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European Spine Journal

ISSN 0940-6719

Eur Spine J
DOI 10.1007/s00586-014-3178-1

Springer

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ORIGINAL ARTICLE

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Received: 22 May 2013 / Revised: 8 January 2014 / Accepted: 8 January 2014

Abstract
Introduction and purpose The purpose of this study was to evaluate and compare disability, quality of life and satisfaction outcomes between young people and elderly who were operated on for degenerative lumbar disease.
Material and methods A database of 263 patients undergoing lumbar surgery for degenerative conditions was collected. There were 74 patients who were 65 years old or above and 189 who were below 65 who had complete preoperative and 2-year postoperative HRQOL data measures: ODI, SF-36 and COMI.
Results There were no significant differences in the outcomes between the two age groups ($p > 0.05$). An improvement from baseline in all quality of life measures in the two age groups was observed. A median improvement of 6.0 points was found in the ODI in the younger patients versus 12.0 in older ones. A median improvement in the SF36 physical component score of 6.95 was seen in the younger group while improvement was reported at 6.36 points in patients over 65. The SF36 mental component score improved by 4.48 points and 4.96 points, respectively. COMI improved a median of 1.2 points in both groups. In terms of satisfaction, 66.9 % of the younger patients were pleased or very pleased whereas this was found to be 59.7 % for the older group.
Conclusion Older patients can see substantial clinical improvement after degenerative lumbar disease surgery similar to that obtained in younger patients in terms of quality of life and satisfaction. The improvement in terms of the disability is greater for older patients. Thus, age should not be a contraindication for this procedure.

Keywords HRQOL · Disability · Satisfaction · Elderly · Degenerative lumbar surgery

Introduction

Degenerative lumbar pathology and chronic low back (or leg) pain are about the most frequent illnesses that orthopaedic surgeons encounter in daily clinical practice [1]. In fact, the pathology is the one that patients most frequently ask about, being the estimated lifetime prevalence at 84 % with a prevalence of 23 % [2] in the general population.

Some of these patients will eventually need surgery. The number of lumbar arthrodeses in the USA has increased from 174,223 in 1998 to 413,171 in 2008 [3]. This makes degenerative lumbar disease a significant issue of concern relative to public health policies due to the enormous direct costs incurred and also those secondary to disability [3]. In fact, the global cost of degenerative lumbar disease in Spain has been reported to be 0.5 % of the Spanish gross domestic product (GDP), some 6 billion Euros per year [4, 5].

On the other hand, the Spanish National Institute for Statistics (INE) explains how western countries are seeing a progressive ageing of their population and forecasts that people 65 years of age and above will increase from 5,880,423 in 2009 to 15,325,274 in 2049. They will then constitute 31.9 % of the total Spanish population [6].

Therefore, the aforementioned figures support the growing interest shown in degenerative lumbar disease

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Published online: 24 January 2014

surgery among the elderly over recent years. This has resulted in some literature focusing on either complications [7, 8] or long-term clinical outcome predictors [9, 10] in elderly patients who have undergone lumbar surgery but very few about quality of life outcomes and satisfaction. Despite the high number of complications, those reports seem to suggest good results in patients above age 65 [8, 9, 11]. However, they only compare patients treated for one particular diagnosis with a single-level arthrodesis. Then again, a comparison between younger and older patients suffering from any of the degenerative lumbar disease diagnosis [12] treated with any kind of approved surgery is still lacking.

In the present study, we quantify quality of life, disability and satisfaction items in patients operated on for any entity described as degenerative lumbar disease with any of the approved techniques for the purpose of showing what is seen in daily clinical practice. The aim of this study was to establish whether there were differences in health-related quality of life (HRQOL), disability and satisfaction between younger and older patients. Differences between diagnoses and procedures were also analysed.

Materials and methods

A retrospective observational study of prospectively collected data on 263 patients was designed. They were operated on, by the spine surgery team of the Orthopedic Department, between 2005 and 2008 for degenerative lumbar disease in one of our two centres.

All patients above age 18 who were operated on for any of the clinical entities included within the degenerative lumbar pathology profile provided by the American Association of Neurological Surgeons [12] and who signed a consent form approved by the Ethical Committee of our Hospital were included. Patients with infections, tumours or rheumatic diseases were excluded. Patients who had a language barrier that prevented them from properly understanding the questionnaires and those who rejected enrolling were also excluded. Epidemiological data collected during the study were age, sex, employment status, clinical presentations included in the degenerative lumbar pathology, the treatment given and the degree of co-morbidity marked on the scale of the American Society of Anaesthesiologists (ASA) [13].

The mean age of the group was 54 years (range 22–86). There were 189 patients who were less than 65 years old (mean age 47; range 22–64) and 74 who were 65 years old or above (mean age 72; range 65–86). The global sample (263 patients) consisted of 131 women and 132 men and there were no statistically significant differences ($p = 0.969$) in terms of sex distribution between the two groups.

All patients were clinically evaluated with a minimum follow-up of 2 years. They self-completed the validated Spanish version of the Medical Outcomes Study Short Form-36 version 2 (SF36v2) [14, 15] to evaluate Quality of Life and the validated Spanish version of the original Oswestry Disability Index (ODI) [16, 17], immediately preoperative and 2 years after surgery. Questions 4a and 4b of the validated Spanish version of the Core Outcomes Measures Index (COMI) [18, 19] were used to comprehensively evaluate patient satisfaction at 2 years' follow-up.

The COMI [18, 19] is a questionnaire with eight questions that evaluate pain (2 items), function (1 item), welfare (1 item), disability (2 items) and patient satisfaction (2 items). The results of the questionnaire ranged from 0 to 10, with 0 being the best possible result. It was designed as a simple and effective standardized evaluation of patients with low back pain and allows for the substitution of other health-related quality of life factors, disability, general well-being and satisfaction in the doctor's daily practice [18–20].

The net change of the different questionnaires was used to evaluate the patients' improvement and whether or not there were significant differences between young and elderly patients. Net change is calculated by subtracting the final score (the one at 2 years' follow-up) from the preoperative score (net change = 2 years' postoperative score − preoperative score).

The statistical analysis was done using SPSS 18.0 (SPSS Inc., Chicago, IL). The results of the quantitative variables were compared using the U Mann–Whitney test or Student's t test, depending on each case. The Chi square or Fisher exact test was used to evaluate categorical variables. In order to analyse the association between quantitative variables, the Rho-Spearman test was employed. A post hoc analysis was made using the Tukey test. Continuous variables are highlighted as the median with their interquartile ranges because extreme observations were found. In all cases, a p value of <0.05 was considered statistically significant with a bilateral distribution of p values.

Results

All of the 263 patients initially included in the study completed all the preoperative questionnaires, but only 221 supplemented them again at 2 years after surgery. Those 42 missed patients represented 16 % of the initial sample, 35 were impossible to locate and 7 had died (without connection to the surgical procedure). There were no

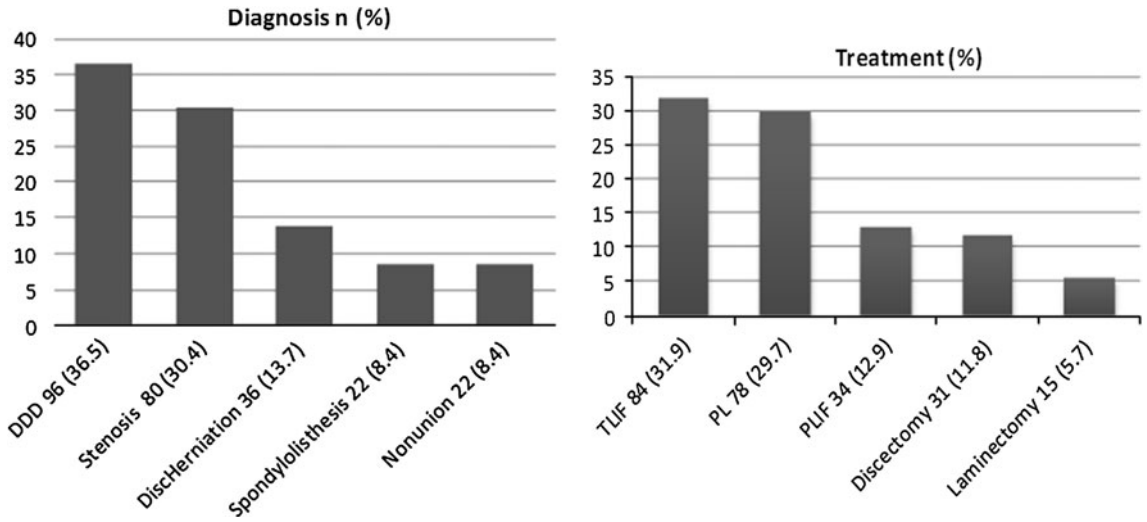

Fig. 1, 2 Diagnosis and treatment in the sample

Table 1 Mean age distribution per diagnosis

	Mean age (years old)
DDD	53
Stenosis	60
Disc herniation	47
Spondylolisthesis	49
Non-union	58

significant differences for missed patients between the two age groups ($p > 0.05$).

The major cause of surgery in the group was degenerative lumbar disc disease (DDD 36.5 %) followed by lumbar spinal stenosis (LSS 30.4 %) and other diagnoses (Fig. 1). In the case of the surgical procedures used to treat these pathologies, transforaminal lumbar interbody fusion (TLIF 31.9 %) and posterolateral fusion (PLF 29.7 %) were the most frequent (Fig. 2). Decompression of the lumbar canal, alone or combined with other techniques, was performed in 173 cases (72.1 %). No differences in the distribution relative to either pathology ($p = 0.547$) or treatment ($p = 0.148$) between younger and older patients were found (Table 1).

There was an improvement in all average values of the questionnaires from the preoperative visit to the visit at 2 years' post-surgery and changes were statistically significant in all cases but for the Mental Health dimension of the SF-36 (Table 2).

Focusing on the primary purpose of our study, the median net change for the SF-36 Mental Composite Scale in our group saw an improvement of 4.48 points in the younger patients and 4.96 points in patients 65 years old or above. The Physical Composite Scale of SF-36 also

Table 2 Preoperative and 2-year postoperative, global sample scores

Health status measures	Preoperative		Postoperative		Difference	
	Mean	SD	Mean	SD	Mean	SD
ODI	45.60	17.85	36.60	22.24	−8.76*	19.43
COMI	3.77	0.76	2.60	0.53	−1.07*	1.19
Pain	3.88	0.89	2.79	1.27	−1.13*	1.28
Function	3.99	1.12	2.90	1.53	−1.01*	1.68
Well-being	4.83	0.47	3.19	1.49	−1.60*	1.48
Disability	3.35	1.67	1.89	1.29	−1.01*	1.85
Satisfaction	2.81	1.09	2.21	1.34	−0.61*	1.15
SF36v2						
Physical function (PF)	29.29	9.48	36.68	12.79	7.18*	12.05
Role physical (RP)	30.66	8.76	21.17	4.37	−9.79*	9.46
Bodily pain (BP)	30.25	6.99	39.10	12.56	8.87*	12.54
General health (GH)	42.16	9.01	39.83	11.98	−1.90**	11.13
Vitality (VT)	35.35	9.36	44.17	12.01	8.82*	11.69
Social function (SF)	30.45	13.71	39.68	13.89	8.56*	15.71
Role emotional (RE)	36.26	14.82	16.10	5.39	−20.38*	13.91
Mental health (MH)	39.40	10.64	37.90	11.92	−1.09	1.77
PCS	30.90	7.41	36.66	10.89	6.38*	10.9
MCS	39.91	12.28	32.78	9.76	−6.10*	12.50
VAS						
Back	7.55	2.15	5.40	3.41	2.01*	3.34
Sciatica	7.62	2.62	4.18	3.47	2.39*	3.81

* $P < 0.001$, ** $P < 0.05$

Table 3 Comparison between young and elderly

	Patients <65 years old	Patients ≥65 years old	*p* value
COMI	1.2 (0.15–1.8)	1.2 (0.5–2.0)	0.858
ODI	6.00 (−8.0–18.0)	12.00 (−1.5–24.0)	0.052
MCS SF-36	4.48 (4.31–14.84)	4.96 (−1.68–16.17)	0.575
PCS SF-36	6.95 (−3.92–14.16)	6.36 (1.85–11.02)	0.495

Median net change at 2 years postoperatively (*U* Mann–Whitney test)

Table 4 Single diagnosis/treatment comparison between young and elderly (*t* Student's *p* values)

	DDD	Stenosis	TLIF	PL
COMI	0.324	0.670	0.345	0.809
ODI	0.381	0.101	0.171	*0.001*
MCS-SF36	0.875	0.574	0.213	0.470
PCS-SF36	0.337	0.206	0.206	0.137

Table 5 Post hoc analysis of the main and secondary variable *p* values (Tukey)

	COMI	ODI	PSC SF-36	MCSSF-36
DDD/stenosis	0.944	1.000	0.994	0.716
DDD/spondylolisthesis	0.263	1.000	1.000	0.725
DDD/non-union	0.904	0.380	0.207	0.598
DDD/disc herniation	*0.002*	*0.009*	*0.023*	0.932
Spondylolisthesis/stenosis	0.622	1.000	0.996	0.994
Spondylolisthesis/non-union	0.949	0.537	0.385	0.226
Spondylolisthesis/disc herniation	*<0.001*	0.108	0.176	0.995
Non-union/stenosis	0.995	0.441	0.362	0.192
Non-union/disc herniation	*0.005*	*0.002*	*0.001*	0.393
Disc herniation/stenosis	*<0.001*	*0.010*	*0.014*	1.000
TLIF/PLIF	0.929	1.000	0.991	0.915
TLIF/PL	0.998	0.590	0.627	0.990
TLIF/discectomy	*0.006*	0.098	*0.042*	0.988
TLIF/laminectomy	1.000	1.000	0.908	1.000
PLIF/PL	0.985	0.774	0.566	0.990
PLIF/discectomy	*0.006*	*0.007*	0.222	0.993
PLIF/laminectomy	0.984	1.000	0.830	0.999
PL/discectomy	*0.005*	*0.007*	*0.003*	0.933
PL/laminectomy	1.000	0.970	0.999	0.990
Discectomy/laminectomy	0.210	0.500	0.104	0.990

showed a positive net change in young patients as well as in the elderly. This median was 6.95 points in those under 65 years of age and 6.36 points in older patients. The Global COMI improved 1.2 points in both younger and older patients (Table 3). The only measure that nears statistical significance ($p = 0.052$) was the Oswestry Disability Index with a more favourable score for older patients. The net change in the ODI in patients below age 65 was 6.00 points and it was 12.00 points for the older patients. A separate analysis of the two major diagnoses and treatments was made to evaluate if there were differences between young and elderly patients. There were no significant differences between them in any scale when DDD, lumbar spinal stenosis and TLIF were looked at separately. In the case of PLF, the ODI net change showed difference between the groups ($p < 0.001$) with better outcome in elderly. The rest of *p* values for this specific analysis and a post hoc analysis can be seen in Tables 4 and 5 respectively.

Table 6 Comparison between young and adults

	Patients <65 years old	Patients >65 years old	*p* value
Pleased/very pleased	83.1 % (108)	75.8 % (47)	0.343
Neutral	7.7 % (10)	12.9 % (8)	
Disappointed/very disappointed	9.2 % (12)	9.9 % (7)	

Satisfaction (Fisher exact test)

Finally, analysing satisfaction in global terms, 80.73 % of all patients were completely or mostly satisfied when asked about the way they were treated (question 6a of the COMI) [19]. The figure was 60.58 % when the patients responded about the treatment itself (question 6b of the COMI) [19]. When both age groups were evaluated, 83.1 % of young patients felt completely or mostly satisfied with the hospital care and the way they were treated and 75.8 % of patients of 65 or older responded in the same way. When the question was about how satisfied they were with the result of the treatment, 66.9 % of the patients below age 65 and 59.9 % of those above 65 were satisfied. In any case, the differences did not reach statistical significance (Table 6).

Discussion

No differences were found in terms of quality of life, disability and satisfaction between the young and the elderly group.

Despite degenerative lumbar disease surgery being a frequent procedure in elderly patients [3, 21], the evaluation of the outcomes for lumbar surgery in older patients has not been widely looked into and there is limited literature related to it. However, the studies that can currently be found point out that there is a clinical benefit for older

patients operated on for degenerative lumbar disease in terms of quality of life [11, 22, 23].

Glassman et al. [11], in a retrospective review of 85 patients over 65 years old who were treated with single-level posterolateral arthrodesis L5-S1, found a mean improvement at 2 years of surgery of 6.21 on the Physical Composite Scale of SF-36 and 5.71 points on the Mental Composite Scale of the SF-36. The disability improvement net score as measured with the ODI was 16.38 points. They compared these results with a younger control group and in any case, no significant differences were found.

Okuda et al. [23] found similar results in terms of quality of life in patients above and below age 70. In this case, it was a cohort study of 101 patients affected by degenerative spondylolisthesis at L4–L5 treated using the PLIF technique. They used a questionnaire from the Japanese Orthopaedic Association quantifying both the fusion degree and the complications. The questionnaire evaluates few questions relative to daily function, disability and pain and, once calculated, they found an improvement, without significant differences, in both the younger and older group of patients.

Recently, Glassman et al. [22], in a retrospective review of prospectively collected data of 224 patients affected by degenerative lumbar disease treated with posterolateral arthrodesis using iliac crest autograft, found a clinical improvement in patients above and below than in 65-year-olds without significant differences between either group. The results for the original ODI, expressed as a mean net change at 2-year surgery, saw an improvement of 28.5 points in the older group and 24.5 points in the younger patients. This means that, as found in the present study, older patients obtain greater improvement. This could be related to patients' expectations as younger patients want to be perfectly fit for work, they need to travel more frequently than elderly or they have more sexual activity. In any case, this is just and hypothesis and further studies should demonstrate this theory. The physical composite score of SF-36 showed an improvement of 14.2 for patients 65 or older and 11.7 in those under 65. Neither the results of the ODI or the SF-36 PCS were significantly different.

Similar results were found when even older patients with a cut-off point of 70 years of age [24] were analysed.

Our results show a substantial improvement in all quality of life measures 2 years after surgery in patients below and above age 65, as previous studies have shown [22, 23, 25]. The median improvement in the Oswestry Disability Index in our group of elderly patients was 12.00 points. Relative to the PCS SF36 results, the group of elderly patients improved by a median of 6.36 points.

This study compared the outcomes of younger and older patients operated on for any degenerative lumbar disease entity with any of the approved techniques (without differences in their distribution between both groups) with the aim of being as close to clinical practice as possible. For this reason, an important number of patients were included.

Statistically significant differences in the results between the younger and the older patients were not found. Results close to significance can be seen in terms of disability along with better outcomes in the group of older patients. This trend has also been seen in previous studies [22, 23], even when older patients had a high rate of complications [8, 22].

There are no studies that compare that parameter between younger and older patients in terms of satisfaction, but results here are similar to those suggested for this kind of surgery [25]. In any case, we believe that satisfaction is a concept that depends on the feelings, expectations and even the beliefs [26] of the patients. Therefore, it needs to be evaluated in every similar population groups.

The main weakness of this study is in its retrospective design, even though data was collected prospectively. In addition, one major advantage is the large number of patients that were evaluated. Another limitation is the lack of study of the complications. Finally, a mid-term follow-up of 2 years has been analysed here. It does not allow us to know whether differences will appear over a longer period of time, even Mannion et al. [27] have determined that clinical changes come into sight in the first 2 months after surgery.

In conclusion, this study shows a substantial clinical benefit to patients 65 years old or above who underwent surgery for degenerative lumbar disease and this improvement will not be different to that obtained by younger patients. In the same way, older patients are satisfied by the surgical treatment. Thus, it may be said that age should not be a contraindication upon deciding on surgery for degenerative lumbar disease, at least in terms of quality of life, disability or satisfaction.

Conflict of interest None.

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