected by systemic IL-6 and CRP response, was significantly less following MED than following OD. The difference in the systemic cytokine response may support that the MED procedure is less traumatic.

Schick U et al[12] , investigated electromyographic (EMG) activity as a marker of nerve root irritation during two different surgical procedures for lumbar disc herniation. Mechanically elicited EMG activity was recorded during the dynamic stages of surgery in muscle groups innervated by lumbar nerve roots. Confirmation of surgical activity was correlated with the activity of the electromyogram. Fifteen patients with lumbar disc herniations were treated via an endoscopic medial approach, and 15 patients via the open microsurgical technique. Results indicated that the endoscopic technique was superior to the open surgical technique and produced less irritation of the nerve root. Significantly less mechanically elicited activity was recorded during both the approach and the root mobilization. The study showed that Microendoscopic discectomy allows a smaller incision and less tissue trauma with comparable visualization of the nerve structures than does open surgery.

Arts MP et al [13] , has reported that Open discectomy is the standard surgical procedure in the treatment of patients with long-lasting sciatica caused by lumbar disc herniation. Minimally invasive approaches such as microendoscopic discectomy have gained attention in recent years. Reduced tissue trauma allows early ambulation, short hospital stay and quick resumption of daily activities. A comparative cost-effectiveness study has

not been performed yet. Arts MP et al presented the design of a randomized controlled trial on cost-effectiveness of microendoscopic discectomy versus conventional open discectomy in patients with lumbar disc herniation. Patients (age 18-70 years) presenting with sciatica due to lumbar disc herniation lasting more than 6-8 weeks were included. Patients with disc herniation larger than 1/3 of the spinal canal diameter, or disc herniation less than 1/3 of the spinal canal diameter with concomitant lateral recess stenosis or sequestration, were eligible for participation. Randomization into microendoscopic discectomy or conventional unilateral transflaval discectomy would take place in the operating room after induction of anesthesia. The length of skin incision was same in the both groups. The primary outcome measure is the functional assessment of the patient, measured by the Roland Disability Questionnaire for Sciatica, at 8 weeks and 1 year after surgery. They also evaluated several other outcome parameters, including perceived recovery, leg and back pain, incidence of re-operations, complications, serum creatine kinase, quality of life, medical consumption, absenteeism and costs. The study was a randomized prospective multi-institutional trial, in which two surgical techniques were compared in a parallel group design. Patients and research nurses were kept blinded of the allocated treatment during the follow-up period of 2 years.

Arts MP et al has reported that open discectomy is the gold standard in the surgical treatment of lumbar disc herniation. Whether microendoscopic discectomy is more cost-effective than unilateral transflaval discectomy has to be determined by this ongoing trial.

Righesso O et al [14] ,compared the intra- and postoperative differences, as well as the final outcome of patients with herniated lumbar discs who underwent either open discectomy (OD) or microendoscopic discectomy (MED). Righesso O et al performed a prospective controlled randomized study of 40 patients with sciatica caused by lumbar disc herniations non responsive to conservative treatment who underwent OD or MED with a 24-month follow-up period. Pre- and postoperative neurological status, pain, and functional outcome were evaluated. Other studied variables were the duration of the procedure, blood loss, time of hospital stay, and time to return to work. Statistical analysis with a P value less than 0.005 was carried out. Righesso O et al reported that the only statistically significant differences found were for size of the incision, length of hospital stay, and operative time. The former two were greater in the OD group ($P < 0.01$ and $P = 0.05$, respectively), and the latter was greater in the MED group ($P < 0.01$). Righesso O et al has concluded that the few parameters that were found to be statistically significant between the groups did not affect the

overall outcome. In the current series, the final clinical and neurological results were similarly satisfactory in both the OD and the MED groups.

Sasani M et al [15] , has reported that extraforaminal disc herniations represent up to 11% of all lumbar herniated discs. Numerous surgical approaches have been described. Percutaneous endoscopic discectomy (PED) is one of the minimally invasive techniques; after mastering this procedure it is a practical method that is used for treatment of foraminal or extraforaminal disc herniation. The outcome of PED for treatment of foraminal or extraforaminal disc herniation has been studied. A total of 66 patients with foraminal or extraforaminal lumbar disc herniation were treated by applying the PED technique between January 1998 and June 2005. The positions of the herniated disc levels were L2-3 (n=5, 8%), L3-4 (n=19, 28%) and L4-5 (n=42; 64%). The selected patients had no previous surgery, appropriate conservative therapies were done before the surgery, and MRI was the main diagnostic method with the clinical findings. Evaluation of the patients with clinical examinations, visual analogue pain scale (VAS) and Oswestry scale was performed preoperatively, on postoperative day 7 and in the postoperative 6-12 months period. In two patients (n=1, L4-5 and n=1, L3-4) disc material could not be removed with PED, so discectomy was performed with microscopic visualization during

the same session. Three patients (n=3, L4-5) were reoperated on three to six months after primary surgery due to recurring disc problems with microscope visualization. In two patients (n=2, L4-5) roots were partially damaged, and in two patients (n=2, L4-5) roots were impinged by the working channel. These 4 patients had dysesthesias from just after surgery to a mean of 45 days after surgery. One of the recurrent cases was among these patients. Neurological examinations showed minimal muscle weakness of the quadriceps femoris and diminished sensation of the L4 dermatomal area in patients with partial nerve root damage. This patient improved and the neurologic examination became normal with disappearance of the dysesthesia. There was no sign of reflex sympathetic dystrophy (RDS). With these two patients VAS and Oswestry scales scores decreased significantly early in the postoperative follow-up. The postoperative 6-month average scores were favourable in comparison with the average score at postoperative day 7. The postoperative 12-month scores showed no significant differences to those of postoperative month 1. They concluded percutaneous endoscopic discectomy is a minimally invasive method and offers many benefits to the patient, but extensive surgical practice is needed to become a capable surgeon. Consequently this technique can only be a treatment option on appropriate patients. This study reconfirmed that the

removal of fragmented disc material is achieved and offers a pain-free status.

Le H et al[16] , has reported their experience with minimal-access surgical approaches for revision lumbar surgery . During a 7-month period, 10 consecutive patients with recurrent disc herniations underwent revision operations in which microendoscopic discectomy (MED) was performed. Perioperative data and clinical outcomes (according to Macnab's criteria) were compared with those obtained in 25 consecutive patients who underwent routine single-level MED as well as with previously published data. Overall, outcome of the MED-treated revision group was excellent or good in 90% during a mean follow-up period of 18.5 months (minimum 12 months). Operative blood loss, duration, complications, and length of hospital stay were not significantly different between the revision and primary MED-treated groups. Le H et al concluded with his study that equivalent or superior results are obtained when performing MED compared with historical controls in which conventional surgery was conducted for recurrent disc surgery. The procedure appears to be a safe and effective alternative in cases in which recurrent lumbar disc herniation causes radiculopathy.

Isaacs RE et al[17] , has reported that the use of microendoscopic discectomy (MED) for the treatment of primary lumbar disc herniations can be fairly well accepted. Its role in recurrent disc herniations is less clear. The reluctance of many surgeons to use this technique stems, in part, from the concern of undertaking an endoscopic discectomy in a patient in whom the anatomy is distorted from a previous operation. It appears counterintuitive to operate through a limited working area when the traditional open approach for recurrence favors wider exposure of the surgical field. Given that operating on previously exposed tissue can be associated with even greater morbidity than on virginal tissue, the authors describe their experience with performing MED for recurrent disc herniation. Unilateral MED was performed in patients with classic symptoms of lumbar radiculopathy, a previous operation at that level, and findings of recurrent disc herniation on magnetic resonance imaging. The approach was similar to a standard MED. Aided by fluoroscopic guidance, a working cannula was docked on the laminofacet junction at the level of the nerve root, with care taken to ensure a slightly more lateral initial trajectory. A good decompression of the nerve root could then be achieved through the use of the endoscope with preservation of the paraspinous musculature and much of the remaining facet capsule. Ten consecutive patients undergoing the procedure were

analyzed prospectively and compared with the previous 25 who underwent routine single-level MED. Use of the MED technique provided excellent visualization and decompression of the nerve root; no conversions to open procedures were necessary in either group. The average operative time in the experimental group was 98.5 minutes, with a mean blood loss of 33 ml and an approximate hospital stay of 7.3 hours. In this respect, there was no statistical difference between the two groups (analysis of variance, $p = 0.39$, 0.68, and 0.51, respectively). There was one cerebrospinal fluid leak in each group. Isaacs RE et al has concluded that Microendoscopic discectomy for recurrent disc herniation can be safely performed without an increase in surgery related morbidity.

Choi G et al [18] has reported that percutaneous endoscopic transforaminal discectomy is often used as a minimally invasive procedure for lumbar disc herniation. However, a transforaminal approach posts limitations at the L5-S1 level owing to anatomic constraints, such as a high iliac crest or small intervertebral foramen and especially for migrated large intracanalicular disc herniations. They discussed the procedure and clinical results of percutaneous endoscopic interlaminar discectomy using a rigid working channel endoscope at the L5-S1 level. They performed percutaneous endoscopic discectomy through the interlaminar approach in

67 patients who satisfied their inclusion criteria during the period from March 2002 to November 2002. All procedures were performed under local anesthesia. Under fluoroscopic guidance, Choi G et al performed discography using indigo carmine mixed with radio-opaque dye. The 6-mm working channel endoscope was then introduced into the epidural space. Herniated disc material was removed using forceps and laser under clear endoscopic visualization. They retrospectively evaluated the 65 cases with more than 1.5 years of follow-up. The patients were evaluated using the visual analogue scale (VAS) and the Oswestry Disability Index (ODI). VAS for leg pain (preoperative mean, 7.89; postoperative mean, 1.58) and ODI (preoperative mean, 57.43; postoperative mean, 11.52) showed statistically significant (P = 0.00) improvement in their values at the last follow-up examination compared with preoperative scores. Of the study group, 90.8% individuals showed favorable result. The mean hospital stay was 12 hours. The average time to return to work was 6.79 weeks. Complications included two cases of dural injury with cerebrospinal fluid leakage, nine cases of dysesthesia that were transient, and one case of recurrence. Two patients required conversion to open procedure at the initial operation. There was no evidence of infection in any patients. Choi G et al concluded that percutaneous endoscopic interlaminar discectomy is a safe, effective, and

minimally invasive procedure for the treatment of intracanalicular disc herniations at the L5-S1 level in properly selected cases, especially when the transforaminal approach is not possible because of anatomic constraints.

Lee DY et al [19] , has reported that the surgical outcome of percutaneous endoscopic lumbar discectomy (PELD) for adolescent lumbar disc herniation. The authors analyzed the surgical outcomes in 46 consecutive adolescent patients between 13 and 18 years of age (mean age, 16.5 years) who underwent PELD for single level lumbar disc herniation from June 2000 to May 2002. Using the clinical charts and mailed questionnaires, the authors also evaluated the patients preoperatively by the postoperative Visual Analogue Scale (VAS) for back and leg pain, and by the postoperative Macnab's criteria. PELD was performed at L3-4 on one patient, at L4-5 on 40 patients and at L5-S1 on 5 patients. One patient complained of transient dysesthesia after the operation. Another patient underwent subsequent open discectomy because only incomplete decompression was achieved with PELD. At a mean follow-up duration of 37.2 months (range: 25-48 months), the mean VAS scores of both the back and leg pain decreased significantly. In terms of the Macnab's criteria, 91.3% of the patients showed excellent or good outcomes. Recurrent disc herniation developed in one patient 14 months after surgery. Lee DY et al

reported as adolescents who underwent PELD for single level soft lumbar disc herniation showed favorable results that were comparable to the results of open discectomy.

Seungcheol Lee et al[20] , propose a radiologic classification of disc migration and surgical approaches of PELD according to the classification. A prospective study of 116 consecutive patients undergoing single-level PELD was conducted. According to preoperative MRI findings, disc migration was classified into four zones based on the direction and distance from the disc space: zone 1 (far up), zone 2 (near up), zone 3 (near down), zone 4 (far down). Two surgical approaches were used according to this classification. Near-migrated discs were treated with "half-and-half" technique, which involved positioning a beveled working sheath across the disc space to the epidural space. Far-migrated discs were treated with "epiduroscopic" technique, which involved introducing the endoscope into the epidural space completely. The mean follow-up period was 14.5 (range 9–20) months. According to the Macnab's criteria, satisfactory results were as follows: 91.6% (98/107) in the down-migrated discs; 88.9% (8/9) in the up-migrated discs; 97.4% (76/78) in the near-migrated discs; and 78.9% (30/38) in the far-migrated discs. The mean VAS score decreased from 7.5 ± 1.7 preoperatively to 2.6 ± 1.8 at the final follow-up ($P < 0.0001$).

There were no recurrence and no approach-related complications during the follow-up period. The proposed classification and approaches will provide appropriate surgical guideline of PELD for migrated disc herniation. Based on their results, open surgery should be considered for far-migrated disc herniations.

Destandau J[21] has reported that the goal of this operation is to reach the disc herniation in the spinal canal, using a special device with an endoscope, through a small incision. The device is composed of three tubes: one for the endoscope, one for suction and the largest one for classical surgical instruments. 1562 patients were operated on between April 1999 and December 2001. In order to permit a valid analysis of the results, a prospective study was begun. Before the operation, each patient was given a questionnaire and he or she had to send back the filled in form as soon as he joins his work or within 2 months after surgery. If the patient did not return to work within 3 months or if he or she was able to return to work later the result was considered as poor. Prolo's criteria were used. Of the 1562 patients, 1028 questionnaires were returned showing excellent results in 980 cases, good in 6, moderate in 1 and poor in 40. The complications observed were: discitis in 5 cases; reoccurrence in 54, of which 44 needed a second surgery; dural tear in 25; nerve root lesion in 7; and resection of articular

process in 36. Of the 746 patients who were working before the operation, 706 were able to return to work with an average delay of 4 weeks. In answer to the questions on global satisfaction and on the accuracy of the information given before surgery, 1005 responded as satisfied and 989 felt the information given to be accurate. He concluded this minimally invasive technique allows a smaller incision, less trauma to lumbar muscles, better identification of the nerve root in the foramen, perfect hemostasis and no drain. Early post-operative mobilisation is easy and special wound dressing allows immediate shower and intensive reeducation.This endoscopic technique gives dramatically better results than an external approach and allows earlier resumption of professional and personal activities.

Materials and Methods:

This was a prospective study conducted in the department of neurosurgery, Stanley medical college between 2004-2007.The patients who had acute onset of symptoms of unilateral low back pain with sciatica and whose clinical examination showed signs of definitive radiculopathy and MRI showing sequestered disc prolapse at that corresponding level were included in to study protocol. Subsequently we have included two level discs in our study. We have excluded the patients with lumbar canal stenosis with

disc prolapse, spondylolysis with listhesis with disc prolapse, old age with severe signs of degeneration (bone,disc, Ligamaentum flavum).We have also excluded patients with bilateral symptoms and signs and MRI showing bilateral root compression.

Hence our selection for endoscopic discectomy was a straight forward, unilateral single or two level sequestrated and large contained discs.

Of the 40 cases operated, 39 were single level discs and one was a double level disc. In a span of 3 years from 2004 to 2007 we have done 40 cases of disc removal using endoscope. Among the cases which had met the crieteria for using the endoscope 31were males,9 were females.. All the cases were in the age group between 20-50 years.

Clinically patients were examined to confirm the radicular involvement. We have ruled out the signs of Lumbar canal stenosis in the form of claudication and also ruled out lysis or listhesis clinically by absent lowback pain in flexion , extension and step sign.

Ethics committee of the institution approval was obtained prior to the commencement of the study.

The investigative procedures for all the patients included, X-ray lumbosacral spine AP, Lateral, CT scan Lumbosacral spine and MRI Lumbosacral spine.

X ray lumbosacral spine had been useful to find out transitional vertebrae so as to help us to localize exactly during surgery. It had also been helpful to identify lysis, listhesis, or any other bony involvement.

CT scan had been useful to rule out lumbar canal stenosis and MRI Lumbosacral spine to identify the sequestrated disc and root compression.

After obtaining anesthetic fitness, surgery was done under General anesthesia.

We followed Destandau's procedure using Storz Endoscopic micro discectomy system. It contains

1) 4mm 0'deg telescope
2) Endospine operating tube with obturator
3) Endospine working sheath which has four portals

a)for endoscope

b) for nerve retractor

c) for working channel for using instruments

d) for suction

Advantage: Each of the portal will not interfere with other

4) 2mm kerrison rongeur
5) 2mm disc punch
6) take apart bipolar forceps
7) camera with light source and fibro optic cable
8) monitor

Procedure:

After localisation of the disc, determination of the point of incision and direction of approach to the disc, a skin incision between 10 to 15mm is made, depending on the patient's corpulence. Transection of the aponeurosis using scissors and disinsertion of the paravertebral muscles adjoining the hernia is done. Insertion of the Endospine operating tube, retracting the obturator, cleaning the window using disc forceps, positioning of the working insert with introduced telescope and continuation of the intervention under video endoscopic control is followed. Resection of a part of superior lamina so as to draw back the superior part of the yellow

ligament, and resection of the latter as well as part of the articular process so as to expose the outer margin of the dural sac and proximal end of the nerve root concerned is done. Dissection of the nerve root allows access to the prolapse. The presence of several channels facilitates handling the anatomical structures within the vertebral canal. The use of nerve root retractor allows for fully exposing the disc prolapse and facilitates the surgical procedures by considerably reducing the risk of damaging nerve structures. The positioning of the endoscope close to the vertebral canal allows a panoramic view and the localisation of the migrated fragments. Depending on the case, microdiscectomy is carried out once the hernia is removed. The cavity is then irrigated, and haemostasis generally achieved simply by packing or by bipolar coagulation. After removal of the endoscopic instruments, careful haemostasis of the muscle masses can be carried out. Intracutaneous sutures are applied followed by water impermeable dressing allowing showering and immediate rehabilitation.

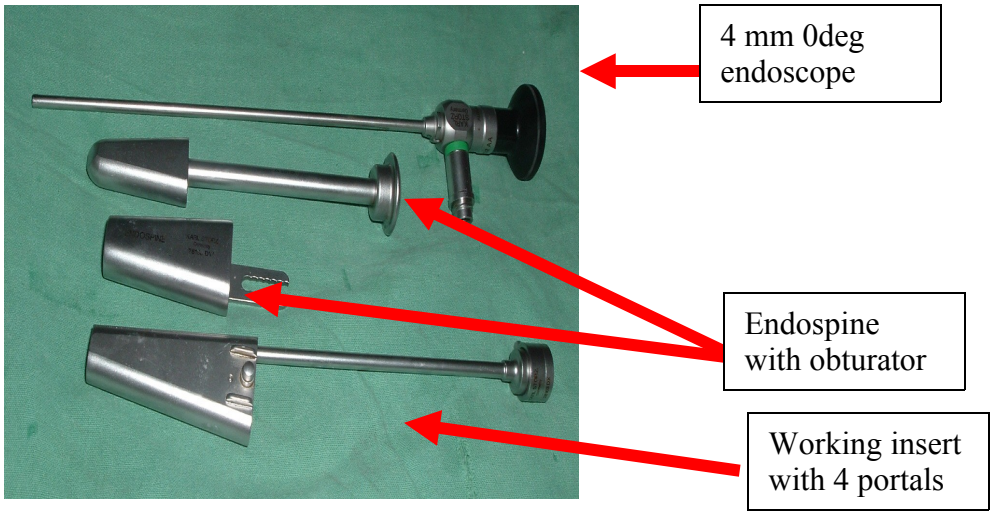
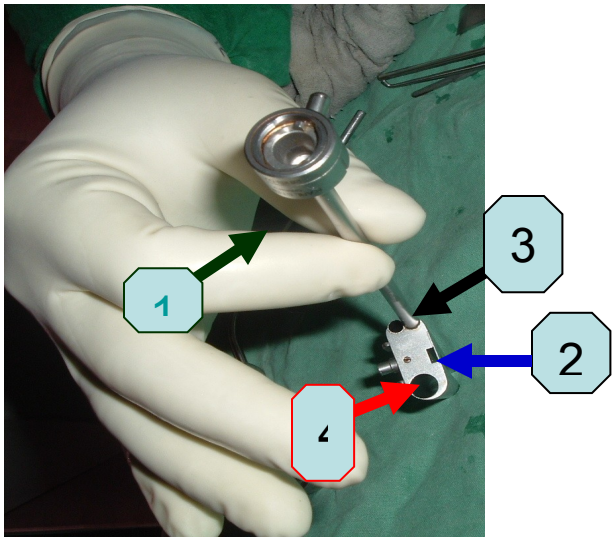


Fig 1.Storz Endoscopic microdiscectomy system



Four portals:
1.endoscope
2.nerve retractor
3.suction
4.working
instruments

Fig 2.Working insert with four portals

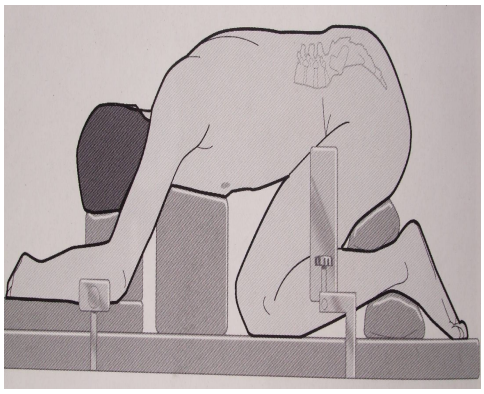


Fig.3&4: Knee-Chest position

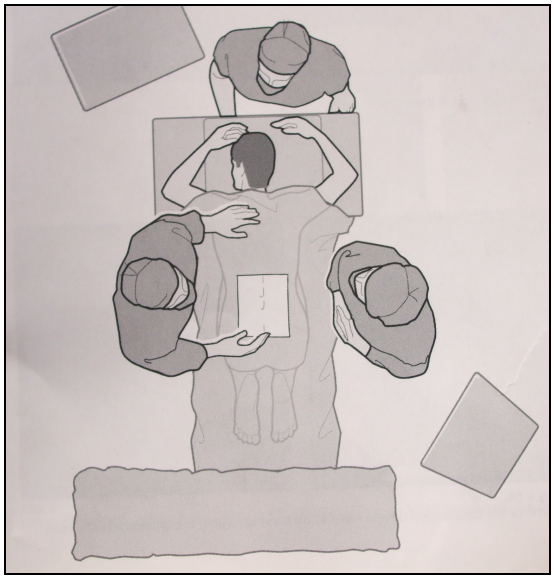


Fig 5: Position of the Operating team

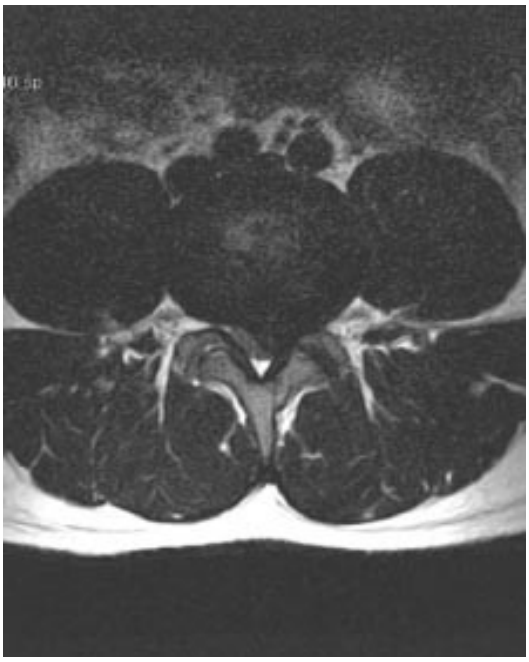


Fig 6&7; Representative MRI pictures for Lumbar Disc disease.

Fig 8: Skin incision

Fig 9:Paraspinal muscle seperation

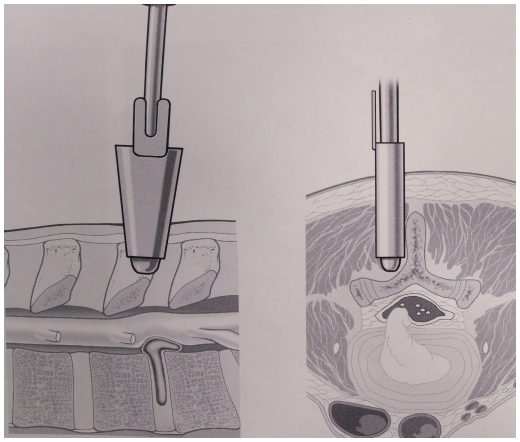


Fig 10&11: Endospine insertion

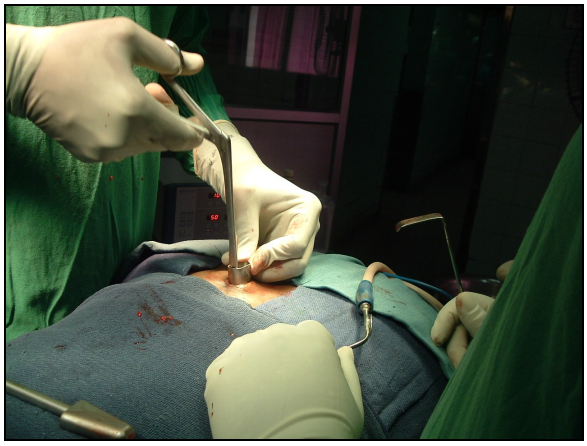


Fig 12: Excision of soft tissues using disc punch.

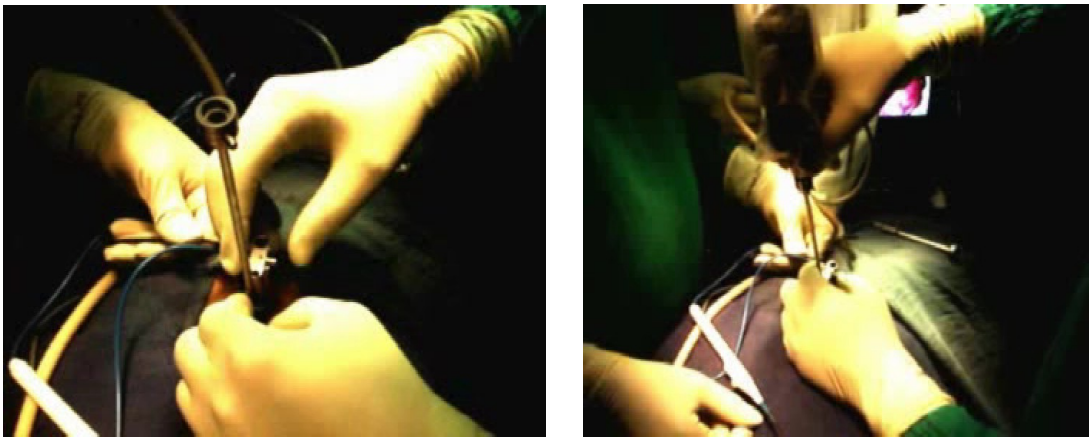


Fig13&14: Working insert, Endoscope and camera placement.

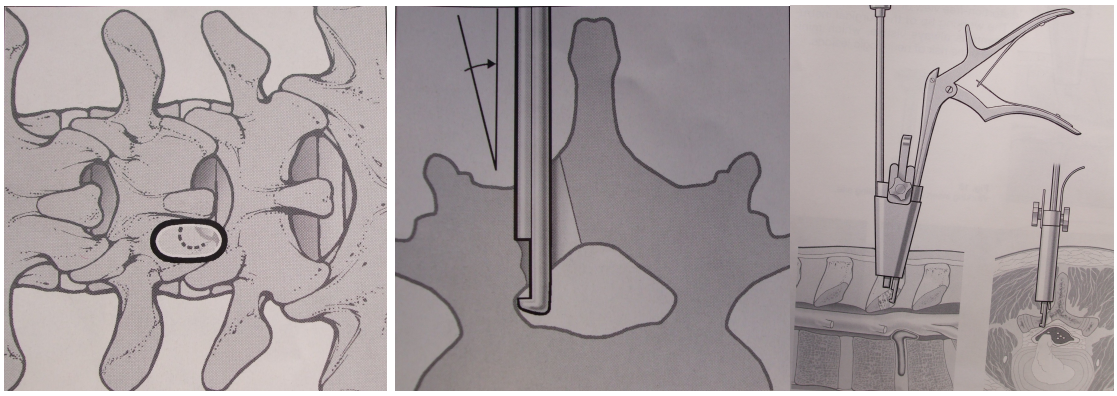


Fig 15,16&17: Diagrams showing bone resection.

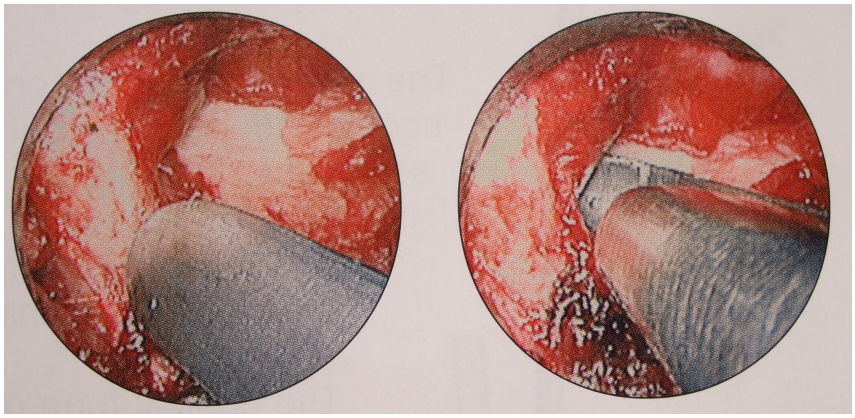


Fig 18&19: Endoscopic partial excision of superior lamina.

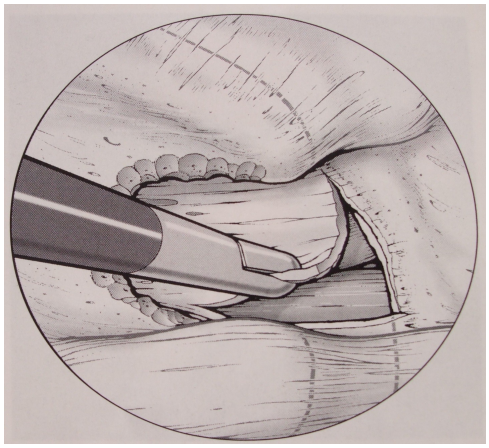


Fig 20&21: Excision of Lig.flavum

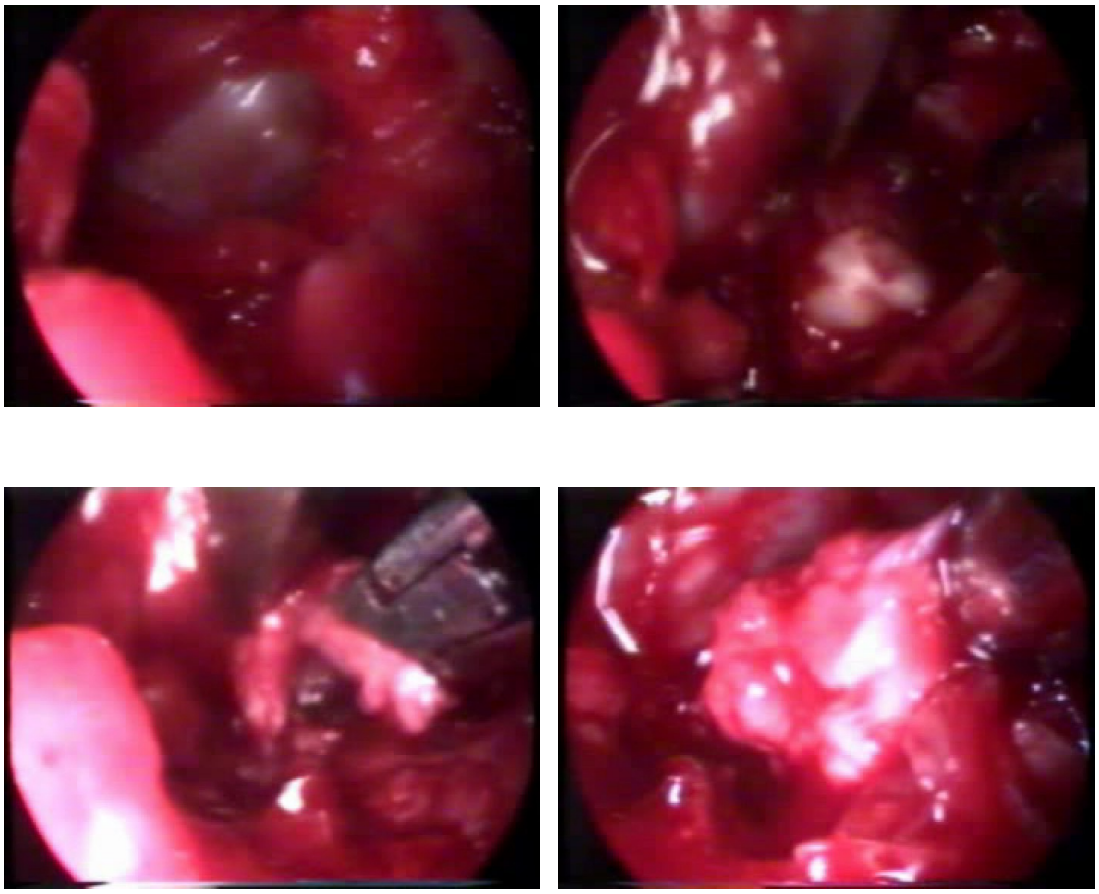


Fig 22-25: Disc Exposure and Discectomy.

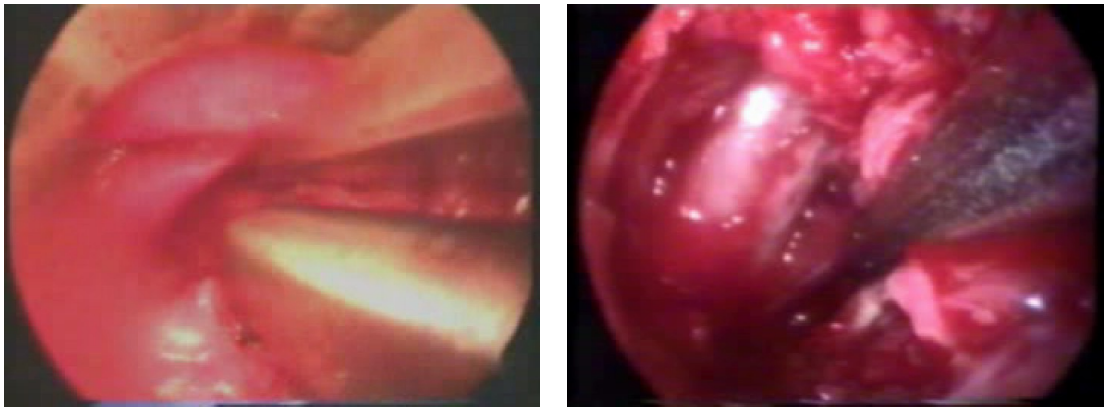


Fig 26&27:Root decompression.

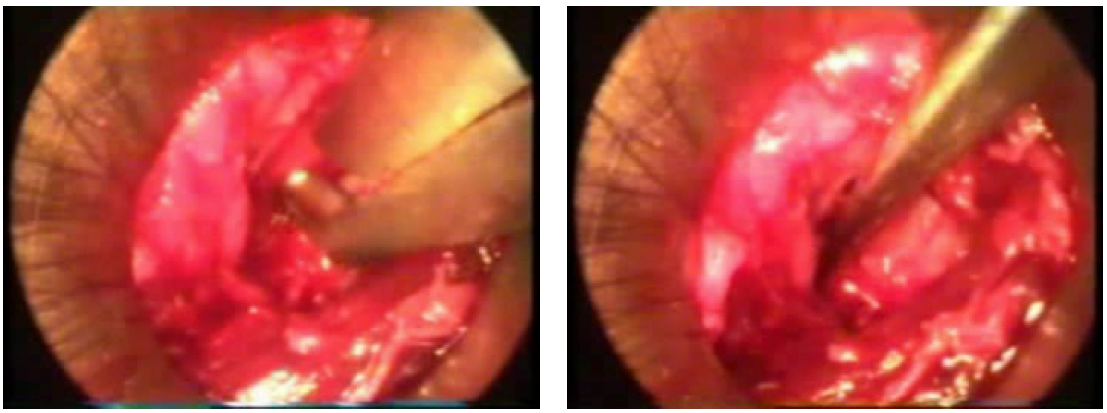
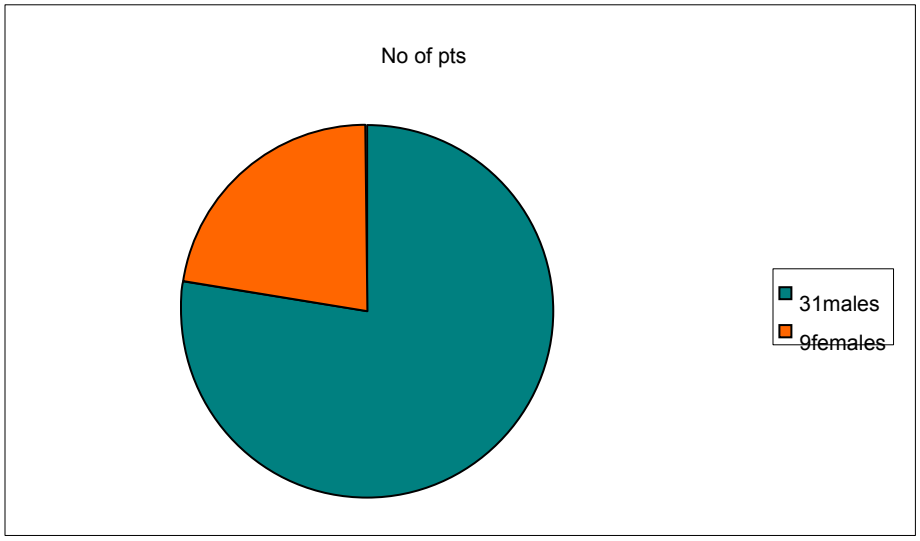


Fig 28&29: Opp Side root decompression.

Initial few cases we used 2'0 ethilon to close the wound and did the suture removal on 10th Post operative day. Subsequently we have been using subcuticular sutures to close the wound.Initial few cases we mobilsed the patients on the 3rd postoperative day and of late we started discharging the patients on the next day and asked them to come for follow up on the 10th postoperative day.

Results:

In our series number of patients who had undergone Microendoscopic discectomy were 40.Among them 31 patients were male and 9 patients were females. All patients were between 20-50 years of age and the mean was 32.3.



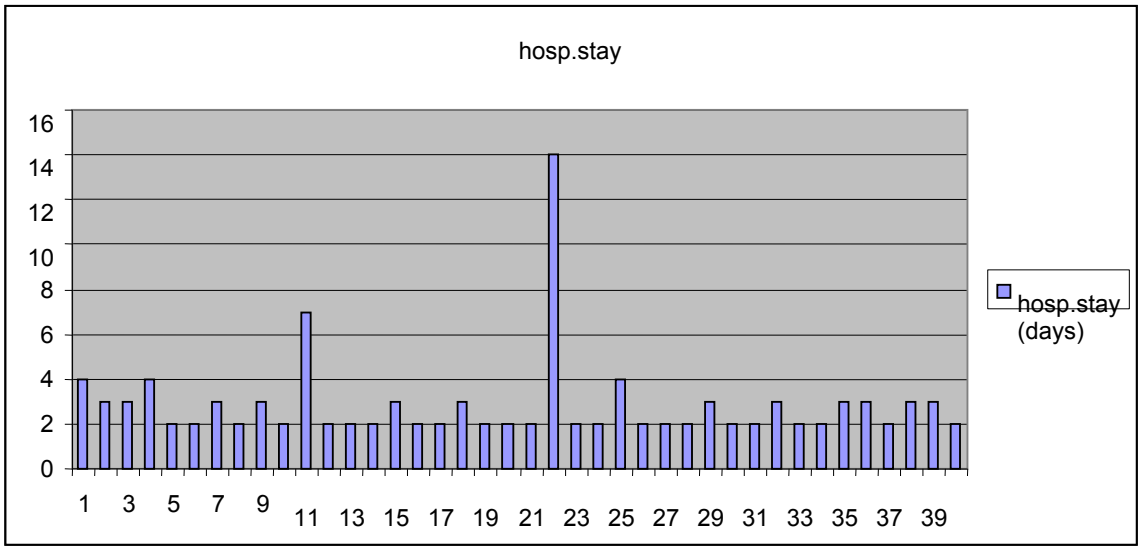
The most common level operated was L5-S1(27) followed by L4-L5(12).We have operated double level in one patient at L4-L5 and L5-S1.

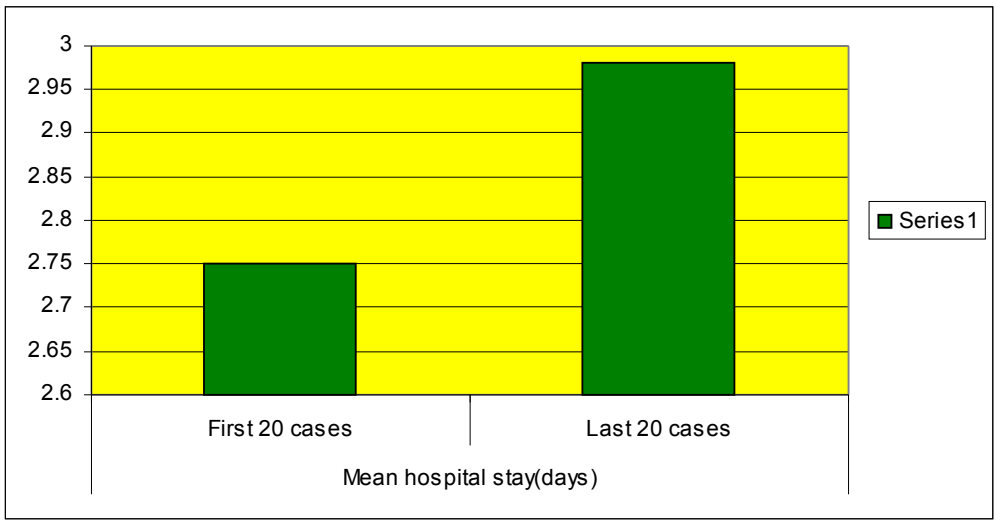
All patients were followed up regularly on 10th post operative day,1 month,3 months and one year. Mean follow up of all patients were 14.1 months and the longest follow up was done at 38 months.

Since the procedure is technically demanding,it took initial 20 cases to complete our learning curve and in the next 20 cases we improved our

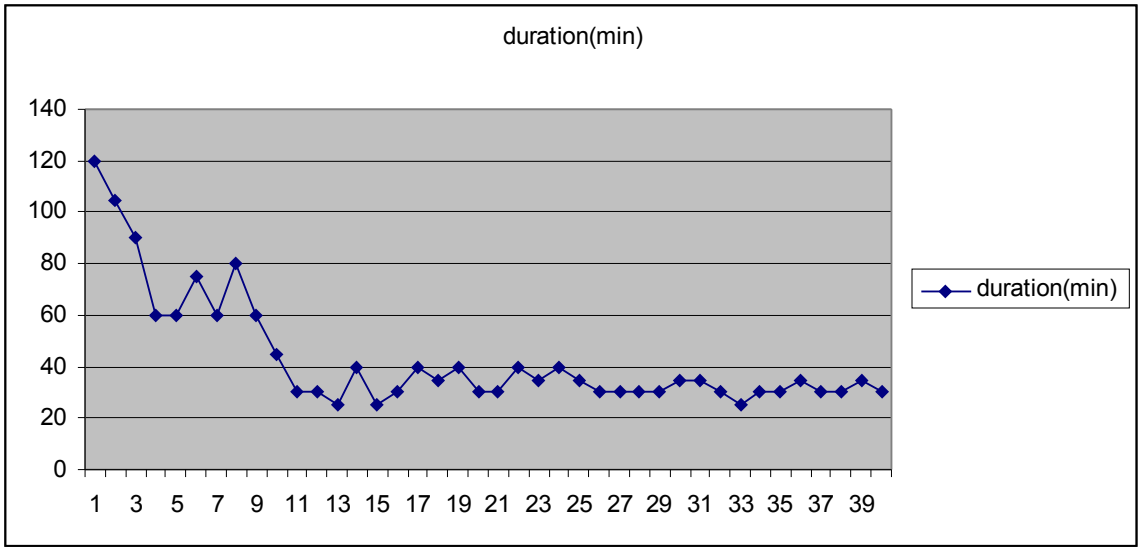
technique, operating time,blood loss,and outcome. So we have compared our results in the first 20 cases and last 20 cases.

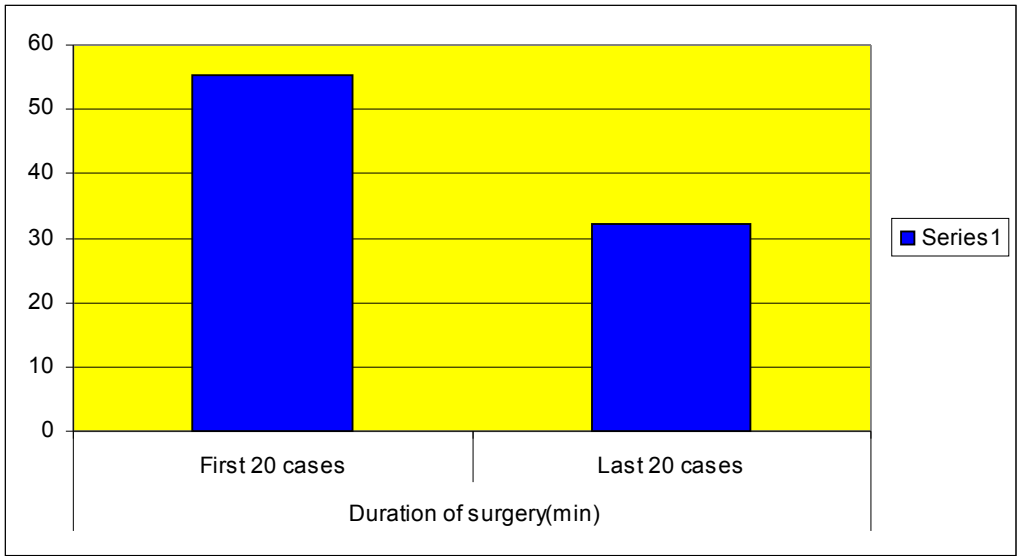
Mean hospital stay in our first 20 cases was 2.75 days and in our last 20 cases was 2.98 days. Mean hospital stay increased in our last 20 cases because of one patient who had wound infection had to stay in the hospital for two weeks. If we exclude the patient who had infection our mean hospital stay drops to 2.4 days as compared to the stay of initial 20 cases.



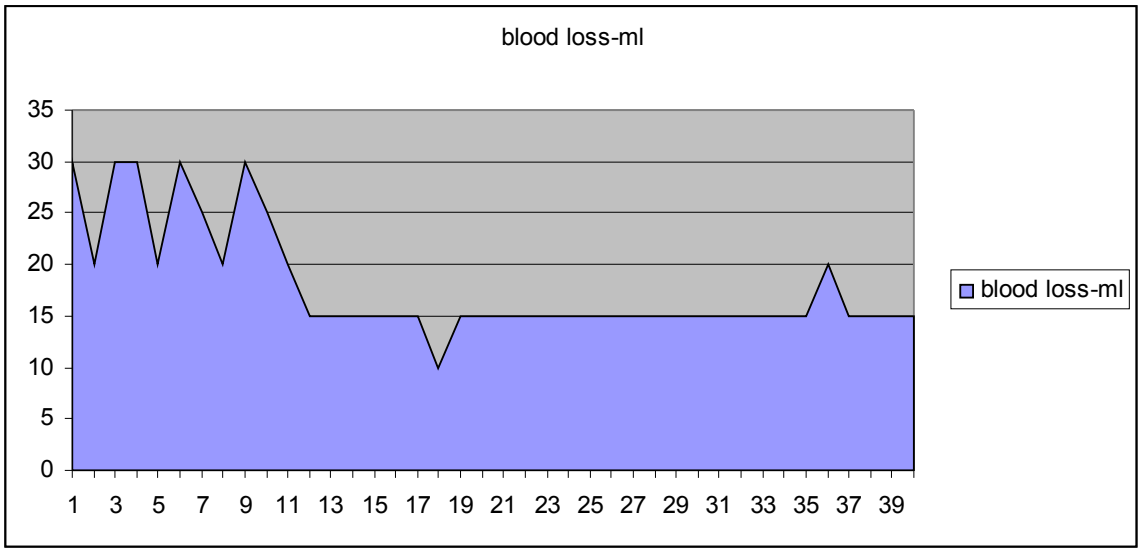

3
2.95
2.9
2.85
2.8
2.75
2.7
2.65
2.6
First 20 cases
Last 20 cases
Mean hospital stay(days)
Series1

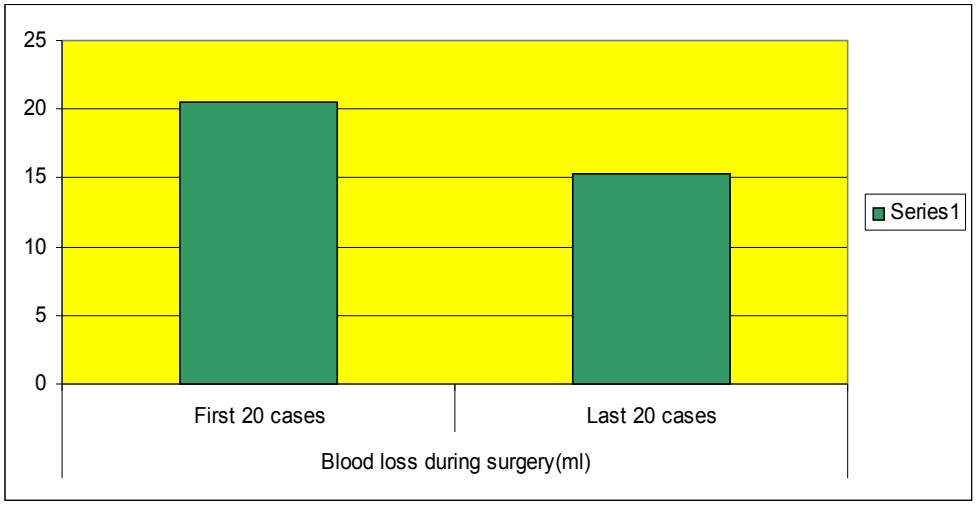
Mean duration of surgery in the first 20 cases was 55.26 minutes and in our last 20 cases was 32.14 minutes.





Mean blood loss during the first 20 cases was 20.5 ml and in our last 20 cases was 15.25 ml.





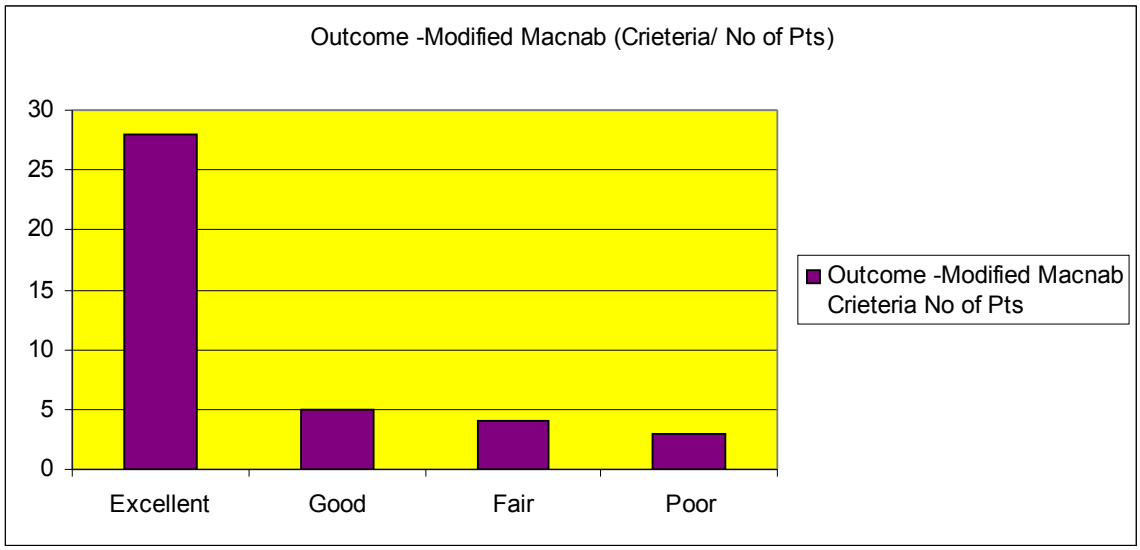
In our series we assessed the outcome based upon Modified Macnab's crieteria.

Modified Macnab's criteria

- Excellent: free of pain; no restriction of mobility & return to normal work
- Good: Occasional non radicular pain; relief of presenting symptom; return to modified work
- Fair: some improved functional capacity; still unemployed and or handicapped

- Poor: continued objective symptoms of root involvement; additional operative intervention needed at index level irrespective of operative time or length of post op stay

In our series according to modified Macnab's crieteria 28 patients had excellent outcome,5 patient had good outcome,4 patients had fair outcome and 3 patient had poor outcome.



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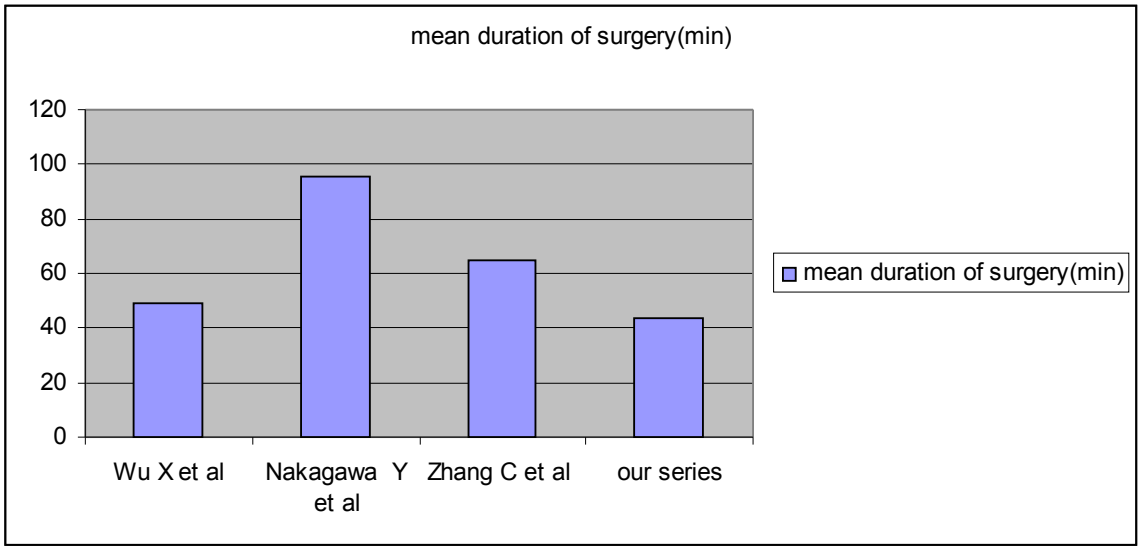
Discussion:

Microendoscopic discectomy is one of the treatment modality for lumbar disc disease and it is an alternate for traditional microscopic lumbar discectomy. We have compared the following results with other published

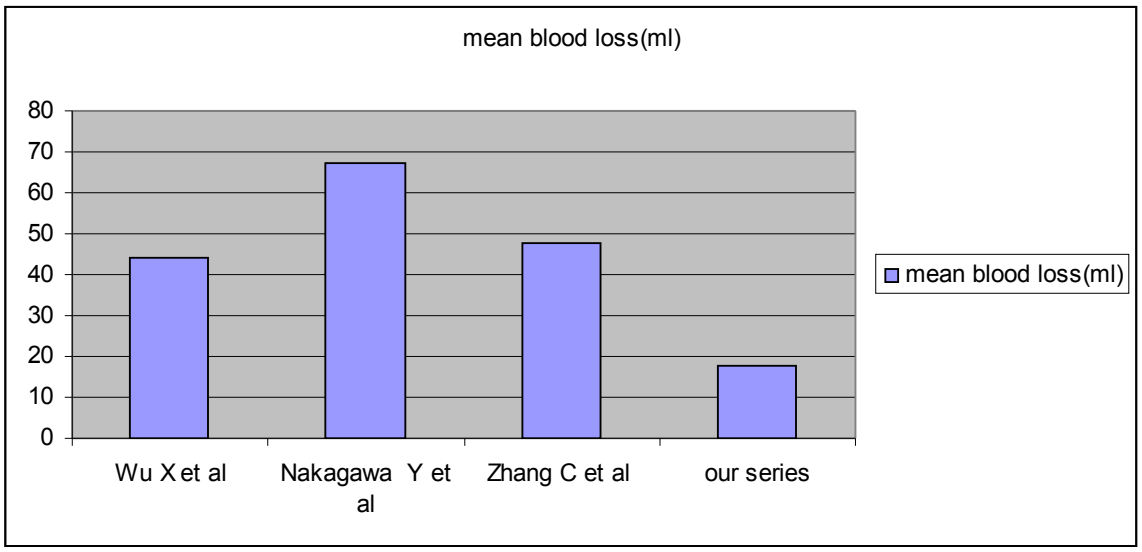
series.1)Mean operative duration 2) Blood loss during surgery 3)Mean hospital stay 4)Time taken to return to work 5) Learning curve 6) Complications 7)Revision surgery 8) Reoccurrence

The mean operative duration in Wu X et al[1] series was 75 ± 26 minutes in their early 220 patients and it was significantly reduced to 49±21 minutes in their last 653 patients.In Nakagawa Y et al[7] series the mean duration for MED was 95.3minutes. Zhang C et al [10] reported 64.77±17.83 as mean duration. In our series in the initial 20 cases the mean duration was 55.26 minutes and it was significantly reduced to 32.14 minutes in our last 20 cases. The mean duration for all 40 cases in our series was 43minutes.



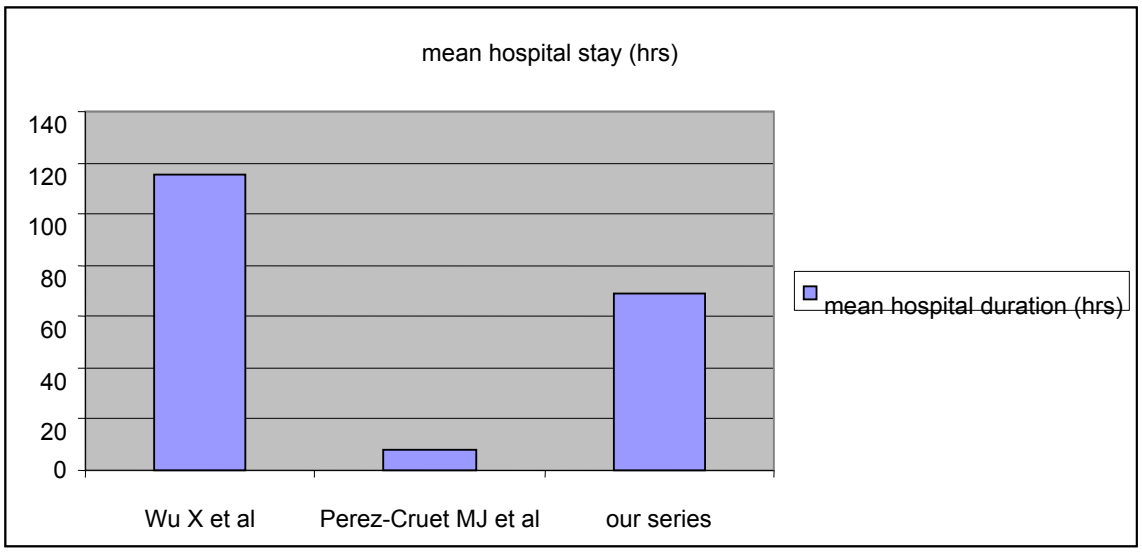
The mean blood loss in Wu X et al[1] series was 44ml and in Nakagawa Y et al[7] was 67.5 ml. In Zhang C et al [10] series it was

47.5±11.62ml.In our series the mean blood loss in the initial 20 cases was 20.5ml and it was significantly reduced to 15.25ml in our last 20 cases. We have used adrenaline soaked gauzes during paraspinal musle separation and we kept adrenaline soaked gauzes for few minutes before placing the Endoscopic microdiscectomy system. The mean blood loss taking in to account of all 40 patients in our series was 17.8ml.

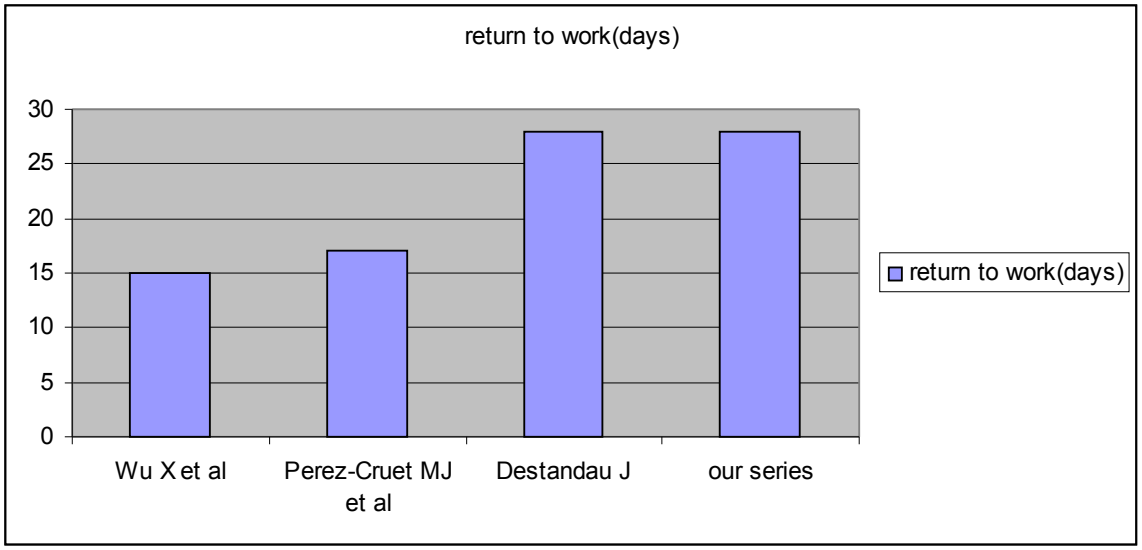


The mean hospital stay in Wu X et al[1] series was 4.8 days and in Perez-Cruet MJ et al[2] series it was 7.7 hours.In our series the mean hospital stay in our first 20 cases was 2.75 days and in our last 20 cases it was 2.98 days. The mean hospital stay in our last 20 cases increased than our first 20 cases beause in our last 20 patients one patient had wound infection and

stayed 14 days in the hospital. The mean hospital stay taking in to account of all 40 cases in our series was 2.8 days or 67.2 hours.



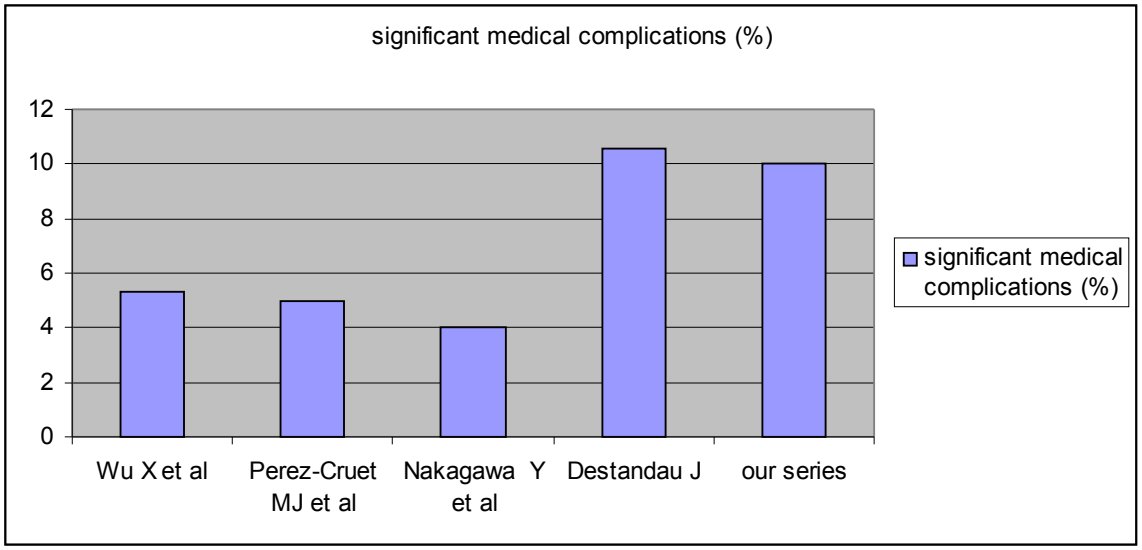
The average days taken to return to work in Wu X et al[1] series was 15 days and in Perez-Cruet MJ et al[2] series it was 17 days. Destandau J[21] who has reported the largest MED series in the world, reported 4 weeks as the average duration taken to return to work. In our series the mean duration to return to work was 4.05 weeks.



The MED procedure requires a steep learning curve and it required 20 cases for us to complete it. Nakagawa Y et al[7] reported in their series as it required 30 cases for them to complete the learning curve.

In Wu X et al[1] series 5.3% of the patients had significant medical complications and 20 patients underwent redo surgery. Perez-Cruet MJ et al[2] reported 5% of the patients in his early cases had significant medical complications. In Nakagawa Y et al[7] series 4% of the patients had complications and 12 patients underwent redo surgery. Destandau J[21] reported 10.6% of his patients had significant medical complications and 44 patients underwent redo surgery . In our series 10% of cases had complications, among them 1 patient had wound infection, 1 patient had

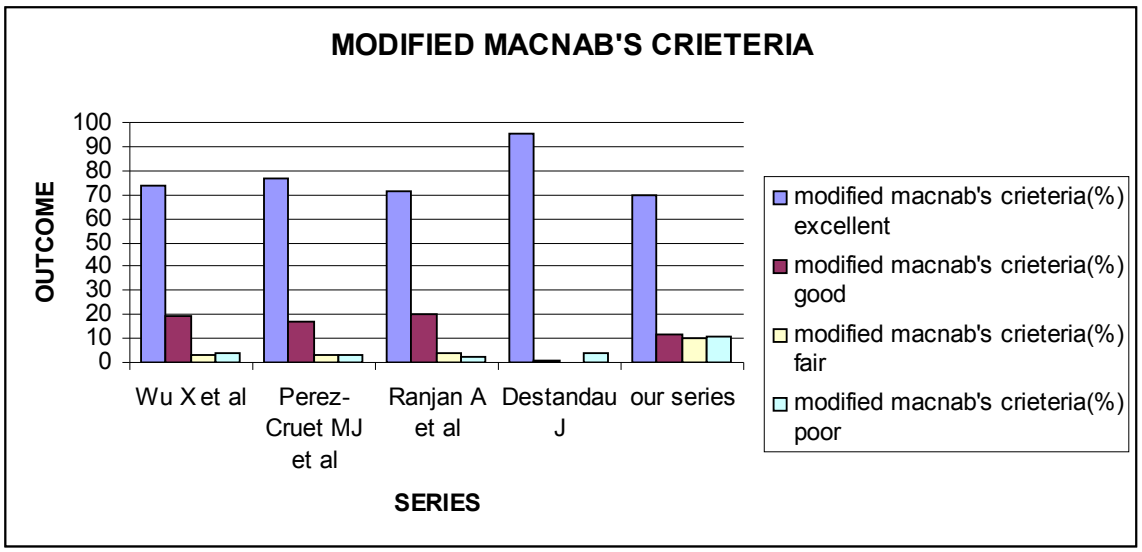
dural tear, and in 2 patients pain didn't subside and they underwent redo open laminectomy.



In the outcome assessment,according to Modified macnab crieteria In Wu X et al[1] series 74% patients had excellent outcome, 19% patients had good outcome, 3% had fair outcome,and 4%patients had poor outcome. In Perez-Cruet MJ et al[2] series 77% patients had excellent outcome, 17%patients had good outcome, 3%patients had fair outcome, and 3% patients had poor outcome. Ranjan A et al[6], reported in their series as 76 patients had excellent outcome,22 patients had good outcome,5 patients had fair outcome and 3 patients had poor outcome.

In Destandau J[21] series out of 1028 patients 980 patients had excellent outcome, 6 patients had good outcome, 1 patient had fair outcome

and 40 patients had poor outcome. In our series out of 40 patients 28 patients had excellent outcome, 5 patients had good outcome, 4 patients had fair outcome and 3 patients had poor outcome.



Based upon Sasaoka R et al [8] , Chao Z et al[9] , Zhang C et al [10] , Huang TJ et al [11] , and Schick U et al[12] series the magnitude of tissue damage and surgical trauma response in MED are significantly lower than traditional lumbar disc surgeries.

Sasani M et al [15] , reported as the MED procedure can be considered as a safe alternative for extraforaminal disc migrations. Le H et al[16] ,and Isaacs RE et al[17] reported as it is also a treatment modality for recurrent lumbar disc herniations.

Conclusion :

Endoscopic discectomy is a minimally invasive procedure with less tissue disruption to achieve the results of the traditional surgery.

- Early mobilisation of the patient on the same day is feasible.
- Intra operative blood loss is negligible.
- Post operative pain is less.
- Hospital stay is less. Can be done as day care surgery.
- Early return to work is possible.
- Hospital expenditure is minimized

MED is also considered as an alternative procedure for extraforaminal disc herniations and recurrent disc herniations.

Microendoscopic discectomy in properly trained hands is an additional efficient armamentarium in the management of lumbar disc disease.

Proforma - MicroEndoscopic Lumbar disecetomy

1. S.No
2. IP.No
3. Age
4. Sex
5. Date of Admission
6. Date of Discharge
7. Hospital Stay
8. Duration of Low back ache
9. Duration of Sciatic pain
10. Duration of Claudication pain
11. Duration of Bladder,Bowel involvement
12. Motor signs
13. Sensory signs
14. Reflex involvement
15. SLRT
16. Xray Lumbosacral spine
17. CT Lumbosacral spine

18. MRI Lumbosacral spine
19. Intra operative findings
20. Duration of surgery
21. Blood loss
22. Post operative events
23. Day of mobilization
24. 10^{th} day follow up
25. 1 month follow up
26. 3 months follow up
27. 1year follow up
28. Last follow up
29. Redo surgery
30. Return to work
31. Outcome based on modified Macnab's crieteria

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