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Early Complications in Hip and Knee Arthroplasties in a Safety Net Hospital vs a University Center

Harry E. Jergesen, MD [a,*], Paul H. Yi, MD [b]

[a] Institute of Global Orthopaedics and Traumatology, UCSF Department of Orthopaedic Surgery, San Francisco, California
[b] UCSF Department of Orthopaedic Surgery, San Francisco, California

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ABSTRACT

Background: Indigent populations face unique challenges that may increase surgical risk and adversely affect the outcomes of hip and knee arthroplasties. This study examines whether there is a difference in early postoperative complications in patients treated in a safety net hospital and in a nearby university center.

Methods: A retrospective review was undertaken of 533 consecutive hip and knee arthroplasties performed by a single experienced surgeon in a safety net hospital and in a university medical center from 2008 to 2012. Patients were followed for a minimum of 2 years. The primary outcomes evaluated were total complications, deep infections, and reoperations. Statistical comparison of the data from the 2 patient groups was carried out using Fisher exact test.

Results: Despite the lower percentage of index revision procedures in the safety net group (8% vs 20.5%; $P = .0003$), the incidence of adverse outcomes was higher in this group than in the university group: for total complications, 12.3% vs 4.9% ($P = .003$); for deep infections, 3.2% vs 0.6% ($P = .025$); and for reoperations, 7.5% vs 2.6% ($P = .009$). For primary procedures in particular, differences in the incidences of these outcomes were even more significant.

Conclusions: In this study, early complications were more frequent in patients who underwent hip and knee arthroplasties in a safety net hospital compared with those who underwent the same procedures in a nearby university center. Future prospective studies are warranted to determine which patient-related or care process-related factors should be optimized to improve arthroplasty outcomes in vulnerable, safety net populations.

Arthroplasty of the hip and knee has become a widely accepted treatment in the management of advanced joint disease in most of the developed world [1,2]. Although evidence has shown that such surgery is an effective health care intervention in terms of improving quality of life [3-9], early and late complications of arthroplasty of the hip and knee may occur, often resulting in the need for reoperation. Revision operations, especially those performed for infection, are costly both in monetary terms and in terms of patient morbidity [10,11].

The varied complications that can occur after hip and knee arthroplasties, as well as those factors that may predispose to poorer outcomes have been well described previously [12-14], although little attention has been paid to safety net hospital settings serving the indigent. Safety net hospitals are defined as those which "…by mandate or mission deliver a large amount of care to uninsured and other vulnerable populations" [15]. The patient populations served by dedicated safety net hospitals exhibit proportionally more socioeconomic and medical challenges than do those served by most university and community hospitals [16]. Many of these challenges have been shown to be associated with increased risk and poorer outcomes: poverty, homelessness, various medical comorbidities, substance abuse, undiagnosed or undertreated psychiatric disease, minority status, and language barriers, to name a few [17-40].

The study was performed at the Orthopaedic Trauma Institute and the Institute for Global Orthopaedics and Traumatology, San Francisco General Hospital and the Department of Orthopaedic Surgery, University of California, San Francisco.

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* Reprint requests: Harry E. Jergesen, MD, Institute of Global Orthopaedics and Traumatology, UCSF Department of Orthopaedic Surgery, 2550 23rd Street, Building 9, 2nd Floor, San Francisco, CA 94110.

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Although the safety and effectiveness of arthroplasty have been documented in community hospitals and academic centers, little attention has been paid to these factors in safety net hospital settings. Safety net hospitals focus fewer resources on elective surgery such as arthroplasty and more on disease prevention, management of acute medical illnesses, and the treatment of trauma. Given this focus and the challenges of the population being served, one might ask what level of safety is being achieved in arthroplasties performed in safety net hospitals. The purpose of this study is to compare the complication and reoperation rates of arthroplasties performed by a single surgeon at a safety net hospital to those performed by the same surgeon at an academic center. We hypothesized that the short-term complication rates after hip and knee arthroplasties would be higher among the safety net population.

Materials and Methods

This study is retrospective in design and received institutional review board approval from the University of California, San Francisco (UCSF) Committee on Human Research. Billing and electronic medical record data from San Francisco General Hospital (SFGH), a safety net hospital, and UCSF, both located in San Francisco, CA (USA), were reviewed to identify all primary and revision hip and knee procedures carried out between 2008 and 2012 by the senior author. UCSF is primarily an academic referral center, whereas SFGH is a public facility, designed to serve the poor and uninsured in the City and County of San Francisco. Overall yearly arthroplasty volumes were smaller at SFGH (100-110 cases/y) than at UCSF (900-1000 cases/y). A total of 533 consecutive primary and revision arthroplasties were identified; these included 187 from SFGH and 346 from UCSF. The SFGH group had a lower proportion of revision arthroplasties compared with the UCSF group (8% vs 20.5%; $P = .0003$). The distribution of primary and revision hip and knee arthroplasties performed in the 2 hospitals is shown in Table 1.

The same surgeon, assisted by residents from the same training program, performed all procedures. Anesthetic technique, surgical exposures, and equivalent implants were used at both institutions. Primary hip arthroplasties were performed with uncemented proximally porous coated, collarless femoral stems, cobalt chrome heads, uncemented acetabular shells, and cross-linked polyethylene liners. All but a few primary knee patients in each group were treated with cemented cruciate-retaining implants; only a few received cruciate-sacrificing designs. Immediate postoperative weight bearing was begun in all cases, except in a few revision cases where bone quality or soft tissue integrity was considered tenuous. Postoperatively, continuous passive motion was used in all knee procedures, and posterior hip precautions were encouraged in all hip procedures because a posterior approach was used.

Table 1
Distribution of Primary and Revision Arthroplasties Performed.

Procedure Type	SFGH	UCSF	Total	Statistical Comparison (% Revision, SFGH vs UCSF)
Hip arthroplasty	77	195	272	
Primary	66 (85.7%)	139 (71.3%)	205 (75.4%)	
Revision	11 (14.3%)	56 (28.7%)	67 (24.6%)	$P = .019$
Knee arthroplasty	110	151	261	
Primary	106 (96.4%)	136 (90.1%)	242 (92.7%)	
Revision	4 (3.6%)	15 (9.9%)	19 (7.3%)	NS ($P = .057$)
Total	187	346	533	
Primary	172 (92.0%)	275 (79.5%)	447 (83.9%)	
Revision	15 (8.0%)	71 (20.5%)	86 (16.1%)	$P = .0003$

NS, not statistically significant; SFGH, San Francisco General Hospital; UCSF, University of California, San Francisco.

There were noteworthy differences between the 2 institutions in the outpatient and inpatient management protocols. In UCSF, the higher volume hospital, there was a dedicated arthroplasty practice staff, preoperative patient education, preadmission discharge planning, and a preoperative anesthesia screening protocol. Inpatient care at UCSF included a dedicated orthopedic inpatient unit, arthroplasty clinical care pathways, an anesthesia regional block team and pain management protocols, dedicated operating room nursing and technologist support, and coordination of inpatient with postdischarge management. SFGH, in contrast, had no dedicated outpatient clinical support team for arthroplasty, no preoperative patient education, no dedicated orthopedic inpatient unit, and no inpatient arthroplasty clinical pathways. Improvements at SFGH in some areas such as in preoperative anesthesia screening and perioperative anesthesia pain management occurred sporadically during the 5-year study period.

All patients were followed for at least 2 years postoperatively to identify early complications and reoperations. The primary outcomes assessed were total complications, deep infections, and the presence of $\geq$1 reoperations. The incidences of these outcomes were compared between the 2 hospital groups using Fisher exact test (statistical significance set at $P < .05$).

Results

Although the SFGH safety net patient group had proportionally fewer index revision cases, it had significantly more total complications (12.8%) compared with the UCSF group (4.9%; $P = .0014$), more deep infections (3.2% vs 0.6%; $P = .025$), and more reoperations (8.0% vs 2.6%; $P = .009$; Table 2).

All Hip Arthroplasties

There was a significantly higher incidence of both total complications and reoperations in the SFGH hip group, with a trend toward more frequent infections (Table 3). Specific hip complications, such as wound healing delays, nerve palsy, dislocation, and complication-related permanent disability were too infrequent in both groups to reveal any differences in incidence. Permanent disability resulted from 2 complications in the SFGH group. The first was a hip disarticulation because of ischemia from femoral artery thrombosis after a complex hip revision. The second was a salvage resection arthroplasty required to manage persistent sepsis after primary arthroplasty in an immunologically compromised patient. In the UCSF hip population, permanent disability occurred in 2 patients after primary hip arthroplasties because of peroneal nerve stretch injuries. The incidence of deep infections in the SFGH hip group was 5.2% (4 out of 77cases) vs 1% in the university group (2 out of 195 cases). All 4 SFGH infections occurred after primary hip procedures, 3 in immunologically normal patients, and 1 in an individual with human immunodeficiency virus, hepatitis C, and a past history of intravenous substance abuse. Both of the UCSF infections occurred in immunologically normal individuals who underwent revision surgery after multiple prior procedures.

Table 2
Overall Complications After Hip and Knee Arthroplasties.

Outcome Measure	SFGH(n = 187)	UCSF(n = 346)	Statistical Comparison
Total Complications	24 (12.8%)	17 (4.9%)	$P = .0014$
Deep infections	6 (3.2%)	2 (0.6%)	$P = .025$
Reoperations	15 (8.0%)	9 (2.6%)	$P = .005$

SFGH, San Francisco General Hospital; UCSF, University of California, San Francisco.