Complications - Other

Prior Lumbar Spinal Arthrodesis Increases Risk of Prosthetic-Related Complication in Total Hip Arthroplasty

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ABSTRACT

Background: Degenerative hip disorders often coexist with degenerative changes of the lumbar spine. Limited data on this patient population suggest inferior functional improvement and pain relief after surgical management. The purpose of this study is to compare the rates of prosthetic-related complication after primary total hip arthroplasty (THA) in patients with and without prior lumbar spine arthrodesis (SA).
Methods: Medicare patients (n = 811,601) undergoing primary THA were identified and grouped by length of prior SA (no fusion, 1-2 levels fused [S-SAHA], and ≥3 levels fused [L-SAHA]).
Results: Compared with controls, patients with prior SA had significantly higher rates of complications including dislocation (control: 2.36%; S-SAHA: 4.26%; and L-SAHA: 7.51%), revision (control: 3.43%, S-SAHA: 5.55%, and L-SAHA: 7.77%), loosening (control: 1.33%, S-SAHA: 2.10%, and L-SAHA: 3.04%), and any prosthetic-related complication (control: 7.33%, S-SAHA: 11.15% [relative risk: 1.52], and L-SAHA: 14.16% [relative risk: 1.93]) within 24 months (P < .001).
Conclusion: The interplay of coexisting degenerative hip and spine disease deserves further attention of both arthroplasty and spine surgeons.

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Adult degenerative disorders of the hip and spine are common, with 51.8 million Americans reporting osteoarthritis and 75.7 million Americans suffering from neck or back pain [1]. A large and increasing portion of annual health care costs and lost wages in the United States can be attributed to these 2 conditions, and the coexistence of these maladies is not uncommon [2,3]. Concomitant degenerative spinal stenosis and hip osteoarthritis has been previously coined "Hip spine syndrome" [4-6] and is likely increasing in prevalence with the aging American population.

With proper patient selection and surgical indications, total hip arthroplasty (THA) and lumbar spine arthrodesis (SA) are effective surgeries that can relieve pain and improve function in patients with degenerative hip and spine disease, respectively. Patients with degenerative lumbar pathologies such as spinal stenosis or deformity are often treated with lumbar SA creating rigidity in the lumbopelvic unit that may affect hip biomechanics. Although 18%-25% of patients undergoing primary THA have previously seen a spine surgeon [7-10], the prevalence of prior lumbar SA within this patient population is unknown. Current literature has not previously described the risks associated with prior lumbar SA and prosthetic-related complications or revision after primary THA.

The purpose of this study is to (1) evaluate the prevalence of patients undergoing primary THA with a history of lumbar SA in the Medicare population and (2) compare the rates of prosthetic-related complication and revision surgery within 24 months of primary THA in patients with and without prior lumbar SA. We hypothesize that prior lumbar SA will increase complication and revision rates after primary THA and should be considered a clinically relevant at-risk subgroup. In addition, we hypothesize that patients with longer lumbar fusion constructs will have further increased risk compared with shorter spine fusion constructs.

Materials and Methods

Database Cohorts

Medicare patient data from 2005 to 2012 were retrospectively queried using the subscription-based PearlDiver Technologies

Database (Fort Wayne, IN). This database is a Health Insurance Portability and Accountability Act–compliant national insurance database with 100% of inpatient and outpatient facility data from the Medicare Standard Analytic Files. All data are deidentified and anonymous; thus, our study was exempt from institutional review board approval.

We used International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes to identify patients who underwent primary THA, as well as subsequent prosthetic-related complications (dislocation, periprosthetic fracture, periprosthetic joint infection, mechanical loosening) and revision THA. All ICD-9 coding is available in Appendix 1. Patient demographics were collected including patient age, sex, and region. Age-adjusted Charlson Comorbidity Index was calculated using patient age and ICD-9-CM diagnoses coding for comorbidities. Inclusion criteria were all Medicare patients who underwent primary THA. We excluded patients with concomitant diagnosis of fracture or avascular necrosis of the femoral head at time of THA.

Primary THA patients were then stratified into 3 cohorts based on ICD-9 coding for presence of prior lumbar SA during the study duration: no prior SA (control), short SA (1-2 levels fused) before THA (S-SAHA), and long (≥3 levels fused) SA before THA (L-SAHA). Cutoffs for short and long fusions were chosen based on available ICD-9 coding for spinal fusion length.

SAHA Prevalence

To analyze SAHA prevalence, all available years of data (2005-2012) were included. First, all patients who had undergone either lumbar SA or primary THA were determined. Next, we identified those patients who had had both procedures during the study period and separated out those with the first occurrence of lumbar SA performed before the first occurrence of primary THA. All patient counts were normalized to the total number of patients in the Medicare database.

Prosthetic-Related Complication and Revisions

For the remainder of the analysis, we excluded patients without at least 24 months of follow-up. Within this cohort, patient demographics and comorbidities were tabulated. We calculated the relative risk (RR) and 95% confidence interval for the association of prosthetic-related complication and revision within 24 months between the control and SAHA groups. Complication rates over time were also expressed in 6-month intervals. Patients who died or were lost to follow-up without diagnosis or procedure coding for complication were counted as complication free.

Statistical Methods

Because PearlDiver does not allow access to patient-level data, analysis was limited to summary statistics testing (ie, multivariate regression could not be performed). The 95% confidence interval for the logarithm of RR was calculated by taking the exponential function of ± 1.96 standard error. Chi-squared analysis was performed to evaluate differences in patient characteristics. The Cochran-Armitage trend test was used to evaluate differences between groups relative to temporal complication rates. Censored-interval Kaplan-Meier survival analysis and log-rank testing were performed to detect differences in complication rates over time. Z tests were used to determine significance within each time group. Analysis of variance was used to determine significance in summary statistics across 3 groups. Significance was defined at $P < .05$. All statistical analysis was performed using R version 3.0.2 (R-Project).

Results

Prevalence of SAHA

Out of 49,550,651 patients available for review with at least 1 orthopedic diagnosis or procedure in the PearlDiver Medicare database from 2005 to 2012, 811,601 patients (164 per 10,000
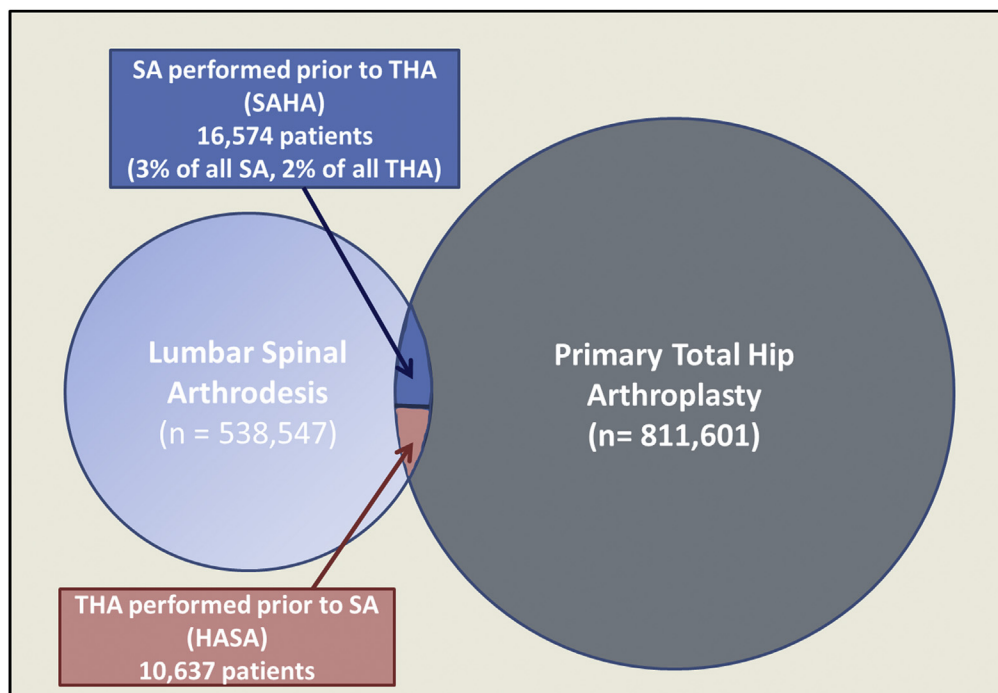
Fig. 1. Prevalence of SAHA within all primary THA patients and all lumbar SA patients. THA, total hip arthroplasty; SA, spine arthrodesis.