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ORIGINAL ARTICLE

Value of Using Interbody Fusion Technique in Recurrent Lumbar Disc Hernia Patients.

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ABSTRACT

Background: The aim of this study is to compare the clinical and functional outcomes of recurrent lumbar disc herniation (RLDH) revision surgery by either rediscectomy alone or rediscectomy with transforaminal lumbar interbody fusion (TLIF).

Methods: This prospective study was performed between August 2018 and August 2019. Twenty patients were surgically treated for recurrent lumbar disc herniation at the Department of Spine surgery, Zagazig University Hospitals and Nasser Institute Hospital. Ten patients underwent rediscectomy (Group A) and the other ten patients underwent rediscectomy with TLIF (Group B) with exclusion to any other pathologies (multi segmental spinal canal stenosis, adjacent level disc herniation, spondylolythesis, spinal instability, spinal deformities and tumors).

Results: Results showed no significant difference between two groups on clinical outcomes, but there was significant improvement in clinical outcomes in both groups post-operatively. Regarding time till return to work, There was statistically significant difference between the two studied groups regarding time till return to work with shorter time among the rediscectomy group than the rediscectomy with TLIF group (2.1±0.7versus3.4±0.8, p-value=0.002).

Conclusion: We concluded that patients without signs of spinal instability and/or sever back pain who suffer from leg pain will benefit from rediscectomy surgery in first time recurrence of herniation with no further benefits from re-discectomy with TLIF over re-discectomy alone in short term follow up.

Key words: Interbody Fusion, Recurrent Lumbar Disc Hernia, Rediscectomy.

INTRODUCTION

Recurrent lumbar disc herniation (RLDH) occurring in patients with prior lumbar discectomy considered as a major cause of morbidity in these patients. Occurrence of disk herniation in previously operated person who was pain free for more than 6 months following the first surgery for a herniated disc. It was reported that 5-18% of persons who had primary discectomy usually suffer from recurrent episodes [1].The main risk factors of Recurrent lumbar disc herniation include smoking, gender, obesity, the size of the annular tear, repeated lifting of high weights, senility, type of herniation, the amount of disc material that were removed during primary operation, degenerations of discs and the surgical technique that have been used [2,3,4,5].There is a broad controversy about the optimum surgical procedure to treat recurrent lumbar discs. Some surgeons believe that RLDH can be treated with re-discectomy alone in the absence of spinal instability and back pain. Others agree that fusion is important for treating the RLDH, as repeated discectomy involves the removal of more disc material and posterior components, including a lamina or facet joint, the risk of instability can increase further invasion on same surgical level [6].The aim of this study is to compare the clinical and functional outcomes of recurrent lumbar disc herniation (RLDH) revision surgery by either rediscectomy alone or rediscectomy with transforaminal lumbar interbody fusion (TLIF).

METHODS

This study had been carried out in the spine unit of the orthopedics department in both Zagazig University Hospitals and Nasser Institute Hospital. Twenty patients were surgically treated for recurrent lumbar disc herniation. The patients were divided into two groups (re-discectomy group and re-discectomy with TLIF group) according to days of month in which patients came to the clinic. Re-discectomy group consisted from patients came to the clinic in even days of month (2,4,6,8) and re-discectomy with TLIF group consisted from patients came to the clinic in odd days of month (1,3,5,7). The mean age of study population was 37.3±7.3 in the rediscectomy group (6 males, 4 females) and 40.4±8.1 in the rediscectomy with TLIF group (5 males, 5 females). The mean follow-up was (8.3±1.6 months) for the study population.

Inclusion criteria: patients (age 20-60) with MRI evidence of disc re-herniation after primary discectomy with at least 6 months of leg pain relief after initial surgery were included in this study. The re-herniation is at the same level of the initial surgery with radicular pain being the main complain of these patients with minimal back pain and a failure of conservative treatment for at least 6 months.

Exclusion criteria: patients with multi-segmental spinal canal stenosis, spondylolisthesis, spinal instability, spinal deformities and tumors were excluded.

Ethical consideration: Written consent was obtained from every patient after explanation of the procedure. Medical research and ethics committee of Zagazig University approved the study. The work was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Pre-operative preparation: All cases were subjected to thorough history taking, general and neurological examinations and investigations (routine laboratory + imaging studies).Imaging studies were done including: Plain X-ray of lumbar spine in standing position (anterior-posterior, lateral), dynamic views (flexion, extension), MRI with Gadolinium enhancement of lumbar spine, VAS for leg pain and ODI were measured preoperatively.

***Surgical techniques*:** All cases were reviewed and checked by the anaesthetist prior to the surgery and general anaesthesia was used in all patients with regular hypotensive anesthesia protocols.

In group A: Skin incision and exposure

After skin preparation midline incision was done and skin scar excision, subcutaneous and lumbar fascia incision, the paraspinal muscles are subperiosteally elevated in the symptomatic level and side reaching pars interarticularis.

Decompression: By using a curette, the epidural scar tissue at the previous laminectomy area was separated. Access to the normal anatomic planes of the epidural space was achieved by removal of the residual lamina and partial medial facetectomy. The epidural scar tissue was detached and partially resected. Exposure was carried out laterally, so that the lateral edge of the nerve root was visualized.The nerve root was then mobilized gently and retracted medially to expose the disc fragment. Occasionally, the nerve root was adhered to the extruded disc fragment or to the ligamentous structures and required sharp dissection for separation.

Discectomy:Once the dura and nerve root can be easily and gently retracted and a portion of the herniated disc exposed, blunt nerve hook can be used to mobilize the disc fragment and bring it into the field for removal with a grasping pituitary rongeur. On removal of a significant extruded disc fragment, tension on the dura and nerve root is reduced and permits further protection of the neural elements during additional dissection required to fully expose the floor of the spinal canal and neuroforamina to ensure complete excision of all herniated disc material and adequate neural decompression.

In group B:

Skin incision and exposure

After skin preparation, a midline incision was done and skin scar excision, subcutaneous and lumbar fascia incision, and the paraspinal muscles are subperiosteally elevated in the symptomatic level and dissected from the dorsal surface of the spinous process as far as the lateral border of the facet joints and transverse process bilaterally.

Pedicle screw insertion The entry point for lumbar pedicle screw insertion is at the intersection of two imaginary lines as follows: A transverse line dividing the transverse process into upper and lower halves, a vertical line that is just lateral to the midpoint of the facet joint.After bone decortication in this entry point with a Rongeur, an Awl and Pedicle Probe were used to create the pathway and trajectory for the pedicle screws.

Decompression: By using a curette, the epidural scar tissue at the previous laminectomy area was separated. Access to the normal anatomic planes of the epidural space was achieved by removal of the residual lamina.Resection of the inferior articular process with a straight osteotome or a kerrison was done. The capsular part of the ligamentum flavum is now visible and can be resected. Resection of upper part of the superior articular process with a straight osteotome or a kerrison to expose the intervertebral foramen.

Discectomy: The nerve root and dural sac was gently mobilized from the adherent fibrous tissue and herniated disc material, blunt nerve hook can be used to mobilize the disc fragment and bring it into the field for removal with a grasping pituitary rongeur. After removal of all herniated disc material, the disc space was distracted (restored) with sequential distraction-cutters (disc space spreaders). The spreaders were inserted horizontally and rotated clockwise to lever the vertebrae apart. To achieve a gradual distraction, distraction-cutters were increased in millimeter increments sequentially. Once the desired height was achieved, the distraction cutter was removed to complete disc preparation.

Cage insertion: ***A*** trial cage was used prior to insertion of the implant to verify cage placement and required disc height.An X- ray should be taken to verify final cage placement. The placement of cages with 4 tantalum beads was done to identify the position of the cage in the sagittal, coronal and axial planes. Ideal placement of the Cage is in the anterior aspect of the disc space.

Follow-up and evaluation in both groups

All patients were evaluated after surgery and at the follow-up visits (2 weeks, 1, 3, 6 months) and the mean follow-up period for both groups was (8.3±1.6 months).

Plain radiographs were obtained before discharge from hospital, and at 1, 6 months of follow-up, VAS for leg pain and ODI were measured at the 1, 3, 6 months and patient satisfaction was evaluated by Modified MacNab's outcome assessment of patient satisfaction 6 months postoperatively.

STATISTICAL ANALYSIS

Data were checked, entered and analyzed using SPSS version 23 for data processing. The following statistical methods were used for analysis of results of the present study. Data were expressed as number and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one.For all statistical tests done, the threshold of significance was fixed at 5% level (*P*-value), *P* value of > 0.05 indicates non-significant results and *P* value of < 0.05 indicates significant results.

RESULTS

There was no statistically significant difference between the two studied groups regarding demographic data as shown in **Table (1), Fig (1).**

There was no statistically significant difference between the two studied groups regarding VAS for leg pain when compared pre or post-operatively in between groups. While on comparing the pre and post-operative VAS for leg pain in each group, there was highly statistically significant improvement (8.5±0.4 versus 1.55±0.7 and 8.6±0.4 versus 1.45±0.4, p=0.001 &0.001) on Group A and B respectively with percent of improvement (81.8% & 82.9%) as shown in **Table (2), Fig (2).**

The pre and post-operative ODI of each group showed statistically significant improvement (75.8±3.3 versus 17.2±3.1 and 75.2±2.8 versus 16.6±1.**3,** p=0.001** &0.001**) in the rediscectomy alone and rediscectomy with TLIF groups respectively with percent of improvement (77.3% & 77.9%) **Fig (2).**But there was no statistically significant difference in between the two studied groups regarding ODI either pre or post-operative as shown in **Table (3** Regarding time till return to work, There was statistically significant difference between the two studied groups regarding return to work with shorter time among the rediscectomy group than the rediscectomy with TLIF group (2.1±0.7 versus3.4±0.8, p-value=0.002). Half of the rediscectomy group (50.0%) and (40.0%) of the rediscectomy with TLIF group had good satisfaction, (20.0% and 40.0%) of both groups respectively had fair satisfaction while (30.0% and 20.0%) of them had excellent satisfaction with no statistically significant difference between both groups as shown in **Table (4).**

Table 1: Comparing demographic characteristics between the two studied groups

Variables	**Rediscectomy alone (10)**	**Rediscectomy with TLIF (10)**	**t- test**	**p-value**
Age (years) mean ± SD (Range)	37.3±7.3 (28-50)	40.4±8.1 (28-50)	0.9	0.3
Variables	**Rediscectomy alone No (%)**	**Rediscectomy with TLIF No (%)**	**χ^2**	**p-value**
Sex				
Male (11)	6 (60.0%)	5 (50.0%)	0.2	0.6
Female (9)	4 (40.0%)	5 (50.0%)		

Variables	Rediscectomy alone (10)	Rediscectomy with TLIF (10)	t- test	p-value
Occupation ***Housewife (6)*** ***Manual work (7)*** ***Office work (7)***	2 (20.0%) 4 (40.0%) 4 (40.0%)	4 (40.0%) 3 (30.0%) 3 (30.0%)	0.9	0.6

Table 2: Comparing VAS for leg pain between the two studied groups

Variables	Rediscectomy alone (10)	Rediscectomy with TLIF (10)	t- test	p-value
Pre-operative VAS mean ± SD (Range)	8.6±0.4 (8-9)	8.5±0.4 (8-9)	0.2	0.7
Post-operative 1st month VAS mean ± SD (Range)	5.6±0.5 (5-6.5)	5.5±0.5 (5-6.5)	0.2	0.8
Post-operative 3rd month VAS mean ± SD (Range)	3.5±0.6 (3-4.5)	3.3±0.4 (3-4)	0.6	0.5
Post-operative 6th month VAS mean ± SD (Range)	1.55±0.7 (1-3)	1.45±0.4 (1-2)	0.3	0.7
Percent of improvement Median (range)	81.8% (66.7%-88.9%)	82.9% (75.0%-88.4%)	M.W 0.3	0.7
P-value for repeated measures	**0.001****	**0.001****		

M.W=*Man-Witenny U test.*,**Statistically highly significant difference (P ≤ 0.001).

Table 3: Comparing the ODI between the two studied groups

ODI	Rediscectomy alone (10)	Rediscectomy with TLIF (10)	t- test	p-value
Pre-operative ODI mean ± SD (Range)	75.8±3.3 (70-80)	75.2±2.8 (70-80)	0.4	0.8
Post-operative 1st month ODI mean ± SD (Range)	54.0±3.2 (50-60)	54.2±1.9 (52-58)	0.1	0.8
Post-operative 3rd month ODI mean ± SD (Range)	34.2±4.7 (30-44)	33.4±2.1 (30-36)	0.4	0.5
Post-operative 6th month ODI mean ± SD (Range)	17.2±3.1 (14-24)	16.6±1.3 (14-18)	0.5	0.6

ODI	**Rediscectomy alone (10)**	**Rediscectomy with TLIF (10)**	**t- test**	**p-value**
Percent of improvement Median (range)	77.3% (70.0%-82.5%)	77.9% (76.3%-80.6%)	M.W 0.6	0.5
P-value for repeated measures	**0.001****	**0.001****		

M.W=*Man-Witenny U test.*, **statistically highly significant difference (P ≤ 0.001)

Table 4: Comparing patients' satisfaction and return to work between the two studied groups

Variables	**Rediscectomy alone (10)**	**Rediscectomy with TLIF (10)**	**M.W test**	**p-value**
Time till return to work (months) mean ± SD	2.1±0.7	3.4±0.8	3.5	**0.002***
Patients satisfaction 6 months postoperative	**Rediscectomy alone No (%)**	**Rediscectomy with TLIF No (%)**	**Test**	**p-value**
Fair	2 (20.0%)	4 (40.0%)	0.9	0.6
Good	5 (50.0%)	4 (40.0%)		
Excellent	3 (30.0%)	2 (20.0%)		

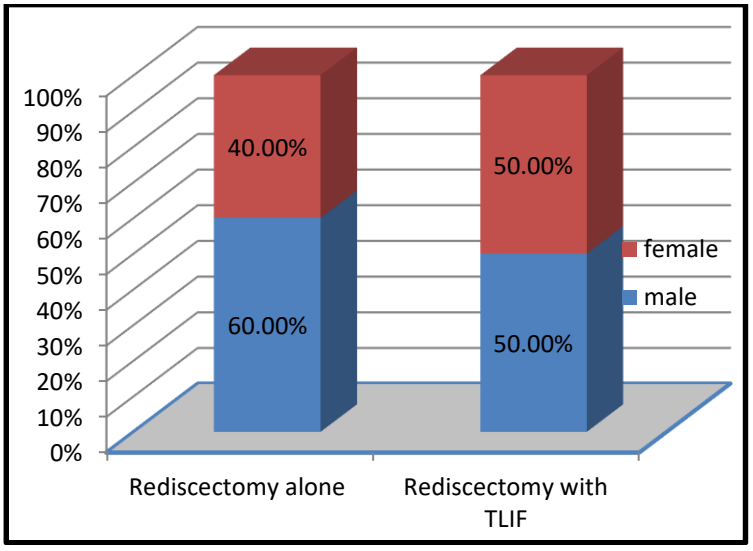

Fig 1: Bar chart for comparing sex distribution between the two studied groups

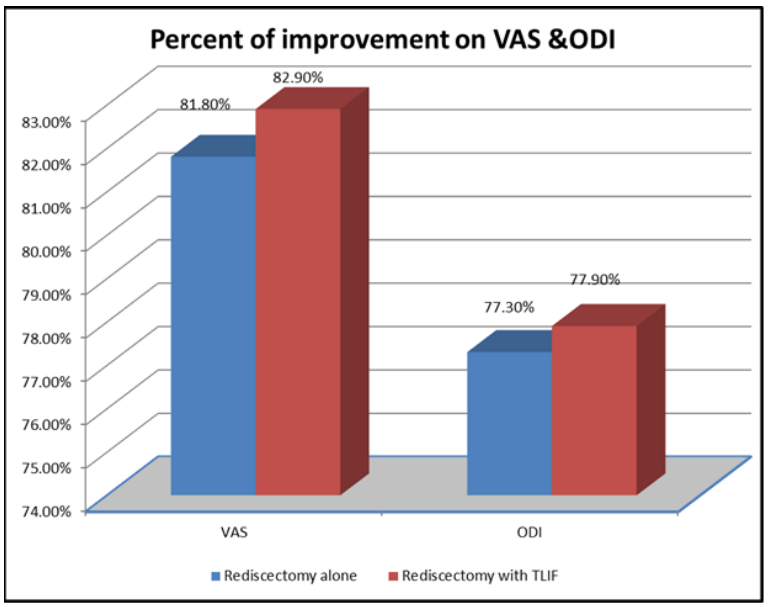

Fig 2: Bar chart for the high improvement on VAS &ODI score postoperative among the two studied groups

DISCUSSION

Currently, there are no clear guidelines established to assist surgeons in determining which approach is most appropriate to treat RLDH. Some authors suggest discectomy to be performed in patients with RLDH and radiculopathy, whereas fusion has been recommended in cases of lumbar instability, degenerative changes and/or chronic axial low back pain. Yurac et al. [7] and Chang et al. [8] had found that age less than 40 years was shown to be associated with recurrence. Few studies showed no statistical significance between age and recurrence [9-11].In contrast, Yao et al. [11] found that age more than 50 years is a strong risk factor for RLDH. The higher risk of recurrence in older patients is believed to be related to the greater disc degeneration in these patients than that in younger ones[2].Shimia et al [12] and Kim et al .[10] reported that risk of recurrence was significantly associated with male sex, other studies are in agreement with our study that no association between sex and recurrence.

The patients in the current study complained from recurrence of the leg symptoms after a period of pain free for more than six months. We divided the patients into two groups in a trail to determine the best treatment modality in cases of RLDH. It was obvious that both techniques can improve significantly the VAS for leg pain and ODI in the short term follow-up in these patients with no statistical difference between both groups in the follow-up. Yao, Yuan, et al. [13] studied 74 patients who suffered from disc herniation recurrence and underwent reoperation {Minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF), 26 cases; Micro-endoscopic discectomy (MED), 20 cases; percutaneous endoscopic lumbar discectomy (PELD), 28 cases). There were no significant differences in the preoperative pain levels or functional scores between the 3 groups according to VAS for leg pain, ODI. At 1 month postoperatively, the scores were decreased significantly in all 3 groups compared with the scores before surgery. In addition, there were no significant differences between the 3 groups for any of the scores over time. These findings were constant with what we found in our study. Fu et al. [14] performed a retrospective study comparing the long-term outcomes of repeat discectomy versus instrumented fusion for the treatment of RLDH. Short-term findings were similar to the study by Guan [1]. There was no difference in complication rates between the two techniques with a 13% durotomy rate in the repeat discectomy group and an 11% rate in the fusion group.

Patient satisfaction and return to work are the main goals of these operations. It has been shown that no significant difference was found with excellent or good clinical outcomes at last follow-up in 78.3% of patients undergoing discectomy alone and 83.3% of patients with instrumented fusion in the study conducted by Hlubek and Mundis [15]. This was the same in our study groups according to patient satisfaction, where there was no statistical significance difference in between both groups. While the return to work was significantly shorter in the re-discectomy group than the TLIF group.

There is some limitations in this work, as the small number of the study groups and the non-randomization of the groups. Short term follow-up period also considered one of these.

CONCLUSION

We concluded that patients without signs of spinal instability and/or sever back pain who suffer from leg pain will benefit from rediscectomy surgery in

first time recurrence of herniation and rediscectomy technique had better results than rediscectomy with TLIF in return of normal movement range and return of patients to work. Further study with larger sample size is recommended to confirm these findings.

Conflict of Interest: None

Financial Disclosure: None

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