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Outcomes of Primary Total Knee Arthroplasty in Patients With Parkinson's Disease

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ABSTRACT

Background: Parkinson's disease is a degenerative disorder causing rigidity, bradykinesia, and tremor of the motor system. There is significant paucity of evidence regarding whether total knee arthroplasty (TKA) is of benefit in patients with both Parkinson's disease and osteoarthritis. We aimed to compare outcomes and complications of TKA between patients with Parkinson's disease and those without.

Methods: A cohort of 43 knees from 35 patients with Parkinson's disease who received a primary TKA between January 2004 and December 2015 were retrospectively extracted from a private clinical database held by 2 surgeons and compared to an age and gender-matched control group of 50 knees from 41 patients. TKAs were performed by 2 surgeons at 1 tertiary private hospital. The indication for TKA in both groups was osteoarthritis. Difference between preoperative and 1-year range of movement (ROM) and 12-point Oxford Knee Score (OKS) was assessed using Student's unpaired t-test. Postoperative complications and revision procedures were also recorded during the follow-up period. The minimal clinically important difference for OKS at 1-year follow-up, defined as improvement of ≥ 6 , was also assessed.

Results: In the Parkinson's group, mean ROM improvement was 14° (100° preoperatively to 114° at 12 months), compared to 12° in the control group (102° – 114° , respectively). Mean OKS improvement was 15 in the Parkinson's group (23 preoperatively to 38 at 12 months) compared to 17 in the control group (23 and 40, respectively.) No significant difference was identified between the 2 groups for either ROM ($P = .96$) or OKS ($P = .45$.) All Parkinson's patients achieved the minimal clinically important difference at 1-year follow-up. There were no mortalities during the study follow-up period and no significant difference in complication rates between the 2 groups ($P = .41$).

Conclusion: Parkinson's disease was not associated with poorer functional outcomes or increased complications compared to controls in our study. We suggest that Parkinson's disease is not an absolute contraindication to TKA.

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Parkinson's disease is a neurodegenerative disorder which typically causes rigidity, bradykinesia, tremor, and postural instability of the motor system. There are occasionally also nonmotor features that can lead to cognitive deficits and

psychiatric manifestations [1]. These signs and symptoms occur secondary to death of cells in the substantia nigra in the midbrain which leads to a loss of dopamine to the caudate nucleus and putamen of the basal ganglia [2,3]. Parkinson's disease is the second most prevalent neurological disease in Australia, affecting 0.3% of the total population and 0.9% of those over the age of 50, and is expected to rise in the near future with the aging population [4].

Similar to osteoarthritis (OA), symptoms of Parkinson's disease generally progress with age [1]. It is noted that physiotherapy and regular physical exercise play an important role in the standard treatment of Parkinson's disease, particularly with regard to restoring functional outcomes [5]. Unfortunately, patients who suffer both from Parkinson's disease and advanced knee OA will

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Table 1
Comparison of Full Patient Baseline Demographics Between the Parkinson's and Control Groups.

Patient Demographics	Parkinson's Group	Control Group	P Value
Age	72.6 ± 7.3	71.8 ± 7.6	.62
Gender			
Male	26	33	.66
Female	17	17	
BMI	27.8 ± 5.1	30 ± 4.9	.12
Preoperative OKS	22.3 ± 6.3	23.8 ± 6.7	.37
Preoperative ROM	97.7 ± 23.2	102 ± 20.1	.40

BMI, body mass index.

have difficulty progressing with physiotherapy given the spasms inherent with the condition, and their low baseline ambulatory status.

Total knee arthroplasty (TKA) is a well-established, safe surgical procedure for end-stage OA that has been found to be effective in reducing pain, increasing range of movement (ROM), as well as improving self-reported patient mobility and function for those who do not respond to nonsurgical interventions [6,7].

However, there is some debate and a paucity of evidence to assist surgeons in deciding whether TKA is of similar benefit in patients with both Parkinson's disease and severe OA [8–12]. Initial studies suggested that TKA in this subgroup of patients caused hamstring rigidity and persistent flexion contractures, and therefore for some time Parkinson's disease was considered to be an absolute contraindication of the procedure [9,10].

More recent studies, on the other hand, suggest that TKA offers acceptable improvement both in pain and function in Parkinson's disease, with a similar complication profile. However, these studies are few and have small cohort sizes [11,12].

Given the sparse evidence on this topic, we aimed to examine the outcomes of TKA in this group of patients by comparing the change in ROM and Oxford Knee Score (OKS) between patients who are diagnosed with Parkinson's and age-matched controls at 1-year follow-up, retrieved from a prospectively collected clinical database held by 2 orthopedic surgeons.

Materials and Methods

We performed a retrospective cohort study of consecutive patients who had undergone primary TKA between January 2004 and December 2015 with a confirmed diagnosis of Parkinson's disease prior to surgery. A cohort was extracted from a prospectively collected clinical database (Socrates, v3.5; ORTHOsoft, Australia) maintained by 2 orthopedic surgeons working in 2 private hospitals.

An age-matched control group without Parkinson's disease was then randomly computer generated from the same database (of 5700 patients) from the same time period.

Information involving postoperative complications was extracted from hospital medical records and a separate clinical database maintained by the same surgeons (Shexie Medical System; Shexie PMS, Australia)

The primary indication for TKA in both groups was OA for all knees in the study and an independent assessment of each knee that met appropriate selection criteria for TKA. A preoperative physician review was also undertaken for medical comorbidities and appropriateness for surgery, as well as postoperative high dependency unit admission planning if necessary.

Patients were included regardless of implant design in order to maximize cohort size in the study. Computer navigation was used for all patients in the study. Tourniquets were used from 2008 until

mid-2011 after which surgery was performed without tourniquet. Routine use of intra-articular tranexamic acid was also commenced in 2011.

Outcome Evaluation

At the time of the preoperative consultation, each patient completed the 12-point OKS and had their range of motion recorded. All patients were then followed up prospectively by the same surgeon at a minimum of 12 months postoperatively and these measures repeated by the same research assistant.

Improvement in OKS was calculated by subtracting the preoperative OKS from the OKS measured at 1 year for each individual knee. Similarly, the improvement in ROM was calculated by subtracting the preoperative ROM from the ROM measured at 1 year for each individual knee.

Acute medical complications evaluated included death, deep vein thrombosis, pulmonary embolism, cerebral vascular accident, myocardial infarction, and other perioperative cardiac complications, respiratory complications, gastrointestinal complications, urinary complications, and confusion. Routine Doppler ultrasound screening for deep vein thrombosis was performed for all patients prior to discharge. Acute surgical complications recorded included superficial and deep infections. Any revision operations performed were recorded in the follow-up period.

Statistical Analysis

Parkinson's and control groups were compared using chi-squared test to compare qualitative variables between groups. The Student's unpaired t-test was used to compare qualitative outcomes between groups.

Statistical analysis was performed with Statistical Analysis Software v 9.4 (SAS Institute Inc, Cary, NC). A P-value of less than .05 was considered to be statistically significant.

Table 2
Comparison of Operative Details Between Parkinson's and Control Cases.

Operative Details	Parkinson's Group	Control Group	P-Value
Date of surgery	26/01/2011 ± 1270 d	05/04/2009 ± 1220 d	.012
Surgeon			
A	20	32	.10
B	23	18	
Bilateral			
No	22	26	.99
Previous (other)	6	6	
Staged	6	8	
Simultaneous	10	9	
Alignment reference			
IM femur/EM tibia	5	16	.02
Navigation	37	33	
Soft tissue release			
None	20	25	.87
Lateral	5	5	
Medial	18	18	
Implant type			
CR	33	20	.06
PS	17	23	
Femur fixation			
Cementless	18	32	.03
Cemented	25	18	
Tibia fixation			
Cementless	3	15	<.001
Cemented	40	34	
Intraoperative ROM	123.7 ± 7.1	124.1 ± 7.3	.81

Bold values indicate statistical significance at $P < .05$.

IM, intramedullary; EM, extramedullary; CR, cruciate-retaining; PS, posterior-stabilized.

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