



Influence of age on pain intensity, functional impairment and health-related quality of life before and after surgery for lumbar degenerative disc disease



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ABSTRACT

Background: Demographic changes will lead to an increase of elderly people in our population and consecutively to a higher prevalence of patients suffering from degenerative disc disease (DDD). The goal of this study was to investigate age-related differences in pain intensity, subjective and objective functional impairment and health-related quality of life (HRQoL) in patients with lumbar DDD.

Methods: In a prospective two-center study, back and leg pain intensity (visual analogue scale (VAS)), functional impairment (Oswestry Disability Index (ODI), Roland-Morris Disability Index (RMDI)) and HRQoL (EuroQol-5D (EQ-5D), Short-Form (SF12)) were collected for consecutive patients undergoing lumbar spine surgery. Objective functional impairment (OFI) was measured using the Timed Up and Go (TUG) test. Adjusted partial correlation was used to correlate age to each scale preoperatively, as well as to the postoperative improvement at six weeks.

Results: A total of $n = 377$ patients (161 females, 42.7%) with a mean age of 58.5 years (SD 15.7, range 18.0–93.7) were included. Unadjusted TUG test raw times naturally increased with age, whereas the age-effect on standardized OFI T-scores was close to zero in patients with a lumbar disc herniation (LDH; $r = -0.0666$, $p = 0.367$) or lumbar spinal stenosis (LSS; $r = -0.0134$, $p = 0.879$). There was a weak correlation between age and higher ODI (LDH: $r = 0.1289$, $p = 0.089$; LSS: $r = 0.1975$; $p = 0.027$), lower EQ-5D (LSS: $r = -0.1824$, $p = 0.042$) and higher RMDI by trend (LSS: $r = 0.1679$, $p = 0.061$). The correlation between age and postoperative improvement was negative on the VAS for back pain (LDH: $r = -0.3189$, $p = 0.026$), VAS for leg pain (LDH: $r = -0.3656$, $p = 0.009$) and RMDI by trend (LSS: $r = -0.2004$, $p = 0.069$), as well as positive on the EQ-5D index ($r = 0.2412$, $p = 0.011$), indicating that younger patients showed better improvement. Due to in-group heterogeneity, no age-effect could be calculated for patients scheduled for surgical fusion.

Conclusions: The influence of age on subjective and objective measures of pain, functional impairment and HRQoL is limited for patients with LDH and LSS, but suggests an age-dependent increase of functional disability. Younger patients generally showed greater postoperative improvement at six weeks than older patients.

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1. Introduction

Demographic changes due to increase in life expectancy will lead to a higher number of elderly people [1,2]. According to the

United Nations Population Fund, people aged 60 years and older made up more than 11 per cent of the global population in the year 2012 – a number that will rise to about 22 per cent by the year 2050 [3]. Consequently, physicians will face an ever-increasing number of elderly patients suffering from degenerative disc disease (DDD) in the future. For a subset of these patients with failed conservative treatment and/or progressive sensori-motor deficits, surgery may be indicated. Irrespective of age, the principle aims of surgical treatment are to relieve pain, ameliorate function and improve health-related quality of life (HRQoL) [4]. In order to determine the

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need for a certain treatment modality or to quantify its effectiveness, subjective and/or objective measures can and should be used [4].

Facing an aging population of patients, it is advisable to understand how age relates to pain in DDD. Thomas et al. and Parsons et al. measured higher pain levels in older patients for a variety of musculoskeletal conditions [5,6]. While acute pain has been reported to occur at the same rates across all age groups [7–9], chronic pain seems to be more prevalent in older people. Several studies report an association between age and functional impairment. Jarvik et al. found the Roland-Morris Disability Index (RMDI) score to increase with age from a mean of 9.2 between 65 and 69 – 10.7 for those older than 85 [10]. Similarly, Tonosu et al. demonstrated a tendency for the Oswestry Disability Index (ODI) score to increase with older age with the highest score for patients in their 70s [11]. Additionally, in terms of HRQoL, it has been hypothesised that the health status decreases in an age-dependent manner [12–14].

There is a dearth of literature specifically looking at age as an influencing factor on pain perception, functional impairment and HRQoL in patients with lumbar DDD. The goal of this study is to investigate age-related differences in pain intensity, subjective and objective functional impairment and HRQoL in patients with DDD. In particular, we aimed to evaluate the results of patient reported outcome measures (PROs) and the Timed Up and Go (TUG) test as a new tool to measure objective functional impairment (OFI) in patients across age.

2. Methods

Patients scheduled for lumbar spine surgery between September 2013 and May 2015 at two Swiss hospitals were included for the following diagnoses: (1) lumbar disc herniation (LDH), (2) lumbar spinal stenosis (LSS) and (3) lumbar DDD with or without instability requiring lumbar fusion (FUS) (transforaminal lumbar interbody fusion (TLIF), posterior lumbar interbody fusion (PLIF) or extreme lateral interbody fusion (XLIF)). Exclusion criteria were age <18 years, pregnancy, known rheumatic disease, severe neurological deficits and/or inability to perform the TUG test (unable to walk a 3 m distance twice and sit down again; e.g. due to severe proximal leg paresis, hemiparesis or severe osteoarthritis of the knee). This work represents a retrospective analysis of prospectively collected data.

2.1. Recorded parameters and outcomes

General demographic data, comorbidities as defined by the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologists (ASA) score, smoking status and Body Mass Index (BMI) were assessed in all patients. The subjective PROs included pain intensity for back and leg pain measured using the visual analogue scale (VAS; range 0–10 points). Functional impairment was assessed with the disease-specific questionnaires ODI (range 0–100%) and RMDI (range 0–24 points), whereas HRQoL was assessed with the EuroQol 5D (EQ-5D; range –0.074 to 1.00) index and the 12-Item short-form health survey (SF-12) that allows calculation of both, the physical (PCS; standardized to a mean of 50) and mental component score (MCS; standardized to a mean of 50). In addition, all patients were evaluated with the TUG test. The TUG test is an objective test of function that measures the time in seconds for a patient to stand up, walk 3 m, turn around, then walk back 3 m and sit down again.

2.2. Ethical considerations

The local institutional review boards of both hospitals approved the study (University Hospital Geneva: 14-079 and Cantonal Hos-

pital St.Gallen: EKSG 14/049). All patients gave written informed consent.

2.3. Definition of OFI, calculation of TUG T-scores and statistical considerations

The null hypothesis of this study was that subjective and objective measures of pain, functional impairment and HRQoL are not age-dependent. All PROs listed above were used at baseline, as well as at six weeks postoperatively. The TUG raw test times were converted into disease-specific Z- and T-scores, standardized for age and sex [15,16]. Instead of looking at raw test times, the Z-scores resemble the number of standard deviations (SDs) away from the mean of the normal population (a Z-score of 1 thus means that a given person's TUG time is 1 SD above the mean). The T-score is a transformation of the Z-score into a number that is easier to interpret. For the evaluation of patients with lumbar DDD using the TUG test, a T-score mean of 100 and a SD of 10 has been chosen previously [16]. With the 99th percentile chosen to discriminate the normal population from patients with impairment, a T-score of 123.3 is the cut-off to define a test result as "abnormal". For this analysis, TUG T-scores were used. Correlation analysis was used to analyze the relationship between each, the subjective and objective measures of pain intensity, functional impairment and HRQoL with age. Analyses were performed separately for each one of the three included diagnoses to prevent bias. Partial correlation coefficients (r) were calculated, removing the effects of all other variables that were imbalanced between old and young patients (with the cut-off set at the age of 65 years) of each disease-group, as shown in Supplementary Tables S1–S3 in the online version at DOI: <http://dx.doi.org/10.1016/j.clineuro.2016.08.024>. All correlation coefficients were additionally adjusted for the center-variable.

The software used for the statistical analysis was Stata v14 (StataCorp LP, College Station, Texas, USA). P values <0.05 were considered statistically significant.

3. Results

3.1. Patient sample and characteristics

A total of n = 377 patients (161 females, 42.7%) with a mean age of 58.5 years (SD 15.7, range 18.0–93.7) were included to almost equal parts from the two centers. Baseline demographic and surgical parameters of the study groups are depicted in Table 1. Half of the studied cohort (n = 189) was scheduled for microdiscectomy, while n = 135 (35.8%) and n = 53 (14.1%) were scheduled for lumbar decompression and surgical fusion, respectively. See the Supplementary Tables S1–S3 in the online version at DOI: <http://dx.doi.org/10.1016/j.clineuro.2016.08.024> contain baseline parameters in patients < and ≥ 65 years for each of the three included diagnoses. As it becomes evident, younger patients were more likely to work, while older patients were more often retired. Younger patients smoked more often, but had less comorbidity. In general, the cohort suffered from moderate VAS back and moderate to severe VAS leg pain. The preoperative values for RMDI and ODI indicate moderate to severe functional disability. Our patients were 1–2 SDs below the German SF-12 population norm (n = 2805; PCS 49.0 ± 9.4; MCS 52.2 ± 8.1) and half a SD below a reference population of German patients with acute low back pain (LBP) (n = 169; PCS: 35.07 ± 9.69; MCS: 47.51 ± 10.72), indicating significantly reduced HRQoL (Table 1) [17]. About 40% of the patients had some degree of OFI at the preoperative assessment, with a mean TUG T-score of 129.6 (SD 62.9).

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