

Management of Lumbar Disc Prolapse Associated with Retrolisthesis

Ibrahim G. Ewaiss, Mustafa M. Abo Elkheir, Adnan M. Albanna*

Department of Neurosurgery, Faculty of Medicine, Al-Azhar University

*Corresponding author: Adnan M. Albanna, Mobile: 01111142290, Email: A_A5005@yahoo.com

ABSTRACT

Background: retrolisthesis is the posterior displacement of one vertebral body in relation to the adjacent vertebrae to a degree less than a dislocation. However, lots of neurosurgeons consider retrolisthesis as incidental finding a rising prove that it is not a rare condition and a cause of many backaches.

Aim of work: to compare between discectomy with or without fixation as regards to pain, function and rate of reoperation in patients with lumbar disc prolapse associated with retrolisthesis.

Patients and Methods: This study is prospective and retrospective study in fifty cases of patients with single level of lumbar disc prolapse associated with retrolisthesis in Al-Azhar University hospitals and Health Insurance hospitals in time between 2018 and 2019. Twenty-four patients were undergone discectomy alone and 26 patients were undergone discectomy plus lumbar fusion surgery.

Results: the main level of retrolisthesis is L5-S1 with higher incidence than other high levels. Sixty six percent (33 cases of 50) and conservative treatment plays an important role in initiation of treatment but surgery by discectomy and fixation according to case demand is the main convenient solution.

Conclusions: In this study we showed that patients with lumbar disc prolapse with retrolisthesis should be managed by discectomy alone in cases presented with radicular pain more than low back pain with dynamic study shows no instability. And should be managed by discectomy and fixation in cases presented with low back pain more than radicular pain with dynamic study showing instability or MRI finding shows advancing facet arthritis.

Keywords: Retrolisthesis, Lumbar disc prolapse, discectomy, fixation.

INTRODUCTION

Retrolisthesis is the posterior displacement of one vertebral body in relation to the adjacent vertebrae to a degree less than a dislocation⁽¹⁾.

Complete Retrolisthesis - The body of one vertebra is posterior to both the vertebral body of the segment of the spine above as well as below.

It's classified as:

- Stair stepped Retrolisthesis - The body of one vertebra is posterior to the body of the spinal segment above, but is anterior to the segment below.

- Partial Retrolisthesis - The body of one vertebra is posterior to the body of the spinal segment either superior or inferior. Since the vertebral body in a retrolisthesis moves in a backward direction, the grading used for retrolisthesis is of little use. It is on the other hand useful to divide the anterior to posterior dimension of the intervertebral foramina (IVF) into four equal units. A backward displacement of up to ¼ of the IVF is graded as Grade 1, ¼ to ½ as Grade 2, ½ to ¾ as Grade 3, ¾ to total occlusion of the IVF as Grade 4.

Otherwise, a measurement of the degree of displacement can also be done by calculating the bone displacement in millimeters⁽¹⁾.

Retrolisthesis may be found more commonly than initially believed. Series have shown that retrolisthesis may be present in up to 30% of extension radiographs of patients complaining of chronic low back pain. Retrolisthesis has been brought into being associated with disc herniation, decrease in lumbar lordosis, and reduction in vertebral endplate angle⁽²⁾.

Retrolisthesis is comparatively rare but when present has been accompanied by increased back pain and impaired back function. It is associated with increased by a degree and thus diminished function of the spine. It is correlated with a decline in lumbar lordosis, endplate, inclination and segmental height. Retrolisthesis hyper loads as a minimum one disc and puts shearing forces of the anterior longitudinal ligament, the annular rings, nucleus pulposus and cartilage end plate ligament. A small number of studies have been done to date and little is known about retrolisthesis. There is a possible association between retrolisthesis and increased back pain and reduced back function⁽³⁾.

Little is known about the effect of retrolisthesis in patients with surgical conditions such as lumbar disc herniation. Retrolisthesis has an impact of a variable nature on nerve tissue and mechanical impact on the spinal joints themselves. Structural instability differs from the local discomfort to structural compensatory distortion involving the whole spine. With joint involvement, there may be changes in posture and range of motion which depend upon the degree of vertebral displacement. The soft tissue of the disc is often tend to bulge in retrolisthesis. The ability to move freely may also be limited.

Majority of retro positions are asymptomatic, though such a subluxation tends to displace nerve roots cranially and leading to lateral entrapment from the superior facet from the segment below. Retrolisthesis has sizable effect on a variable nature on nerve tissue and mechanical impact on the spinal

joints themselves. With joint involvement, there may be changes in posture and range of motion, which rely on the degree of vertebral displacement. The ability to move freely may also be limited⁽⁵⁾.

Pain occurs as a result of irritation to the sensory nerve roots by bone and relies on the degree of displacement and rotation of the involved vertebrae. Constant pressure on the nerve root that exits the spine at that specific level leads to tingling, numbness or pain in the hip, buttock, thigh or leg. Associated retrolisthesis with a bulging disc. No retrolisthesis - no disc bulge⁽⁶⁾. Retrolisthesis is essentially investigated by plain x-ray of lumbosacral spine, dynamic x-ray of lumbosacral spine, CT and MRI of lumbosacral spine⁽⁵⁾.

The management of retrolisthesis varies due to degree and associations like disc herniation or the presence of neurological deficit. Conservative treatment by physical exercise and adhesive back stripping, back support, Transcutaneous electrical nerve stimulation as an initial treatment plus medical treatment could be useful as a start. If failed or not sufficient, we have to do surgical intervention, which is discectomy plus or minus fixation according to case demand⁽⁷⁾.

AIM OF WORK

It is to compare between discectomy with or without fixation as regards to pain, function and rate of reoperation in patients of lumbar disc prolapse associated with retrolisthesis.

PATIENTS AND METHODS

This study was done prospectively and retrospectively on fifty patients with single level of lumbar disc prolapse associated with retrolisthesis in Al-Azhar University hospitals (Al Hussein and Sayed Galal) and Health Insurance hospitals (Nasr city and 6th October).

The study was approved by the Ethics Board of Al-Azhar University and an informed written consent was taken from each participant in the study.

The study was carried out to study the outcome of surgical management of lumbar disc prolapse with retrolisthesis as regards improvement of pain, function and rate of reoperation by use of Oswestry Disability Index⁽³⁾ and Visual Analogue Scale^(Ref) pre- and post-operative. The study was approved by the Ethics Board of Al-Azhar University.

Inclusion criteria: single level lumbar disc with retrolisthesis.

Exclusion criteria: multilevel disc prolapse & recurrent lumbar disc with retrolisthesis. We compared two procedures; discectomy alone or discectomy plus lumbar fusion surgery. All patients pre-operatively underwent complete general and neurological examination, presenting symptoms and signs, sex as regards male to female ratio, level of pathology. Associated medical history was evaluated.

Neuro-radiological assessment: Preoperative MRI lumbosacral spine was done to all cases. X-Ray of lumbosacral spine was done to all cases. Dynamic X-Ray of Lumbosacral spine was done to all cases. Routine pre and post-operative lab include CBC, liver and kidney function tests, bleeding profile (PT, PC, INR and PTT) and random blood sugar.

Surgical Procedures:

Lumbar discectomy alone or lumbar discectomy with fixation according to radiological and clinical assessment and according to that cases with radicular pain only or radicular pain equal to low back pain and showed no element of instability radiologically are treated with discectomy alone. Cases with low back pain more than radicular pain or showed instability radiologically are treated with discectomy and fixation.

Surgical Outcome:

Post-operative pain score as measured by Visual Analogue Scale^(Ref).

Functional outcome score as measured by Oswestry Disability Index^(Ref).

RESULTS

Table (1): Clinical presentation in relation to surgical procedures and outcome

Clinical presentation	No.	surgical procedure	No.	Outcome				Chart
				Excellent	Good	Fair	No improvement	
Low Back pain more than Radicular Pain	13	Discectomy & Fixation	13	8	3	2	0	
				62%	23%	15%	0%	
Radicular Pain	19	Discectomy	19	11	4	4	0	
				58%	21%	21%	0%	
Radicular Pain equal to Low Back pain	13	Discectomy & Fixation	13	8	4	1	0	
				61%	31%	8%	0%	
Radicular Pain equal to Low Back pain	5	Discectomy	5	0	0	0	5	
				0%	0%	0%	100%	

This table showed clinical presentation in relation to surgical procedures and outcome: 13 cases have Low Back pain more than Radicular Pain and operated with discectomy & fixation with result: 8 cases with excellent improvement, 3 cases with good improvement and 2 cases with Fair improvement. 19 cases have radicular pain and operated with discectomy with result of 11 cases with excellent improvement and 4 cases with Good improvement and 4cases with Fair improvement. 13 cases have Radicular Pain equal to Low Back pain and operated with Discectomy & Fixation with the result: 8 cases excellentimprovement,4 cases with good improvement and 1 case with Fair improvement. 5 cases have Radicular Pain equal to Low Back pain and operated with Discectomy with No improvement.

DISCUSSION

Retrolisthesis is the posterior displacement of one vertebral body in relation to the adjacent vertebrae, to a degree less than a dislocation. It is accompanied by increased by a degree and thus impaired function of the spine. It is correlated with a decrease in lumbar lordosis, end plate predisposition and segmental height. Retrolisthesis hyper loads at least one disc and puts shearing forces of the anterior longitudinal ligament, the annular rings, nucleus pulposus and cartilage end plate ligament. There is a different biomechanical causes for the two types of degenerative retrolisthesis; one mechanism is the natural occurrence of backward displacement⁽²⁾.

Rothman et al.⁽⁹⁾ stated that degenerative retrolisthesis is primarily a disease of the intervertebral disc, whereas anterolisthesis is a disease of the posterior joints. When the lumbar spine is hyperlordotic, the contact force on the posterior joints and the intervertebral tilt will increase, thereby increasing the forward sliding force. By contrast, the contact force on the anterior intervertebral disc will increase with hypo lordosis, subsequently decreasing the intervertebral tilt. As hypo lordosis is related to a lower Sacrum Slope, and consequently lower Pelvic Index. Backward displacement could occur in patients with a low Pelvic Index for that reason.

The other mechanism of backward displacement is as reimbursement for a kyphotic imbalance disorder which includes degenerative spondylolisthesis. In kyphotic discrepancy disorders, the axis of gravity moves anteriorly. So as to compensate for it, there is a decrease in the thoracic kyphosis, intervertebral hyperextension, retrolisthesis, pelvis back tilt, knee flexion and ankle extension. Via this mechanism, retrolisthesis could occur secondarily after degenerative anterolisthesis, which is usually accompanied by high Pelvic Index⁽¹⁰⁾.

However little is known about the incidence of retrolisthesis and little attention has been paid to retrolisthesis. Recent studies have, however, shown that it may exist more commonly than was previously believed and with significant symptoms. **Iguchi et al.**⁽¹⁰⁾ reported 83 cases (2.6%) of degenerative retrolisthesis between 3259 outpatients with low back pain. Their series included 39 patients with a single-level retrolisthesis, 25 with multiple level retrolisthesis and 19 with a retrolisthesis combined with an spondylolisthesis.

Jeon et al.⁽⁸⁾ reported 269 consecutive patients with degenerative spondylolisthesis. There are 106 patients (39. 4%) with a pure retrolisthesis, 130 (48.3%) with a pure anterolisthesis, and 33 (12.3%) with a combined retrolisthesis and anterolisthesis. The number of patients with a retrolisthesis was similar to the number of patients with an anterolisthesis, implying that degenerative retrolisthesis is not a rare condition.

Shen et al.⁽²⁾ reported a 53. 2% incidence of L5 retrolisthesis between 125 individuals with L5-S1 disc herniation ⁽²⁾. In our study, 50 cases complaining of single level lumbar disc prolapse associated with retrolisthesis, this study was done prospectively and retrospectively.

Thamer et al.⁽¹¹⁾ reported that 26 males 65% and 14 females 35% with back pain and a proved plain radiological diagnosis of retrolisthesis in the lumbar spine. No statistically significant gender variation was noted in patients suffering from back pain with a pure and significant retrolisthesis. In Our study, there were 28 male cases and 22 female cases. Male to Female ratio was 56%: 44%. With no statistically significant gender variation.

Shen et al.⁽²⁾ suggested in children, the most common cause is a birth defect which happens most commonly between the fifth vertebra and the sacrum. In adults, it is mostly occurs between the 4th and 5th vertebra due to arthritis or any other degenerative disease. Other causes may include stress fractures and traumatic fractures. Infections of blood or bone disease, nutritional deficiencies **Shen et al.**⁽²⁾ reported that retrolisthesis are mainly caused by injury and resulting the instability of the connecting soft tissues, particularly ligaments, discs, muscles, tendons and fascia. Muscles are involved through a spasm as a result of nerve malfunction due to a change in pressure caused by the posterior displacement of the vertebra encroaching on the contents of the space where the spinal nerves exit from the bones of the vertebral column. Degenerative spinal changes are often noticed at the levels where a retrolisthesis is found. These changes are more obvious as time progresses after injury and are evidenced by endplate osteophytosis, disc damage, disc narrowing, tearing failure and finally results in disc bulging.

Shen et al.⁽²⁾ suggested that retrolisthesis hyper load as a minimum one disc and puts shearing forces on the anterior longitudinal ligament, the annular rings, nucleus pulposus, cartilage endplates and capsular ligaments. The bulging, twisting and straining tissues attached to the endplates pull, push and stretch it. It gets worse with time, gradually becoming irreversible. Morgan and King found that the retrolisthesis results from congenital laxity or gradual stretching of the ligaments at the lateral articulations.

Kang et al.⁽³⁾ During spinal extension, the lateral facets of the superior vertebra have a tendency to drive backwards partly in consequence of the force of gravity and partly because the surface of the lamina slopes downwards and backwards. Therefore, when the end of the articular surface is reached by the point of the facet. It is carried backward till the stretched ligament comes to be taut. By bending his trunk forwards, the patient approximates the surfaces of the facet joints once more. Such instability at these lateral joints leads to sluggish destruction of the disc.

Jeon *et al.*⁽⁸⁾ found that no statistically significant gender variation was noted in the patients suffering from back pain with a pure and significant retrolisthesis.

Jeon *et al.*⁽⁸⁾ found retrolisthesis occur more commonly in higher lumbar spine levels, namely in L3-L4 (44. 3%) followed by L2-L3 (35. 7%).

Thamer *et al.*⁽¹¹⁾ Retrolisthesis is commoner than it was assumed. Partial retrolisthesis is commonest type, The L5-S1 is the most common level for retrolisthesis followed by L4-L5 and then by other higher lumbar levels. In Our study, we found that 33 cases L5-S1 level (66 %) and 17 cases (34 %) of other levels. So, we found that the main affected level is L5-S1.

O'Brian *et al.*⁽¹²⁾ showed that retrolisthesis may cause narrowing of the disc space when the annulus fibrosus bulges posteriorly. Concomitantly, there can be a relative translation of the superior articular process of the vertebra caudal to the mobile segment in the direction of the intervertebral foramen. This can cause a lateral stenosis which can produce painful radicular symptoms.

Vogt *et al.*⁽¹³⁾ showed that retrolisthesis was accompanied by a higher likelihood of low back pain. Although once believed to be a benign finding, it is becoming more obvious that retrolisthesis can be a source of morbidity for patients. In our study we found that 13 cases of low back pain more than radicular pain 26% of cases and 19 cases of radicular pain only 38% of cases and 18 cases of radicular pain equal to low back pain 36% of cases. 13 cases of low back pain more than radicular pain 26% of cases and 19 cases of radicular pain only 38% of cases and 18 cases of radicular pain equal to low back pain 36% of cases.

In our study, we found that the clinical presentation is low back pain and radicular pain but radicular pain is the main complaint in cases of retrolisthesis showed no element of instability or advanced facet arthropathy radiologically and low back pain is the main complaint in cases of retrolisthesis showed radiologically element of instability or advanced facet arthropathy.

Videman *et al.*⁽¹⁴⁾ showed that Patients suffering from retrolisthesis who underwent an exercise protocol, which included stretching and strengthening after application of electrotherapeutic modalities for pain relief and were instructed with the required precautions had improved visual analog scores and Oswestry disability scores and improved dynamic abdominal durability. Therefore, conservative treatment plays an instrumental role in the management of retrolisthesis but doesn't exclude surgical intervention for possible failure of conservative treatment which is not by necessity suitable for all cases⁽¹⁴⁾. In our study, Conservative methods played an important role but showed no

more sufficient improvement of pain score and function outcome. So, cases with radicular pain only or radicular pain equal to low back pain and showed no element of instability radiologically are treated with discectomy alone and cases with low back pain more than radicular pain or showed instability radiologically are treated with discectomy and fixation.

Thamer *et al.*⁽¹¹⁾ no statistically significant gender variation was noted in the patients suffering from back pain with a pure and significant retrolisthesis. Retrolisthesis is commoner than it was assumed. Partial retrolisthesis is commonest type, The L5-S1 is the commonest level for retrolisthesis followed by L4-L5 and then by other higher lumbar levels. The degenerative spinal disease is the main cause of retrolisthesis. Treatment is mainly by conservative method and little cases 8 of 40 are treated by laminectomy.

In our study, The outcome: 23 cases pass with excellent improvement 46%, 17 cases with good improvement 34%, 5 cases with fair improvement 10% and 5 cases 10% with no improvement.

Complications: Forty six cases with no complications 46% and 3 cases with dural tear 6% and 1 case 2% with left lower limb weakness grade 4/5. Those 5 cases with no improvement were complaining of low back pain equal to radicular pain and operated with discectomy alone. After follow up no improvement and 6 months later operated again for fixation.

CONCLUSION

In this study we showed that patients with lumbar disc prolapse with retrolisthesis should be managed by discectomy alone in cases presented with radicular pain more than low back pain with dynamic study shows no instability. And should be managed by discectomy and fixation in cases presented with low back pain more than radicular pain with dynamic study showing instability or MRI finding shows advancing facet arthritis.

REFERENCES

1. **Franco p, Cinotti C, Osti L *et al.* (2003):** Spinal fusion and disc prosthesis at primary surgery.20.In: Franco Postacchini. Lumbar Disc Herniation.
2. **Shen M, Ruben A, Lurie JD *et al.* (2007):** Retrolisthesis and lumbar disc herniation: a preoperative assessment of patient function. *Spine J.*, 7:406–413.
3. **Kang K, Shen M, Zhao W *et al.* (2011):** Retrolisthesis and lumbar disc herniation: A postoperative assessment of patient function. *Spine J.*, 11:S104-?.
4. **Giles LG, Mollar R, Winter GJ (2006):** Lumbosacral disc bulge or protrusion suggested by lateral lumbosacral plain X- ray flm – Preliminary results. *J Bone Joint Su- B.*, 450:44-47.
5. **Barrey C, Jaund J, Perrin G *et al.* (2007):** Spinopelvic alignment of patients with degenerative spondylolisthesis. *Neurosurgery*,61:981–986.

6. **Waddle G (2003):**Low back pain: A twentieth century health care enigma.Spine .21:2820- 5.
7. **Boulay C, Tardiue.C, Hecquet J *et al.* (2006):** Sagittal alignment of spine and pelvis by pelvic incidence: standard values and prediction of lordosis. Eur Spine J., 15:415-422.
8. **Jeon C (2013):** Degenerative retrolisthesis: is it a compensatory mechanism for sagittal imbalance?? .Bone Joint J., 95: 1244–1249.
9. **Rothman SL, Glen W V, Kerber CW (2016):** Multiplanar CT in the evaluation of degenerative spondylolisthesis: a review of 150 cases. Comput Radiol .,9:223–232.
10. **Iguchi, Wakami.T, Kurihara A *et al.* (2002):**Lumbar multilevel degenerative spondylolisthesis: radiological evaluation and factors related to anterolisthesis and retrolisthesis. J Spinal Disord Tech ., 15:93–99.
11. **Thamer A , Mubder A , Mohamed S *et al.* (2015):** pattern of degenerative lumbar retrolisthesis in Basrah. <https://pdfs.semanticscholar.org/a1f5/6e3728d2e07b4c0b57f6ead0954d626f9824.pdf>
12. **O.Brian JP (2001):** The role of fusion for chronic low back pain. Orthop Clin North Am.,14:1893–1896.
13. **Vogt MT, Rubin D, Palermo L *et al.* (2003):** Vogt MT, Rubin DA, Palermo L, et al. Lumbar spine listhesis in older African American women. Spine J., 3:255–261.
14. **Vide man T, Battie M (2002):** Videman T, Battie M. A critical review of the epidemiology of idiopathic low back pain. Eur Spine J.,55:637–641.