Physical activity level, leisure activities and related quality of life 1 year after lumbar decompression or total hip arthroplasty

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Abstract

Purpose Lumbar decompression surgery (LDS) and total hip arthroplasty (THA) are frequently performed in the elderly population, but very little is known about their subsequent physical capacity and participation in leisure activities. Despite similar demographics and comorbidities, it is questionable whether LDS patients achieve equally high levels of physical capacity and quality of life postoperatively as do THA patients. The aim was to compare the physical activity level, participation in leisure activities and related quality of life 1 year after an LDS and THA procedure.

Methods Data from 95 THA patients and 83 LDS patients were gathered from questionnaires on self-reported physical activity level, leisure activities and quality of life.

Results LDS and THA patients reported equally moderate levels of physical activity. The median score was 42.3 METs/day (IQR 37.9; 47.7) for the LDS group and 41.0 METs/day (IQR 38.5; 48.5) for the THA group ($p = 0.79$). Weekly time consumption for leisure activities in the LDS group was a median of 420 min/week (IQR 210; 660) compared to a median of 480 min/week (IQR 240; 870) in

the THA group ($p = 0.16$). Regarding quality of life, LDS patients reported significantly worse Euroqol Five Dimensions scores with a median value of 0.740 (IQR 0.68; 0.82) compared to THA patients' median of 0.824 (IQR 0.72; 1.0), $p < 0.001$.

Conclusion Despite being equally physically active and engaged in leisure activities, LDS patients did not achieve a quality of life comparable to that of THA patients 1 year postoperatively.

Keywords Total hip arthroplasty · Lumbar decompression surgery · Physical activity · Leisure activities · Quality of life

Background

The aging of Western society's population reflects a combination of declining birth rate and increasing life expectancy, so that more people live into old age. Physical activity in old age is associated with a lower risk of degenerative joint disease, and in addition reduces the risk of dementia and depression, diabetes and cardiovascular diseases [5, 7, 14, 20, 25]. With that in mind, it seems important that elderly patients keep fit and socially active after treatment for musculoskeletal diseases, as for example spinal stenosis (SpS) and hip arthrosis (HA). Well-established surgical procedures such as lumbar decompression surgery (LDS) and total hip arthroplasty (THA) are frequently performed in the older population, and the general demographics and health status in patients with SpS and HA are very similar [9, 18, 19, 21]. Reindl et al. found comparatively low complication rates of the two types of surgery for patients aged 65+ years, and other studies have furthermore shown significant improvements in the level of

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function, pain and quality of life after both LDS [12, 18, 26] and THA procedures [8, 16]. Although LDS patients seem to have a significant improvement in quality of life after surgery, the effect may not reach that of THA surgery [9, 21]. A recent study comparing the SF-36 score of matched LDS and THA patients preoperatively and 1 and 2 years postoperatively found that although LDS patients achieved a significant pre- to postoperative improvement in the physical component of the SF-36, their score was still significantly lower than that of THA patients 1 and 2 years after the operation [18].

Whereas quality of life, function and pain have all been the focus of many studies in the two groups of patients, only few studies have focused on physical activity, including the participation in leisure activities. This end point might be important for several reasons. For the individual, a certain level of physical activity will contribute to quality of life, life expectancy, prevention of loss of function and lifestyle-related diseases [5, 7, 14, 20]. To society, this is important as an increase in morbidity and mortality, due to a low level of physical activity, can result in increased expenses due to treatment of lifestyle diseases, need for homecare and other public services [10].

The literature reports contradictory results concerning increase of physical activity following total joint arthroplasty and generally prospective studies on the subject are lacking [22]. Two cross-sectional studies of THA patients have found the level of physical activity 1 year postoperatively to be comparable to the general population [2, 24]. One study, based on recall questionnaires, found a general increase in the self-reported recreational activity, although the number of patients participating in activities posing stress on the new hip (i.e., tennis, jogging) decreased [4]. To date, no studies have focused on the physical activity level of individuals following LDS. Therefore, the purpose of this study was to compare the physical activity level, the participation in leisure activities and the quality of life of LDS patients to those of patients who underwent a THA operation.

Methods

This was a historical cohort study conducted at a Danish regional hospital. Eligible participants were all patients older than 60 years, who had undergone primary THA because of HA or LDS due to lumbar SpS in the period September 2007 to September 2008. Exceptions were patients who had died or were diagnosed with malignant diseases in the follow-up period, and patients with cognitive/reading/writing deficiencies, making them unable to answer the questionnaires. For the selected time period, a total of 239 consecutive patients fulfilled the inclusion criteria. Of these patients, 21 were excluded. Seven had

died at the time from surgery to follow-up, 11 were diagnosed with malignant disease and three were lost to follow-up. Questionnaires were forwarded to the remaining 218 patients, of whom 115 were THA patients. Questionnaires were answered by 83 patients in the LDS group and 95 in the THA group (view flow-chart in Fig. 1). None of the patients who underwent LDS received any supplemental stabilization. The indication for surgery was based solely on neurogenic claudication symptoms. If the patients had a substantial back pain problem, they were offered supplemental stabilization procedure of some kind, according to guidelines and then excluded from this study.

Data collection

The following data were collected: age, gender, type of operation, smoking habits, marital status and level of education, quality of life 1 year postoperatively using the Euro-qol Five Dimensions (EQ-5D) [27], level of physical activity using the Physical Activity scale (PAS) [1] and the time spent on leisure activities including the types of activities.

The EQ-5D has been validated in Danish [6, 28]. It consists of two parts, the EQ-5D and the EQ-VAS. The EQ-5D comprises five dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression), each with three levels (1 = no problems, 2 = some problems, 3 = extreme problems/unable). The answers form a five-digit number, which is transformed to a weighted time

Fig. 1 Flowchart

trade-off value between 0.000 and 1.000; the higher the score, the better is the health. The EQ-VAS is a numerical visual analog scale with endpoint 0 indicating worst possible health and 100 indicating perfect health. The individuals were asked to rate their own health on the scale by making an indication on the line.

The PAS is a short questionnaire designed, developed and validated in Denmark, used for measuring a person's level of physical activity on an average day [1]. It is suitable for persons with a moderate or low level of physical activity. It contains nine levels of activities ranging from light activities like sleeping or watching television to vigorous activities like jogging or playing tennis. The individuals record the number of hours they spend doing the various activities, and this information is then recalculated according to the manual to give a final score measured in metabolic equivalents (METs). A high score indicates a high level of physical activity (a score of about 40 METs/day is considered a moderate level of physical activity).

For measurement of participation in leisure activities, no suitable standardized or validated instrument was found. A short questionnaire was developed for this purpose, containing questions regarding 11 different leisure activities. The question posed was "Please mark with a cross the activities in which you are presently participating (one or more activities, as you find relevant)". The choices were golf, bicycle, going for walks, swimming/water gymnastics, gymnastics, tennis/badminton, gardening, working out on machines, jogging, dancing and others (please describe). Patients ticked the relevant types of activities and the number of minutes spent on each activity per week.

Before commencement of the study, approval from the Danish Data Protection Agency was given in June 2009. No approval from the ethics committee was required.

Statistical analysis

Statistical analysis was performed using Stata IC version 11.0. The socio-demographic characteristics of the two

groups, gender (men/women), education (high/low), smoking (smoker/non-smoker) and marital status (living with spouse/single) were compared using the χ^2 test. Age was compared using Wilcoxon rank sum test due to the cutoff value at 60 years.

Outcome measures for primary and secondary outcome measures, being continuous outcomes, were compared using parametric or non-parametric statistics (Student's *t* test or Wilcoxon rank sum test) depending on the distribution of the data.

Results

In total, 40 patients did not answer the questionnaires, corresponding to a response rate of 80 and 85 % in the LDS and THA groups, respectively. This left 83 LDS patients and 95 THA patients for analyses. Patient demographics are presented in Table 1. The mean follow-up time was 22.4 months (range 18.4–23.9) for THA patients and 19.3 months (range 12.1–23.7) for LDS patients. The two groups were alike on all variables except sex, where male sex was more often represented in the LDS group compared to the THA group (48 % vs. 33 %, $p = 0.03$). The non-responders did not differ significantly from the responders on any variables except smoking status (non-responders 27.5 % smokers vs. 35 %, $p = 0.001$).

Quality of life

EQ-5D scores at 1-year follow-up for the two groups are presented in Table 2 and Fig. 2. As scores were non-normally distributed, medians and IQR (lower and upper quartiles) are presented. The median score was 0.740 (IQR 0.68; 0.82) for LDS patients and 0.824 (IQR 0.72; 1.0) for THA patients. The difference of 0.084 was both clinically and statistically significant, a difference of 0.074 being the minimal important difference. Similarly, THA patients did significantly better on the EQ-VAS with a median score of 80 (IQR 60; 94) compared to a median score of 70 (IQR 51; 80) in the LDS group.

Physical activity

Results for the physical activity level and time spent on leisure activities are presented in Table 3 and Fig. 3. Regarding the level of physical activity, the groups achieved almost identical PAS scores, the median score for THA patients being 41.0 (IQR 38.5; 48.5) compared to 42.3 (IQR 37.9; 47.7) for the LDS group. The same applied for the time spent on leisure activities in the two groups. LDS patients reported a median weekly time consumption

Table 1 Cohort demographics

	LDS (<i>n</i> = 83)	THA (<i>n</i> = 95)
Gender (male/female)	40/43	31/64
Age, mean (SD)	71.5 (6.7)	72.3 (6.2)
Married/alone	57/26	61/34
Smoker/non-smoker	32/51	30/65
Education $\leq$ / $>$ 12 years	60/23	73/22

Age tested using Wilcoxon rank sum and all other variables tested using the χ^2 test

LDS lumbar decompression patients, THA total hip arthroplasty patients

Table 2 EQ-5D and EQ-VAS scores for the cohort

	LDS group	THA group	Difference	<i>p</i> value
EQ-5D, median (IQR)	0.740 (0.68; 0.82)	0.824 (0.72; 1.0)	0.084	<0.001
EQ-VAS, median (IQR)	70 (51; 80)	80 (60; 94)	10	<0.001

Median EQ-5D and EQ-VAS scores of the two groups tested using Wilcoxon rank sum test

LDS lumbar decompression surgery, THA total hip arthroplasty, IQR interquartile, numbers representing lower and upper quartiles

Fig. 2 Box and whiskers plot illustrating quality of life (EQ-5D) of the cohort 1 year after LDS or THA

of 420 min (IQR 210; 660) compared to 480 min (IQR 240; 870) in the THA group.

In Table 4 details of the reported types of leisure activities for the patients are given. The preferred activities of the two groups were walking (THA 79 %, LDS 72 %), gardening (THA 66 %, LDS 64 %) and bicycling (THA 48 %, LDS 40 %). THA patients were more often ‘working out in machines’ and ‘dancing’ compared to LDS patients. For the other leisure activities, no significant differences were found between the two groups of patients.

Quality of life related to physical activity

A positive association was found between the self-reported average daily physical activity (in METs) and self-rated quality of life, as measured by the EQ-5D (view Fig. 4). As values were non-normally distributed, a Spearman’s rank correlation coefficient was calculated, resulting in a highly significant rho of 0.36 ($p < 0.001$).

Quality of life related to type of activity

A significantly larger number of THA patients reported participation in the activity “working out on machines”, and a possible association of this activity with a better quality of life

was explored. The 23 THA participants and 8 LDS participants achieved a median EQ-5D score of 0.824 (IQR 0.723; 1.0) and 0.723 (IQR 0.522; 0.776), respectively, indicating that participation in this activity did not influence the quality of life of the participants. Comparing the 23 THA participants with the remaining 67 non-participants in the THA group did not reveal any difference either ($p = 0.51$).

Discussion

The results of this study support previous findings that patients undergoing elective LDS due to SpS do not achieve a quality of life comparable to that of patients undergoing THA due to HA 1 year following surgery [9, 18, 21].

Although we did not have preoperative scores, it is reasonable to assume that the two groups were comparable at baseline regarding quality of life. This assumption seems justified, as baseline average SF-36 scores of LDS and THA patients were comparable in the study of Rampersaud. Furthermore, the average preoperative EQ-5D scores in the study by Jansson, based on the annual reports from the Swedish Spinal Register, do not differ from the preoperative EQ-5D scores of primary THA patients reported in the Swedish Hip Registry [9, 12, 21]. Comparison of the 1-year postoperative EQ-5D scores of annual reports from the Swedish Spine Register and the Swedish Hip Registry also supports the findings of our study regarding quality of life, as EQ-5D scores of THA patients exceeded LDS patients by around 0.1 point (minimal important difference = 0.074).

Looking at the postoperative self-reported physical activity in our study, LDS patients did however achieve the same results as the THA group, both concerning the average daily level of physical activity and the weekly time spent on leisure activities. To the best of our knowledge, no studies have compared the two groups of patients with respect to physical activity measures. Studies examining the level of physical activity in THA patients using the UCLA or Grimby scales have found a moderate level of physical activity postoperatively (UCLA 6–6.8, Grimby 3.5) [2–4]. Our results are consistent with this, as the achieved PAS score of 42 similarly corresponds to a moderate level of physical activity. Regarding LDS patients, we did not find any studies dealing with physical activity level.

Table 3 Level of physical activity in METs and time spent on leisure activities (min/week) for the cohort

	LDS group	THA group	Difference	<i>p</i> value
METs, median (IQR)	42.3 (37.9; 47.7)	41.0 (38; 548.5)	−1.30	0.79
Weekly time on activities, median (IQR)	420 (210; 660)	480 (240; 870)	60	0.16

Median level of physical activity in METs and min/week tested using Wilcoxon rank sum test

METs metabolic equivalents, LDS lumbar decompression surgery, THA total hip arthroplasty, IQR interquartile, numbers representing lower and upper quartiles

Fig. 3 Box and whiskers plot illustrating the level of physical activity of the cohort 1 year after LDS or THA**Table 4** The self-reported participation of the patients in various types of leisure activities

Activity	LDS group, <i>n</i> (%)	THA group, <i>n</i> (%)	<i>p</i> value
Golf	3 (3.6)	6 (6.3)	0.45
Bicycle	33 (39.8)	46 (48.4)	0.35
Going for walks	60 (72.3)	75 (79.0)	0.54
Swim./water gym	11 (13.3)	16 (16.8)	0.58
Gymnastics	23 (27.7)	18 (19)	0.13
Tennis/badminton	1 (1.2)	4 (4.2)	0.24
Gardening	53 (63.9)	63 (66.3)	0.99
Working out in machines	9 (10.8)	24 (25.3)	0.02
Jogging	1 (1.2)	2 (2.1)	0.67
Dancing	0 (0.0)	5 (5.3)	0.05
Other	4 (4.8)	3 (3.2)	0.53

All variables compared between groups using χ^2 test

LDS lumbar decompression surgery, THA total hip arthroplasty

Limitations

Although our study is characterized by a high response rate of 80–85 %, there are several weaknesses. To assess the

Fig. 4 Correlation between self-reported daily physical activity and quality of life (EQ-5D)

level of physical activity and time spent on leisure activities, we used self-administered questionnaires. Recalling physical activity is a highly complex cognitive task and instruments can vary in their cognitive demands, and also people generally tend to overestimate their level of physical activity [1]. This is probably also the case when reporting the time spent on leisure activities. As this overestimation is most likely independent of the type of operation, it should not pose substantial effect on our results. The choice of using the PAS may complicate direct comparisons with the described studies on physical activity. However, as it is a Danish validated instrument, developed and tested on a Danish population, we assumed that it would give a more correct impression of our patient's level of physical activity compared to the often used UCLA, which is an American instrument. Similar considerations applied concerning the reporting of type and weekly duration of leisure activities. As it was not possible to find a Danish validated questionnaire for measuring leisure activities, a questionnaire was developed. It was tested on a comparable age group and a few corrections were made after the pilot study, concerning rephrasing of a few of the questions for better comprehensibility.

Another weakness in our study was the skewed distribution of gender in the two groups, with significantly more

Table 5 Outcome measures of the two groups stratified for gender

	LDS group, median (IQR)	THA group, median (IQR)
EQ-5D		
Male	0.771 (0.723; 0.824)	0.824 (0.723; 1.0)
Female	0.723 (0.624; 0.776)	0.824 (0.723; 1.0)
<i>p</i> value	0.11	0.97
EQ-VAS		
Male	75 (55; 80)	80 (60; 94)
Female	68 (50; 80)	83 (70; 95)
<i>p</i> value	0.30	0.31
Physical activity (METs/day)		
Male	44.5 (38.3; 52.7)	45.1 (40.0; 51.8)
Female	40.2 (36.3; 45.5)	40.2 (38.0; 57.6)
<i>p</i> value	0.01	0.01
Leisure time activity (min/week)		
Male	540 (225; 930)	600 (360; 1,230)
Female	360 (195; 570)	480 (173; 795)
<i>p</i> value	0.12	0.05

All differences tested using Wilcoxon rank sum test

LDS lumbar decompression surgery, *THA* total hip arthroplasty, *METs* metabolic equivalents, *IQR* interquartile, numbers representing lower and upper quartiles

women being present in the THA group. A stratified analysis was undertaken to assess any influence this might have had on the results, as female gender is known to be associated with both a lower level of physical activity and a lower quality of life in relation to surgical procedures [8, 12, 24]. Stratification of the quality of life analysis did not indicate any effect modification by gender, as the results of the primary analysis did not change with gender (Table 5). Regarding the results for physical activity level (METs/day), the stratification revealed a possible difference between males and females in each group, and in the THA group for time spent on leisure activities (Table 5). As expected, women in both groups reported a lower level of activity compared to men. Although the difference appeared small when looking at medians for the two groups, the difference was found to be significant using the Wilcoxon rank sum test. An equal distribution of gender in the two groups may therefore have resulted in a lower average PAS score for the LDS group. However, as groups had almost identical scores in the initial analysis, it is questionable whether an adjustment for gender would reveal a difference large enough to change the conclusion based on the primary analysis.

For this study, patients undergoing total knee arthroplasty were not included, which should be kept in mind for generalizability of the results. Knee arthroplasty patients were omitted, as degenerative joint disease of the knee has a somewhat different symptomatology than that of our

study population and, furthermore, the target of our interest was the explicit comparison of the chosen outcomes between THA surgery, the gold standard with regards to surgical outcomes in orthopedic surgery, and LDS.

In conclusion, despite being equally physically active and engaged in physical activities, LDS patients did not achieve a quality of life at the level of THA patients 1 year postoperatively. This observation leads to the consideration that the impairments associated with the two different pathologies may have a fundamental difference in how they affect the patients' systems of attitudes, beliefs and behaviors toward health. It is very likely that patients undergoing spine surgery suffer pain for months or years longer than patients undergoing THA surgery. The true cause of low back pain is often more difficult to establish than HA and often has multiple causes, making the ideal treatment for the individual patient a complex and slow task. LBP patients are therefore usually required to have tried one or more types of conservative treatment before being referred to surgery, and have thereby automatically suffered pain for a longer time by the time of referral than HA-patients. Also it is common knowledge that chronic pain is associated with several psychological issues, i.e., higher levels of distress, anxiety, fear-avoidance belief and depression [13, 17, 23]. These are all factors that would naturally affect a person's quality of life, perhaps causing LDS patients to report lower levels of quality of life than THA patients. Further research on this matter could be of relevance and clinical importance, as a lower quality of life caused by, for instance, poor coping strategies, a high level of fear-avoidance belief and distress could be susceptible for targeted interventions. Interventions containing elements of cognitive behavioral therapy have proven efficient in improving the psychological variables mentioned and has also been found to positively affect the quality of life for chronic pain patients [11, 15].

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Conflict of interest None.

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