

Recurrent Lumbar Disc Herniation: Is Fusion Necessary?

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Abstract

Background

Options of surgical treatment of a symptomatic recurrent lumbar disc include simple lumbar discectomy or discectomy with instrumented fusion. Controversy still exists on which is the better treatment option. The aim of this study is to determine clinical outcomes of patients with recurrent lumbar disc herniation after re-do lumbar microdiscectomy versus discectomy and fusion in an attempt to determine if fusion is necessary.

Methods

Data of 47 patients who underwent surgery for a recurrent lumbar disc herniation from July 2013 to January 2018 were retrospectively reviewed. Patients were divided into 2 groups depending on the surgical treatment modality, whether redo lumbar discectomy or discectomy and instrumented fusion with interbody transforaminal interbody (TLIF) cage. The patients' demographics, clinical data, radiographic data and clinical outcomes were evaluated.

Results

There were 25 patients (53.2%) who underwent redo-lumbar discectomy and 22 patients (46.8%) who underwent discectomy and fusion. There were 5 (20%) patients treated by redo discectomy who required a repeat surgery in the form of fusion. Comparison of the preoperative data between both groups showed no statistical significant difference in the following parameters: age, sex, mean time for disc recurrence; symptom duration; disc levels operated; herniated disc characteristic; association of modic changes; preoperative VAS and JAO scores. Satisfaction was rated as excellent in 96% of simple discectomy group patients versus 77.2% of discectomy and fusion group.

Conclusion

Redo discectomy provides the required symptoms relief with an early recovery and return to work. Lumbar fusion does offer symptoms relief with a clinical outcome comparable to simple discectomy. Fusion can be advantageous over simple discectomy in selected cases.

INTRODUCTION:

Recurrent lumbar disc herniation is defined as disc herniation at the same level of a previous discectomy (1). The incidence of recurrent lumbar disc herniation is reported in the range of 5-18% of patients (2,3,4). Options of surgical treatment of a symptomatic recurrent lumbar disc include simple lumbar discectomy or discectomy with instrumented fusion despite the lack of overt lumbar instability. Controversy still exists on which is the better treatment option or when fusion would be advantageous over simple discectomy for a recurrent symptomatic lumbar disc

herniation.

In this article a comparison of clinical outcomes of a contemporary series of patients with symptomatic recurrent disc herniation treated by either redo lumbar discectomy or discectomy and instrumented fusion is made, along with a thorough review of literature, in an attempt to identify indications of fusion for symptomatic recurrent lumbar disc herniation and a grading system by which can guide the choice of surgical treatment.

METHODS:

Data of 47 patients who underwent surgery for a recurrent lumbar disc herniation from July 2013 to January 2018 were retrospectively reviewed. A recurrent disc was defined as ipsilateral or contralateral disc herniation at the same level that was operated before, as diagnosed by contrasted MRI of the lumbar spine. Early recurrent disc herniations within the 1st month of treatment were excluded (considered as a failed surgery rather than a true disc recurrence). Patients with evidence of associated spinal instability as evidenced on dynamic lumbar Xrays were also excluded.

Patients were divided into 2 groups depending on the surgical treatment modality, whether redo lumbar discectomy or discectomy and instrumented fusion with interbody transforaminal interbody (TLIF) cage. The decision to treat by discectomy alone versus discectomy and instrumented fusion was merely based on the surgeon's assessment and discussion with the patient on the risks and benefits of each surgical modality.

The patients' demographics, clinical data, radiographic data and clinical outcomes were evaluated. Clinical outcome was evaluated using back and leg visual analog scale (VAS) scores, Japanese Orthopaedic Association (JOA) score (5), Modified McNab's criteria (6) and complication rates. For the instrumented group, evaluation of successful fusion by assessment of bridging bone and lack of motion on flexion/extension films were also done. Patients failing a redo discectomy and requiring repeat surgery in the form of discectomy and fusion were also determined (patients with persistent symptoms or recurrent symptoms due to a second recurrent disc herniation), including analysis of this subset group of failed re-do discectomy to identify clinical and radiographic data that may predetermine a subgroup of patients for which fusion would be more advantageous after an initial disc recurrence.

Statistical analysis was performed using SPSS 16.0 for Windows. Fisher exact test was used to evaluate the differences of clinical outcomes between the 2 groups. P values <0.05 were accepted as statistically significant.

RESULTS:

Surgical Groups

There were 47 patients included in this retrospective study who underwent surgery for a recurrent lumbar disc herniation from July 2013 to January 2018. Table 1 illustrates the 2 surgical groups. The choice of surgery

whether redo lumbar discectomy or fusion was based on the surgeon's decision made after a thorough discussion with the patient explaining risks and benefits of redo surgery with or without fusion. There were 25 patients (53.2%) who underwent redo-lumbar discectomy with a mean follow up of 21 months and 22 patients (46.8%) who underwent discectomy and fusion with a mean follow up of 38 months. There were 5 (20%) patients treated by redo discectomy who required a repeat surgery in the form of fusion. The mean duration after which a third surgery was required was 5 months. The mean follow-up of this subset of patients was 18 months.

Demographic data and pre-operative clinical and radiological characteristics

A summary is illustrated in Table 2. There were 15 males and 10 females in the discectomy group; versus 14 males and 8 females in the fusion group. The mean age for the discectomy group was 39 years, while for the fusion group was 47 years. The mean time for disc recurrence (MRI lumbar spine diagnosis) was 8 months for the discectomy group and 11 months for the fusion group. The mean symptoms duration prior to the second surgery was 3 months for the discectomy group and 5 months for the fusion group. On the visual analogue scale the severity of the preoperative back pain, leg pain and leg numbness were very similar for both surgical groups as was the preoperative Japanese Orthopaedic Association Scores (JAO) for both groups.

Contrasted MRI of the lumbar spine as well as dynamic lumbar Xrays were the radiological investigations used for diagnosis of lumbar disc recurrence (occurring ipsilateral or contralateral to previous discectomy) and spine parameters including lumbar spine stability, spinal alignment, Modic changes and facet arthrosis. The most common level operated by redo lumbar discectomy was L5-S1 (14 patients) versus L4-5 (12 patients) for the fusion group. Herniated discs were more commonly ipsilateral to a previous herniation (21 (for redo discectomy); 20 for fusion group). There were more MRI Modic changes in the fusion group (5 patients) versus the discectomy group (2 patients).

Comparison of the preoperative data between both groups showed no statistically significant difference in the following parameters: age, sex, mean time for disc recurrence; symptom duration; disc levels operated; herniated disc characteristic; association of Modic changes; preoperative VAS and JAO scores.

Postoperative Outcome

Postoperative outcome is illustrated in Table 3. Among postoperative analysis parameters only the postoperative back pain at the last follow-up was slightly higher in the discectomy group without statistical significance. Two of these patients however had progressively increasing back pain attributed to significant disc degeneration which required a lumbar fusion surgery. There were recurrence of disc prolapse at the level occurring in the redo lumbar discectomy group (3 (12%) patients) which also required a lumbar fusion surgery. There was a statistically significant need for blood transfusion in 10 (45.5%) of the fusion patients. Dural tear was of a higher incidence in the fusion group (13.6%) versus the discectomy group (4%). There was recurrent radiculopathy due to adhesions in both groups being slightly higher in the discectomy group versus the fusion group but was not statistically significant. For the other postoperative parameters outlined in Table 3 there was no significant difference in outcome.

The mean return to work was also shorter in the redo lumbar discectomy group without statistical significance. Satisfaction was rated as excellent in 96% of simple discectomy group patients versus 77.2% of discectomy and fusion group.

For the instrumented fusion group follow up of fusion by evidence of bridging bone and lack of motion on flexion/extension films showed successful fusion in all patients at 12-15 months from surgery.

Table 1

Type of surgery	Number of patients	Mean Follow up (months)
Re-do Lumbar discectomy	25 (53.2%)	21
Discectomy and fusion	22 (46.8%)	38
Discectomy and fusion after initial simple discectomy (for second recurrence or progressive low backache)	5 (20%)	18

Table 2

Variable	Simple discectomy group (n=25)	Fusion group (n=22)	P Value
Age (years)*	39	47	0.468
Sex (M/F)	15/10	14/8	1.00
Mean time (months) for disc recurrence (MRI diagnosis)	8	11	0.587
Symptoms duration (months)*	3	5	0.468
Disc level			
L1-2	0	0	
L2-3	1	0	
L3-4	4	2	
L4-5	6	12	0.176
L5-S1	14	8	0.447
Herniated disc characteristic Ipsilateral/ Contralateral	21/4	20/2	0.670
Associated MRI modic changes	2	5	0.420
Preoperative VAS Back pain *	7	8	0.769
Leg pain *	10	10	1.00
Numbness *	4	7	0.504
Preoperative JOA score (points) *	16	16	0.821

* Mean; VAS (Visual Analogue Score); JOA (Japanese Orthopedic Association Score)

Table 3

Outcome at last Follow up	Simple discectomy	Discectomy and Fusion	P Value
Mean Postoperative VAS Back pain	4	2	0.677
Leg pain	1	1	1.00
Numbness	2	3	0.662
JOA score (mean)	27	25	0.89
Recovery Outcome according to Modified McNab's criteria			
Excellent	24 (96%)	17 (77.2%)	0.670
Good	1 (4%)	5 (22.7%)	0.192
Fair	-	-	
Poor	-	-	
Complications			
Superficial Wound infection	2	3	1.00
Deep wound infection	0	0	0.479
Dural tear	2	4	0.349
Disc recurrence (at level)	3	-	
Adjacent segment disc herniation	0	2	0.235
Iatrogenic instability	0	0	1.00
Deep venous thrombosis	0	1	0.479
Hardware revision	-	1	
Recurrent symptomatic radiculopathy due to adhesions	2	2	1.00
Need for blood transfusion	0	10(45.5%)	0.001
Mean time to return to work	3 weeks	6 weeks	0.469

Table 4

Author/year	Surgery type	Outcome	Follow up Duration Mean/range
Fu TS et al/2005 (5)	Discectomy only (13) Discectomy + posterolateral fusion (18)	Significantly less intraoperative blood loss, length of surgery and hospital stay in discectomy only group. Excellent clinical outcome in 83.3% in discectomy and fusion, versus 78.3% for discectomy only.	88.7 months (range 60-134 months)
Hoogland T et al/ 2008 (7)	Transforaminal endoscopic excision (262 patients)	Excellent or good outcome in 85.71%. Recurrence rate of 4.62%	2 years
Lee DY et al/2009 (6)	Percutaneous endoscopic lumbar discectomy (25 patients), open lumbar discectomy (29 patients)	Mean improvement of back pain, leg pain and functional improvement better in open lumbar microdiscectomy group.	54.2 months (range 25-41 months)
Shin KH et al/2011 (9)	Percutaneous endoscopic lumbar discectomy (38 patients interlaminar, 9 patients transforaminal)	VAS for leg and back pain significantly reduced; excellent or good outcomes in 90.2%.	18 months (range 13-42 months)
El Shady AA et al, 2013 (10)	Revision discectomy alone (15); discectomy with TLIF (15); Discectomy with PLIF (15)	No significant difference among all 3 groups for postoperative JOA score, recovery rate and satisfactory rate.	37 months (range 24-54 months)
Agharee HN et al, 2014 (11)	Discectomy only (17); discectomy and PLIF (24)	Radicular pain significantly lower in discectomy and PLIF group; back pain and mean ODI the same in both groups.	13.9 months for discectomy only; 15 months for discectomy and PLIF
Hou Tet et al, 2015 (12)	Posterior microendoscopic discectomy (25)	Excellent or good outcome in 96%; significantly reduced leg pain and lower ODI scores.	3 years (1-6 years)
Guam J et al, 2017 (13)	Discectomy only (25); discectomy and fusion (12)	Lower ODI scores for back and leg pain similar at 3 and 12 months; 12% (3 patients) of simple discectomy required a third surgery.	2.2 years for discectomy (1-5.4 years); 2.2 years for instrumented fusion group (1.2-3.2 years)
Current/2019	Discectomy (25 patients) vs discectomy and fusion (22 patients)	Leg pain improvements were similar; early postoperative low backache worse in fusion group but significantly better at 1 year postoperative. Risk of second herniation or significant worsening back pain requiring fusion is in the rate of 20%. Factors determining need for fusion after initial discectomy for disc recurrence include persistent significant low backache (associated with significant disc degeneration, reduced disc height, reduced foraminal height) contralateral disc herniation.	21 months for discectomy group; 38 months for fusion group; 18 months for second recurrence (1-4 years)

Table 5

Parameter

Clinical :

-Long history of recurrent low backache

Radiological :

-Contralateral disc herniation

- Significant radiological degeneration of the motion segment:

-degenerated disc

-reduced foraminal height or facet arthrosis at the level

DISCUSSION

The optimal surgical treatment for a recurrent lumbar disc herniation still remains a controversial topic. Surgical treatment options is divided into either a redo-lumbar discectomy versus a discectomy and instrumented fusion with interbody cage fusion (transforaminal lumbar interbody cage fusion). These may be done via a conventional open or minimally invasive techniques. Revision surgery is always more challenging than the primary surgery due to the presence of perineural scarring. Never the less redo discectomy has been proven in multiple studies as relatively simple and effective, but with a relative risk of a second disk recurrence . Lumbar discectomy and

fusion eliminates the risk of a disk recurrence at the level but with its own set of risks and complications including loss of a motion segment and potential risk of adjacent segment disease.

In this series 47 patients who underwent surgery for a recurrent lumbar disc herniation from July 2013 to January 2018 were identified to compare outcomes of redo lumbar discectomy versus discectomy and transforaminal lumbar interbody cage fusion (TLIF) in an attempt to determine when fusion is advantageous over redo discectomy. There were 25 patients who underwent a simple redo lumbar discectomy versus 22 patients who underwent lumbar discectomy and fusion with a transforaminal lumbar interbody cage . Five patients (20%) from the re-do lumbar discectomy group required another surgery in the form of lumbar TLIF due to a second lumbar disc recurrence (3 patients (12%)) or progressive low backache not responding to conservative measures (2 patients (8%)). The mean follow up was 21 months for the re-do discectomy group, 38 months for the discectomy/fusion group and 18 months for those patients requiring fusion after an intitial redo discectomy.

This study was not a randomized prospective trial but a retrospective analysis of a group of patients with lumbar disc recurrence. Preoperative analysis of clinical and radiographic parameters appear to be similar and with no statistically significant differences. These include clinical factors as preoperative demographics (age and gender), mean time for disc recurrence and symptoms duration or severity of back, leg pain and numbness as assessed by the VAS and preoperative JAO scores. Preoperative radiological parameters as level of herniated disc, ipsilateral or contralateral herniations, evidence of modic changes were comparable in both groups. In this series of patients however, being non-randomized , we can not totally exclude some selection bias of the surgical modality chosen for treatment . It can be noted that in younger patients a simple discectomy was more likely (mean age was 39 years) while a fusion was more likely for older patients (mean age was 47 years). This observation however, did not have any statistical significance. This selection bias maybe related to history of recurrent low backache in this group of patients , in association with radiological degenerative changes of the motion segment in question, including significant disc degeneration at the level, facet arthropathy or reduced foraminal height which would explain the history of recurrent low backache in these patients and hence tendency for

offering fusion in this group.

The clinical outcomes in both groups are comparable. Leg pain improvements were similar, early postoperative low backache was worse in the fusion group but significantly better at 1 year postoperative. The over all outcome according to the modified McNab's criteria was excellent in 96% (4 patients) of the redo discectomy group versus 77.2% (17 patients) in the fusion group. Good outcome was in 4% (1 patient) of the redo lumbar discectomy group versus 22.7% (5 patients) in the fusion group. Complication rates were low in both groups as outlined in Table 4. Dural tears were slightly higher in the fusion group without statistical significance. The risk of a second herniation or significant worsening back pain after a redo discectomy requiring fusion was in the rate of 20%. For the fusion group the rate of hardware malposition requiring revision was 4.5% (1 patient), risk of adjacent segment disc progression was 13.6% (3 patients) which was managed conservatively. The fusion group showed a statistically significant need for blood transfusion in the rate of 45.5% (10 patients). Recurrent radiculopathy due to adhesions were similar in both groups with no statistical significance. There was an earlier return to work and regular activity in the redo-discectomy group (3 weeks) and opposed to 6 weeks in the fusion group with more restrictions in physical activity.

A subgroup analysis of the patients with a second disc recurrence at the same level of surgery, illustrate some factors worth noting that may predict a higher incidence for a second disc recurrence and hence offering fusion for such patients may be a better option. This includes contralateral disc herniation, as all 3 patients with a recurrence had an initial contralateral herniation. This maybe explained by the fact that there is a larger annular tear predisposing for a second recurrence. Patients with a progressive back pain (2 patients) who eventually required a fusion had a history of recurrent low backache and radiological evidence of reduced disc and foraminal height. Although this subgroup analysis holds no statistical significance due to the small number, predictors of the need for later fusion include clinical and radiological parameters outlined in Table 5. Thus such parameters may favor offering fusion for lumbar disc recurrence over a redo discectomy.

Multiple studies have illustrated comparable outcomes with both surgical approaches, with no real conclusive superiority demonstrated of one approach over the other. There are a

number of publications reporting outcomes of microdiscectomy, endoscopic discectomy and comparative studies of repeat discectomy versus fusion. A summary of selected publications is illustrated in Table 4.

Redo simple discectomy outcomes (conventional or minimally invasive endoscopic techniques)

Hoogland T et al (7) studied 262 patients with recurrent lumbar disc herniation treated by endoscopic transforaminal discectomy. Excellent or good outcome was achieved in 85.71% of patients at 2 years follow-up. Recurrence rate was reported at 4.62%. This study concludes on the effectiveness of the transforaminal discectomy approach for recurrent cases and a low risk of disc recurrence.

Lee DY et al (8) compared the outcome of percutaneous endoscopic lumbar discectomy (25 patients) and open microdiscectomy (29 patients) for recurrent disc herniation. Both groups showed favorable outcomes (slightly better for open microdiscectomy). Disc height did not change after percutaneous endoscopic discectomy but was significantly reduced after open microdiscectomy. The second recurrence was in the rate of 4% for the endoscopic group and 10.3% in the open discectomy group.

Shin KH et al (9) also assessed the outcome of 41 patients with recurrent lumbar disc treated by percutaneous endoscopic lumbar discectomy. Based on the MACNab's criteria 90.2% showed excellent or good outcomes. A second disc recurrence occurred in 2 cases, with a mean follow up of 16 months.

Hou T et al (12) assessed outcomes of series of 25 patients with recurrent lumbar discs treated by microendoscopic discectomy. An excellent or good outcome was achieved in 96% of patients. The mean follow up was 3 years. There was 1 patient with a second recurrence requiring a repeat surgery in the form of lumbar fixation and interbody fusion.

Lumbar fusion studies outcome

El Shazly AA et al (10) was a prospective study comparing discectomy alone versus discectomy and fusion with transforaminal lumbar interbody fusion (TLIF) or posterior lumbar interbody fusion (PLIF). There was no significant differences in outcome among all 3 groups. The mean follow-up was 37 months.

Agharee HN et al (11) compared outcomes of discectomy

alone versus discectomy and posterolateral interbody fusion. There were no significant differences in outcome. Mean follow-up was 13.9 months for the discectomy group and 15 months for the discectomy and PLIF group.

Fu TS et al (5) compared the results of repeat discectomy versus discectomy and posterolateral fusion in 41 patients with lumbar disc recurrence. The clinical outcome was excellent or good in 80.5% of patients, including 78.3% of patients undergoing discectomy alone and 83.3% of patients with posterolateral fusion. The difference between the fusion and nonfusion groups was insignificant. This study concluded that repeat discectomy alone was the recommended surgery.

Guan J et al (13) compared 2 groups of patients with recurrent lumbar disc herniation treated by redo discectomy (25 patients) or discectomy and fusion (12 patients). There was a lower Oswestry disability index (ODI scores) for back and leg pain similar for both groups at 3 and 12 months. There were 12% (3 patients) of simple discectomy patients requiring a third surgery. The mean follow up was 2.2 years for discectomy (1-3.4 years); and 2.2 years for instrumented fusion group (1.2-3.2 years).

CONCLUSION

The debate of the optimum surgical option for recurrent lumbar disc herniation is still ongoing. Multiple publications show comparable outcomes of redo lumbar discectomy (whether conventional microdiscectomy or minimally invasive endoscopic techniques) as compared with discectomy and fusion. It is clear from the current study and from the literature that redo discectomy provides the required symptoms relief with an early recovery and return to work. It does carry a risk of second recurrence of 12% requiring eventual surgical fusion, which is a recurrence rate similar to the initial surgery. Lumbar fusion does offer symptoms relief with a clinical outcome comparable to simple discectomy. It does eliminate the risk of disc recurrence at the level but has its own set of risks including hardware complications, possible need for blood transfusion, longer recovery time, fusion of the motion segment and risk of adjacent segment disease. There is a selection bias in this

study and other studies of which patients are offered fusion, this together with the subgroup analysis of patients who underwent redo discectomy and eventually required fusion for a second disc recurrence or progressive low backache indicates that fusion can be advantageous over simple discectomy in selected cases.

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