Original Article

Frequency and determinants of surgical treatment in patients with uncomplicated disc-related sciatica hospitalized in the Rheumatology Department of Lille University Hospital

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Background: Disc-related sciatica is a frequent condition. Most cases of sciatica evolve favorably. Although several randomized controlled trials have reported that surgery is more effective than conservative management in the short-term, no significant differences in pain or functional disability have been reported in the longer term. As such, discounting complications requiring urgent intervention, surgery is generally only performed in patients in whom medical treatment has failed. Our objective was to determine the rate and predictive factors of surgical treatment one year after in-hospital conservative management of disc-related sciatica.

Methods: Retrospective, observational, single-center study conducted in the Rheumatology Department of the Lille University Hospital Center between 2014 and 2018.

Results: In the study population (n=405), the frequency of surgery one year after hospitalization was 34.8%. Median time to surgery was 31 days. In multivariate analysis, working [odds ratio (OR) 2.3, 95% confidence interval (CI): 1.5; 3.6)], impulsive pain (OR 2.0, 95% CI: 1.3; 3.1), motor loss (OR 1.7; 95% CI: 1.2; 2.4) and number of infiltrations (OR 1.4, 95% CI: 1.2; 1.7) were predictive of surgery. A decrease in numeric pain-scale rating of the leg between the beginning and end of hospitalization was associated with fewer cases of surgery (OR 0.921, 95% CI: 0.861; 0.985).

Conclusions: A proportion of 34.8% of the patients hospitalized for disc-related sciatica did undergo surgery within one year of our medical management protocol. Several predictive factors for surgery were found.

Keywords: Disk herniation; outcomes; sciatica; in-hospital management

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Introduction

Lumbosciatica is a condition affecting the L5 and/or S1 nerve roots, resulting in lower back pain radiating to a lower limb along a specific root path (1).

It is a frequent condition, with about 100,000 cases/year and a prevalence of 3–5% (2). Most cases of sciatica evolve favorably further to rest, treatment with analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs), and possibly epidural corticosteroid injection (1,3).

Although several randomized controlled trials have reported that surgery is more effective than conservative management in the short term (6 weeks to 6 months), no significant differences in pain or functional disability have been reported in the longer term (1, 2 and 5 years) (4-12). As such, discounting complications requiring urgent intervention (motor deficit ≤3/5 and cauda equina syndrome), surgery is generally only performed in patients in whom medical treatment has failed (13).

The evolution of lumbosciatica is usually favorable without surgery, which highlights the interest of medical management for the vast majority of patients.

However, a *post-hoc* analysis of the Spine Patient Outcomes Research Trial (SPORT) highlighted better outcomes when surgery is early (14).

In addition, patients with severe sciatica who are resistant to first-line medical treatment often visit hospitals' emergency departments, and once a surgical emergency is ruled out, they are usually admitted to the rheumatology department in France. These patients represent only a small proportion of patients with sciatica—but they are the ones with the most severe forms of the condition.

The main objective of our study was to assess the proportion of patients treated by surgery one year after hospitalization in a rheumatology department for uncomplicated disc-related sciatica.

Our secondary objective was to identify possible determinants of surgical outcome. We present the following article in accordance with the STROBE reporting checklist (available at https://jss.amegroups.com/article/view/10.21037/jss-22-43/rc).

Methods

This was a retrospective, observational, single-center study conducted at the Rheumatology Department of Lille University Hospital Center (LUHC) between January 2014 and December 2018. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The National Commission for Data Processing and Liberties approved the study and individual consent for this retrospective analysis was waived.

Patients

Patients were selected from the LUHC Medical Information Department's records and were included if they were over 18 years of age and were hospitalized for uncomplicated disc-related sciatica. They were excluded if they had an indication for emergency surgery during hospitalization (i.e., motor deficit less than or equal to 3/5, cauda equina syndrome).

Data collection

The data were collected retrospectively from the patients' computerized medical records. Follow-up was performed in out-patients visits with rheumatologists and/or surgeons.

Statistical analysis

The surgery rate was estimated using the Kaplan-Meier method.

Factors associated with the probability of surgery were analyzed using univariate Cox proportional hazards models. Hazard ratios were calculated with their 95% confidence interval (CI). Significant factors ($P<0.05$) considered to be the most clinically relevant were included in a multivariate Cox model with stepwise backward selection, with a selection criterion of $P<0.10$.

Missing data were treated by multiple imputations under the assumption "missing at random" using the chained equation method with 10 imputations. Quantitative variables were imputed using predictive mean matching, and qualitative variables using logistic regression models (binomial, ordinal or multinomial according to the number and order of the modalities) (15). Rubin's rules were used to combine the estimates obtained in each imputed dataset (16).

All statistical tests were two-tailed with a 5% significance level. Statistical analyses were performed using SAS software (SAS Institute Inc., Cary, NC 25513, version 9.4).

Results

Of the 450 patients hospitalized for disc-related sciatica between 2014 and 2018, 405 were included (*Figure 1*). The

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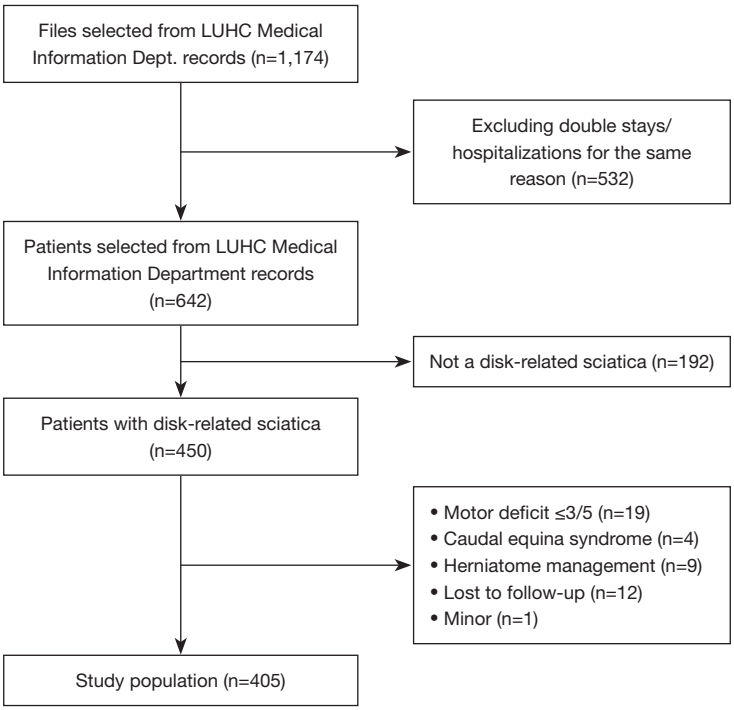

Figure 1 Flow-chart of the study: patients hospitalized in the Rheumatology Department for an uncomplicated sciatica. LUHC, Lille University Hospital Center; Dept. department.

Table 1 Patients' characteristics

Patients' characteristics	N (%) or mean (SD)
Gender (female)	214 (52.8)
Age (years)	47.5 (13.8)
BMI (kg/m²)	27.4 (6.1)
Charlson Comorbidity Index	1.47 (2.02)
Working	260 (69.5)
Precipitating factor	161 (50.6)
Carrying heavy load	77 (24.2)
Wrong move	31 (9.8)
Duration of symptoms	
Acute: <1 month	208 (51.4)
Sub-acute: 1–3 months	70 (17.3)
Chronic: >3 months	127 (31.3)
Positive straight leg-raising test	283 (76.0)
Impulsive pain	220 (68.8)
Motor loss ⅘	129 (31.9)
Hypoesthesia	97 (24.3)
Concordant herniated disc on cross-sectional images (CT or MRI)	347 (89.9)

P<0.05 considered significant. SD, standard deviation; BMI, body mass index; CT, computed tomography; MRI, magnetic resonance imaging.

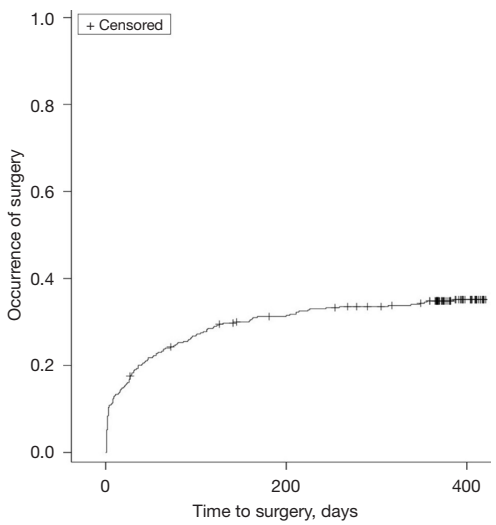

Figure 2 Occurrence of surgery within two years of hospitalization in rheumatology for lumbosciatica.

description of our population is presented in *Table 1*.

The analysis of the occurrence of herniated disc surgery after hospitalization for uncomplicated disc-related sciatica revealed a rate of 34.8% at 1 year and 37.5% at 2 years (*Figure 2*). The median time to surgery was 31 days, with

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interquartiles of 3 and 112 days.

Univariate and multivariate associations of baseline factors with the risk of surgery are presented in *Tables 2,3*.

In univariate analysis, predictive factors for surgery were, in backward order, presence of a concordant herniated disc, number of epidural infiltrations, working, duration of leg-pain greater than 3 months before hospitalization, clinical signs of disco-radicular conflict (such as positive straight leg-raising test and impulsive pain), use of morphine before hospitalization, motor loss at initial clinical examination, use of intravenous (IV) NSAIDs during hospitalization, and longer hospital stay (*Table 2*). Conversely, certain factors—such as higher body mass index (BMI) and a decrease in pain following hospitalization—were associated with a

Table 2 Predictive factors of surgery after hospitalization for disk-related sciatica: univariate analysis

Univariate analysis	Hazard ratio (95% CI)	P
Biometric data		
Gender (female)	1.123 (0.816; 1.548)	0.476
Age (years)	0.992 (0.980; 1.003)	0.153
BMI (kg/m²)	0.953 (0.917; 0.990)	0.013
Medical background		
Charlson Comorbidity Index	0.756 (0.616; 0.928)	0.0075
Active smoking	1.935 (1.326; 2.824)	0.0006
Working	2.213 (1.433; 3.419)	0.0003
Carries heavy loads at work	1.047 (0.707; 1.552)	0.818
Anamnesis		
Carrying heavy load	0.942 (0.598; 1.486)	0.798
Wrong move	0.766 (0.380; 1.545)	0.457
Duration of symptoms		
Acute: <1 month	1	
Sub-acute: 1–3 months	1.170 (0.737; 1.856)	0.505
Chronic: > 3 months	1.669 (1.173; 2.375)	0.0044
Treatment prior to hospitalization		
Non-steroidal anti-inflammatory drugs	1.323 (0.949; 1.847)	0.099
Corticosteroids	1.266 (0.811; 1.975)	0.299
Morphine	1.591 (1.115; 2.271)	0.011
Epidural glucocorticoid injections	1.346 (1.139; 1.591)	0.0005
Clinical findings at admission		
Low back pain	1.109 (0.721; 1.706)	0.637
Spinal stiffness	1.041 (0.719; 1.506)	0.831
Nerve root pain distribution		
S1	1	
L5	0.714 (0.508; 1.005)	0.0533
L5 and S1	0.488 (0.178; 1.333)	0.162
Not systematized	1.034 (0.607; 1.763)	0.902
Complete radiculalgia	1.245 (0.855; 1.813)	0.252

Table 2 *(continued)*

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Table 2 *(continued)*

Univariate analysis	Hazard ratio (95% CI)	P
Positive straight leg-raising test	2.022 (1.270; 3.220)	0.003
Impulsive pain	2.238 (1.407; 3.560)	0.0007
Motor loss ⅘	1.463 (1.055; 2.035)	0.024
Hypoesthesia	1.228 (0.855; 1.766)	0.2666
Concordant herniated disc on cross-sectional images (CT or MRI)	3.996 (1.636; 9.761)	0.0024
Hospital care		
Length of hospital stay (days)	1.045 (1.012; 1.080)	0.008
IV NSAIDs	1.539 (1.067; 2.220)	0.021
Corticosteroids	0.901 (0.519; 1.562)	0.710
Anti-neuropathic treatment	0.949 (0.642; 1.403)	0.795
Initial numeric pain-scale rating	0.975 (0.900; 1.057)	0.544
Decrease in numeric pain-scale rating between beginning and end of hospitalization	0.898 (0.846; 0.953)	0.0004
Infiltrative management		
Epidural glucocorticoid injections	3.219 (1.784; 5.81)	0.0001
Number of injections received per patient before and during hospitalization	1.55 (1.326; 1.813)	<0.0001

P<0.05 considered significant. CI, confidence interval; BMI, body mass index; CT, computed tomography; MRI, magnetic resonance imaging; IV, intravenous; NSAIDs, non-steroidal anti-inflammatory drugs.

Table 3 Significant predictive factors of surgery after hospitalization for disk-related sciatica in multivariate analysis

Multivariate analysis	Hazard ratio (95% CI)	P
BMI (kg/m²)	–	0.17
Charlson Comorbidity Index	–	0.87
Working	2.314 (1.481; 3.617)	<0.001
Active smoking	–	0.10
Duration of symptoms	–	–
Acute: <1 month	1	–
Sub-acute: 1–3 months	1.277 (0.772; 2.112)	0.34
Chronic: >3 months	1.667 (1.115; 2.492)	0.013
Use of opioids before hospitalization	–	0.30
Nerve root pain distribution	–	0.13
Positive straight leg-raising test	–	0.99
Impulsive pain	1.985 (1.258; 3.133)	0.003
Motor loss ⅘	1.728 (1.229; 2.431)	0.002
Decrease in numeric pain-scale rating between beginning and end of hospitalization	0.921 (0.861; 0.985)	0.017
Number of epidural injections received per patient before and during hospitalization	1.393 (1.165; 1.665)	<0.001
Length of hospital stay (days)	–	0.11
IV NSAIDs	–	0.67

P<0.05 considered significant. CI, confidence interval; BMI, body mass index; IV, intravenous; NSAIDs, non-steroidal anti-inflammatory drugs.

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lower occurrence of surgery.

In multivariate analysis, we found that working, impulsive pain (coughing, defecation), motor loss, duration of pain greater than 3 months, and higher number of epidural injections were significantly associated with the occurrence of surgery (*Table 3*). Surgery was less frequent in patients in whom a decrease in numeric pain-scale rating was observed between the beginning and the end of the hospitalization.

Discussion

One of the key findings of this study is that a relatively low proportion (one-third) of patients hospitalized for sciatica due to discal herniation required surgery at one year, which underscores the interest of our medical management protocol. This finding also seems to be consistent with the findings reported in the few previous studies carried out with the same objective.

Indeed, 34.8% of our patients underwent surgery within a year of hospitalization. This finding is comparable to that reported by Valls *et al.* (17)., where 35.1% of their patients underwent surgery one year after hospitalization, as well as to findings reported in older studies (18-20), where the proportion was 28% to 32%. In a study conducted by Berthelot *et al.*, the authors reported that 13% of their patients underwent surgery following hospitalization in a rheumatology department. However, in that study, the authors focused only on surgery immediately following hospitalization (20). In fact, that finding is quite consistent with our data, which showed a median time to surgery of 31 days.

At a time when institutions are questioning the relevance of maintaining hospital beds in rheumatology departments, our study underscores the benefit of doing so, since two thirds of our patients—in many of whom out-hospital management had failed—recovered and did not need to undergo surgery as a result of their being hospitalized in our rheumatology department.

Our surgery rate may seem high, but it should be interpreted in light of the fact that it was determined in patients who had been hospitalized and does not reflect all disc-herniated sciatica cases, especially those seen in an out-patient setting.

Indeed, as our pre-hospitalization care data shows, medical care had already failed for many patients hospitalized in our department: 52.5% of the patients had already received NSAIDs, 13% corticosteroid therapy, 22.5% opioids and 27% infiltration.

Regarding the median time to surgery of 31 days, this should be interpreted in light of the proportion of patients who had been exhibiting symptoms for more than 3 months before hospitalization. In addition, as previously mentioned, our study was carried out in a University Hospital Center, which is a tertiary center.

We did not find an association between gender or age and surgery, which is consistent with the findings of previous studies (6,10,17,21-28).

However, we did find a statistically significant association between BMI and lower occurrence of surgery in univariate analysis. This finding differs from previous studies evaluating the impact of obesity on radical treatment (23,28). On the other hand, in those studies, there were fewer patients and the proportion of obese patients was lower. As the prevalence of obesity is increasing in France, changes may have occurred in the knowledge and management of obese patients with sciatica.

Another explanation could be that the functional prognosis for herniated disc surgery among obese patients is less favorable. This was demonstrated by Weinstein *et al.* in the SPORT trial (6), but also in several other studies, which report less satisfaction and less improvement in perceived quality of life (29-31). In addition, the frequency of reoperation tends to be higher in obese patients (32), who are also at higher risk of postoperative complications (33).

Likewise, we observed that patients with a higher Charlson Comorbidity Index underwent less surgery, which also seems to be related to a different risk-benefit ratio, which is probably due to the increase in anesthetic risk and complications among older patients and/or patients with more co-morbidities (33-37). In the observational cohort in the SPORT trial (6), the findings were not consistent with ours, but in that study, the "comorbidities" parameter was not the Charlson index and included conditions such as anxiety or migraine, which could explain the differences between our findings and those reported by the authors of that study.

We found that active smoking increased the risk of surgery. As this finding has not been reported by other authors (10,23,26), it should be interpreted with caution. It is nevertheless surprising because a few studies have reported less favorable outcomes for pain symptoms and functional impairment following lumbar spine surgery in patients who smoke (38-40). To understand this finding, we wondered whether it might be associated with the difficulty in observing the relative rest that is recommended in the medical management of lumbosciatica, and with the involvement of inflammatory discoradicular phenomena, promoted by active smoking. We also hypothesized that the sensation of pain

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would be greater among smokers, especially since it has been shown that there is a higher proportion of smokers in patients with chronic pain (41). However, these explanations should be treated with caution, since smoking was not associated with surgery in the multivariate analysis.

Like Deshayes *et al.* (42), we found that working influenced the surgical management decision, since professionally active patients, regardless of their activity, were more likely to receive radical treatment. We found that this factor had the highest weight in multivariate analysis [odds ratio (OR) 2.314, 95% CI: 1.481; 3.617]—in which we took into account the Charlson score, which included age and comorbidities, which could be confounding factors—and this could be explained by the fact that professionally active patients are younger and have fewer comorbidities. We can assume that because recovery is faster with surgery, these patients would choose this option more often so that they could resume work more quickly.

We also found that the presence of clinical signs of discoradicular conflict—such as impulsive pain and a positive straight leg-raising test—were more often observed in patients who subsequently underwent surgery. Other authors have also reported a statistically significant association between a positive straight leg-raising test and surgery (6,17,43). However, the presence of clinical signs of discoradicular conflict is an argument in favor of the discal origin of lumbosciatica and of the indication for surgery, and therefore might be confounding factors.

A motor deficit rated at 4/5 was predictive of surgery. This finding was not reported by Valls *et al.* (17), but their results were equivocal since paresis was found in 18.6% of operated patients as opposed to only 8.7% of non-operated patients, with P=0.13. As our study included more patients—and perhaps was more powerful—we were able to conclude that this parameter was significant.

Regarding infiltrative management, our objective was not to determine the effectiveness of epidural infiltrations. The statistically significant association we found between the number of infiltrations and surgery, or between IV NSAIDs and surgery, is more likely a reflection of the severity of the patients' symptoms, which ultimately justified surgical management.

We also found a statistically significant association between a decrease in numeric pain-scale rating at the end versus the beginning of hospitalization and less surgery, which seems to suggest that patients who experience the most relief further to medical management undergo less surgery. This finding was also highlighted in the SPORT trial (6), where patients with lower numeric pain-scale ratings after medical treatment had less cross-over to surgery. It has also been shown in the literature that when infiltrative management allows for a favorable evolution of pain symptoms, patients resort less to surgery (17,23).

The main limitation of our study lies in its retrospective nature, which led to missing data.

Moreover, since it was a single-center study, carried out in a university (i.e., tertiary) center, a recruitment bias, which could limit the extrapolation of our results, cannot be ruled out.

The main strengths of our study are the large number of patients that were included, and the fact that a thorough assessment was obtained for all patients, which enabled us to analyze relevant factors associated with the use of surgery.

In our study, a third of the patients underwent surgery within one year of hospitalization. This rate is rather a low and underscores the interest of hospitalizing these patients in a rheumatology department. However, this rate was determined in a population that was hospitalized in a university (i.e., tertiary) center and does not reflect all cases of lumbosciatica, and in particular ambulatory cases.

Predictive factors of subsequent surgery were highlighted, in particular working, having pain for more than 3 months before the hospitalization, and having a motor deficit of 4/5. We also demonstrated that patients who failed to experience pain relief through medical care during hospitalization, and who did not experience less pain at the end than at the beginning of hospitalization, were more likely to undergo surgery.

These identified factors could orient patients with severe lumbosciatica more towards surgical management, since, as Fjeld's team has shown, surgery is associated with better outcomes in severe sciatica (44).

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jss.amegroups.com/article/view/10.21037/jss-22-43/rc

Data Sharing Statement: Available at https://jss.amegroups.com/article/view/10.21037/jss-22-43/dss

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jss.amegroups.com/article/view/10.21037/jss-22-43/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The National Commission for Data Processing and Liberties approved the study and individual consent for this retrospective analysis was waived.

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