Sanna Sinikallio
Timo Aalto
Olavi Airaksinen
Arto Herno
Heikki Kröger
Sakari Savolainen
Veli Turunen
Heimo Viinamäki

Somatic comorbidity and younger age are associated with life dissatisfaction among patients with lumbar spinal stenosis before surgical treatment

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S. Sinikallio (✉)
Department of Rehabilitation,
Kuopio University Hospital,
Kuopio, Finland
E-mail: sanna.sinikallio@kuh.fi
Tel.: +358-171-78689
Fax: +358-171-78551

T. Aalto
Department of Surgery, Kuopio University,
Kuopio, Finland

O. Airaksinen · A. Herno · T. Aalto
Department of Physical Medicine and
Rehabilitation, Kuopio University
Hospital, Kuopio, Finland

H. Kröger
Department of Surgery/Orthopaedics,
Kuopio University Hospital, Kuopio,
Finland

S. Savolainen · H. Kröger
Department of Neurosurgery, Kuopio
University Hospital, Kuopio, Finland

V. Turunen
Department of Surgery/Orthopaedics,
Kuopio University Hospital, Kuopio,
Finland

H. Viinamäki
Department of Psychiatry, Kuopio
University and Kuopio University
Hospital, Kuopio, Finland

Abstract The objective of the study was to examine self-reported life satisfaction and associated factors in patients ($n = 100$) with lumbar spinal stenosis (LSS) in secondary care level, selected for surgical treatment. Life satisfaction was assessed with the four-item Life Satisfaction scale. Depression was assessed with a 21-item Beck Depression Inventory (BDI). Psychological well-being was assessed with Toronto Alexithymia Scale and Sense of Coherence Scale. LSS related physical functioning and pain were assessed with Oswestry disability index, Stucki questionnaire, Visual Analogue Scale and pain drawings. All questionnaires were administered before surgical treatment of LSS. Results showed that 25% of the patients with LSS were found to be dissatisfied with life. In a univariate analysis, smoking, elevated subjective disability scores and extensive markings in the pain drawings were more common in the dissatisfied patients. The dissatisfied patients also showed lower coping resources, elevated alexithymia and depression scores, and were more often depressed. In multiple logistic regression analyses, only younger age and somatic comorbidity were associated with life dissatisfaction. This association remained significant even when the BDI score was added into the model. No other significant associations emerged. In conclusion, life dissatisfaction was

rather common among preoperative LSS patients. Pain and constraints on everyday functioning were important correlates of life dissatisfaction. However, only younger age and somatic comorbidity were independently associated with life dissatisfaction. These results emphasize the importance of recognizing and assessing the effect of coexisting medical conditions and they need to be addressed in any treatment program.

Keywords Lumbar spinal stenosis · Life satisfaction · Somatic comorbidity

Introduction

Life satisfaction may be viewed as a desired subjective perception [30], a component of psychological well-being [18] and a dimension of mental health [15]. Life satisfaction measured with a four-item Life Satisfaction (LS) scale [1, 27, 31] has proven to have strong predictive power among general population subjects with respect to various adverse health outcomes [27, 29–31].

Life satisfaction has also been found strongly associated with self-rated health as well as with objectively assessed physical health in the Finnish general population [26]. Also the severity and symptoms of somatic disease and the need to use of medication have been found to be related with reduced life satisfaction among general population subjects [19, 26]. In the general population, life dissatisfaction is also related to other health risk predictors such as low social support and adverse health behaviour [23, 34, 37]. In the general population, life dissatisfaction has been found in 19% of men and 18% of women, in 13% of healthy individuals and in 25% of subjects with some illness [26]. In the general population, self-reported life dissatisfaction has been associated in prospective studies with psychiatric morbidity [26] and even with mortality [29] and suicides [30].

Lumbar spinal stenosis (LSS) is a painful and disabling disease caused most typically by degenerative changes, and it affects most frequently the elderly population [13, 54]. A typical symptom of LSS is neurogenic intermittent claudication, which is generally described as pain in the lower extremities, aggravated by walking and lumbar extension, and which is relieved by lumbar flexion. In addition to low back pain, numbness, weakness and tingling in the buttocks and/or thighs are also commonly described symptoms. The diagnosis is based on clinical and radiological findings [24, 41, 54]. For patients who are persistently or increasingly symptomatic, surgical intervention is indicated [24, 42].

Preoperative poor quality of life has been found to be improved after surgery among octogenarians with LSS [13]. Rillardon et al. [42] reported that surgery enabled LSS patients to enjoy a quality of life similar to the age-matched control population. In Schillberg and co-workers' study [44], after microsurgical decompression, 13 of the 14 patients with pure spinal stenosis evaluated that their quality of life had improved after microsurgical decompression and assessed it as basically normal. Nonetheless, life satisfaction among preoperative LSS patients has not been extensively studied although it may be an important factor.

In summary, the present awareness about life satisfaction of LSS patients is incomplete and further research is needed. Therefore, the aim of our study was to examine preoperative self-reported life satisfaction and associated factors in patients with LSS.

Materials and methods

Patients

The study subjects were 100 patients with both clinically and radiologically defined LSS selected for surgical treatment. Selection for surgery was made by the orthopaedist or neurosurgeon between October 2001 and October 2004 in Kuopio University Hospital, Finland. The hospital catchment area includes one university hospital, four central hospitals and four regional hospitals with 860,000 inhabitants. LSS patients are treated operatively in principal in all of these hospitals. However, the LSS patients of the two regional hospitals are referred to Kuopio University Hospital for operative treatment. Only one of the study patients was referred to university hospital from a central hospital. Thus, the study patients represent ordinary LSS patients treated operatively in secondary care level. The inclusion criteria were (1) the presence of severe back, buttock and/or lower extremity pain, with radiographic evidence (computed tomography, magnetic resonance imaging, angiography) of compression of the cauda equina or exiting nerve roots by degenerative changes (ligamentum flavum, facet joints, osteophytes and/or disc material); (2) the surgeon's clinical evaluation that the patient had degenerative LSS needing operative treatment [24]; in addition, all patients had a history of ineffective treatment results with conservative treatment. A previous spine operation or co-existing disc herniation was not an exclusion criterion. The exclusion criteria were emergency or urgent spinal operation precluding recruitment and protocol investigations, cognitive impairment prohibiting completing of the questionnaires or other failure in co-operation and presence of metallic particles in the body preventing the MRI investigation. The surgeons sent the information of eligible patients to be operated to the Department of Physical and Rehabilitation Medicine, which organized the study.

The patients received an account of the study during their outpatient visit to the Department of Physical and Rehabilitation Medicine and provided informed consent. The study design was approved by the Ethics Committee of University of Kuopio and Kuopio University Hospital. A total of 119 patients were examined for the study in the Department of Surgery/Orthopaedics. Seven patients refused to participate in the study; one patient was operated before the investigation protocol could be carried out; the symptoms became alleviated in four patients leading to refusal to undergo or postponement of the operation, and three patients were not operated after a re-evaluation by the surgeon. One patient died before the operation, and one patient was admitted to joint arthroplasty after the operator's reconsideration. Two of

the 102 study patients had missing LS scale [1] data, thus the final sample size was 100.

Questionnaires

Questions about socio-demographic background (age, marital status, employment status), smoking habits, time since first back pain episode were included. Also questions concerning self-reported walking capacity and use of supportive vest were included.

Somatic comorbidity was assessed with one modified item (item number 3) of the Work Ability Index (WAI) questionnaire [51]; the self-reported number of current or recurring somatic diseases diagnosed by a physician (range 0–49). The number of diseases was then recorded as a sum score. The musculoskeletal diseases (in addition to LSS) were: pain and degeneration in the extremities (42%), cervical pain and degeneration (33%), disc herniation (13%) and rheumatoid arthritis (3%). The concomitant circulatory diseases were: circulatory diseases: arterial hypertension (45%), coronary artery disease (16%), a history of myocardial infarction (7%) and cardiac insufficiency (4%). The majority of the patients had multiple concomitant diseases, this precluding separate diagnostic statistical analysis.

A modified *pain drawing* [36] was used to locate the pain and numbness (patients marked the sensations felt in various body parts on a schematic map of the body) with the map being divided into 100 cells (range 0–100). Back pain intensity was measured with a self-administered Visual Analogue Scale (VAS) (range 0–100 mm). This has proved to be a valid index of experimental, clinical and chronic pain [40]. Subjective disability was measured by the Oswestry Disability Index (0–100%), where 0% represents no disability and 100% extreme debilitating disability [9, 10]. We used the validated Finnish version [14] of the Oswestry index. The questionnaire devised by Stucki [47] assessed spinal-related physical function and symptom severity with higher scores indicating more LSS related problems. The *questionnaire* was translated into Finnish by one of the authors (TA) and the translation was checked by a native English speaker. The questionnaire consists of three scales: (1) A seven-question scale on symptom severity where all but one item had Likert response scales with five categories scored 1–5 (none, mild, moderate, severe, very severe). The score was calculated as an unweighted mean of all answered items. (2) A scale of physical function where all but one item had Likert response scales with four categories (no, could not perform; yes, but always with pain; yes, but sometimes with pain; yes, comfortably). The score was calculated as an unweighted mean of all answered items. The possible range of scores was 1–4. (3) The scale concerned with postoperative satisfaction was not used in our preoperative patient sample.

Alexithymia has been originally defined as an inability to recognize and verbalize emotions [46]. Alexithymic features were assessed with a validated Finnish version [21] of the 20-item Toronto Alexithymia Scale (TAS-20) [4, 5]. Subjects indicated how much they agreed with the statements (e.g. “I am often confused about what emotions I am feeling”) using a five-point Likert scale; responses range from 1 (totally disagree) to 5 (totally agree), with the total range of scores being 20–100. Scores ≥ 61 are indicative of alexithymia [17, 50]. The Sense of Coherence (SOC) scale [2, 3] measures coping resources. The short, well-validated 13-item version (range 13–91) of the SOC scale was used [7, 12, 25, 48] with responses on a seven-point scale. Examples of items include the following: In the past, have you been surprised by the behaviour of people whom you thought you knew well? (never happened—always happening). Do you feel that you are being treated unfairly? (very often—very seldom or never). A high SOC score reflects good coping resources. Due to the multifaceted nature of the SOC concept, no particular cut-off points were used [3]. Depression was assessed with the 21-item Beck Depression Inventory (BDI) with scores ranging from 0 to 63 [6]. The cut-off point for clinically important depression was set at 14/15, 0–14 indicating normal mood and 15 or more indicating clinically important depression [55].

The four-item self-reported LS scale [1] was used. For each item, subjects chose the statement which best described their experience when asked: Do you feel that your life at present is (response scores in parenthesis)... 1. very interesting (1); fairly interesting (2); fairly boring (4) or very boring (5). 2. very happy (1); fairly happy (2); fairly unhappy (4) or very unhappy (5). 3. very easy (1); fairly easy (2); fairly hard (4) or very hard (5). 4. very lonely (5); fairly lonely (4) or not at all lonely (1). The item responses “cannot say” were scored as 3. The sum scores were analysed continuously or dichotomously (the satisfied group scores 4–11 and the dissatisfied group scores 12–20) [26, 27].

Statistical analyses

All statistical analyses were performed using SPSS/PC (version 12.0, SPSS, Chicago, IL, USA). Statistical methods included the χ^2 test or Fisher’s exact test with class variables and Student’s *t* test or the Mann–Whitney *U* test with continuous variables, depending on the distribution. Data distribution was tested against normality using the Kolmogorov–Smirnov goodness-of-fit test. Spearman’s correlation coefficients were also calculated. Multivariate logistic regression analyses (method enter) were used to assess factors independently associated with dissatisfaction with life among LSS patients.

Results

In this study sample, 25% of the patients with LSS were found to be dissatisfied with life. The dissatisfied patients were significantly younger and had more self-reported somatic comorbidity. The proportion of smokers was also significantly higher in the dissatisfied patients. However, there were no statistically significant differences between the satisfied and dissatisfied patients in

terms of gender, marital status, employment status or years elapsed since first back pain episode (Table 1). In this sample, the mean life satisfaction score of all subjects was 9.41 [standard deviation (SD) 3.29].

There were no statistical differences between the life satisfaction groups in the Stucki scores (either severity of pain or disability of function) or in back pain VAS scores. A trend towards significance in VAS scores was seen; the dissatisfied individuals reported higher ratings

Table 1 Characteristics of all the lumbar spinal stenosis patients and in relation to life satisfaction

Variable	All (<i>n</i> = 100)	Satisfied (LS 4–11) (<i>n</i> = 75)	Dissatisfied (LS 12–20) (<i>n</i> = 25)	<i>P</i> value between satisfied and dissatisfied
Age [years; mean (SD)]	61.7 (11.17)	63.3 (10.61)	56.5 (11.5)	< 0.01
Sex (%)				
Male	42.2	37.3	56.0	NS
Marital status (%)				
In relationship (married or co-habiting)	64.4	66.7	60.0	NS
Employment status (%)				
At work	13.9	14.7	12.0	NS
Current smoker (%)	20.6	13.3	40.0	< 0.01
Number of somatic diseases (%)				
0–5	55.9	62.0	36.4	< 0.05
6–11	39.8	33.8	59.1	< 0.05
12–17	4.3	4.2	4.5	NS
> Median (5) (%)		38.0	63.6	< 0.05
Time since first back pain episode				
Years [mean (SD)]	15.8 (13.9)	15.8 (14.1)	16.1 (13.4)	NS
≥ Median (13) (%)		51.4	44.0	NS

NS not significant

Table 2 Clinical characteristics of all the lumbar spinal stenosis patients and in relation to life satisfaction

Variable	All (<i>n</i> = 100)	Satisfied (LS 4–11) (<i>n</i> = 75)	Dissatisfied (LS 12–20) (<i>n</i> = 25)	<i>P</i> value between satisfied and dissatisfied
Stucki score [mean (SD)]				
Severity	3.3 (0.57)	3.3 (0.57)	3.5 (0.57)	NS
Disability	2.5 (0.47)	2.4 (0.47)	2.6 (0.47)	NS
Oswestry %				
Mean (SD)	43.9 (15.2)	41.5 (15.1)	50.3 (13.5)	< 0.05
≥ Median (44 points) (%)		48.0	64.0	NS
VAS score [mean (SD)]	55.2 (26.8)	52.3 (26.2)	64.3 (28.3)	NS (<i>P</i> = 0.053)
Walking capacity, m				
Mean (SD)	1,427 (1,787)	1,464 (1,935)	1,380 (1,351)	NS
≥ Median (900 m) (%)		46.7	60.0	NS
Pain drawing; markings				
Mean (SD)	22.5 (19.4)	20.2 (15.1)	29.7 (28.0)	< 0.05
≥ Median (17.5 markings) (%)		45.3	72.0	< 0.05
Use of supportive vest (%)	24.5	22.7	32.0	NS
Sense of coherence score [mean (SD)]	70.3 (12.6)	73.3 (10.4)	61.4 (14.6)	< 0.001
Beck Depression Inventory (BDI) score				
Mean (SD)	10.2 (6.0)	8.6 (4.7)	15.1 (6.8)	< 0.001
Depressed (%)	20.0	10.7	48.0	< 0.001
TAS-20 score				
Mean (SD)	46.7 (10.9)	45.4 (11.4)	50.6 (8.5)	< 0.05
Alexithymic (%)	10.0	10.7	8.0	NS
Life satisfaction score [mean (SD)]	9.4 (3.3)	7.8 (1.7)	14.3 (1.6)	< 0.001

NS not significant

than the satisfied subjects. Self-reported walking capacity or use of supportive brace did not differ significantly in relation to life satisfaction (Table 2).

The mean Oswestry disability score of all patients was 43.9 (SD 15.2). The mean Oswestry disability score was significantly higher among the dissatisfied patients whereas the proportion of high Oswestry scores (Oswestry score over median) did not differ between the groups. The dissatisfied patients experienced more extensive pain as reflected in their more frequent markings in the pain drawings. Also the proportion of patients showing extensive pain markings (pain drawing markings over the median) was statistically higher in the dissatisfied subjects.

The mean SOC score was significantly lower in the dissatisfied group indicating that these patients had lower coping resources. The mean TAS-20 score of all the subjects was 46.7 (SD 10.9). The mean TAS-20 score was significantly higher in the dissatisfied group pointing to more alexithymic features in these subjects. However, the proportion of alexithymic patients was not higher in the dissatisfied group. The mean BDI score of all patients was 10.2 (SD 6.0). Both the mean BDI score and the proportion of subjects who were depressed were significantly higher in the dissatisfied group (Table 2). The LS score correlated moderately with the Oswestry score (Spearman's $r=0.35$), sense of coherence score (Spearman's $r=-0.46$), BDI score (Spearman's $r=0.58$) and the TAS-20 score (Spearman's $r=0.33$).

Based on the results of Table 1 and 2, the following factors were included in the final multivariate logistic regression analyses (method enter): age (years), sex (male/female), marital status (single: no/yes), current smoking (no/yes), somatic comorbidity (number of somatic diseases over median: no/yes), Oswestry score over median (no/yes), pain drawing markings (over median: no/yes), SOC-13 score (continuous score), TAS-20 score (continuous score) and BDI score (continuous score) in order to identify factors independently associated with life dissatisfaction among LSS patients. The first regression model (–) suggested that younger age and somatic comorbidity were associated with life dissatisfaction in LSS patients. This association remained significant even though the BDI score was added into the model (+) and no other significant associations emerged (Table 3).

Discussion

The main finding of this study was that 25% of the preoperative LSS patients were dissatisfied with their lives. As far as we are aware, life dissatisfaction among patients with LSS has never been previously assessed. In

the general population, life dissatisfaction has been recorded in 13% of the healthy population and in 25% of those with illnesses, using the same cut-off and scale as we used here [26]. With this same scale, life dissatisfaction was also found in 24% of the patients with coronary heart disease (CHD) [53]. Thus, the LSS patients are more dissatisfied than the general population, but do seem to exhibit the same level of dissatisfaction with life as CHD patients, or other sick patients in the general population.

The mean life satisfaction score among the adult Finnish population has been reported to be 8.23 [33] and 13.76 among depressive patients [30]. The mean life satisfaction score among preoperative LSS patients was 9.41, reflecting their lower satisfaction than the general population but clearly better satisfaction than depressive patients.

Secondly, our results revealed that the dissatisfied LSS patients reported more somatic comorbidity than the satisfied individuals. The importance of comorbidity was evident in logistic regression analyses, indicating that somatic comorbidity is an independent factor associated with life dissatisfaction. Earlier results have shown that the quality of life among LSS patients [8, 44] is associated at least partly with concomitant diseases. One limitation of our study is its rather small sample size, which precluded the analysis of somatic comorbidity according to specific diagnoses. In addition, the accumulation of multiple concurrent somatic diseases in an individual patient makes it impossible to analyse the effects of these different diseases independently. However, somatic comorbidity was the most important correlate of life dissatisfaction, highlighting the necessity of careful clinical assessment. However, the importance of somatic comorbidity to life satisfaction can be evaluated more reliably in studies with a prospective design.

Thirdly, the importance of younger age both as an indicator and a predictor of life dissatisfaction was evident both in univariate comparisons and multivariate logistic regression analyses. Prior research has suggested that in contrast to health constraints age per se is not a cause of decline in subjective well-being [11, 35]. It may be postulated, according to our results, that the life dissatisfaction of younger LSS patients is partly explained by the poorer adaptation to disability and pain, lack of coping and greater amount of personal losses (i.e. loss of work ability, disturbed social life, etc.).

A significantly higher proportion of the dissatisfied LSS patients were smokers than of the satisfied LSS patients. This is in line with prior studies [43, 49] suggesting that health behaviours are important correlates of life satisfaction. The clear reciprocal nature of the smoking–health behaviour relationship makes it difficult to determine causality. However, this association was not significant in the logistic regression analyses.

Table 3 Multiple logistic regression models with (+) and without (–) Beck Depression Inventory scores in relation to life dissatisfaction (life satisfaction score 12–20)

Variable	Model (–) OR (95% CI)	Model (+) OR (95% CI)
Age (years)	0.91 (0.84–0.98)*	0.90 (0.83–0.98)*
Sex (female/male)	0.53 (0.13–2.18)	0.61 (0.14–2.69)
Single (no/yes)	1.82 (0.43–7.73)	1.60 (0.34–7.47)
Smoking (no/yes)	3.55 (0.62–20.27)	3.14 (0.49–20.27)
Number of somatic diseases (over median (5); no/yes)	7.92 (1.43–43.84)*	7.19 (1.22–42.49)*
Oswestry % (continuous score)	1.02 (0.98–1.07)	1.00 (0.95–1.06)
Pain drawing markings (over median (17.5); no/yes)	1.72 (0.42–7.01)	1.66 (0.40–6.88)
Sense of coherence (continuous SOC-13 score)	0.98 (0.92–1.61)	1.00 (0.93–1.08)
Alexithymia (continuous TAS-20 score)	1.07 (0.98–1.16)	1.07 (0.93–1.08)
Depression (continuous BDI score)	–	1.17 (0.98–1.39)

OR odds ratio, CI confidence interval* $P < 0.05$

It is important to note that the satisfied and dissatisfied patients did not differ clearly with respect to strictly LSS related physical function or symptom severity as measured with the Stucki questionnaire. Furthermore, there were no statistically significant differences in experienced intensity of back pain (VAS ratings). However, a clear trend regarding the difference in VAS ratings was noted, implying that the dissatisfied patients do experience more intensive back pain. When we assessed the subjective constraints on their everyday functioning by using the Oswestry disability index a statistical difference was detected: the patients who were dissatisfied with life had higher mean Oswestry disability scores than the satisfied patients. The mean Oswestry score of all the subjects in this study was 43.9 which is clearly higher than previously reported in preoperative LSS patients [16: 27.1; 20: 39.1]. This reflects the high severity of symptoms and strict inclusion criteria in our study patients. Our results indicated that the Oswestry disability score seems to be a sensitive method for the detection of the subjective disability and the sense of everyday functioning of LSS patients. In comparison, it appears that the Stucki questionnaire focuses on rather limited aspects of pain characteristics and walking capacity. Our finding that the dissatisfied patients experienced more extensive painful sensations which they marked in the pain drawings, may be explained by the greater somatic comorbidity of the patients who were dissatisfied with life. To conclude, pain and constraints of everyday functioning are important correlates of life dissatisfaction among LSS patients.

The mean SOC score was significantly lower among the patients who were dissatisfied with life indicating that these patients had lower coping resources. Low SOC scores have been frequently found to be associated with various somatic diseases among the general population [25, 38, 39, 48]. These previous studies indicate that those patients with a strong sense of coherence are

likely to take an active role in shaping their own health outcomes. SOC has also been found to correlate with life satisfaction among the healthy adult population [22, 45]. However, no earlier results of SOC among LSS patients are available.

Higher mean TAS-20 scores were observed in the patients who were dissatisfied with life. However, the proportion of alexithymic patients per se was not higher in the group of dissatisfied patients. The mean TAS-20 score of all our study patients was 46.7, which is slightly lower than that has been reported among patients with CHD (48.5) [52]. The mean TAS-20 score in the Finnish general population has been reported to be 44.1 [17]. Hence, recognizing and verbalizing emotions does not seem to be particularly problematic among the preoperative LSS patients.

Finally, the patients who were dissatisfied with life showed both significantly elevated BDI scores and were more often depressed. This finding was predictable in the light of earlier studies: depression is known to be associated with life dissatisfaction, this has been shown not only in psychiatric patients [27, 28], but also in CHD patients [52] and even in the general population [32]. The mean BDI score in the North Savo general population has been reported to be 5.8 [49], whereas the dissatisfied LSS patients' mean BDI score was 15.1 in our study. However, in logistic regression analyses, the BDI scores were not significantly associated with life dissatisfaction. Thus, it is noteworthy that somatic comorbidity was a strong variable and it remained independently associated with life dissatisfaction in the logistic regression models even when depression scores were added into the model. Finally, as a limitation of our study it must be mentioned that due to the small sample size the risk of false negative findings (type II statistical error) cannot be ruled out. In addition, to our knowledge, there are no studies using comparable methods on patients with LSS. The literature to date has focused primarily on surgical

treatment of LSS. At this point, our results are applicable only to presurgical LSS patients in secondary care level.

Conclusions

One out of every four of the secondary care LSS patients is dissatisfied with life prior to operative treatment. Dissatisfaction with life is associated with younger age and greater somatic comorbidity. Our results suggest that life dissatisfaction of LSS patients is not merely a function of psychological factors; the constraints on physical well-being and disruption of everyday activities are more important. Several major clinical implications emerge from our results. Effective treatment strategies

for LSS have to take into account somatic comorbidities and these factors should be routinely evaluated in the treatment program of LSS. Even though our cross-sectional design does not permit causal inference, the observed relations do provide valuable evidence for further follow-up research, particularly with respect to the outcome of surgical treatment of LSS.

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