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Does Co-Existing Lumbar Spinal Canal Stenosis Impair Functional Outcomes and Activity Levels after Primary Total Hip Arthroplasty?

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ABSTRACT

Degenerative lumbar spinal stenosis (LSS) is a cause for substantial morbidity in the elderly population: many often undergo total hip arthroplasty for associated hip arthritis. With a matched cohort we investigated the effect of co-existing LSS on aseptic survivorship, functional outcomes, activity levels, overall subjective physical and mental health status, and satisfaction rates in patients undergoing primary THA. The aseptic-implant survivorship was similar in LSS and non-stenosis cohort. Although both cohorts significantly improved, the LSS cohort achieved lower improvements in HHS, UCLA, SF-36 physical, and satisfaction rates than the matched non-stenotic cohort. Surgeons should consider cautioning patients with LSS that although they can expect relief of their arthritic symptoms following THA, they may continue to expect limitations in function, physical-status, activity-levels, and satisfaction rates.

Degenerative lumbar canal stenosis is a well-recognized spinal problem that is known to cause neurogenic claudication and referred pain to the lower back, hip, and thigh region in the elderly population who are typically past their sixth decade of life. With an aging population, the incidence of this condition is expected to increase in the next 20 years, when nearly 20% to 25% of the United States population will be above the age of 65 years. The symptoms are often aggravated by standing and walking and relief is obtained with bending forward or sitting. Thus, the presence of this clinical condition often negatively affects the walking ability, activity levels, and independence leading to increased disability among the elderly population [1,2]. Limitations in standing and walking secondary to lumbar spinal canal stenosis frequently force these patients to lead a more sedentary life which decreases their health related quality of life [3,4].

Moreover, many of these patients have associated severe degenerative hip disease, and they frequently undergo arthroplasties for relief of hip joint symptoms [5,6]. Despite hip joint reconstruction, a considerable number of patients report persistent pain, decreased function, and reduced satisfaction that may be potentially related to the degenerative spine. In a previous study, we had reported that patients who had pre-existing lumbar spinal canal stenosis and had undergone total knee arthroplasty, often achieve lower functional outcomes [7]. This may be theoretically caused by the unmasking of more severe symptoms of neurogenic claudication following higher post-operative activity levels achieved after total joint reconstruction. However, due to the paucity of reports, it is unclear whether these patients achieve optimal clinical outcomes and activity levels following primary total hip arthroplasty (THA) [8].

Therefore, we aimed to evaluate the clinical and radiographic outcomes of primary total hip arthroplasty in patients who had a preexisting diagnosis of lumbar spinal canal stenosis while comparing these to a matched cohort of patients who did not have this co-existing comorbidity. We specifically evaluated: (1) aseptic survivorship; (2) functional outcomes; (3) activity levels; and (4) satisfaction scores in the two comparison cohorts. In addition, we aimed to determine if a difference existed in these outcomes following total hip arthroplasty between patients with spinal stenosis who had spinal decompressive surgery and those who did not have spinal surgery.

Methods

The prospectively collected total joint arthroplasty database of our institution was reviewed to identify patients who had coexisting preoperative clinical and radiographic evidence consistent with lumbar spinal canal stenosis, and had undergone primary total hip arthroplasty. Patients were included if they underwent surgery for spinal stenosis either before (n = 11) or after (n = 18) THA and/or were symptomatic and had magnetic resonance imaging with evidence of severe stenosis (marked flattening of the thecal sac and an antero-posterior (AP)

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Table 1
Demographics and Pre-Operative Functional and Activity Levels between the Two Comparison Cohorts.

	Lumbar Stenosis Cohort	Matched Pair Cohort	*P* Value
Total Number of THAs	**68**	**68**	–
Demographics	**Mean (Range)**	**Mean (Range)**	
Age in years	67 (45 to 89)	66 (range, 44 to 90)	0.6
Sex	40 women and 28 men	40 women and 28 men	–
BMI, kg/m^2	31 (19 to 58)	29 (19 to 61)	0.2
Follow-up	84 (24 to 153 months)	80 (29 to 148 months)	0.4
Functional and Activity Scores	**Mean (Range)**	**Mean (Range)**	
Harris hip scores	51 points (15 to 71 points)	47 points (10 to 75 points)	0.06
SF-36 physical component	35 points (9 to 52 points)	35 points (14 to 58 points)	0.8
SF-36 mental component	53 points (28 to 70)	50 points (25 to 75 points)	0.09
UCLA scores	4 points (1 to 7 points)	3.8 points (1 to 8 points)	0.2

canal diameter which was less than 50% of the expected). If patients had only magnetic resonance imaging evidence of moderate (minimal flattening of the thecal sac with an AP canal diameter of 50% to 75% of the expected) to mild spinal stenosis (thickening of the ligamentum flavum and a triangularly shaped medullary canal), they were included in the stenosis cohort if symptoms of neurogenic claudication, extremity weakness, voiding difficulties, or severe back pain were present.

We identified 71 patients who had undergone 71 primary total hip arthroplasties in the period between 2001 and 2011 who had a minimum follow-up of 2 years and had co-existing clinical and radiographic evidence of lumbar spinal canal stenosis. Three patients had revision total hip arthroplasties and were excluded from the follow-up. All remaining patients had undergone primary total hip arthroplasties by two experienced adult reconstructive surgeons for primary hip osteoarthritis. A Trident acetabular component (Stryker Orthopaedics, Mahwah, New Jersey) and an Accolade TMFZ femoral component (Stryker Orthopaedics, Mahwah, New Jersey) were used in all patients.

The lumbar stenosis cohort of 68 patients (68 total hip arthroplasties) included 40 women and 28 men who had a mean age of 67 years (range, 45 to 89), and had a mean body mass index (BMI) of 30 (range, 19 to 58) at the time of the index total hip arthroplasty. All patients were evaluated clinically and radiographically at a mean follow-up of 84 months (range, 24 to 153 months). The lumbar levels L4/5 (46%) and L3/4 (28%) were the common lumbar levels affected in the stenosis cohort, while the remaining patients had multi-level L2 to L5 involvement. Nineteen of the 68 patients (28%) with spinal stenosis had undergone decompressive spinal surgery at the time of latest follow-up.

The lumbar stenosis cohort was compared to a (1:1) matched group of patients (n = 68 THAs in 68 patients) who had undergone primary total hip arthroplasty during the same time period by the same surgeons and who had a similar minimum follow-up of 2 years with no pre-existing evidence of lumbar spinal stenosis. The matching criteria used were age within ±12 months, body mass index within ±3 kg/m^2, gender (1:1 for men and women), follow-up within ±6 months, and pre-operative Harris hip scores within ±5 points. The mean age of the patients in the matched cohort was 66 years (range, 44 to 90 years) and was found to be similar to the mean age in the lumbar stenosis cohort ($P = 0.6$). The mean follow-up in the matched cohort was 80 months (range, 29 to 148 months). In addition, the matched cohort had similar mean BMI of 29 (range, 19 to 61) compared to the mean BMI of 30 (range, 19 to 58) in the lumbar stenosis group ($P = 0.2$; see Table 1).

Aseptic survivorships between the two population cohorts were compared using the Kaplan–Meier survivorship curves. Pre-operative and post-operative functional outcomes were assessed using the Harris hip scores (HHS), while the activity levels were evaluated using the University of California Los Angeles (UCLA) activity scale. Patient reported health status and satisfaction rates were evaluated with the Short Form-36 (SF-36) questionnaire and satisfaction was assessed with a previously validated self-administered satisfaction score [9], respectively. Institutional review board approval was obtained prior to the conduct of the study.

Pre-operatively, there were no significant differences in the Harris hip scores (mean, 51 vs. 47 points; $P = 0.11$), UCLA scores (mean, 4 vs. 3.8 points; $P = 0.3$), SF-36 mental component (mean, 54 vs. 51 points; $P = 0.6$), and SF-36 physical component (mean, 35 vs. 35 points; $P = 0.8$) scores between the lumbar stenosis group and the matched comparison cohort, respectively (see Table 1).

The data collected was integrated in to an Excel spreadsheet (Excel, Microsoft Corporation, Redmond, Washington) for initial tabulation and further analysis. Student t-test was used to calculate the statistical significance between the observed means of the various outcome metrics, while a z-test was used to determine the difference in proportions between the outcome measures in the two cohorts. Statistical software Graph Pad Prism version 5.01 (GraphPad Software Inc., La Jolla, California) was used for the statistical analysis. A P value <0.05 was considered to be statistically significant.

Results

The Kaplan–Meier aseptic implant survivorship in the spinal canal stenosis cohort was 98.5% with 1 patient undergoing revision of the acetabular component 2.4 years after the index procedure (see Fig. 1). This was similar to the aseptic component survivorship of 97.1% found in the matched cohort with 2 patients undergoing revision surgery for aseptic stem failure at 2.7 and 3 years after surgery ($P = 0.8$; 95% CI, −5.4% to 7.9%).

At final follow-up, the spinal stenosis cohort had significant improve-

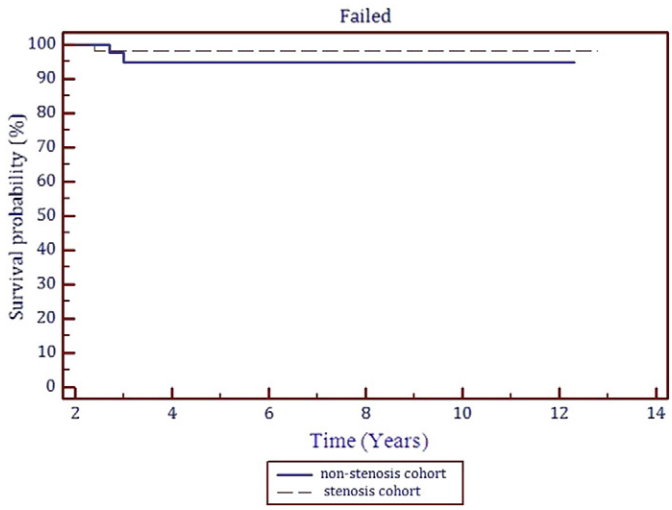

Fig. 1. Kaplan–Meier aseptic implant survivorship curves from the lumbar stenosis and the non-stenosis cohorts.