Aggressive discectomy for single level lumbar disk herniation

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Abstract

Aggressive open lumbar discectomy is the most commonly performed surgical procedure for patients with persistent low back and leg pain. In this retrospective study, 1,380 patients were evaluated for long-term results of aggressive discectomy for the single level lumbar disk herniation. Demographic data, surgical data, complications and reherniation rate were collected and clinical outcomes were assessed using visual analogue score (VAS), Oswestry disability index (ODI) and modified Mcnab criteria. The mean follow-up period was 28.8 months. According to the modified Mcnab criteria, the long-term results were excellent in 640 cases, good in 445 cases, fair in 255 cases, and poor in 40 cases. The mean VAS scores for back and radicular pains and ODI at the end of 2 years were 1.1 ± 1.0, 1.5 ± 0.5 and 6.6 ± 3.1% respectively. The complications were foot drop (n=7), dural tear (n=14), superficial wound infection (n=17), discitis (n=37) and reherniation (n=64). The dural tear and superficial wound infections resolved after treatment but 28 discitis patients were treated by conservatively and the remaining 9 underwent surgery. Among reherniation patients, 58 underwent revision discectomy and 4 underwent transforaminal lumbar interbody fusion and stabilization. Aggressive discectomy is an effective treatment of lumbar disk herniation and maintains a lower incidence of reherniation but leads to a collapse of disc height and in long run gives rise to intervertebral instability and accelerates spondylosis.

Introduction

Low back pain secondary to lumbar disc herniation is a cause of morbidity. The incidence of lumbar disc herniation is 1 to 2% in general population[1, 2] and 4.9 per 1,000 person-years in a young population.[3]

There are many different options for lumbar herniated disk surgery, but open lumbar disc surgery using minimally invasive technique is still the most frequent and important intervention of spine even with the development of many surgical techniques.[4] Among the different options one is aggressive discectomy, which means removal of the offending herniated disc as well as curettage of the normal disc[5] and other is limited discectomy which means removal of the offending disc fragment alone with or without minimum invasion of the disc space[6, 7] but the overall unsatisfactory rate after discectomy is 3 to 20%.[8–12] Its recurrence (at the same level regardless of ipsilateral or contralateral herniation) following disc excision is reported to be 5 to 11%.[8-10, 12]

We reviewed 1,380 patients who underwent aggressive open lumbar discectomy for a single level prolapsed lumbar intervertebral disc using a minimally invasive open technique.

Materials and Methods

In this retrospective study, 1,500 patients were evaluated who underwent aggressive open lumbar discectomy for a single level prolapsed lumbar intervertebral disc from October 2003 to December 2016 through investigating the medical records in our hospital and private settings. Thirteen hundred eighty patients were finally included. Among them, 995 men and 385 women age ranged from 21–60 (mean, 43.7 ± 9.3) years who underwent aggressive discectomy at L4-5 (n=835), L5-S1 (n=530) and L3-4 (n=15) were reviewed.

Patients were included if they had a) dominant leg pain rather than back pain, b) severe motor and sensory deficits, c) progressive neurological deficits with sciatica, d) persistent pain hampering daily activities, e) restricted straight leg-raising test and positive radiographic or magnetic resonance imaging findings (Figure 1) and f) minimum follow-up of two years. Patients with spinal instability, other spinal pathology, cauda equina syndrome, previous lumbar spine surgery or recurrent PLID were excluded. One hundred and fifteen patients who were lost to follow-up. Five patients who died of unrelated medical illness. Demographic data (Table I), surgical data, complications, reherniation rate,

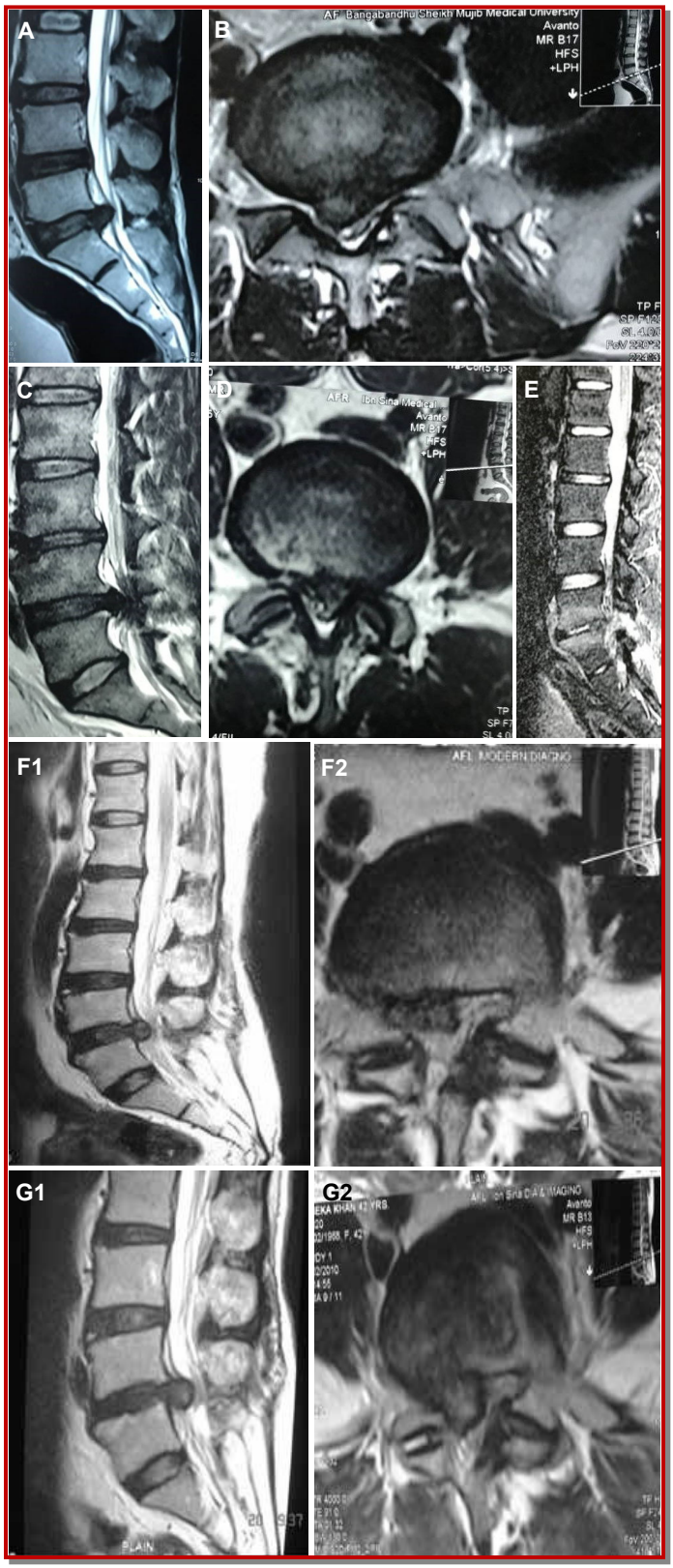

Figure 1: MRI of lumbar disc herniation L5-S1 level (A, B), at L4-5 level (C, D), post-operative discitis (E). Primary (F) and recurrent (G) (1.5 years later) prolapsed lumbar intravertebral disc at L4-5

pre- and post-operative visual analogue score (VAS) for back and radicular pain and Oswestry disability index (ODI) were recorded (Table II). Clinical outcomes were assessed by modified Mcnab criteria.[13]

After proper counseling informed written consent was taken from all the patients and under general anesthesia patients were placed in a prone position with support for the iliac crest and the chest in order to leave the abdomen free of any compression and thus minimizing epidural venous dilation and intraoperative bleeding. A pre-operative marker film was obtained in all the cases to identify the proper level. Skin scratch, which was done pre-operatively with marker film on the level of the prolapsed disc, further confirmation of the level was done before the skin incision. After thoroughly preparing the skin, a posterior midline 3.5 cm longitudinal incision was made centering the scratch mark and the paraspinal muscles were elevated to approach the interlaminar space. A microlumbar retractor was used to expose the interlaminar space. The yellow ligament was then incised and mobilized from the underlying dura with small dissector. After complete excision of yellow ligament dura along with nerve root usually mobilized to the medial side. Through a transverse annulotomy an aggressive discectomy was performed and washed with normal saline. After proper hemostasis wound closed in layers with or without drain *in situ*. The midline structure e.g. ligaments, lamina and facets were left undisturbed. The operating microscope was not used.

All 1,380 patients were allowed to ambulate on the first post-operative day and discharged on the 5th post-operative day (3–7 days). Sutures were removed on the 14th post-operative day and allowed to start back muscle strengthening exercises and subsequent follow-up done at 6, 12 weeks, 6 month and once yearly. Long-term outcome was assessed by telephone survey or mail-in survey. Statistical analyses were done by Chi-squared test and paired t-test. A p value of <0.05 was considered to be significant.

Results

The mean follow-up period was 28.8 (range 24-74) months. Most of the patients were in 16-40 years age group (71.4%). Male to female ratio was 2.58:1. The most common level of involvement was at L4-5 (60.5%) and side of involvement was on the left side (62.7%). The mean operative time was 95 ± 9 min (range, 45–105 min) and the average length of hospital stay was about 5 days (range, 3–8 days). The mean blood loss was 34.9 ± 18.5 mL (range 20-85 mL). According to the modified Mcnab criteria, long-term results were excellent in 640 cases whereas poor in 40 cases with surgery. Two hundred fifteen patients had occasional intermittent

Table I

Characteristics and outcomes of patients

Characteristics	Patients (n=1,380)
Age (years)	
16–40	985
41–65	395
Mean	43.7 ± 9.3
Sex	
Male	995
Female	385
Involved level	
L3-4	15
L4-5	835
L5-S1	530
Involved side	
Right	480
Left	865
Bilateral (central)	35
Recurrence (months)	
1–2	4
3–24	30
25–42	22
43-60	8
Discitis	37
Outcome	
Excellent	640
Good	445
Fair	255
Poor	40

Table II

Clinical outcomes of aggressive discectomy

VAS scores	
Pre-operative	
Back pain	3.1 ± 2.4
Radicular pain	6.8 ± 0.7
2 weeks post-operative	
Back	1.5 ± 0.9
Radicular	2.3 ± 0.7
2 years after surgery	
Back	1.1 ± 1.0
Radicular	1.5 ± 0.5
Disability status (Oswestry disability index)	
Pre-operative	73.6 ± 7.6%
2 weeks post-operative	23.0 ± 5.0%
2 years after surgery	6.6 ± 3.1%
Occasional pain at >2 years	215 (15.6%)
Mean operating time (min)	95 ± 9

Data are mean ± standard deviation

pain and taking occasional analgesics and overall satisfactory outcome occurred in 1,085 of the patients. Complications were foot drop (n=5), dural tear (n=14), superficial wound infection (n=17), discitis (n=37) and reherniation (64). The dural tear and superficial wound infections resolved after treatment but 28 discitis patients were treated conservatively in the form of antibiotic and the remaining 9 patients underwent surgery. Among 9 patients, 5 patients underwent simple posterior debridement and drainage and 4 underwent posterior instrumentation and postero-lateral fusion for post-discectomy syndrome. Sixty four patients had recurrence of symptoms and needed revision surgery, four of them (0.3%) had a recurrence 1-2 months after surgery due to residual sequestrum, 30 patients had recurrence after 3-24 months, and 22 patients had recurrence after 25-42 months while 8 patients had recurrence after 43-60 months post-surgery. Among reherniation, 58 patients underwent revision discectomy and 6 underwent transforaminal lumbar interbody fusion and stabilization. Eighty five patients experienced 1-3 attacks of back pain after 2-7 years of surgery that responded to conservative treatment (analgesic and physiotherapy except 20 patients who was treated with epidural steroid).

Discussion

Williams[6] in 1978 was the first who described a limited discectomy (fragmentectomy) operation; in which he removed only the herniated part of the disc to treat the lumbar intervertebral disc prolapsed (IVDP) and described a success rate of 90% and a recurrence rate of 4-9%.[14] Several articles were published following that, which confirmed William's results.[15,16] By this technique, the surgeon avoids entering the disc space and avoids destruction of the intervertebral disc height and its complications. Comparison studies have shown both limited and aggressive discectomy had equivalent reherniation rate and complications but limited discectomy maintains a lower incidence of recurrent low back pain and higher satisfactory rate.[17]

Both young and old population, suffer the lumbar disc herniation, but the highest incidence of prolapsed disc in most of the reported series are between 30-50 years.[18,19] which were consistent in our series. Most common level of involvement at L4 -5 and side of involvement on the left side in reported series[19] which were comparable to our series.

The complications associated with aggressive discectomy and limited disc excision is similar. One large series of 2503 open disc excision showed postoperative infection rate 3.2%, deep disc space infection rate 1.1%, a thromboembolism rate 1% and mortality rate 0.1%.[20] Kraemer et al. showed intraoperative complications in their open lumbar microdiscectomy study, are related to position of patient (brachial plexus injury), wrong level, epidural venous injury, dural injury, nerve root injury and intra-abdominal vessels and visceral injuries and post-operative spondylo discitis.[4] Using the aggressive discectomy technique, there was no intra-abdominal vessels and visceral injuries and are almost comparable to above study.

A comparison studies between microdiscectomy and sequestrectomy showed same improvement of VAS score and the reherniation rate.[21] Another comparative study between conventional microdiscectomy and sequestrectomy (LD) showed no difference in clinical results and recurrence rate.[22] Our retrospective study confirms the results of aggressive discectomy (fragmentectomy) for lumbar disc herniation that are seen by the above articles. A comparative meta-analysis of discectomy group (n=896) versus sequestrectomy group (n=896) showed the reherniation rate in discectomy group ranged from 0 to 10.5% with an average of 4.7%, while that in sequestrectomy group ranged from 1.0 to 21.2% with an average of 6.6%[21] which was comparable to our study (4.6%). Carragee et al.[23] reported a reherniation rate after limited discectomy for discs with "massive" annular defects (>6 mm in width) that was almost six times greater when compared to the remaining patient cohort with smaller defects (27.3 vs. 4.8%), identifying this as "an independent predictor of reherniation". Though we cannot measure the actual size of annulus defect but the majority of causes of reherniation in our study may be due to annulus

defects which were wider than 6 mm. Other factors may be environmental factors, such as obesity, occupational activities, and posture. On the other hand, men with markedly degenerated discs are more prone to recurrence, particularly after an injury or a precipitating event.[9] 78% of our patients with recurrence were men.

The incidence of disc space infection is <4% in patients with discectomy.[24] But infection rates range from 0.4 to 4.3% in case of fusion without instrumentation and with instrumentation infection rate increases significantly from 6.6–8.7%.[25] In the present study, discitis occurred in 37 patients (2.7%), which were comparable to Moon et al.[24] study.

Pre- and post-operative VAS scores for leg pain and ODI scores were significantly reduced following surgery throughout the 24 months follow-up period ($p<0.0001$, Wilcoxon Rank-Sum test) which were comparable to others.[21, 23] Overall satisfactory outcome according to Mcnab criteria was 78%. The results of this study showed that aggressive discectomy cannot increase the recurrence rate or any differences in post-operative VAS scores in back and radicular pains.

Conclusion

Aggressive discectomy can be a good surgical option for lumbar disc herniation, if we select the patients according to well-defined criteria. Our long-term outcome study shows that aggressive discectomy for single level lumbar disk herniation using a minimally invasive open technique is an effective way to treat lumbar disk herniation and maintains a lower incidence of reherniation but leads to a collapse of disc height and in long run gives rise to intervertebral instability and accelerates spondylosis.

Conflict of interest

There is no conflict of interest.

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