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Early Outcomes of Primary Total Hip Arthroplasty After Prior Lumbar Spinal Fusion

Jeffrey J. Barry, MD, David C. Sing, BS, Thomas P. Vail, MD, Erik N. Hansen, MD *

Department of Orthopaedic Surgery, University of California, San Francisco, San Francisco, California

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ABSTRACT

Background: The coexistence of degenerative hip disease and spinal pathology is not uncommon with the number of surgical treatments performed for each condition increasing annually. The limited research available suggests spinal pathology portends less pain relief and worse outcomes after total hip arthroplasty (THA). We hypothesize that primary THA patients with preexisting lumbar spinal fusions (LSF) experience worse early postoperative outcomes.

Methods: This study is a retrospective matched cohort study. Primary THA patients at 1 institution who had undergone prior LSF (spine arthrodesis-hip arthroplasty [SAHA]) were identified and matched to controls of primary THA without LSF. Early outcomes (<90 days) were compared.

Results: From 2012 to 2014, 35 SAHA patients were compared to 70 matched controls. Patients were similar in age, sex, American Society of Anesthesiologist score, body mass index, and Charlson Comorbidity Index. SAHA patients had higher rates of complications (31.4% vs 8.6%, $P = .008$), reoperation (14.3% vs 2.9%, $P = .040$), and general anesthesia (54.3% vs 5.7%, $P = .0001$). Bivariate analysis demonstrated SAHA to predict reoperation (odds ratio, 5.67; $P = .045$) and complications (odds ratio, 4.89; $P = .005$). With the numbers available, dislocations (0% vs 2.8%), infections (0% vs 8.6%), readmissions, postoperative walking distance, and disposition only trended to favor controls ($P > .05$). Comparing controls to SAHA patients with <3 or ≥ 3 levels fused, longer fusions had increased cumulative postoperative narcotic consumption (mean morphine equivalents, 44.3 vs 46.9 vs 169.4; $P = .001$).

Conclusion: Patients with preexisting LSF experience worse early outcomes after primary THA including higher rates of complications and reoperation. Lower rates of neuraxial anesthesia and increased narcotic usage represent potential contributors. The complex interplay between the lumbar spine and hip warrants attention and further investigation.

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Disorders of the adult hip and spine are common, and treatment for the various pathologies represents a significant portion of health-care burden in the United States. Total hip arthroplasty (THA) and lumbar spinal fusion (LSF) are 2 of the more common and effective procedures performed for the treatment of advanced degenerative pathology of the hip and spine. The number of THAs

performed in 2010 exceeded 300,000 with a projected rise to over 500,000 by the year 2020 [1]. Meanwhile, low back pain has been reported to affect 73% of the population and 413,000 spinal fusions were performed in 2008 (a 137% increase from 1998) [2,3].

There is evidence that degenerative hip disorders often coexist and parallel degenerative changes of the lumbar spine [4,5]. This combination of spinal stenosis and hip arthritis was coined “hip-spine syndrome” by Offierski and MacNab [6]. Despite the prevalence of pathologies of the hip and spine, little has been published regarding the interplay of these 2 common conditions. The limited research to date suggests patients with spinal pathology experience less pain relief and worse outcomes after THA compared to THA patients without spinal disorders [7–10]. Parvizi et al and Staibano et al demonstrated worse patient-reported outcomes in patients who had preexisting back pain after

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* Reprint requests: Erik N. Hansen, MD, Department of Orthopaedic Surgery, University of California, San Francisco, 500 Parnassus Ave, MU320W, San Francisco, CA 94143.

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primary THA via HHS, SF-36 physical and mental scores, and Oxford Hip Scores [7,9]. Similarly, Prather et al [8] found that patients with lumbar spine disorders had less pain relief after THA and experienced less improvement in activity levels and function, compared with patients with THA alone based on modified Harris Hip Score and University of California, Los Angeles activity score. They also found increase in expenditures per episode of care and increased length of each care episode for the same cohort.

LSF is often employed as part of the treatment for numerous spinal pathologies including spinal stenosis, spondylolisthesis, and sagittal or coronal deformity. LSF reduces flexibility, can alter spinopelvic parameters and sagittal balance, and subsequently changes the joint mechanics of the hip. Additionally, these patients often have more functional limitations and are more likely to be on chronic pain medications. Furthermore, the presence of a prior lumbar fusion mass may make neuraxial anesthesia difficult if not impossible to accomplish, relegating the patient to general anesthesia and postoperative intravenous and oral opiates with their attendant side effects. All of these variables may adversely affect the success of a primary THA in the immediate postoperative period. There is currently a dearth of published literature regarding outcomes of primary THA in patients with preexisting LSF. For this reason, we undertook the following investigation. We hypothesize that primary THA patients who have previously undergone LSF experience worse early postoperative outcomes, including worse pain scores, higher opiate requirement, as well as a higher complication and reoperation rate.

Methods

A retrospective case-control study was performed sampling patients from June 2012 to January 2015 at a single tertiary care center, academic institution. The start date was chosen based on the date of implementation of the institution's current electronic medical record which allowed queries of many of the variables of interest. All primary THA patients at our institution who had undergone prior LSF, deemed spine arthrodesis-hip arthroplasty (SAHA), were identified via chart review. Spine fusions (instrumented and uninstrumented) were identified by patient-reported surgical history, operative notes if the surgery was performed at the same institution, or radiographs identifying spinal fusion instrumentation. These patients were further categorized based on the length of fusion for subgroup analysis as ≥ 3 levels or 1–2 levels. SAHA patients were then matched (1:2) using propensity scoring based on age, sex, and American Society of Anesthesiologist (ASA) score to a control group of primary THA patient who had not undergone a prior LSF. Patients were not excluded from the control group if they had other prior spine diagnoses, nonfusion operations, or back pain. Fusions that did not include the lumbar spine were not included in the SAHA group (ie, Anterior Corpectomy Discectomy Fusion patients). Patients were excluded if joint arthroplasty was performed for acute fractures or oncologic diagnoses.

The standard arthroplasty protocol at our institution was employed for all patients within the cohort. The preferred anesthetic modality was a single-shot spinal. Patients were treated postoperatively with a multimodal pain control pathway that included nonsteroidal anti-inflammatory drugs, acetaminophen, and breakthrough oral and intravenous narcotics for pain. Deep venous thrombosis prophylaxis included mechanical prophylaxis immediately postoperatively as well as subcuticular low-molecular-weight heparin injections initiated on the morning of postoperative day 1 (POD1). Antibiotic prophylaxis was continued for 24 hours postoperatively. Exceptions were made when medically indicated. In regard to intraoperative anesthesia, reasons for deviation from a single-shot spinal included patient preference,

Table 1
Cohort Characteristics.

Patient Characteristics	Control	SAHA	P Value
Total	70	35	
Age (y), mean (SD)	68.4 (10.6)	68.5 (9.2)	.995
Sex			.728
Female	39 (55.7%)	21 (60.0%)	
Male	31 (44.3%)	14 (40.0%)	
ASA rating			1
2	39 (55.7%)	19 (54.3%)	
3	31 (44.3%)	16 (45.7%)	
Anesthesia type			<.001
Single-shot spinal	66 (94.3%)	15 (42.9%)	
General	4 (5.7%)	19 (54.3%)	
Epidural	0 (0%)	1 (2.9%)	
CCI			.807
0	47 (67.1%)	24 (68.6%)	
1	12 (17.1%)	7 (20%)	
2	6 (8.6%)	3 (8.6%)	
>3	5 (7.1%)	1 (2.9%)	
BMI			.144
Underweight (<18.5)	1 (1.4%)	0 (0%)	
Normal (18.5–24)	18 (25.7%)	13 (37.1%)	
Overweight (25–29)	28 (40%)	6 (17.1%)	
Obese class I (30–34)	15 (21.4%)	9 (25.7%)	
Obese class II (35–40)	4 (5.7%)	3 (8.6%)	
Obese class III (>40)	4 (5.7%)	4 (11.4%)	
Preoperative opioid use			.007
Nonuser	42 (60%)	11 (31.4%)	
Opioid user	28 (40%)	24 (68.8%)	
Spinal levels fused ^a			<.001
No prior fusion	70 (100%)	0 (0%)	
1–2 Levels	0 (0%)	17 (50.0%)	
≥ 3 Levels	0 (0%)	17 (50.0%)	
Fusion includes S1/pelvis	0 (0%)	24 (70.6%)	
Surgical approach			.204
Anterolateral	43 (61.4%)	18 (51.4%)	
Posterior	21 (30.0%)	16 (45.7%)	
Direct anterior	6 (8.6%)	1 (2.9%)	

SAHA, spine arthrodesis-hip arthroplasty; SD, standard deviation; ASA, American Society of Anesthesiologist; CCI, Charlson Comorbidity Index; BMI, body mass index.

^a One patient with unknown fusion length excluded from subgroup analysis.

anesthesia team preference, failure of neuraxial anesthesia, and inability to place a needle through the spinal fusion mass.

Demographic, claims, and early postoperative outcome data were collected via chart review from the electronic medical record retrospectively. Demographic data collected included age, gender, and body mass index (BMI). Patient administrative records were reviewed to calculate Charlson Comorbidity Index (CCI) without age adjustment using 16 comorbidities identified through International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9_CM) coding [11]. Data collected included type of anesthesia, pain scores using the visual analog scale (VAS), and opiate usage (calculated as morphine equivalent/day). Walking distance with physical therapy (recorded in maximum distance ambulated/therapy session) was used as a proxy for mobility. Disposition following hospital discharge was recorded as either home or facility (skilled nursing facility or acute rehabilitation facility). Complications (both operative and nonoperative) were recorded by direct chart review of all available records, as were any readmissions or reoperations that occurred within 90 days of the THA surgery.

Cases were compared to controls on the above variables and statistical significance defined as $P < .05$. Chi-square or Fisher exact tests were used to compare categorical data based on sample size. Student *t* test or analysis of variance was used when comparing the groups of distributed data. Bivariate analysis was performed to identify association of predictor variables on outcomes of interest including reoperation, complication, and disposition. Findings were

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