■ HIP ARTHROPLASTY: MANAGEMENT FACTORIALS

The outpatient total hip arthroplasty

A PARADIGM CHANGE

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Aims

To examine incidence of complications associated with outpatient total hip arthroplasty (THA), and to see if medical comorbidities are associated with complications or extended length of stay.

Patients and Methods

From June 2013 to December 2016, 1279 patients underwent 1472 outpatient THAs at our free-standing ambulatory surgery centre. Records were reviewed to determine frequency of pre-operative medical comorbidities and post-operative need for overnight stay and complications which arose.

Results

In 87 procedures, the patient stayed overnight for 23-hour observation, with 39 for convenience reasons and 48 (3.3%) for medical observation, most frequently urinary retention (13), obstructive sleep apnoea (nine), emesis (four), hypoxia (four), and pain management (six). Five patients (0.3%) experienced major complications within 48 hours, including three transferred to an acute facility; there was one death. Overall complication rate requiring unplanned care was 2.2% (32/1472). One or more major comorbidities were present in 647 patients (44%), including previous coronary artery disease (CAD; 50), valvular disease (nine), arrhythmia (219), thromboembolism history (28), obstructive sleep apnoea (171), chronic obstructive pulmonary disease (COPD; 124), asthma (118), frequent urination or benign prostatic hypertrophy (BPH; 217), or mild chronic renal insufficiency (11).

Conclusion

The presence of these comorbidities was not associated with medical or surgical complications. However, presence of one or more major comorbidity was associated with an increased risk of overnight observation. Specific comorbidities associated with increased risk were CAD, COPD, and frequent urination/BPH. Outpatient THA is safe for a large proportion of patients without the need for a standardised risk assessment score. Risk of complications is not associated with presence of medical comorbidities.

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Recently, there has been increasing interest in performing total hip arthroplasty (THA) as an outpatient or day-case procedure.[1] This concept has already been safely applied to unicompartmental knee arthroplasty.[2] To perform a same day arthroplasty safely, there are many factors that have to be addressed. One factor is the fear and anxiety associated with a new experience of surgery and the concern about management of the surgical pain.[3] A programme for safe outpatient THA must also militate against the risk associated with the patients' comorbidities and reduce the risk of medical complications. Surgeons and care givers associated with outpatient THA must manage the side effects of treatment, including the use of narcotics and anaesthesia, minimising blood loss, and reducing surgical trauma. The purpose of this study is to report the incidence of medical and surgical complications associated with outpatient THA, if patient medical comorbidities are associated with these complications or extended length of stay and to question the need for a complex pre-operative score to determine suitability for outpatient THA.

Patients and Methods

Between June 2013 and December 2016, we performed 1472 outpatient hip arthroplasty procedures in 1279 patients at a free-standing ambulatory surgery centre. All patients signed

Table I. Relative contraindications for outpatient total hip arthroplasty (THA)

Contraindication
Congestive heart failure
Valvular disease
Severe chronic obstructive pulmonary disease
Home oxygen use
Untreated sleep apnoea with body mass index > 40 kg/m^2
Severe renal disease
Cerebrovascular accident
Solid organ transplant

our general research consent, approved and monitored by an independent institutional review board (Western IRB, Puyallup, Washington, implemented in 2005), which allows inclusion in retrospective reviews. There were 1443 primary THA, 22 revision THA, and seven conversion THA associated with previous retained hardware. There were 54% or 797 THA in male patients and 46% or 675 THA in female patients. The approach adopted in primary THA was direct anterior in 1299 hips (90%) and direct lateral in 144 hips (10%). The mean age was 57 years (standard deviation (SD) 7.4; 18 to 87) and the mean body mass index (BMI) was 30.4 kg/m^2 (SD 6.6; 16 to 58).

Pre-operative preparation begins with an orthopaedic assessment of the patient and confirmation of indications for THA having failed conservative treatment. Pre-operative educational videos and books are provided to the patient and family to ensure that expectations are aligned. The outpatient THA candidate must have appropriate medical insurance and must be functionally independent. Age is not an independent contraindication for outpatient THA. However, most patients aged ≥ 65 years will have their healthcare funded by Medicare, which only supports inpatient THA, which also applies to patients supported by Medicaid.

Venous thromboembolic disease prevention is based upon an aspirin-based multimodal, risk-stratified approach.[4] In patients with normal peri-operative risk, ambulatory calf compression devices are placed at the time of surgery and worn for two weeks. Patients are placed on 81 mg aspirin twice a day for six weeks. In patients identified as having an increased risk additional chemoprophylaxis is prescribed.

We apply exclusion criteria for outpatient THA, where ongoing comorbidities cannot be optimised. These may include: congestive heart failure (CHF) or valvular disease; chronic obstructive pulmonary disease (COPD) or home use of supplemental oxygen; untreated obstructive sleep apnoea with a BMI > 40 kg/m^2; haemodialysis or severely elevated serum creatinine; anaemia with haemoglobin < 130 g/L; cerebrovascular accident or history of delirium or dementia; and solid organ transplant (Table I).

A multimodal peri-operative pain management protocol is used, with patients being given a mixture of medications with synergistic actions to reduce the need for narcotic medications post-operatively (Tables II and III). The anaesthetic technique consists of a short-acting spinal neuroaxial block with general anaesthesia. Hypotensive anaesthesia with a mean arterial pressure goal of 60 mm Hg is combined with peri-operative administration of oral tranexamic acid (TXA),[5,6] with 1 g TXA given two hours prior to incision and a second 1 g dose given three hours after the initial dose. As noted, 90% of cases were performed through the direct anterior approach with the use of a standard operating table.[7]

Statistical analysis. We calculated the relative risk and odds ratios with 95% confidence intervals of major comorbidities being associated with the need for an overnight stay in hospital after a planned day-case THA. A p-value < 0.05 was considered statistically significant.

Results

In 87 procedures (5.9%) the patient stayed overnight for 23-hour observation. Of these, 39 (2.6%) were for reasons of convenience related to travel distance or later operative time. The remaining 48 (3.3%) stayed for medical observation most commonly related to urinary retention (13 patients), obstructive sleep apnoea (nine patients), post-operative nausea and vomiting (four patients), hypoxia (four patients), and pain management (six patients). No patients stayed for observation of cardiac issues. Within 48 hours of release from the centre, five patients (0.3%) experienced major complications, including three patients requiring transfer to an acute care facility. These acute transfers included two patients with acute onset of atrial fibrillation and one patient with anaemia requiring a transfusion.

After 48 hours, six patients required unplanned care and there was one death (0.4%). One patient was admitted for constipation/ileus, one for urinary tract infection and septicaemia, one for diverticulitis, one for a fall at home with shoulder dislocation, one urinary retention, and one for chest pain. There were an additional 21 surgical complications that required treatment within 90 days of the index arthroplasty including 11 wound revisions, five incision and drainage procedures for haematoma or early infection, four cases of periprosthetic fracture, and one closed reduction of dislocation. The overall rate of medical and surgical complications requiring unplanned care was 2.2% (32/1472).

One or more significant medical comorbidities were present in 647 patients (44%). This includes previous coronary artery disease (CAD) in 50 patients, valvular heart

Table II. Pre-operative, intra-operative and post-operative medications

Medication	Dosing information
Pre-operative	
Celecoxib	400 mg PO
Pregabalin or gabapentin	600 mg PO or 300 mg PO if > 65 yrs
Acetaminophen (Paracetamol)	1 g PO
Dexamethasone	10 mg IV
Metaclopramide	10 mg IV
Scopalamine patch	Consider if no benign prostatic hypertrophy or glaucoma
Peri-operative antibiotic	
Tranexamic acid	1 g PO 2, hrs prior to incision
Crystalloid	Start for resuscitation/hydration
Intra-operative	
Short-acting spinal anaesthesia Propofol short-acting sedation ± Short-acting inhalants	
Ketamine	0.5 mg/kg IV
Crystalloid for resuscitation/hydration	2 l IV
Periarticular injection	
Ropivacaine	50 mL 0.5%
Epinephrine	0.5 mL 1:1000
Ketorolac	30 mg
Ondansetron	4 mg IV
Post-operative	
Tranexamic acid	1 g PO, 3 hrs after initial dose
Urecholine	20 mg PO for benign prostatic hypertrophy/urinary retention
Crystalloid for resuscitation/hydration	Minimum 1 additional litre
Ondansetron	4 mg IV PRN
Promethazine	6.25 mg IV PRN
Oxycodone	5 to 10 mg PO every 4 hrs PRN
Acetaminophen (Paracetamol)	1 g PO prior to discharge
Hydromorphone	0.5 mg IV every 10 mins PRN

PO, orally; IV, intravenous; PRN, as needed

Table III. Discharge medications

Medication or therapy	Dosing information
Celecoxib	200 mg PO once daily for 2 wks
Aspirin	81 mg PO twice daily for 6 wks
Antibiotics	< 24 hrs
Acetaminophen (Paracetamol)	1000 mg PO, 3 times daily for 48 hrs
Oxycodone	5 mg PO, 1 or 2 every 4 hrs to 6 hrs PRN
Hydromorphone	2 mg PO, PRN breakthrough pain
Hydrocodone/Acetaminophen (Paracetamol)	5 mg 1 or 2 every 4 hrs to 6 hrs PRN (beginning 48 hrs post-operative)
Ondansetron	10 mg PO PRN
Portable ambulatory calf pumps	
Cryotherapy motorised unit	

PO, orally; PRN, as needed

disease in nine, arrhythmia in 219, history of venous thrombotic disease in 28 patients, obstructive sleep apnoea in 171 patients, chronic obstructive pulmonary disease (COPD) in 124 patients, asthma in 118, frequent urination or benign prostatic hypertrophy (BPH) in 217, or mild chronic renal insufficiency in 11 patients. Each of these patients was considered to have been fully optimised pre-operatively and their comorbidities were not associated with medical or surgical complications. With only 11 procedures (0.7%) experiencing a medical complication and a large variety of medical comorbidities being present in our cohort, we could not identify any clear association between these and the patients' outcome. However, the presence of one or more major comorbidity was associated with a significantly increased risk of needing to stay overnight for observation (Table IV). Specific comorbidities associated with increased risk of requiring an overnight stay were history of CAD, COPD, and frequent urination or BPH. Additionally, the specific medical comorbidities of COPD and frequent urination/BPH were associated with increased risk of need for overnight observation for a related reason, obstructive sleep apnoea and urinary issues, respectively.

Table IV. Risk of overnight stay for medical reason by major comorbidity

Major comorbidity	Pre-operative finding, n, (%)	Overnight stay for medical reason	Overnight for medical reason with *versus* without comorbidity (%)	Relative risk	95% CI	p-value	Odds ratio	95% CI	p-value
Coronary artery disease	50 (*3.4*)	5	*10.0 vs 3.2*	3.09	1.3 to 7.4	0.012	3.32	1.3 to 8.8	0.015
Valvular disease	9 (*0.6*)	1	*11.1 vs 3.4*	3.25	0.5 to 21.0	0.216	3.53	0.4 to 28.8	0.238
Arrhythmia	219 (*14.8*)	12	*5.5 vs 3.1*	1.76	0.9 to 3.3	0.079	1.80	0.9 to 3.5	0.081
Venous thromboembolism	28 (*1.9*)	0	*0.0 vs 3.5*	0.48	0.03 to 7.7	0.606	0.47	0.02 to 7.9	0.603
Obstructive sleep apnoea	171 (*11.6*)	7	*4.1 vs 3.4*	1.21	0.6 to 2.6	0.632	1.22	0.5 to 2.8	0.633
Chronic obstructive pulmonary disease	124 (*8.4*)	10	*8.1 vs 3.0*	2.65	1.4 to 5.2	0.004	2.80	1.4 to 5.7	0.005
Asthma	118 (*8.0*)	9	*7.6 vs 3.1*	2.46	1.2 to 4.9	0.011	2.58	1.2 to 5.4	0.013
Urinary frequency	217 (*14.7*)	15	*6.9 vs 2.9*	2.41	1.3 to 4.3	0.003	2.51	1.4 to 4.7	0.004
Kidney disease	11 (*0.8*)	1	*9.1 vs 3.4*	2.66	0.4 to 17.6	0.311	2.82	0.4 to 22.5	0.327
Any major comorbidity	647 (*44.0*)	33	*5.1 vs 2.2*	2.34	1.3 to 4.1	0.003	2.41	1.3 to 4.3	0.003

CI, confidence interval

Discussion

The current study demonstrates that in medically optimised patients, despite a large proportion of associated medical comorbidities, outpatient THA is associated with a low rate of medical and surgical complications. However, existing medical comorbidities are associated with the need for extended observation and overnight stay. Our data would refute the need or validity of a standardised scoring system for determining the suitability of a patient for outpatient arthroplasty as pre-existing comorbidities were not associated with risk of complication in optimised patients.

We defined significant medical comorbidities as described above and considered CHF, or valvular disease; severe COPD or home use of supplemental oxygen; untreated obstructive sleep apnoea with a BMI > 40 kg/m^2; haemodialysis or severely elevated serum creatinine; haemoglobin < 130 g/L; cerebrovascular accident or history of delirium or dementia; and solid organ transplant as relative contraindications for outpatient arthroplasty. These contraindications are similar to those described by Courtney et al[8] who described an increased risk of medical complications in patients with COPD, CHF, CAD and cirrhosis. The current study, and similarly the series from Courtney et al[8] did not use BMI as an absolute contraindication. Additionally, the ASA Physical Status Classification System[9] was not used in either study. Despite these relative contraindications, patients in 44% of procedures had one or more major medical comorbidities, the presence of which was not associated with medical or surgical complications. These comorbidities were directly related to the need for overnight observation and should be taken in to consideration in centres where overnight stay is not available.

Our rate of overnight stay was 6% with roughly half of these patients staying for reasons of convenience and half requiring additional observation for medical reasons. This is lower than the rate reported by Goyal et al[10] where 24% of 112 cases required overnight stay in the randomised trial. There was a 2.2% incidence of medical or surgical complications in our series. This low rate of unplanned medical care or complications compares favourably with the rates presented in the literature for both inpatient and outpatient THA.[11]

The current study demonstrates that outpatient THA is safe, while Aynardi et al[12] have demonstrated that same-day surgery can provide significant cost savings compared with inpatient care. They compared two groups of THA performed by the same surgeon. The outpatient cohort had a nearly $7000 cost savings per patient over inpatient care.

Outpatient THA is safe for many patients and the risk of complications is not associated with the presence of medical comorbidities. The presence of comorbidities is, however, associated with an increased need for overnight medical observation. The paradigm change of patient education, medical optimisation, and a multimodal programme to limit blood loss and reduce the need for narcotics, results in an ability to perform safely outpatient THA in a large proportion of patients without the need for a standardised risk assessment score.

Take home message:

- Our contraindications for outpatient THA are these ongoing comorbidities that cannot be optimised: congestive heart failure or valvular disease; severe chronic obstructive pulmonary disease or home use of oxygen; untreated obstructive sleep apnoea with a BMI > 40 kg/m^2; severe renal disease; anaemia with haemoglobin < 13.0 g/L; cerebrovascular accident or history of delirium or dementia; solid organ transplant.
- Of 1443 procedures in 1279 patients, 48 (3.3%) required a 23-hour overnight stay for medical observation, five patients (0.3%) experienced a major medical complication within 48 hours including three transferred to an acute facility; six additional patients had medical complications within 90 days and one patient died; 21 patients had surgical complications that required further treatment within 90 days for an overall rate of 2.2% (32/1443) medical and surgical complications requiring unplanned care.
- One or more major comorbidities were present in 647 patients (44%). The presence of these comorbidities was not associated with medical or surgical complications. However, presence of one or more major comorbidity was associated with increased risk for overnight medical observation, and specific comorbidities associated with increased risk were coronary artery disease, chronic obstructive pulmonary disease, and frequent urination and/or benign prostatic hypertrophy.

- With appropriate optimisation of medical comorbidities, THA may be safely undertaken at an ambulatory surgery centre. However, the likelihood of the need for an overnight stay is related to the presence of preoperative comorbidity but these comorbidities are not related to the risk of post-operative complications.

Supplementary material

A figure showing the frequency of major medical comorbidities in the study group of patients who underwent outpatient total hip arthroplasty can be found alongside the online version of this article at www.bjj.boneandjoint.org.uk

Author contributions

K. R. Berend: Collected primary data, Wrote the manuscript.
A. V. Lombardi Jr: Collected primary data, Critically appraised the manuscript.
M. E. Berend: Collected primary data, Critically appraised the manuscript.
J. B. Adams: Collected primary data, Analysed the data, Critically appraised the manuscript.
M. J. Morris: Collected primary data, Critically appraised the manuscript.

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