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Is it safe? Outpatient total joint arthroplasty with discharge to home at a freestanding ambulatory surgical center

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ABSTRACT

Background: Total joint arthroplasty (TJA) is trending toward shorter hospitalizations; as a result, there are many ambulatory surgical centers (ASCs) starting to perform outpatient TJA. However, there are limited studies examining the safety of outpatient TJA in the freestanding ASC setting. This study aims to evaluate 30-day and 90-day complication rates in patients who underwent outpatient TJA at a freestanding, independent ASC with direct discharge to home.

Methods: A retrospective cohort review using health records was performed on the first 115 TJAs performed between August 2015 and March 2017 by one of the 4 orthopedic surgeons. Before the first TJA, the ASC had developed a multidisciplinary TJA pathway.

Results: Of the 115 TJAs, 37 (32%) were total hip arthroplasties (THAs), 53 (46%) total knee arthroplasties (TKAs), and 25 (22%) unicompartmental knee arthroplasties, with a mean age of 57 ± 7 years and body mass index of 30 ± 5 kg/m^2. There were no intraoperative or direct ASC-related complications. There was 1 instance (0.9%) of a postoperative minimally displaced intertrochanteric femur fracture after THA due to a fall treated nonoperatively complication within 30 days of surgery. Of the 90-day complication events, there were 2 patients (2%) with postoperative arthrofibrosis of the knee after TKA requiring manipulation under anesthesia, 1 postoperative patellar tendon rupture during therapy after TKA requiring surgical repair and 1 delayed hematogenous infection after international travel after THA requiring 2-staged exchange.

Conclusions: Outpatient TJA with discharge to home at a freestanding, independent ASC is a safe option after development of a multidisciplinary TJA pathway.

Introduction

Demand for total joint arthroplasty (TJA) is expected to grow exponentially in the next 10 years. One estimate places the total number of hip and knee arthroplasties at over 4 million by 2030, an increase of 174% [1]. TJA has excellent short- and long-term clinical results and, in the recent years, has been successfully performed with rapid recovery protocols. There has been a trend toward short hospitalizations, which has been facilitated by refinements in surgical techniques, advancements in pharmacologic regimens, and modification of postoperative physical therapy pathways. The development of such clinical efficiencies, such as comprehensive pre and perioperative pathways, has allowed for the development of truly outpatient or ambulatory total joint surgery [2-6]. Today, there is an increasing interest in outpatient TJA as there are perceived advantages for the patient, potential cost reduction [7], and general benefits to the health-care system. Conversely, hidden costs from managing complications and readmissions have recently come under question [7,8]. Several studies have demonstrated that

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TJA performed in an outpatient setting is safe, effective, and efficient [9-15], however, these studies were all performed within the safety net of hospital outpatient departments [15]. Thus, patients who do not meet discharge criteria are easily transitioned to inpatient hospitalization. Furthermore, the definition of outpatient TJA in some studies has included overnight stay of under 23 hours [16]. Although there are potential benefits associated with TJA at an ambulatory surgical center (ASC), potential complications and safety of outpatient TJA at a standalone ASC continue to be quantified and demonstrate promising outcomes with complication rates $\leq$7% [2,17-19]. However, safety of major surgeries at ASCs continues to be questioned in mainstream media [20].

The objective of this study was to evaluate 30- and 90-day complication rates in patients who underwent TJA at a freestanding, independent ASC after development of a multidisciplinary pathway.

Material and methods

On receiving institution institutional review board approval, a retrospective review of electronic health records was performed for all patients who underwent total hip arthroplasty (THA), total knee arthroplasty (TKA), or unicompartmental knee arthroplasty (UKA) at a freestanding ASC between August 2015 and March 2017 by one of the 4 fellowship-trained reconstruction surgeon investigators. The direct anterior, posterior, and mini-posterolateral approaches were used for all patients undergoing THA, based on surgeon preference. Patients undergoing TKA used medial parapatellar or midvastus approaches using conventional instrumentation or patient-specific instrumentation based on routine surgeon preference.

Before the first TJA, the ASC had already developed a multidisciplinary TJA pathway. The preoperative pathway integrated selection of patients based on a thorough evaluation of the current and past medical history and stricter exclusion criteria, based on existing comorbidities, as compared with standard hospital-based TJA procedures to minimize adverse events. Patients with a medical history significant for thromboembolic disease, major cardiovascular or cerebrovascular events, and cardiac arrhythmias with a body mass index (BMI) of $\geq$35 and insulin-dependent diabetes were excluded from outpatient TJA. Preoperative testing included electrocardiogram, complete metabolic panel, complete blood counts, and clearance from the patient's primary care physician.

At the preoperative visit, each patient met with their surgeon and clinical staff to explain the logistics of the operative day, postoperative care, and home care. The patient also met with a physical therapist to review postoperative ambulation and therapy protocols. Finally, the patient met with an anesthesiologist to confirm that the patient was an appropriate candidate for outpatient TJA and to discuss the pain management protocol. These meetings ensured safe selection of patients and multidisciplinary discussion of postoperative expectations.

Perioperative pathway

Preoperative medications included Celebrex, when not contraindicated, hydrocodone or oxycodone based on surgeon preference, and gabapentin. All patients underwent general anesthesia with a regional adductor block before undergoing TKA or UKA. Aggressive intraoperative intravenous (IV) hydration was provided to all patients unless contraindicated. All patients underwent preoperative IV antibiotic administration. An intraoperative pericapsular injection consisting of liposomal bupivacaine, epinephrine, morphine, bupivacaine, and toradol was given to all patients. Intraoperative IV or topical tranexamic acid (TXA) was used in all patients depending on surgeon preference. Foley catheters were not used. Postoperative pain management consisted of celecoxib, oxycodone, or hydrocodone based on surgeon preference with minimization of IV narcotic administration. Venous thromboembolism (VTE) prophylaxis was used with enteric-coated aspirin 325 mg twice a day and mobile calf pumps, warfarin, or lovenox based on surgeon preference.

Physical therapy protocol

All patients were allowed to bear full weight immediately after TJA with the guidance of a physical therapist using an appropriate assistive device. All patients subsequently climbed stairs under physical therapy guidance.

Follow-up protocol

All patients received phone calls from the ASC nursing staff. Patients were seen daily at home by a physical therapist starting from the same day of surgery. Patients were also seen by a visiting nurse 3 times a week for 1 week. There was a uniform patient follow-up protocol with all patients seen postoperatively at 3, 6, and 12 weeks.

This study collected demographic information including age, sex, BMI, laterality, and preoperative American Society of Anesthesiologists physical classification system. The primary outcome measures included postsurgical recovery time in the ASC, intraoperative complications, adverse events within the ASC, postoperative hospitalizations, any postoperative complications within 30 and 90 days postoperatively, and length of follow-up.

Data analysis and sample size calculation

Continuous data are reported as mean $\pm$ standard deviation, and categorical data are reported as number (percent). The proportion of subjects having a 30- or 90-day complication with 95% confidence interval (CI) is reported. For purposes of the analysis, TKAs and UKAs were combined into 1 group. Analysis was performed using SPSS for Windows, version 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Investigators anticipated a <10% complication rate, expected proportion (P), of 0.10 $\pm$ 0.05 (width = 0.10) with a 90% confidence level, which called for approximately 100 charts [21].

Results

After instituting a multidisciplinary TJA pathway, a total of 115 consecutive patients underwent TJA at a freestanding ASC. Included were 37 (32%) THAs, 53 (46%) TKAs, and 25 (22%) UKAs with a mean age of 57 $\pm$ 7 years, BMI of 30 $\pm$ 5 kg/m^2, and 68 (59%) males. One hundred percent of patients were discharged directly to home postoperatively from the ASC. The mean postoperative recovery time including postoperatively convalescence, ambulation with physical therapy (PT), stair climbing with PT, and nursing care before discharge was 135 minutes for THA and 132 minutes for TKA. Tables 1 and 2 outline the subject characteristics and comorbidities by joint.

There were minimal complications postoperatively. There was 1 (0.9%, 95% CI 0-2) instance of a postoperative minimally displaced intertrochanteric femur fracture after THA due to a fall and treated nonoperatively within 30 days of surgery. There were 2 (2%, 95% CI 0-4) instances of arthrofibrosis requiring knee manipulation under anesthesia within 90 days of surgery. There were 2 (2%, 95% CI 0-4) instances of open reoperation within 90 days of surgery. One of these patients experienced a postoperative patellar tendon rupture after TKA. One of these patients experienced a hematogenous

Table 1
Subject characteristics (N = 115).

Characteristics	Hips (n = 37)	Knees (n = 78)
Age at surgery (y)	55 ± 8[a]	58 ± 7
Male gender	23 (62)[b]	45 (58)
Body mass index (kg/m^2)	29 ± 4	31 ± 5
Side		
Right	13 (35)	38 (48)
Left	24 (65)	40 (52)
ASA class		
I	33 (89)	55 (71)
II	4 (11)	23 (29)
Recovery time[c] (min)	135 ± 32	132 ± 31
Length of follow-up (wk)	14.6 ± 9.9	23.1 ± 16.8

ASA, American Society of Anesthesiologists physical classification system.
[a] Data are expressed as mean ± standard deviation.
[b] Data are expressed as number (percent).
[c] Starts with the transfer of the patient from the operating room to postanesthesia care unit and concludes at the time the patient is discharged from the surgery center.

infection after international travel after THA requiring 2-staged exchange (Table 3). There were zero incidents of intraoperative complications, blood transfusions, admission to the hospital, adverse events within the ASC, VTE, or readmissions for postoperative pain.

Discussion

The safety of initiating an outpatient TJA program at a freestanding ASC has been published previously in a limited fashion [4,6,17,18]. The safety of major surgery in ambulatory surgery centers has been questioned in mainstream media [20]. Limited studies have been published examining the safety of outpatient TJA in the ASC setting immediately after initiating a program [2]. The purpose of this study was to demonstrate the safety of outpatient TJA in a freestanding ASC immediately after establishing an evidence-based TJA outpatient program. As patient recovery pathways, anesthesia pathways, surgical techniques, and cost containment models have been refined and the Center for Medicare and Medicaid Services has allowed outpatient TKA in the hospital setting, there is significantly more interest in performing outpatient TJA. The current literature defines outpatient TJA in numerous ways including 23-hour stays, discharge to skilled nursing facility, discharge to a medically staffed hotel, or direct discharge to home. In addition, the site of surgery is also varied including traditional hospital setting, hospital-attached ASC, or freestanding ASC. For a surgeon contemplating initiating a TJA program at an ASC, there are currently limited data defining the safety curve during the outset of the program.

There are numerous studies demonstrating significant advantages of utilizing multimodal pain pathways to manage postoperative pain for patients undergoing TJA [22-24]. There are also numerous studies illustrating the advantages of IV and topical administration of TXA during TJA [25]. There are many studies showing the positives of early ambulation after TJA and utilization of aspirin, warfarin, or lovenox for VTE prophylaxis [26,27].

Table 2
Subject comorbidities (N = 115).

Comorbidity	Hips (n = 37)	Knees (n = 78)
Non–insulin-dependent diabetes	1 (3)[a]	3 (4)
Cardiac disease	0	2 (3)
Kidney disease	0	1 (1)
History of stroke	0	0
Malnutrition	0	0

[a] Data are expressed as number (percent).

Table 3
30 and 90 day complications (N = 5).

Number	Days	Complication	Treatment
1	30	Intertrochanteric femur fracture	Nonoperative management
2	90	Arthrofibrosis	Manipulation under anesthesia
1	90	Patellar tendon rupture during therapy	Surgical repair
1	90	Hematogenous infection	Two-staged exchange arthroplasty

For this study, the surgeons and anesthesia team collaboratively formed an agreed-upon multidisciplinary TJA pathway before performing the first outpatient TJA. Using established evidence-based guidelines, the pathway allowed for surgeon preferences for preoperative pain medication, postoperative pain medication, use of gabapentin, administration of IV or topical TXA, and VTE prophylaxis. All surgeons adhered to strict patient selection criteria. All patients had preoperative visits with the surgical team, anesthesia team, and physical therapy team. All surgeons were high-volume TJA surgeons without previous outpatient TJA experience at a freestanding ASC. Two surgeons had performed same-day discharge TJA at the hospital before the program initiation.

The rate of major postoperative complications including 2 open reoperations within 90 days of surgery was 2%. The complications included a postoperative patellar tendon rupture status after TKA with an unresurfaced patella requiring primary repair and a hematogenous infection after whirlpool use in a developing country after THA requiring a 2-staged exchange.

There was a 100% rate of direct discharge to home after TJA at the ASC at a mean time of 135 minutes and 132 minutes for THA and TKA, respectively. There were zero incidents of intraoperative complications, blood transfusions, admission to the hospital, adverse events within the ASC, VTE, or readmissions for postoperative pain. As the results show, the rate of complications was relatively low for a newly initiated outpatient TJA program at a standalone ASC. The authors attribute this success to a collaborative effort with surgeons and anesthesia; preoperative patient visits with surgeon, anesthesiologist, and PT; sound surgical technique; blood conservation techniques; following established evidence-based guidelines (pain management, prophylactic antibiotic administration, VTE prophylaxis, TXA administration); early ambulation postoperatively with PT guidance; use of appropriate home PT and nursing; and reliable patient communication and follow-up.

There are several limitations to this study. This study is a retrospective cohort review. There are 4 surgeons involved with utilization of different surgical techniques. The established collaborative pathway is evidence based but allows for surgeon preference in postoperative oral pain medication, surgical technique, and VTE prophylaxis. The patients underwent a thorough multidisciplinary preoperative review to determine candidacy for TJA at the ASC, and all patients understood the lack of availability for overnight stay at the ASC.

As the popularity of outpatient TJA increases, the study demonstrates the importance of forming a collaborative evidence-based pathway to minimize complications. The pathway allowed for evidence-based surgeon preference in postoperative oral pain medication, surgical technique, and VTE prophylaxis; this shows the generalizability to use a similar pathway for TJA at ASCs. Furthermore, the study demonstrates direct discharge to home within 3 hours of surgery is safe with few 30-day and 90-day complications. As payers, patients, and surgeons increasingly utilize ASCs for TJA,

the authors believe it will be important to form and review collaborative evidence-based pathways to improve safety and minimize complications. The study shows that initiating a TJA program at an ASC is safe after developing a multidisciplinary pathway.

Conclusions

Outpatient TJA with direct discharge to home at a standalone, independent ASC is a safe option after development of a multidisciplinary TJA pathway.

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