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Preoperative Reduction of Opioid Use Before Total Joint Arthroplasty

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ABSTRACT

Background: The purpose of this study was to assess whether weaning of opioid use in the preoperative period improved total joint arthroplasty (TJA) outcomes.
Methods: Forty-one patients who regularly used opioids and successfully weaned (defined as a 50% reduction in morphine-equivalent dose) before a primary total knee or hip arthroplasty were matched with a group of TJA patients who did not wean and a matched control group of TJA patients who did not use opioids preoperatively. The difference between preoperative and postoperative (at 6-12 months follow-up) patient-reported outcomes were assessed using the change in University of California, Los Angeles (UCLA) activity score, SF12v2, and The Western Ontario and McMaster Universities Arthritis Index (WOMAC). Paired *t* tests and 1-way repeated measures analysis of variance were performed to assess differences in TJA outcomes between groups.
Results: Patients using opioids who successfully weaned had greater improvements in both disease-specific and generic measures of health outcomes than patients who did not wean (WOMAC 43.7 vs 17.8, $P < .001$; SF12v2 Physical Component Score 10.5 vs 1.85, $P = .003$; UCLA activity score 1.49 vs 0, $P < .001$). There was no statistical difference between the 2 groups on SF12v2 Mental Component Score 2.48 vs 4.21, $P = .409$. Patients who successfully weaned from opioids had similar outcomes to control patients who did not use opioids: WOMAC 39.0 vs 43.7, $P = .31$; SF12v2 Physical Component Score 12.5 vs 10.5, $P = .35$; SF12v2 Mental Component Score 3.08 vs 2.48, $P = .82$; UCLA activity 1.90 vs 1.49, $P = .23$.
Conclusion: Patients with a history of chronic opioid use who successfully decreased their use of opioids before surgery had substantially improved clinical outcomes that were comparable to patients who did not use opioids at all.

Osteoarthritis (OA) is a leading cause of disability, and its prevalence continues to rise due to the increasing obese and elderly population. Worldwide, OA affects almost 10% of men and 18% of women older than 60 years, increasing to around 30% for those older than 70 years [1,2]. About 40%-60% of patients with radiologically confirmed knee OA experience pain, stiffness, and decreased mobility, with more than half stating that pain causes the most burden above all other arthritic symptomology [3]. OA pain can cause decreased quality of life by interfering with activities of daily living, impairing cognition, reducing productivity, and increasing mood symptoms. Therefore, pain control is an essential part of managing OA. Analgesics, including nonopioid (eg, nonsteroidal anti-inflammatory drugs) and opioid pain medications, are the most common type of pharmacotherapy used in the treatment of OA. Previously, opioids were limited to managing predominantly acute pain and chronic cancer pain; however, opioids are now more liberally prescribed for chronic noncancer pain syndromes such as OA [4]. In a sample of elderly Medicare patients with knee OA, a study demonstrated that opioid use has increased from 31% to 40% between 2003 and 2009 [5].

Several clinical practice guidelines are currently available for the management of OA. The 2012 American College of Rheumatology guidelines on management of osteoarthritis recommends the use of opioids in management of osteoarthritis after failed medical therapy if the patient is not willing or has contraindications for total joint arthroplasty [6]. National Institute of Clinical Excellence

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guidelines also propose opioids if inadequate pain control with nonsteroidal anti-inflammatory drugs or paracetamol [7]. The American Academy of Orthopedic Surgeons provide inconclusive recommendations for the use of opioids in the treatment of OA [8], whereas other organizations, including the American Geriatrics Society and the OA Research Society International, remain unclear on how and when to use opioids in managing OA [9,10]. Although opiates have emerged as potential agents for select patients with symptomatic OA who are unresponsive or have contraindications to antiinflammatory medication, the association with adverse effects has highlighted the potential harms of chronic opiate use.

As prolonged use of opioids to manage chronic pain associated with OA becomes more prevalent, a growing body of evidence has amassed that suggests that such exposure may affect outcomes of total joint arthroplasty. Long-term use of opioid medications may lead to dependence or hyperalgesia, both of which might adversely affect perioperative and postoperative pain management, risk of complications, rehabilitation, and clinical outcomes after a total joint arthroplasty [11-14]. Although several studies have raised concerns about the association of preoperative opioid use with worse clinical outcomes after surgery, it has yet to be explored whether this risk factor is modifiable with weaning of opioid dose before surgery. The purpose of this study was to evaluate whether weaning of opioid dose in patients with a history of chronic opioid use before undergoing a total joint arthroplasty would improve clinical outcomes compared to patients who did not wean.

Methods

A retrospective matched cohort study design was used to define 3 cohorts of patients: (1) Intervention group, which included patients who successfully weaned their opioid dose before surgery, which was defined as weaning their morphine equivalent dose by 50% after recommending the patient to self-wean, referring patient to pain management to help wean, or suggesting they wean under the supervision of their primary care provider; (2) Opioid-dependent control group, which included patients with chronic opioid use, defined as continued use for at least 4 weeks, based on Chu et al [15] who reported that hyperalgesia was achieved after chronic use of morphine for 4 weeks; and (3) opioid naïve control group, which included patients with no prior narcotic history. A review of all patients who underwent unilateral primary hip or knee arthroplasty at a single institution between 2007 and 2014 was conducted using multiple sources including clinical office notes and referral notes to identify a study group of 41 patients with a history of chronic opioid use before a primary hip or knee arthroplasty who successfully weaned their dose before their surgery. All opioid medications and dosages were converted to a morphine-equivalent dose [16]. Patients were excluded if they had a bilateral or revision procedure. Postoperative pain management protocol (gabapentin 200 mg three times a day, acetaminophen 1000 mg three times a day, celebrex 200 mg twice a day, oxycodone 5-15 mg as needed for moderate pain, Dilaudid IV 0.2-0.8 mg as needed for severe pain) was followed for all patients barring any contraindications. Patients undergoing a total knee arthroplasty also received an adductor canal block.

Patients from the study group were individually pair-matched 1:1:1 with patients who met the definition for chronic opioid use, however did not wean, and patients who managed their pain without narcotics. Patients in the control group were selected from a list of all patients who received a total joint arthroplasty at the same institution over the same period of time at random using a random number generator. Patients were matched based on primary diagnosis, affected joint (hip/knee), American Society of Anaesthesiologists' classification of physical health, sex, body mass index (BMI) (+/− 10), age (+/− 10), and daily morphine equivalent group. Opioid subgroups were based on methodology published by Kidner et al [17] and was divided as follows: low (<30 mg), medium (31-60 mg), high (61-120 mg), and very high (>120 mg).

Table 1
Demographics of Patient Cohorts.

Characteristics	Intervention Group	Opioid-Dependent Control Group	Opioid Naïve Control Group
Mean age	59	60	58
Sex			
Female	27 (66%)	27 (66%)	27 (66%)
Male	14 (34%)	14 (34%)	14 (34%)
Primary diagnosis			
Primary OA	34 (83%)	34 (83%)	34 (83%)
Osteonecrosis	4 (10%)	4 (10%)	4 (10%)
Posttraumatic	3 (7%)	3 (7%)	3 (7%)

OA, osteoarthritis.

An a priori power analysis was performed and indicates that 41 matches of subjects were needed for a power of 80% to detect a real clinical difference between the subjects and 2 control groups at a *P*-value of <.05. Primary outcome studied was the delta of patient-reported outcomes (PRO) from baseline to 6-12 month follow-up as measured by University of California at Los Angeles Activity Score, SF12v2, and The Western Ontario and McMaster Universities Arthritis Index (WOMAC). Outcomes data were taken from a database of prospectively collected PROs. The continuous outcomes of PRO change were analyzed using a paired 2-tailed Student *t* test and 1-way analysis of variance. Categorical variables were compared utilizing chi-squared test. Statics were performed using STATA.

Results

There were 41 patients in each group. Mean age of the intervention, opioid dependent, and opioid naive groups were 59.0, 60.1, and 58.2, respectively. Mean BMI was 29.5 (range, 21.6-47.5), 32.8 (20.6-54.9), and 29.4 (21.4-42.89), respectively. Each group was comprised of 34% males and 66% females. The primary diagnoses of each group were distributed as follows: 34 primary osteoarthritis (83%), 4 osteonecrosis (10%), 3 posttraumatic osteoarthritis (7%) (Table 1). There were 14 patients using a low morphine equivalent (34%), 7 taking medium morphine equivalent (17%), 6 taking high morphine equivalent (15%), and 14 taking very high morphine equivalent in each of the groups (34%). There were no differences in baseline University of California, Los Angeles (UCLA) activity and SF12v2 mental component scores between the groups, (*P*-value = .052, *P*-value = .057, respectively). The intervention group had significantly lower mean WOMAC and SF12v2 physical component scores than the two control groups, (*P*-value < .01) (Table 2).

The opioid naïve control group had significantly higher increases from their baseline to their postoperative UCLA, WOMAC, SF12v2 physical component scores than the opioid-dependent control group ($P < .01$ for all 3 measures). The change in SF12v2 mental component score between the opioid naïve and opioid-dependent control groups was not significant ($P = .63$) (Fig. 1). The opioid naïve group had significantly higher final PROs at 6-12

Table 2
Differences in Patient-Reported Outcomes Between Patient Groups.

Patient Reported Outcome Measure	Intervention Group	Opioid-Dependent Control Group	Opioid Naïve Control Group	*P*-value
UCLA	3.1	3.6	4.1	.052
WOMAC	32	47.5	44.1	<.01
SF12v2-P	24.7	28.8	30.9	<.01
SF12v2-M	47.5	42.8	49.1	.057