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Mid-Term Outcomes in HIV-Positive Patients After Primary Total Hip or Knee Arthroplasty

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ABSTRACT

We hypothesized that infection rates following total joint arthroplasty (TJA) in those with the human immunodeficiency virus (HIV) without hemophilia or drug use would be similar to rates in HIV-negative patients. Records at an urban HIV referral hospital were searched for patients who underwent primary total hip and knee arthroplasty from 2003 to 2010. The primary outcome was revision for infection. 372 HIV-negative and 22 HIV-positive TJA patients met inclusion criteria. The HIV-positive group had more deep infections than the HIV-negative group (9.1% v 2.2%, $P = 0.102$). There were no infections in those with AIDS-defining CD4 counts. Those with HIV may have a higher risk of developing a deep infection. A low CD4 count is not an absolute contraindication to TJA in HIV positive patients.

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The human immunodeficiency virus (HIV) compromises the immune system by attacking CD4 T-lymphocytes. It currently affects an estimated 1.5 million people in North America and 33 million worldwide [1]. Since the advent of highly active antiretroviral therapy (HAART) in 1997, medical management has significantly improved the lifespan of those living with HIV [2,3]. Patients now commonly reach their fifth or sixth decade of life and are subject to the degenerative conditions associated with age. Total joint arthroplasty (TJA) for arthropathy in HIV-positive patients can provide long-term pain relief and an improved quality of life [4], however implant surgery in this cohort has been associated with a high rate of complication with reported infection rates as high as 50% [5,6].

Because of the low rate of HIV infection in the developed world [1], most published studies of orthopaedic outcomes in HIV positive patients have included a predominance of high-risk patients such as those with concurrent intravenous drug use (IVDU) or haemophilia and have often included a mix of orthopaedic procedures [4,7–10]. Furthermore, many studies involved procedures performed prior to the widespread use of HAART [4,7,9,11,12]. More recent studies that have attempted to assess the effect of CD4 counts and HAART in these groups have yielded mixed results [13–16]. As such, the current rate of infection following total joint arthroplasty and the effect of disease control on the HIV-positive patient are still unclear.

This is a retrospective analysis of HIV-positive patients who underwent primary TJA at a single institution. We hypothesized that HIV-positive patients managed in the HAART era without active IV drug use or hemophilia would have deep infection rates similar to HIV-negative patients.

Materials and Methods

This retrospective review at a single, urban, university-affiliated safety net hospital was approved by the institution's Human Subjects Research Committee. Billing records from July 1, 2003 to March 30, 2010 were searched for International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Current Procedural Terminology (CPT) codes pertaining to primary total joint arthroplasty, revision arthroplasty, and implant resection. These patients were cross-referenced with a city-wide clinical database of HIV-positive patients within the hospital network. Patients with a diagnosis of fracture, previous hip or knee surgery, or who had clinical follow up for less than 2 years were excluded. Clinical follow up was defined by the presence of a CPT Evaluation and Management (E&M) code of any level. The records of patients with HIV were then assessed for viral load, CD4 count, and the use of HAART within

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3 months of their surgery. We defined well-controlled disease as a CD4 count > 350 cells/mL [17,18] – as this is the threshold at which HAART may be initiated – and an undetectable viral load (<75 copies/mL) [19]. Patients without HIV were used as a control group. Additional comorbidities as defined by the Elixhauser Comorbidity Index [20] were also recorded. A sample of specific diagnoses and their categories is listed in Appendix A.

All patients referred to the Orthopaedic Surgery Clinic for evaluation for TJA were required to undergo a thorough preoperative medical and social screening process to ensure medical optimization and appropriate post-operative housing and social support. Additionally, patients with a history of illicit drug use were required to provide documented evidence of at least one year of sobriety in the form of negative random urine drug screens or a letter from their drug rehabilitation supervisor or primary care physician. Any patient presenting with recent or active drug use was counseled to enroll in an inpatient or outpatient drug rehabilitation program and their surgery deferred until they could demonstrate at least one year of sobriety. Patients with polyarthropathy were required to wait a minimum of 4 months between each TJA. THA patients were treated with either an anterolateral or posterolateral approach and uncemented implants. Those undergoing TKA were treated with a standard median parapatellar approach and cemented implants using vancomycin and tobramycin- or gentamicin-impregnated cement. All patients received one dose of preoperative prophylactic antibiotics and no more than 24 h of postoperative prophylaxis.

Our primary outcome was defined as implant removal or revision for infection and identified using ICD-9-CM or CPT codes. Secondary outcomes were revision for any reason. When these procedures were found, the clinical record was reviewed to confirm the laterality of the procedure and determine the associated diagnosis. Patients were considered infected if they had a white blood cell (WBC) count > 2500 cells/μL on joint aspiration with a predominance of neutrophils, positive culture on joint aspiration, positive intraoperative tissue culture, or an exposed implant. In arthroplasties revised for infection, the causative organism was recorded. In HIV-positive patients with implants revised for infection, CD4 count, viral load, and the use of HAART within 3 months of the revision were recorded.

Patients diagnosed with an implant infection within 3 weeks of the onset of symptoms were treated with aggressive synovectomy, debridement, and exchange of the modular surfaces. This was followed by organism-specific antibiotics as recommended by the Infectious Disease service. For those with clinical evidence of an infection last longer than 3 weeks, a two-stage reimplantation was performed.

Statistical Methods

All statistical calculations were performed using STATA 10 (StataCorp, College Station, TX, 2007). Demographics, comorbidities, and rates of revision were compared using Fisher's exact test and reported as the odds ratio with the 95% confidence interval (CI). Continuous variables were assessed using a two-tailed unpaired Student's t-test and reported as the mean and 95% CI of the difference of the means. Each joint was considered a separate data point. For the analysis of revisions, patients were stratified into THA or TKA groups. Implant survivorship was assessed using the Kaplan–Meier estimator. A P value < 0.05 was considered significant. A *post hoc* analysis showed that, at a significance level of 5%, our study had a statistical power of 0.53.

Results

During the study period, six different orthopaedic surgeons performed a total of 521 primary total joint arthroplasties. Of these, 394 (76%) had a minimum of two year clinical follow up and form the basis of this study. Three-hundred fifty-five patients who underwent a total of 372 TJAs were HIV-negative and 20 patients who underwent a

Table 1
Demographic Characteristics and Medical Comorbidities.[a]

	HIV Negative n = 372	HIV Positive n = 22	OR or Mean Difference	95% CI	*P*
Age, mean (SD)	59.5 (11.8)	49 (17.8)	10.5	5.2 to 15.8	< 0.001
Gender[b]					
F, n (%)	208 (58.9)	0 (0.0)			
M	147 (41.6)	20 (100.0)			< 0.001
Procedure					
THA	133 (48.9)	18 (81.8)			
TKA	239 (87.9)	4 (18.2)			< 0.001
Comorbidities					
CHF	14 (4.0)	0 (0.0)	0	0 to 5.56	1
Pulmonary Disease	73 (20.7)	3 (13.6)	0.68	0.12 to 2.43	0.776
Coagulopathy	2 (0.6)	0 (0.0)	0	0 to 96.09	1
Complicated Diabetes	10 (2.8)	2 (9.1)	3.79	0.38 to 19.8	0.131
Uncomplicated Diabetes	75 (21.2)	2 (9.1)	0.41	0.05 to 1.79	0.392
Complicated HTN	32 (9.1)	4 (18.2)	2.5	0.57 to 8.40	0.115
Uncomplicated HTN	252 (71.4)	4 (18.2)	0.1	0.2 to 0.32	<0.001
Obesity	72 (20.4)	0 (0.0)	0	0 to 0.82	0.018
Morbid obesity	19 (5.4)	0 (0.0)	0	0 to 3.91	0.613
Liver disease	56 (15.9)	8 (36.4)	3.52	1.2 to 9.87	0.011
Neurologic disorder	22 (6.2)	1 (4.5)	0.79	0.02 to 5.48	1
Peripheral vascular disease	13 (3.7)	0 (0.0)	0	0 to 6.06	1
Renal failure	15 (4.2)	4 (18.2)	5.58	1.21 to 20.45	0.014
Inflammatory arthropathy	52 (14.7)	0 (0.0)	0	0 to 1.22	0.091
Osteonecrosis	31 (8.8)	13 (59.1)	18.96	6.48 to 60.48	< 0.001
Depression	70 (19.8)	10 (45.5)	4.02	1.44 to 11.24	0.003
Alcohol abuse	24 (6.8)	2 (9.1)	1.52	0.16 to 6.99	0.641
Opioid dependence	1 (0.3)	0 (0.0)	0	0 to 681.04	1
Drug abuse	29 (8.2)	7 (31.8)	5.96	1.86 to 17.66	0.001

[a] Continuous variables expressed as mean (standard deviation). Categorical variables expressed as n (%).
[b] Each joint arthroplasty in patients with multiple arthroplasties was considered as a separate data point. Therefore, the total number of patients is less than the number of joint arthroplasties.