



Lumbar disc herniation: long-term outcomes after mini-open discectomy

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Abstract

Purpose The outcomes of mini open discectomy in lumbar disc herniation are usually satisfying. Our study aims at finding if its results are still good at long-term follow-up.

Methods We reviewed 552 patients operated between 1993 and 2013 by mini open discectomy procedure. Our main evaluation criterion is a modified Stauffer and Coventry classification applied during follow-up visits at three months, one year, five years, and every five years. The secondary criterion was the Oswestry Disability Index.

Results The outcomes are considered good to very good in 87.3% of the cases at one year follow-up. These results deteriorate after an average follow-up of 14.7 years but remain satisfactory with 63.7%. The global decrease is 23.6%. The Oswestry Score decreases by 35 points at the same follow-up. In addition, 6.52% of patients required fusion at first revision and 1.08% at second revision. We also noticed 51 (9.2%) post-operative recurrences at the same level. In 23 (4.16%) of them, we proceeded to a new discectomy in an average interval of 41.4 months. At an adjacent level, 29 patients (5.2%) presented a new symptomatic disc herniation; among them, eight cases (1.44%) needed discectomy. The re-operative rate (including recurrent disc herniation and fusion for degenerative indications) is 10.68% at the last follow-up.

Conclusions Nearly 2/3 of our patient series keep satisfactory outcomes after about 15-year follow-up. The mini open discectomy remains a reliable surgical technique provided we respect the indications and surgical requirements. This procedure also avoids excessive instrumentation and its possible iatrogenic complications. Powerful randomized and controlled trials are needed to strengthen these deductions.

Keywords Long-term outcome · Discectomy · Lumbar disc herniation

Introduction

Symptomatic lumbar disc herniation is a frequent and disabling pathology. Physical activity and workload increase the risk of intervertebral disc herniation and degeneration [1].

If conservative treatment fails or if the impact of the disease on daily activities is significant, surgery becomes an important modality for these patients [2]. Most often, the surgical treatment of choice is mini-open discectomy that generally allows satisfactory outcomes [3]. Fusion is not recommended for routine discectomies [4]. However, there are still controversies about which surgical technique to use. Options include discectomy alone or discectomy associated with rigid or dynamic stabilization. Isolated discectomy is the most common spinal surgery performed throughout the world, especially in the USA [5]. Fusion is often preferred in case of advanced facet degenerative arthritis, spondylolisthesis, instability [4], revision surgeries, or extended laminectomy. It is therefore necessary to select the correct surgical option for lumbar disc herniation. One has to keep in mind that the first-line discectomy alone is generally sufficient and could avoid the associated risks of abusive instrumentation.

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The objective of this study is to present the long-term results of mini-open isolated discectomy for symptomatic lumbar disc herniation. The assumption is that the clinical outcomes are satisfactory.

Materials and methods

Study design

We conducted a retrospective study of patients operated on by one of the authors (T.B.) between 1993 and 2013. Pre and intra-operative data were collected from the medical file. The patients were contacted by mail for the first time in a follow-up consultation. In case of a no show, they were contacted by phone. In the event of inability to join our consultation centre, a telephone interview was conducted. A patient was considered lost to follow-up if he or she missed two consecutive consultation appointments.

Inclusion and exclusion criteria

All patients operated upon for symptomatic lumbar disc herniation by discectomy using a mini-open approach were eligible for the study. The inclusion criteria were a patient with a single hernia at level L3/L4, L4/L5, or L5/S1, more than 18 years old and who consented to this study.

The exclusion criteria were prior lumbar spine surgery, cauda equina syndrome, complicated radiculopathy with deficits < 3/5 in motor testing before surgery, scoliosis (Cobb angle > .15°), spondylolisthesis, vertebral fractures, and other spinal pathologies (infections, tumours, inflammatory diseases). Patients with less than five years of follow-up and pregnant women were also excluded.

Surgical technique

The indication for discectomy option was chosen after failure of well-conducted medical treatment of at least six weeks. The disco-radicular conflict itself was evaluated by MRI (Fig. 1) and/or CT scan.

The procedure is performed under general anesthesia, in a knee-chest position, by mini-open discectomy alongside a thorough check of the involved nerve root [6]. After a 3- to 4-cm skin incision, a unilateral interlaminar approach is used, as described by Delamarter et al. [6], for paracentral unilateral disc herniation. The superior facet is partially removed if needed to provide a good view of the involved nerve root. A small annular incision is performed to remove the herniated disc part before smoothly extracting the mobile disc fragments. The intervertebral space is cleaned by suction without any excessive curettage. Afterwards, the canal is inspected to ensure that there is no more detached disc fragment and that



Fig. 1 Huge lumbar disk herniation

the nerve root is freely mobile after decompression. In case of extraforaminal hernias, a Wiltse approach is performed [7].

Evaluation criteria

Our main evaluation criterion inspired from the modified Stauffer and Coventry classification [8] was applied at three months, one year, five years, and at about every five years until the last appointment.

The results were classified into four categories:

- Very good (complete relief > 90% of radicular pain and return to previous activities),
- Good (relief from 70 to 90% of low back pain and radicular pain with ability to return to previous work),
- Moderate (partial relief from 30 to 70% of low back pain and radiculopathy and ability to return to previous work with limitations or lighter work);

- Poor (very little relief from 0 to 30% of radicular pain, inability to return to work; very limited physical activities and strong analgesics used regularly).

The secondary criterion for clinical evaluation was the Oswestry Disability Index (O.D.I) [9] for patients operated upon after 2002 (the year we started using this newly published questionnaire).

These main and secondary criteria have been used in other literature studies on long-term outcome of discectomy [10].

Statistical analysis

Descriptive epidemiological data were expressed as mean ± standard deviation for quantitative data or as an absolute value (proportions) for qualitative data.

Results

Characteristics of the population

Our study includes 552 patients. The average follow-up is 14.7 years (range 5 to 24). The average age is 36.1 years (18–71). The sample population includes 362 males and 190 females. The main clinical presentation was intense radicular pain, resistant to conservative treatment for six weeks in 87% of cases. Patients with severe hyperalgesic radiculopathy who were resistant to opioids for 12 hours represent 13% of the cases.

Post-operative health status analysis

In Fig. 2, we report the results of discectomy according to the modified Stauffer and Coventry’s evaluation criteria at the last follow-up: 14.7 years (range 5 to 24). The evaluation shows

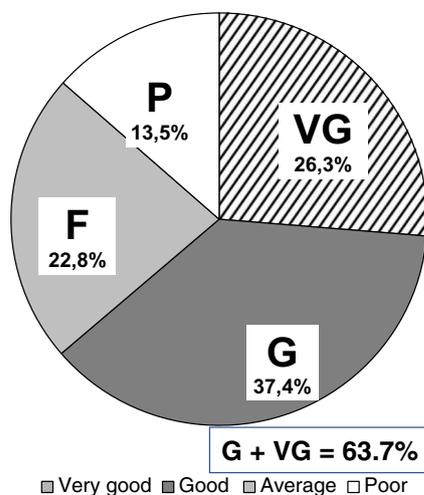


Fig. 2 Outcomes at the last follow-up (average 14.7 years)

very good outcome in 26.3%, good in 37.4%, average in 22.8%, and poor in 13.5% of the cases.

Our second criterion: the Oswestry Index allowed to estimate our patient’s functional disability at 62.9% pre-operatively and 18.4% at 1-year visit and 27.9% at the last follow-up visit.

Evolution of results over time

Our general results of discectomy have deteriorated slightly over time (Fig. 3).

At 3-month follow-up, patients showed 91.7% of good and very good results.

At one year follow-up, we had 87.3% of good and very good results. Thus, this percentage has undergone a slow gradual deterioration. Then, at the last follow-up (average 14.7 years), this percentage was only 63.7%.

Complications

Intra-operative complications in the series are rather uncommon and are distributed as follows: 21 cases (3.8%) of accidental durotomy (treated immediately by suture and fat patch ± glue, no patient needed revision for this complication), two cases (0.36%) of incomplete cauda equina syndrome, 8 (1.4%) post-operative palsies of the concerned root (4 of them recovered totally), and 2 (0.36%) isthmus fractures (managed by 2-month cast). We also noticed 24 cases (4.34%) of radiculitis (radicular pain without imaging proof of conflict), among them 13 recovered at one year follow-up.

As for early post-operative complications we had: six wound infections (1.08%) which necessitated early revision surgery and antibiotics. It is worth noting that there were no intra-operative vascular or intestinal injuries. We also noticed 51 (9.2%) post-operative recurrences at the same level (whatever the herniation side). In 23 (4.16%) of them, we proceeded to new discectomy in an average interval of 41.4 months between initial and second surgery (1–118 months). The specific

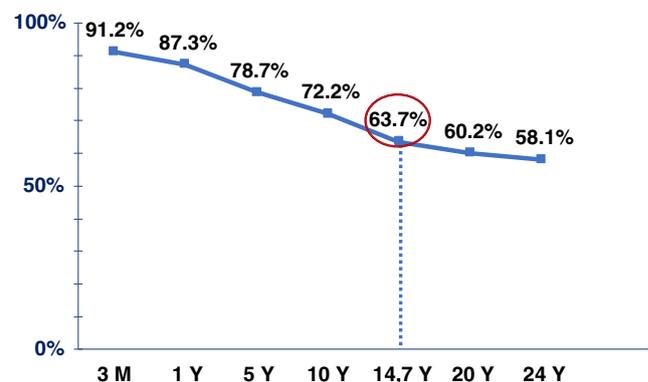


Fig. 3 Decrease of good and very good outcomes over time: 63.7% at average follow-up of 14.7 years

re-operative rate for recurrent disc herniation at the same level is 4.16%. Among these 23 patients, six (1.08%) needed fusion during a third procedure for a second recurrence of herniation. In addition, 29 patients (5.2%) presented a new symptomatic disc herniation at an adjacent level, among them eight (1.44%) patients needed discectomy.

At the last follow-up of the 552 lumbar disc herniation initially treated by mini-open discectomy, we had 36 cases (6.52%) of fusion performed during revision at the same degenerated level including nine cases for post-operative instability reasons and 27 cases for degenerative indications (discopathy, foraminal stenosis, or spondylolisthesis). The global re-operative rate at the level operated upon is 10.68% (59 patients) at the last follow-up (including 23 cases of new discectomy for recurrence and the 36 cases (6.52%) of fusion performed during revision. More than half of these patients are heavy workers: 31 among 59.

Discussion

Population

The average age is 36.1 years old. Our population is young and the most exposed to disc herniation because of sports and heavy work. Men are more frequently affected than women probably because of their usually heavier work [11].

Technique

Mini open discectomy was used because it has proven its efficiency [3] and because there was no evident reason to change the mini open option all along of this series.

Main results

The long-term outcomes of mini-open discectomy after symptomatic lumbar disc herniation show satisfactory results of this surgical technique. Indeed, the results are considered good to very good in 91.2% of the cases at three month follow-up, according to the modified Stauffer and Coventry classification. These results deteriorate over time, but remain satisfactory with 63.7% of good to very good results persisting after an average follow-up of 14.7 years. Regarding our second criterion, the Oswestry Index has decreased by 35 points out of 100 between pre-operative visit and the last follow-up. In addition, we noticed that 6.52% of our cases required fusion during first revision. In fact, a weak general social health cover and a local population not always in favour of instrumented procedures partially explain our low rate of fusion.

Force and limitations

Some limitations are related to the design of the study. This is a monocentric study extending over a long period of consecutive patient recruitment. In addition, during the study period, the senior surgeon was able to improve his procedures, increasing the initial good results. Moreover, this is a retrospective study and some patients may have been lost sight of, or may have submitted incomplete data. Finally, there was no control group of fused patients in order to compare different treatment options.

However, the large size of the series (552) and its average follow-up (14.7 years) are important in determining a real trend towards maintaining quite good results over time. Thus, this study benefits from a very long term evaluation in comparison with the literature [10, 12–14].

Surgery

Compared to the mini invasive techniques, mini-open discectomy allows a longer interval time between initial surgery and revision [15]. Our average interval (41.4 months) is quite close to that reported by Cheng (33.1 months) [15] and longer than what was recently reported by Shin et al. (17.6 months) [16].

Moreover, 3.8% of our cases had incidental durotomy that was immediately managed and did not present any later complications. In addition, this rate is close to the 4.9% of the retrospective database review presented by Puvanesarajah [17]. In our series, no disc closure technique was performed. Indeed, some authors [18] use an annular closure technique of the disc after discectomy to avoid recurrence of herniation.

In our technique, only saline washing with suction and smooth curettage inside the intervertebral space was used to remove any mobile disc fragment. In so doing, the procedure aims at avoiding or diminishing the risk of recurrence.

Long-term outcomes

There is a significant variation in the rates of good post-operative outcomes. This is related to the different scoring systems, as Prolo et al. said [19]. Our study found 63.7% of good and very good results using the modified Stauffer and Coventry classification at the average last follow-up. We have chosen this evaluation method as the main criterion because it also takes into account the psychological evaluation which was demonstrated as the best prognostic element by Spengler et al. [20].

Moreover, our rate of poor results (13.5%) may be explained by some psychological predispositions such as depression or somatization. Some psychological signs are in fact negative predictors of discectomy success [21] and may induce poor clinical outcomes, as reported by Chaichana et al.

[22]. In the same way, some cultural beliefs may induce similar unsatisfying outcomes due to underdiagnosed depression. On the other hand, at one year follow-up, Atlas [23] and Weinstein [24] agreed that surgical treatment gives better results than conservative treatment (90% versus 60%). This is in line with our therapeutic option, which allowed us to achieve good and very good initial results of 87.3% after one year follow-up.

In the long term, our good and very good results decreased to 63.7%. This could mainly be due to disc degeneration or to hernia recurrence. In another long-term outcome series, Loupasis et al. [10] with an average follow-up of 12.2 years (7–20) found a 7.3% re-operation rate (1/3 for recurrent disc herniation). Our 10.68% rate (1/2 for recurrent disc herniation) is relatively close to his findings. Moreover, Loupasis et al. stated that patients with physically strenuous jobs may get an unsatisfactory outcome. Half of our re-operated patients are heavy workers, which could make sense for a similar conclusion on outcomes. The rationale behind fusion in isolated disc herniation is lacking in literature guidelines [4]. Meanwhile, Çaçar [25] stated recently that fusion may be considered an option for patient with a primary herniation surgery in heavy-duty workers. It is worth noting that when fusion was performed during revision in our study, we took into account the spinal sagittal balance as recommended by Le Huec et al. [26], Chevillotte et al. [27], and Vazifehdan et al. [28].

Finally, regarding the extent of discectomy, we only performed a limited one. This procedure, comparatively to aggressive discectomy, allows less risk of back pain in the long-term outcomes but with increased incidence of recurrent herniation [29].

Moreover, non-instrumented discectomy could avoid any additive errors of indications and of operative technique. Indeed, a surgical revision in symptomatic lumbar disc herniation is often more difficult and the result is seldom satisfactory.

Conclusion

Mini-open discectomy for symptomatic lumbar disc herniation remains our preferred surgical option thanks to its long-lasting satisfying outcomes.

Mini-open discectomy allows 87.3% of good and very good results at one year follow-up. This rate decreases only by 23.6 points until 63.7% after the long term of 14.7 years.

Therefore, the long-term results are quite good provided the surgeon makes a good patient selection and takes into account the socio-cultural, professional, and psychological profiles.

This procedure also avoids excessive instrumentation and its possible iatrogenic complications as well as unnecessary increased costs. Powerful randomized and controlled trials are needed to strengthen these deductions.

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