Published in final edited form as:

Clin Spine Surg. 2016 December ; 29(10): E509–E513. doi:10.1097/BSD.0b013e31829e1514.

Spinal Stenosis: Factors that influence patients' decision to undergo surgery

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Abstract

Study Design—Prospective non-interventional observation

Objective—To examine factors that influence a patient's real decision to accept the offer of surgery for lumbar spinal stenosis in a relatively controlled situation.

Summary of Background Data—A patient's decision to undergo spine surgery might be influenced by factors other than pathology. However there is limited research exploring the decision.

Methods—A study performed for other purposes recruited persons aged 55–90 with medical record evidence of an offer of surgery for spinal stenosis by a university faculty surgeon. Inclusion criteria included neurogenic claudication, subjectively positive imaging, difficulty walking 200 yards. Potential subjects with additional disabling conditions (e.g. lower limb amputation), conditions that might mimic stenosis (e.g. polyneuropathy) or some contraindications to invasive treatment (e.g. anticoagulation) were excluded. Subjects filled out questionnaires on function, quality of life, pain, and health, and were examined by a spine surgeon masked to diagnostic category. (Other recruits had back pain or no symptoms) Telephone follow-up 6–12 months later determined whether surgery was done.

Results—Of 39 qualifying subjects, 20 followed through with surgery. A binary logistic regression revealed that significant factors that influence patient decision-making included SF-36 measures of "Comparative Health" and "Role Limit Emotional" as well as the subject's overall perception of their quality of life. The combination of all three factors yielded a predictive model ($p = .031$). Individually, however, only "Comparative Health" was significant and able to predict a decision to proceed with surgery ($p = .036$).

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Dedicated to the memory of co-author Karen S.J. Yamakawa, M.S.

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The authors believe that there is no direct conflict of interest in this paper. However Author Haig discloses the following information: He consults with various hospitals and healthcare systems to improve spine care through Haig et al., Consulting. He has received research and consulting support from the Center for Healthcare Research and Transformation. He has leadership roles in the International Society for Physical and Rehabilitation Medicine and is president of the International Rehabilitation Forum.

Conclusions—In this population with significant disability, uncomplicated medical history and a relatively clear diagnosis, the decision to accept surgical intervention was influenced by issues of perceived overall health and quality of life. Interventions to change real or perceived overall health may impact patient acceptance of surgery.

Keywords

Surgery; spinal stenosis; back pain; clinical decision making; rehabilitation; quality of life

Introduction

Lumbar spinal stenosis is a common affliction that creates a significant burden, especially on persons who are middle aged and older ^{1,2}. While a precise clinical definition of the condition is not well established, most patients with stenosis experience pain in the lower back or legs which is relieved with sitting or flexion of the trunk, and many have difficulty walking due to such pain ^{1,3}.

Of all primary care patients, 3–4% have clinically diagnosed spinal stenosis, and 13–14% have back pain ^{4–7}. Conservative treatment such as physical therapy, epidural injections, and analgesic medications are often considered first-line treatment in uncomplicated cases ⁸.

Surgery is usually considered a “last resort” when conservative treatment fails ⁹. The rate of surgical treatment for stenosis has been increasing ^{10,11}, and the costs of such invasive surgery continue to rise ¹². The decision to operate is an elective one, as stenosis rarely causes rapid progression. Because spinal surgery is a major procedure with extensive recovery time, determining the factors which influence a patient's decision to undergo surgery is vital in understanding satisfaction and necessity of surgery for this population.

Few past studies have investigated the psychology of choosing surgery. Bancheri, et al. ¹³ did find psychological factors to be strongly associated with the decision to undergo bariatric surgery versus conservative weight loss treatment. However, there is very little research on the psychological factors that influence a patient's decision to undergo elective spine surgery. Research in this area is difficult, in part because surveys and hypothetical cases may not actually reflect a patient's real thought process. The current study followed the actual decision making process of persons who had strong evidence for disease, otherwise uncomplicated medical histories, and who were offered a real choice of surgery. It aimed to uncover the psychological and physical factors that drove patients to choose surgery over non-surgical management.

Methods

Subject data was obtained from the Michigan Spinal Stenosis Study II, an NIH-funded, ethical review board approved research study which involved subjects recruited from a university hospital neurosurgery and orthopedic surgery clinic. Qualified subjects must have been offered surgery for spinal stenosis by a surgeon, as reflected in the medical record. The subjects affirmed that ambulating two-hundred yards was difficult for them due to pain which they attributed to spinal stenosis and not due to another musculoskeletal or neurologic

condition. Subjects were screened for previous back surgery, cardiopulmonary precautions for ambulation testing, contraindications to MRI scanning (metal, obesity, unmanageable claustrophobia), relative contraindications or technical barriers to electromyographic testing (coumadinization, severe immune disorder, extreme obesity, 3+ or greater pitting edema, or implanted electrodes such as defibrillators), and risk factors for neuromuscular disease (diabetes, alcohol more than 12 drinks per week, personal or familial neuromuscular disease, or history of previous significant focal lower limb nerve injury). Potential subjects with any other medical disorder of a level of severity that might interfere with daily walking were eliminated. Finally, subjects were required to be legally competent and willing to travel to the clinic at their own expense for testing.

All participants were screened against confounding medical problems, such as diabetic neuropathy, peripheral vascular disease, musculoskeletal disease, and history of significant injury to the lower limb.

As part of the MSSS-II study protocol, each subject completed a thorough questionnaire, which included basic demographic, medical, social, family, and spine history items. The questionnaire also included the Tampa Scale, a tool to measure kinesiophobia and psychometric factors of chronic pain¹⁴; the Walking Impairment Questionnaire¹⁵; the Swiss Spinal Stenosis Scale, which is an outcome questionnaire about the patient's symptom severity, physical function, and surgery satisfaction¹⁶; The Center for Epidemiological Studies Depression scale (CES-D) scale which is an inventory of the subject's mood and behavior in the week prior to filling out the questionnaire¹⁷; and the SF-36, a comprehensive questionnaire that provides a summary of various aspects of the subjects' perception of their mental and physical quality of life¹⁸. These and other questions offered important information about the location and level of pain, participants' emotional status, physical impairment level, family history, medical history, work status, and satisfaction with surgery if applicable.

Subjects were called on average one year following participation in the MSSS-II study; the shortest amount of time between a subject finishing the MSSS-II and receiving the follow-up call was two and a half months and the longest amount of time was three years. Subjects were asked whether they had undergone spine surgery since participation, their level of satisfaction with the treatment they had received (surgical or other) and their current level of pain. Feedback was also obtained on participation in the MSSS-II for other purposes.

The sample was divided into "surgery" and "no surgery" groups. Demographics of the groups were compared with t-tests and chi-squares using SPSS/PASW v.17 software. Study variables, based on the various scales on the patient questionnaires were also evaluated for differences between groups. Significantly different variables as well as the visual analog scale (VAS) rating of average pain in the past week, age, and body mass index (BMI), were evaluated for collinearity using Analysis of Variance (ANOVA). Based on this multivariate analysis, three important factors – Role Limiting, Emotional (RLE) and Comparative Health (CH) (both subscales from the SF-36), and quality of life (QoL, as rated by subjects) – were selected for further analysis in a binary logistic regression.

Results

43.14% of the subjects contacted had followed through with surgery, 39.22% did not elect to have surgery, and 17.65% were lost to follow-up. Table 1 shows the demographic information of the sample. No significance difference in any demographic variable was found. Trends that bear watching but were not statistically significant in this moderate sized population include surgery chosen by a higher percentage of people who were still working and by those whose symptoms had lasted a shorter time. In addition, as table 2 shows, only three of the study variables compared (General Health, RLE, and CH) were significantly different between the groups ($p=0.05$, $p=0.04$, $p=0.04$, respectively) (table 2). QoL was not significantly different between groups ($p=.651$).

Collinearity was determined using ANOVA as well as correlation statistics between the variables of interest. GH and RLE were significantly correlated ($r=.41$, $p=.01$) with each other and thus RLE was retained for regression analysis based on its higher level of significance in between-groups comparison ($p=0.04$ vs. $p=0.05$). In addition, there was no significant collinearity between CH and RLE ($F=.70$, $p=.56$); respectively).

A binary logistic regression was used to evaluate the predictive value of CH, QoL, and RLE on a patient's likelihood to get surgery. CH was individually significant ($p=0.036$), however neither QoL or RLE contributed any significance on their own. The model as a whole was significant with $p=0.031$ (Table 3).

Discussion

This study found that the decision of people with spinal stenosis to accept the offer related to general health and quality of life issues more than other factors that appear directly related to pathology, such as pain or disability. The methodology from which these findings are derived, and the context within the literature should be discussed.

This study found that the items that play the largest role for patient decision-making regarding spinal stenosis surgery include limitations on fulfilling emotional/psychosocial roles (RLE), quality of life, and how the subject's health compared to a year before (CH). Individually, only CH is predictive of a patient's surgical decision ($p = .036$). However, when considered in combination with all three items, the model is slightly more predictive ($p = .031$). Therefore, while not predictive of surgery on their own, the effect of stenosis symptoms on fulfilling perceived roles within one's family or community as well as their overall perception of quality of life, when combined with how their health has changed can be quite influential on the decision to get elective spine surgery.

Surgery for spinal stenosis is a costly and physically taxing procedure¹², requiring months of recovery and risk of complications. In addition, the result is not always what was expected^{19–22}. Why would a patient lean toward this type of management? The rational answer—one that a surgeon or ethicist might make, would be that he or she balanced the risks and benefits of surgery vs. not operating. This study shows, however, that emotional and psychosocial difficulties come into play, as well. It is possible that patients are reaching a point at which surgery seems like the only way to improve quality of life, as

their health continues to deteriorate. However, multiple studies have shown that those with poorer emotional/mental health status prior to surgery had less favorable outcomes (more chronic pain, lower functional status) following surgery than those with better emotional profiles^{23,24}. It is possible, therefore, that while some patients may have tried aspects of conservative management prior to surgery, a multi-disciplinary approach involving both medical and therapeutic management as well as pain psychology to address the psychosocial/emotional needs of the patients could be more beneficial than those disciplines alone. Psychological treatment could improve patient outcomes after surgery, and possibly prevent unnecessary surgery altogether. This multi-disciplinary approach has been a standard in the management of back pain in general, but is not held as a standard in management of spinal stenosis.

The stenosis subjects used in this study represent a useful population as they had all been stringently screened against confounding medical problems, and had been offered surgery by faculty physicians in a University setting. This helped to reduce diagnostic ambiguity, however this study must be viewed as a preliminary inspection of the issue. The findings should be considered preliminary and limited due to the small sample size and other factors not considered or not controlled for. Among these is a selection bias created by use of a population of patients who chose care at a Midwestern university setting and were willing to volunteer for research. A larger study recruiting patients from both community and academic hospitals would be of value. In addition, it is likely that most people who are offered surgery make a decision within months after the offer, therefore the timing of follow-up surveys should be standardized to more accurately determine decision-making influences using data from the original questionnaires, or follow-up questionnaires should be used.

Further research might assess effectiveness of co-managing emotional factors. This study found that those who have these limitations due to emotional circumstances are more likely to elect surgery. Someone who is limited by depression or anxiety will not necessarily benefit from surgery, and a patient who has no emotional limitations may still choose to undergo surgery. Through improved patient and physician education regarding these influencing factors, the medical community will be better prepared to set patients on their path to recovery using more effective and less costly and invasive treatments.

Acknowledgment

“The project described was supported by Award Number R01HD059259 from the Eunice Kennedy Shriver National Institute Of Child Health & Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver National Institute Of Child Health & Human Development or the National Institutes of Health.”

References

1. Goh K, Khalifa W, Anslow P, Cadoux-Hudson T, Donaghy M. The clinical syndrome associated with lumbar spinal stenosis. *Eur Neurol*. 2004; 52(4):242–249. [PubMed: 15583458]
2. Porter RW. Spinal stenosis and neurogenic claudication. *Spine*. 1996; 21(17):2046. [PubMed: 8883210]
3. Haig A, Tomkins C. Diagnosis and Management of Lumbar Spinal Stenosis. *JAMA: The Journal of the American Medical Association*. 2010 Jan 6; 303(1):71–72. 2010. [PubMed: 20051574]

4. Fanuele J, Birkmeyer N, Abdu W, Tosteson T, Weinstein J. The impact of spinal problems on the health status of patients - Have we underestimated the effect? *Spine*. 2000 Jun 15; 25(12):1509–1514. [PubMed: 10851099]
5. Hart L, Deyo R, Cherkin D. Physician office visits for low back pain. Frequency, clinical evaluation, and treatment patterns from a U.S. national survey. *Spine*. 1995 Jan 1; 20(1):11–19. [PubMed: 7709270]
6. Long DM, BenDebba M, Torgerson WS, et al. Persistent back pain and sciatica in the United States: Patient characteristics. *Journal of Spinal Disorders*. 1996 Feb; 9(1):40–58. [PubMed: 8727456]
7. Kalichman L, Cole R, Kim DH, et al. Spinal stenosis prevalence and association with symptoms: the Framingham Study. *The Spine Journal*. 2009; 9(7):545–550. [PubMed: 19398386]
8. Tran de QH, Duong S, Finlayson RJ. Lumbar spinal stenosis: a brief review of the nonsurgical management. *Can J Anaesth*. 2010 Jul; 57(7):694–703. [PubMed: 20428988]
9. NASS. Evidence Based Clinical Guidelines for Multidisciplinary Spine Care: Diagnosis and Treatment of Degenerative Lumbar Spinal Stenosis. 2007 [Accessed 8/11/11] http://www.spine.org/Documents/NASSCG_Stenosis.pdf.
10. Lurie JD, Birkmeyer NJ, Weinstein JN. Rates of advanced spinal imaging and spine surgery. *Spine*. 2003 Mar 15; 28(6):616–620. [PubMed: 12642771]
11. Deyo R. Trends and Variations in the Use of Spine Surgery. *Clinical orthopaedics and related research*. 2006; 443:139–146. (·). [PubMed: 16462438]
12. Overvest GM, Luijsterburg PA, Brand R, et al. Design of the Verbiest trial: cost-effectiveness of surgery versus prolonged conservative treatment in patients with lumbar stenosis. *BMC Musculoskelet Disord*. 2011; 12:57. [PubMed: 21371314]
13. Bancheri L, Patrizi B, Kotzalidis G, et al. Treatment Choice and Psychometric Characteristics: Differences Between Patients Who Choose Bariatric Surgical Treatment and Those Who Do Not. *Obesity Surgery*. 2006; 16(12):1630–1637. [PubMed: 17217640]
14. Clark, M.; Kori, S.; Brockel, J. Kinesiophobia and chronic pain: psychometric characteristics and factor analysis of the Tampa Scale; 15th Annual Scientific Meeting of the American Pain Society; 1996.
15. Coyne K, Margolis M, Gilchrist K, et al. Evaluating effects of method of administration on Walking Impairment Questionnaire. *Journal of Vascular Surgery*. 2003; 38(2):296–304. [PubMed: 12891111]
16. Stucki G, Daltroy L, Liang MH, Lipson SJ, Fossel AH, Katz JN. Measurement Properties of a Self-Administered Outcome Measure in Lumbar Spinal Stenosis. *Spine*. 1996; 21(7):796–803. [PubMed: 8779009]
17. Radloff LS. The CES-D Scale. *Applied Psychological Measurement*. 1977 Jun 1; 1(3):385–401. 1977.
18. Brazier J, Harper R, Jones N, et al. Validating The SF-36 Health Survey Questionnaire: New Outcome Measure For Primary Care. *BMJ: British Medical Journal*. 1992; 305(6846):160–164. [PubMed: 1285753]
19. Herron L, Mangelsdorf C. Lumbar spinal stenosis: results of surgical treatment. *J Spinal Disord*. 1991 Mar; 4(1):26–33. [PubMed: 1807528]
20. Katz JN, Lipson SJ, Chang LC, Levine SA, Fossel AH, Liang MH. Seven- to 10-year outcome of decompressive surgery for degenerative lumbar spinal stenosis. *Spine(Phila Pa 1976)*. 1996 Jan 1; 21(1):92–98. [PubMed: 9122770]
21. Weinstein JN, Tosteson TD, Lurie JD, et al. Surgical Versus Nonoperative Treatment for Lumbar Spinal Stenosis Four-Year Results of the Spine Patient Outcomes Research Trial. *Spine*. 2010; 35(14):1329–1338. [PubMed: 20453723]
22. Atlas S, Deyo R, Keller R, et al. The Maine Lumbar Spine Study, Part III: 1-Year Outcomes of Surgical and Nonsurgical Management of Lumbar Spinal Stenosis. *Spine*. 1996; 21(15):1787–1794. [PubMed: 8855463]
23. Block AR, Ohnmeiss DD, Guyer RD, Rashbaum RF, Hochschuler SH. The use of presurgical psychological screening to predict the outcome of spine surgery. *The Spine Journal*. 2001; 1(4): 274–282.

24. Trief PM, Ploutz-Snyder R, Fredrickson BE. Emotional Health Predicts Pain and Function After Fusion: A Prospective Multicenter Study. *Spine*. 2006; 31(7):823–830. [PubMed: 16582857]

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Figure 1.

Table 1

Demographics of persons who chose and did not choose surgery.

Variable	Surgery (N=20)	No Surgery (N=19)	χ^2 or T-Test Statistic	Significance
Age; Mean (SD)	66.3 (9.44)	67.36 (9.04)	0.36	0.58
Gender (% male)	52.63	55	0.022	.882
Body Mass Index	30.45 (5.52)	31.69 (4.81)	0.64	0.62
Race (% White)	75	94.74	2.916	.088
Marital Status (% Married)	80	73.68	.219	.640
Years of Schooling	14.11 (2.33)	14.32 (3.76)	0.208	0.168
Employment Status (% Retired)	55	68.42	0.742	.389
Length of Time Living With Problem (yrs)	4.71 (5.73)	8.24 (12.74)	1.096	0.281
Number of Treatments Tried	2.9 (1.45)	3.16 (1.71)	.510	0.278
Total Diagnostic Tests Taken	2.5 (1.28)	2.53 (1.26)	0.065	.930
Time to Recover After Walking as Far as Possible (mins)	11.26 (13.97)	15.16 (15.28)	.752	.663

Table 2

Physical, Social and Emotional Functioning Among Persons Who Did or Did Not Choose Surgery.

Scale	Surgery X (sd)	No Surgery x(sd)	T-Test Statistic	Significance
PDI Total	31.10 (13.14)	29.31 (16.93)	-.365	.717
PDI Pain Interference	5.58 (2.19)	5.47 (2.70)	-.132	.896
QBPDS total	48.16 (17.06)	47.72 (23.08)	-.067	.947
QBPDS Pathological Somatic	11.68 (5.57)	11.58 (6.43)	-.054	.957
QBPDS Activity Avoidance	21.16 (5.75)	19.16 (9.47)	-.787	.437
SF36 General Health	60.74 (23.13)	73.84 (16.04)	2.03	.050*
SF36 Physical Function	30.26 (15.68)	36.11 (24.10)	.880	.385
SF36 Social Functioning	59.21 (21.59)	73.03 (22.54)	1.93	.062
SF36 Role Limit - Physical	10.53 (25.43)	31.58 (38.04)	2.005	.054
SF36 Role Limit - Emotional	50.88 (43.56)	78.95 (37.20)	2.136	.040*
SF36 Mental Health	77.33 (18.41)	75.16 (17.92)	-.364	.718
SF36 Energy/Fatigue	44.47 (19.00)	52.63 (20.77)	1.263	.0215
SF36 Pain	34.63 (14.83)	39.89 (19.26)	.944	.352
SF36 Comparative Health	26.32 (19.50)	40.79 (22.38)	2.126	.040*
Mood Inventory Score Total	12.46 (9.14)	13.12 (11.97)	.164	.871
Quality of Life	2.56 (1.10)	2.39 (1.09)	.457	.651
Overall Health	3.11 (1.150)	2.44 (.92)	1.922	.063
Life Satisfaction	2.61 (1.42)	2.44 (1.25)	.374	.711
MCG Total	23.65 (13.95)	22.89 (16.71)	-.154	.879

Note: SF36 = Short Form (36) Health Survey; QBPDS = Quebec Back Pain Disability Scale; MCG= McGill Pain Questionnaire; TMP = Tampa Scale of Kinesiophobia; PDI = Pain Disability Index.

Table 3

Logistic Regression Analysis of Surgical Predictors

Predictor	β	SE β	Wald's χ^2	df	p	e^{β} (odds ratio)
Constant	4.213	2.135	3.895	1	.048	67.537
Quality of Life	-.592	.484	1.495	1	.221	.553
SF36 RLE	-.018	.011	2.603	1	.107	.982
SF36 CH	-.048	.023	4.406	1	.036	.958
Test			χ^2	df	p	
Overall model statistics			8.840	3	.031	

Note SF36 = Short Form (36) Health Survey; RLP = Role Limit Physical; CH = Comparative Health.

* $p < .05$