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Total Joint Arthroplasty and Preoperative Low Back Pain

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ABSTRACT

Lower extremity osteoarthritis with concomitant low-back pain (LBP) may obscure a clinician's ability to properly evaluate the status of hip or knee osteoarthritis and subsequent total joint arthroplasty (TJA) candidacy. A prospective cohort study was conducted to determine prevalence and severity of preoperative LBP among TJA patients, and the effect of TJA on alleviating LBP. Preoperative moderate to worst imaginable LBP pain on the Oswestry Disability Index (ODI) was significantly higher among hips compared to knees (28.8% *vs.* 16.1%, $P < 0.0001$). Compared to knees, hips also saw significant ODI improvement from preoperative to one-year postoperative. TJA candidates with considerable preoperative LBP should be counselled that TJA outcome may be impaired by the coexistence of spine disease, and that residual spine pain may continue following otherwise successful TJA.

It is estimated that approximately 40 million Americans suffer from osteoarthritis (OA), and 80% of those affected are aged 55 years or more [1]. In Canada, OA is equally prevalent and affects 1 in 10 individuals [2]. Among patients with end-stage disabling degenerative hip and knee OA, total joint arthroplasty (TJA) is the most successful and cost-effective procedure to alleviate pain and improve function and health-related quality of life [3,4]. Unfortunately though, there exists a subset of patients with lower extremity OA that suffer from concomitant low back pain (LBP), and together these diagnoses may obscure a clinician's ability to properly evaluate the status of hip and/or knee OA and subsequent candidacy for TJA [1,5].

Reported prevalence rates of OA with associated LBP among arthroplasty patients vary widely, and to our knowledge there have been no studies to date that have compared differences among both hip and knee arthroplasty candidates. In a review of 344 preoperative total hip arthroplasty (THA) patients Parvizi et al [6] have reported a 49.4% prevalence rate of persistent LBP. In a similar review, Hsieh et al [7] found a 21.2% prevalence rate of LBP among patients with end-stage hip disease. In a small prospective study of 25 THA patients Ben-Galim et al [5] found that all patients within their sample had at least moderate LBP and spinal disability prior to surgery. While prevalence rates among THA candidates vary depending on the definition and grading of LBP, the link between knee OA among total knee arthroplasty (TKA) candidates and lumbar pain has been less well characterized. Results of the Osteoarthritis Initiative [8] have shown that 57.4% of participants with tibiofemoral knee OA reported LBP which was significantly associated with increased WOMAC knee pain scores. Wolfe et al [9] found that 54.6% of patients presenting to a Rheumatology Clinic with knee OA experienced back pain. Burnett et al [10] further found that 74% of patients included in their retrospective review of unilateral TKA reported chronic back pain which first occurred approximately 10 years prior to TKA candidacy, and that 15% had felt that their worst back pain occurred after the onset of knee OA.

The purpose of this prospective cohort study was threefold: 1) to investigate the prevalence of LBP in patients with end-stage hip or knee osteoarthritis electing to undergo primary TJA, 2) to evaluate the postoperative effectiveness of TJA in reducing LBP, and 3) to determine whether the presence of a coexisting spinal condition impairs the ability of TJA to alleviate OA symptoms.

Methods

A prospective cohort study was conducted on patients with end-stage hip or knee osteoarthritis electing to undergo TJA to determine the prevalence and severity of preoperative LBP amongst our total hip and knee arthroplasty population, and subsequently to determine the effect of TJA on alleviating such prevalence or severity of back pain. All patients underwent primary unilateral TJA at one high volume academic orthopaedic

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centre between September 2009 and December 2010 among 6 arthroplasty surgeons. All cases were performed for a primary diagnosis of osteoarthritis. Patients scheduled to undergo sequential bilateral TJA under one anesthetic, revision TKA, and/or presenting with diagnoses secondary to primary osteoarthritis (i.e. rheumatoid arthritis, avascular necrosis) were not considered for inclusion.

To determine the prevalence of LBP among our patient population, patients were asked to identify the location of any back pain on a body map indicating the neck, upper back and/or lower back. The severity of preoperative LBP among TJA candidates was then determined according to the Oswestry Disability Index (ODI) version 2.1a [11,12]. The ODI is a reliable and well-validated condition-specific patient report outcome tool used to determine patient-perceived levels of disability in ten everyday activities of daily living to assign a subjective score of level of function. The ODI score of level of function corresponds to a percentage of disability whereby a score of 0–20% = minimal disability, 21–40% = moderate disability, 41–60% = severe disability, 61–80% = crippled, and 81–100% = bed bound or exaggerated symptoms [11,12]. Patients were asked to complete the ODI at the time of their preoperative assessment 1–2 weeks prior to surgery. Those patients who reported moderate to worst imaginable preoperative back pain were also asked to complete the score again at one-year postoperative to assess effect of TJA on change in back pain.

Secondary outcome measures included the Oxford Hip (OHS) and Oxford Knee (OKS) scores assessed preoperatively and at 6 months and one-year postoperative. The Oxford Score is a 12-item measurement tool designed to determine patient perceived rating of hip/knee pain and activity limitations scored from 12 (excellent function) to 60 (poor function) points [13,14]. A non-treating Physiotherapy Assistant assessed clinical function using the Harris Hip (HHS) and Knee Society (KSS) scores at the above noted intervals. Both the HHS and KSS clinical score are disease specific tools incorporating pain, stability and range of motion each rated on a 100-point scale where a score of 100 corresponds to excellent function [15,16].

Severity of preoperative back pain among the TJA sample was determined based on ODI score percentage of disability levels and ODI specific back pain intensity rating. Differences in severity between the hip and knee cohorts were assessed using the Chi-square or Fisher's Exact Test where appropriate. Correlations among outcome measures were conducted using Pearson's correlation coefficient. To determine differences in effect of THA and TKA on back pain, Oxford Scores and HHS/KSS were compared between the hip and knee cohorts at all postoperative assessment intervals using independent samples t-tests.

Outcomes among patients who rated their preoperative back pain intensity as none or very mild on the ODI were compared to those who rated their preoperative back pain as moderate, fairly severe, very severe or worst imaginable pain. A detailed subgroup analysis of postoperative outcomes among those patients who rated their preoperative back pain as moderate to worst imaginable was also conducted to determine the postoperative effectiveness of TJA in reducing lower back pain. Additional data specific to incidence of preoperative and/or postoperative back pain investigations that led to diagnoses specific to spinal stenosis, degenerative disk disease, etc., as well as back surgery prior TJA were abstracted. All analyses were performed using IBM SPSS Statistics version 20. A value of $P < 0.05$ was considered statistically significant.

Results

A total of 776 TJA patients participated in the prospective cohort study including 491 TKA and 285 THA patients, comprised of 59% female and 41% males with mean age 67.5 years ($\pm$10.4) and mean BMI 30.9 kg/m^2 ($\pm$6.3) at time of surgery. Demographics for the hip and knee groups are outlined in Table 1. Of the TJA candidates 52.1% (404/776; 95% CI 48.5–55.6%) identified the presence of existing LBP on a body map, including 60.4% of hips (172/285 95% CI 54.6–65.9%) and 47.3% of knees (232/491 95% CI 42.9–51.7%), ($P < 0.0001$) (Fig. 1). Mean preoperative ODI score was 21.6 ($\pm$19.1) for the TJA cohort indicating moderate disability, and 50.4% of patients had rated their preoperative back pain intensity as none, 28.9% as very mild, and the remaining 20.7% as moderate, fairly severe, very severe or worst imaginable.

Table 1
Demographics.

	Knee Cohort Mean (SD) or % (n = 491)	Hip Cohort Mean (SD) or % (n = 285)	*P*-Value
Age	67.6 ($\pm$9.6)	67.4 ($\pm$9.6)	0.788
BMI (kg/m^2)	31.9 ($\pm$6.4)	29.3 ($\pm$5.7)	**0.000**
Male	40.1%	43.2%	
Female	59.9%	56.8%	0.408

Bold denotes statistically significant at $P < 0.05$.

The prevalence of preoperative lower back pain, as identified on the body map and rated as moderate to worst imaginable pain on the ODI was also significantly higher among hip patients at 28.8% (82/285; 95% CI 23.8–34.3%) compared to 16.1% of knee patients (79/491; 95% CI 13.1–19.6%) ($P < 0.0001$), while 71.2% (203/285; 95% CI 65.7–76.1) of hip patients and 83.9% (412/491; 95% CI 80.4–86.9) of knee patients reported none or very mild preoperative LBP ($P < 0.0001$). More specifically, 55% of knee patients rated their preoperative back pain intensity as none compared to 42.5% of hip patients ($P < 0.0001$). Likewise, only 11.6% of knees versus 18.9% of hips rated their preoperative back pain intensity as moderate ($P = 0.005$) (Table 2). Significantly more females scheduled to undergo THA had rated their preoperative back pain as moderate to worst imaginable as compared to males (35.2% vs. 20.3%, $P = 0.006$).

Mean preoperative ODI score and corresponding back pain disability were rated higher among THA patients at 26.8/100 ($\pm$21.4) indicating moderate disability compared to a score of 18.6/100 ($\pm$16.9) indicating none or minimal disability among TKA patients ($P < 0.0001$) (Fig. 2). Significantly more hip patients had ODI scores corresponding to 41–60% or severe disability, and 61–80% indicating crippled as compared to knee patients ($P < 0.0001$). Conversely, significantly more knee patients had ODI scores of 0–20% corresponding to none or minimal disability (knee = 60.7%, hip = 46.3%, $P < 0.0001$) (Table 2).

Among both hip and knee patients the preoperative ODI score was significantly correlated with the preoperative HHS ($r = -0.139$, $P = 0.020$), KSS ($r = -0.116$, $P = 0.011$), and OHS ($r = 0.229$, $P < 0.0001$) and OKS ($r = 0.268$, $P < 0.0001$) scores.

Higher ODI preoperative scores for hip patients reporting moderate to worst imaginable preoperative back pain were associated with significantly inferior Oxford Hip scores preoperatively and at 6 months and one-year postoperative, as well as inferior HHS scores at both 6 months and one-year postoperative (Table 3). There were no noted gender differences among knee patients and no postoperative effect of preoperative back pain evident in terms of inferior postoperative knee outcomes (Table 3).

In a subgroup analysis of only those patients who reported moderate to worst imaginable preoperative LBP intensity including 82 THA and 79 TKA patients, 47.6% (39/82) of THA patients reported existing postoperative LBP on the body map as compared to 68.4% (54/79) of TKA patients ($P = 0.008$).

Interestingly, the prevalence of LBP persisting out to one-year postoperative, as identified on the body map and rated as moderate to worst imaginable pain on the ODI was also significantly higher among knee patients with a 68.4% (54/79; 95% CI 57.4–77.6%) incidence as compared to 46.3% (38/82; 95% CI 35.9–57.1%) among THA patients ($P = 0.005$). THA patients also saw a significantly greater improvement in ODI score from preoperative to one-year postoperative,