

Outpatient Lumbar Microdiscectomy: Safe, High Patient Satisfaction and Lower Cost

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Abstract

Since July 2007, the surgical treatment of lumbar herniated intervertebral disc's radiculopathy has been part of the Chilean system of explicit health guarantees. Thereafter this treatment became priority in every neurosurgical service of the country.

Objective: Compare retrospectively the results of two cohorts of patients with surgical indication for the treatment of lumbar disc prolapse selected by the protocol of outpatient lumbar microdiscectomy (OLM) of the Puerto Montt Hospital, performed under outpatient modality and as hospitalized patients.

Methods: Patients with indication for lumbar disc surgery and lumbar microdiscectomy (LM) performed between July 2015 and July 2017 were included. Two cohorts were analysed: outpatient and hospitalized. Pain relief, complication rates, length of stay, surgical waiting time in days, costs and patient satisfaction were compared retrospectively with the patients' records and a telephone survey.

Keywords: Outpatient, same-day, ambulatory, lumbar, discectomy, protocol.

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Results: A total of 299 LM were performed between July 2015 and July 2017; 164 were selected for OLM; 52 were outpatients and 112 were hospitalized. Of these only 138 could be contacted, 41 outpatients and 97 inpatients, so that the information of these was used. The complication rate was low in both groups, being impossible to calculate statistical difference. As for the waiting time for surgery, it tends to be lower for outpatients. A total of US\$5,980 (March 2017 value) was saved with OLM and 104 bed days were released. The patient's satisfaction experience was equally high in both groups.

Conclusions: OLM is safe and with a satisfactory experience for our patients. It decreased the bed day need, patients' waiting time for the procedure and the system's costs.

Introduction

Chronic lumbar pain is one of the most frequent causes of retirement in adults under 45 years old [1,2]. Lumbar disc herniation is the most common cause of lumbar radiculopathy in younger than 50. Its prevalence in European countries is 1-3% and in Chile it is estimated at 4-5% [1].

Disc herniation surgical treatment offers early labour reinsertion for patients with lumbar radiculopathy refractory to physical therapy and oral analgesia [4-8]. Many procedures have been described but the lumbar microdiscectomy has shown to have, over open laminectomy, less postoperative pain, intraoperative bleeding, complications and length of hospital stay [9-10]. Lumbar discectomy is traditionally performed as an inpatient procedure with an average 2.5-day stay. The global development of outpatient surgery has shown benefits for the patient, as well as for healthcare institutions. In the United States around 8% of lumbar discectomies are solved as outpatient cases, in Italy 9.5% and in Portugal 6.1%. However, in centres with outpatient protocols for lumbar discectomy, only 50% of the cases are solved as ambulatory cases. [11,12]

A protocol for the selection of candidates for outpatient lumbar microdiscectomy was implemented in July 2015 in Puerto Montt Hospital (PMH), Chile. Of the patients chosen by the protocol there was a group that was treated as outpatient and another group that, due to logistical and administrative hospital issues, was treated as inpatient.

We conducted a retrospective analysis of all lumbar discectomies that were selected for the PMH outpatient protocol. We categorized the information of the group of patients that were treated as outpatient and of those, chosen by the protocol, treated as inpatient. We compared the results in pain relief, complications, costs, surgical waiting time and patient satisfaction.

Materials and Methods

Population studied

The PMH database was searched for all patients with lumbar microdiscectomy between July 1st 2015 and July 31st 2017 that met the criteria for outpatient modality under PMH protocol. We defined outpatient as those that did not spend the night at the hospital. Not all patients chosen by the protocol could be treated as outpatients because there were not enough operating rooms available for neurosurgery outpatient cases in the morning. Patients with surgeries that were performed in the evening could not be discharged because it was not safe and had to stay overnight. Therefore, we have two study groups: patients treated as outpatient and patients that stayed at least one night.

Diagnosis, evaluation and follow-up

All members of the PMH neurosurgery team participate in the patients' evaluation. Lumbar microdiscectomy (LM) was indicated for all patients with symptomatology and physical refractory signs to physical therapy and oral analgesics with concordant lumbar spine imaging (computer tomography or magnetic resonance). The pre-surgical clinical evaluation and exams were performed according to our OLM protocol. The post-surgery evaluation was carried out by the main neurosurgeon of the case. The patients were followed up with a phone call. Lumbar back pain scale (1 to 10 points), radicular pain scale (1 to 10 points), Oswestry disability score (10 to 60 points) and the patient surgical procedure satisfaction questionnaire (1 to 7 points) of the Chilean Health Ministry (MINSAL) were applied to each patient.

Surgical technique

LM was performed by the 8 PMH neurosurgery team members. Patients were set over Wilson's frame in decubitus prone position. Surgical level was marked with fluoroscopy. A microsurgical

hemisemilaminectomy, flavotomy and a partial microdiscectomy were performed. All patients received 1 gram of Cefazolin as surgical antibiotic prophylaxis.

Costs and surgical waiting time

Cases' costs were estimated with data from the Chilean public health insurance system (Fondo Nacional de Salud or FONASA). Lumbar discectomy is part of a special program within our healthcare system, known as the explicit health guarantees (Garantias Explicitas de Salud or GES). The neurosurgeon indicating the procedure is required to notify this program as the program guarantees the patient to be treated within 45 days from the surgical indication. We use the notification date and surgery date to calculate the waiting time for surgery.

Statistical Analysis

Two retrospective cohorts were analysed: those selected by the protocol that were solved as ambulatory cases and those that were hospitalized. In order to analyse the information, descriptive statistics were used (averages, standard deviation, number of cases, percentages and standard error). Bar graphs with margins of error (standard error) were used to make comparisons between hospitalized and outpatients according to sex and type of treatment. The evaluation of the mean (or median) difference between hospitalized and outpatients with different variables was conducted by applying the nonparametric Mann Whitney test. The comparison of the proportions between the groups was carried out by applying the Z test for difference of proportions, with respect to the case of $np > 5$. The hypotheses were contrasted with one significance, $p < 0.05$.

The data was analysed with IBM® SPSS® Statistic 20.0 SPSS and Microsoft Office Professional Plus 2013 software.

Of total patients, 41 outpatients and 97 hospitalized patients replied, so that this information was used.

Results

In the period between July 2015 and July 2017, 299 HNP were performed at the PMH Neurosurgery Service. Of these patients, 164 were selected for MLA: 52 patients were effectively treated on an outpatient basis and 112 were hospitalized for at least one night in the hospital (Figure 1). Of these only 138 could be contacted, 41 outpatients and 97 inpatients, so that this information was used. The hospitalization of these patients was due to the fact that the availability of the operating rooms was during the afternoon, which meant that hospital release was possible between 9 and 10 pm. At this time the establishment does not have personnel available for evaluation prior to discharge, thus forcing hospitalization. The information collected indicated that there were no hospitalizations associated with intraoperative complications that required surveillance, nor decompensation of the underlying pathologies. The follow-up was 8-20 months, with a median of 12.7 months.

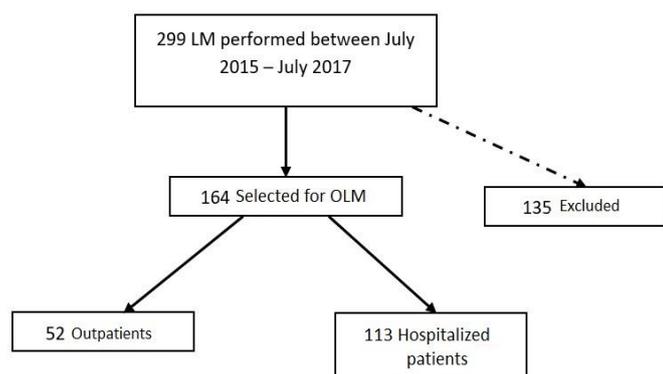


Figure 1 Patient outcomes.

When evaluating the homogeneity of both groups, no statistically significant differences were found regarding the characteristics of gender, age, time of follow-up and lumbar level operated. When evaluating the total number of patients with comorbidities, no significant differences were found, but in detail, the distribution per pathology showed a significantly higher frequency of patients with arterial hypertension in the outpatient group. The distribution was homogeneous for the rest of the comorbidities. The waiting time for the surgery from its indication on average for outpatient clinics was 24.5 days and for hospitalized patients 31.9 days, without significant difference ($p = 0.149$). (Table 1)

When evaluating the differences in the scale of radicular pain, the outpatient group presented on average a decrease of 5.88 points, while the hospitalized group 5.08 points. Regarding low back pain, the ambulatory group managed to reduce it by 5.24 points, while the hospitalized group 5.33 points. Regarding the postoperative Oswestry scale, the results for the outpatient group was 17.07 points on average and for the hospitalized group it was 16.49 points. There were no statistically significant differences between the two groups (Table 2 and Figure 2). A review of the literature was made, regarding the level of pain that allows functionality in daily life activities. The patients of both groups were divided into two categories: Mild-Moderate and High-Extreme, comparing a crossing of Odds Ratio.

According to the results, outpatients would have 1.21 and 3.57 times more risk of being in the High-Extreme category of lumbar and radicular pain, respectively, compared with hospitalized patients. However, the confidence interval reaches values lower than 1 in both cases, so the ORs are not significant. That said, outpatients do not present a higher risk of having high-extreme pain (Table 3). Due to the size of the groups and the low incidence of complications, a reliable statistical analysis could not be performed, so it was decided to only perform the description of these. The ambulatory group presented a total of 4.9% of surgical complications, consisting in persistence of radicular pain and seroma. The hospitalized group presented 16% of complications, where 7 were complications of the surgical wound and persistence of radicular pain in 7 patients; 3 of these cases were due to herniated disc recurrence (Table 4). The outpatient group did not present new hospitalizations in a period less than 30 days, unlike the hospitalized group where 3.5% readmission was evident in 30 days. None of the groups presented incidental durotomy, decompensation of the underlying pathologies or non-surgical complications.

When comparing the results of the user satisfaction survey, the ambulatory group presented an average of 6.88 points on a scale ranging from 1 to 7 points, while those who were hospitalized scored 6.86 points, without significant differences.

The estimated cost according to the FONASA values of the benefits

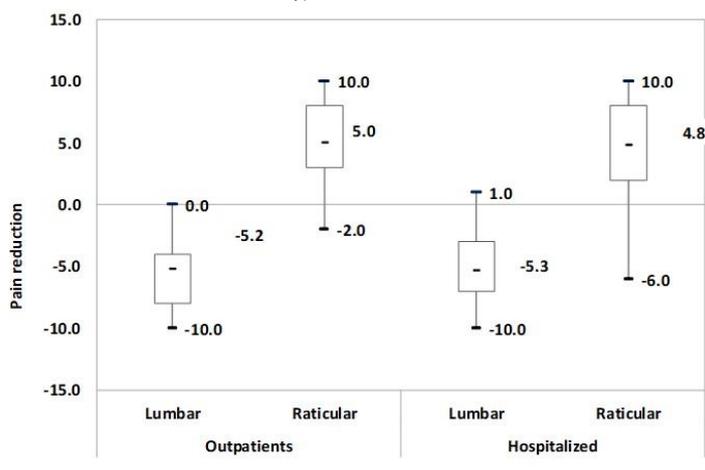


Figure 2 Pain reduction.

Table 1 Demographic characteristics. HTA: arterial hypertension; DM2: diabetes mellitus type 2; DLP: dyslipidemia; RA: Rheumatoid arthritis.

Characteristics	Outpatients (n=41)	Hospitalized (n=97)	p	
Sex (n [%])				
Women	16 [39.0]	40 [41.2]	0.412	ns
Men	25 [61.0]	57 [58.8]		
Age (mean ± SD)	45.7 ± 12.7	43.1 ± 13.6	0.125	ns
Days of stay (mean ± SD)	0	2.2 ± 0.9		
Months follow-up (mean ± SD)	12.7 ± 6.1	12.6 ± 6.0	0.174	ns
Days waiting for surgery (mean ± SD)	24.5 ± 17.5	31.9 ± 24.9	0.149	ns
Level of surgery (n [%])				
L3-L4	1 [2.4]	2 [2.1]	0.448	ns
L4-L5	22 [53.7]	45 [46.4]	0.217	ns
L5-S1	18 [43.9]	50 [51.5]	0.205	ns
Number of comorbidities (n [%])				
0	17 (41.5)	42 (43.3)	0.42	ns
1	13 (31.7)	32 (33.0)	0.25	ns
2	8 (19.5)	13 (13.4)	0.28	ns
3	-	6 (6.2)	-	-
4	1 (2.4)	2 (2.1)	-	-
5	2 (4.9)	2 (2.1)	-	-
Most frequent comorbidities (n [%])				
HTA	11 [26.8]	13 [13.4]	0.04	s
Smoking	10 [24.4]	26 [26.8]	0.38	s
Obesity	5 [12.2]	8 [8.2]	0.25	ns
Hypothyroidism	-	8 [8.2]		
DM2	4 [9.8]	5 [5.2]		
DLP	4 [9.8]	4 [4.1]		
RA	2 [4.9]	4 [4.1]		
Fibromyalgia	1 [2.4]	4 [4.1]		

Table 2 Pain characteristics.

Treatment	Outpatients	Hospitalized	p	
Pre-treatment (mean ± EE)				
Lumbar pain	8.68 ± 0.32	8.65 ± 0.20	0.913	ns
Radicular pain	8.44 ± 0.38	8.12 ± 0.26	0.712	ns
Post-treatment (mean ± EE)				
Lumbar pain	3.44 ± 0.4	3.32 ± 0.28	0.448	ns
Radicular pain	2.56 ± 0.4	3.04 ± 0.30	0.483	ns
Reduction (mean ± EE)				
Lumbar pain	-5.24 ± 0.43	-5.33 ± 0.30	0.757	ns
Radicular pain	-5.88 ± 0.48	-5.08 ± 0.34	0.232	ns

Table 3 Comparison of pain in two groups: mild-moderate and high-extreme. OR: Odds Ratio.

Characteristics	High-extreme	Mild-moderate	OR (95% I.C.)	p
Lumbar pain (n [%])				
Outpatients	36 [87.8]	5 [12.2]	1.21 (0.47 -3.63)	0.727
Hospitalized	83 [85.6]	14 [14.4]		
Radicular pain (n [%])				
Outpatients	39 [95.1]	2 [4.9]	3.57 (0.78 - 16.37)	0.084
Hospitalized	82 [84.5]	15 [15.5]		

Table 4 Complications of both groups.

Complications	Outpatients (n = 41)	Hospitalized (n = 97)
Wound dehiscence	1 (2.4)	1 (1.0)
Radicular pain	1 (2.4)	5 (5.2)
Granuloma	0	2 (2.1)
Wound Infection	0	2 (2.1)
HNP relapse		4 (4.1)
Seroma	0	2 (2.1)
Durotomy	1 (2.4)	1 (1.0)

was US\$1,126.52 (March 2017 value) for the outpatient group and US\$1,241.39 for hospitalized patients ($p < 0.01$). A saving of US\$114.87 per case was established.

Discussion

Throughout Chile many are the ambulatory procedures that are performed. Formal protocols in public hospitals started in 1998 [44,45]. Since then, the results of these groups have shown a significant benefit for patients as well as the public healthcare system.

Zahrawi et al. (1985) published the first worldwide case of lumbar disc herniation solved through ambulatory treatment [3]. The same team in 1994 published a series of 103 outpatient cases of lumbar disc discectomy with 88% patient satisfaction. After that publication many have been the centres around the world that have adopted this modality for their lumbar disc herniation cases. Asch, H. et al. (2002) described a prospective group of 212 cases of OLM with a two-year follow-up. They found 80% radicular pain improvement, 78% surgery satisfaction, 65% return to daily life activity and 70% return to work after a year [33]. These results were similar to what had been published until then for conventional inpatient lumbar discectomy. Best et al. (2006) presented a 1,377 LM retrospective series in which 98.3% were discharged from hospital as part of their protocol condition while 0.44% presented new hospital admissions [37]. The 4,310 lumbar discectomy prospective series of Pugely et al. (2013) found a 6.5% complication rate within 30 days in the inpatient group and 3.5% in outpatient cases without significant differences in the multivariate analysis [30]. They established independent risk factors such as age, surgical place previous infection, diabetes, blood transfusion, surgical time and whether the patient needed to remain admitted. In 2014, Bekelis et al. published a 27,174 retrospective series (6,954 OLM) in which 2.5% of the OLM and 6.9% of the

inpatient cases were readmitted. They discussed that this difference was due to the outpatient protocol selected patients being in better medical condition for this modality [35].

However, all OLM results have not been favourable. Lang, S-S. et al. (2014) evaluated retrospectively 1,011 patients before and after the OLM protocol. After the protocol had begun, 368 of the 1,011 were selected for OLM. In this series, 4.3% of OLM patients were readmitted in contrast with 2.3% of inpatients; 6% of the OLM and 4.3% of inpatients consulted in the emergency room within the first 30 days after surgery. The reherniation rate rose from 0.31% to 1.9% after protocol implementation [22]. The main causes of the new admissions were pain that could not be reduced with oral analgesics, base morbidities, decompensation and cerebrospinal fluid (CSF) leaks.

Hersht, M. et al. performed the only qualitative study found with 28 patients treated with OLM [32]. Most of the patients of this study had the perception that outpatient modality improved the experience for their families, healthcare providers and for them. 90% of the patients would choose the OLM modality again because they believe their family care is better, in their house, bed and privacy. Patients that established they would prefer to stay a night in hospital were those who presented pain and nausea. It was relevant for the patients to receive the help given by outpatient unit nurses clarifying doubts and worries before the procedure, to have the same surgeon check on them before performing the procedure and that it was difficult to retain much information.

The present study has the methodological advantage of using two homogenous cohorts, as all patients were selected through the OLM protocol (divided into those that were treated as outpatient and those as inpatient). Earlier publications compared patients before

the implementation of an outpatient protocol and patients after the implementation, having the limitation of comparing an entire population of lumbar discectomy patients with a selected group created by their protocols [22-48]. This singular scenario in PMH is because ambulatory operating rooms are limited and the Chilean healthcare system is pushed to solve these cases within 45 days. Patients with surgeries performed in the afternoon could not be sent home due to transportation and safety issues at the time of the night they would be released. OLM protocol waiting list patients were randomly treated either in the ambulatory operating room (OR) or during inpatient time.

Thanks to strict discharge requirements, close follow-ups and a low complication rate (4.9%) in the outpatient group, there were no new admissions within the first 30 days after surgery.

OLM is safe in our population with an outpatient complication rate that tends to be lower than the inpatient group, but with no statistical difference as the size and incidence of the groups is too low to be calculated. Lumbar and radicular pain improvement was similar in both groups as was the Oswestry disability score, without significant differences between groups. Thus OLM is an effective treatment for lumbar disc herniation cases with surgical indication in PMH.

The waiting time for surgery tends to be lower in the ambulatory group, but without significant difference. The average waiting time for OLM cases was 7 days less than for inpatients, probably increasing the number of patients studied; this difference could be verified statistically. As mentioned earlier, the Chilean healthcare system is legally obligated to solve these cases in less than 45 days so that the reduction in surgical waiting time has relevant administrative and legal implications for our system. In our study, the total ambulatory rate was 33% and we have the potential to increase it to 50-65%, so that it is possible to reduce even more our population waiting time for lumbar disc surgery.

The cost analysis observed a reduction in the OLM modality with an average saving of US\$ 115. This would mean a US\$ 5,980 saving for the 52 cases. In any case, this is just an initial approach to the economic analysis of OLM benefits. The cost values of the procedure were taken from the PMH cost centre and they obtain the values from FONASA. The public health insurance significantly underestimated the operational costs. The cost values are just an approximation of the differences; it does not give us the real economic impact. Nevertheless, there is another variable not considered in the costs that has an economic impact, which is the release of 104 bed days. Bed-days release opens up the opportunity for other patients to be treated and reduces their healthcare problem resolution time. As we already mentioned, in our healthcare system waiting time reduction is mandatory because of GES pathologies. Many times the public insurance needs to ask services from private institutions to solve healthcare problems, at a much higher cost, in order to meet the time established by law. A. Magee evaluated the cost reduction between 21 outpatient LM and 41 inpatient LM [47]. They used the PowerPerformance Manager system to calculate the cost of each case in detail as well as the related indirect costs. They found significant statistical differences between the groups, being smaller in outpatients. The main reduction in the cost was in the healthcare givers rather than in other items.

Many are the variables to be taken into account in a real economic analysis in order to achieve the number of cost savings of the implementation of this modality, but it is possible to say that OLM brings about a significant cost reduction.

Patients' experience satisfaction was high for both groups and without significant difference. This finding is supported by the patient experience of lumbar microdiscectomy in our hospital, which has a

high satisfaction perception by the patient. The cultural context of the southern part of Chile is quite particular, with a lot of countryside areas, fishing communities and some urban areas. In this population it is possible to provide healthcare services with a high user satisfaction. Even when the modality was changed to OLM the perception in the community was still high, with the same quality standard.

We have not been able to implement the OLM programme in the way that we would like to. We have faced the difficulty of not having access to morning outpatient operating rooms. As we explained above, patients with surgery performed in the afternoon need to stay overnight in the hospital for safety reasons. The pressure that our healthcare system puts on quick case resolution leads to many of the cases having to be solved during afternoon surgical time. The solution for this setback would be to allow over 50% of patients with indication for lumbar disc surgery to be solved as OLM.

Study's limitations

Our study is a retrospective cohort study and that is its main limitation. There could be some bias in the data collection. Both the pain scale information was collected and patient satisfaction questionnaire was conducted over the phone and it was not possible to contact all patients. The cost analysis of the healthcare services was carried out with the cost references given by our national health insurance office (FONASA). This value underestimated the real cost of the total healthcare.

Conclusions

It is possible to say that the OLM modality with a well-regulated protocol is safe for the patient, maintaining an excellent user satisfaction. It brings improvement in the access time to the surgery and lower operational costs. It also helps other patients of the system by releasing hospital bed days.

Disclosures

This project did not receive funding of any kind; it was driven only by the motivation to generate knowledge. None of the authors present conflicts of interest in this regard.

Acknowledgements

Special thanks to the staff of the Puerto Montt Hospital, especially to the neurology and neurosurgery service, for facilitating the authors' research work. And to the patients for agreeing to be part of this project.

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