

Total Knee Arthroplasty in Patients With Parkinson's Disease: Impact of Early Postoperative Neurologic Intervention

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Abstract

The impact of Parkinson's disease (PD) on the outcomes of total knee arthroplasty (TKA) is not well understood. The purpose of this study was to evaluate whether early medical management of PD affects TKA outcomes.

We retrospectively reviewed the cases of 34 patients (39 knees) who had PD and underwent TKA. Patients received a preoperative/immediate-postoperative neurologic consultation (n = 13) or a delayed consultation (n = 21). Clinical outcomes and functional recovery were assessed with the Knee Society scoring system and the Unified Parkinson's Disease Rating Scale (UPDRS).

There were no significant preoperative differences between the 2 cohorts. Mean follow-up was 36 months. Compared with the delayed-consultation group, the preoperative/immediate-postoperative consultation group had a 2.5-day shorter length of stay after surgery and 19 points more improvement in Knee Society Pain and Function scores. In addition, there was statistically significant improvement in UPDRS Severity scores in the preoperative/immediate consultation group but not in the delayed-consultation group.

Early neurologic consultation in patients with PD can significantly decrease length of stay and improve early outcomes after TKA.

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Parkinson's disease (PD), one of the most common neurologic disorders in the geriatric population, has an estimated incidence of up to 1% in patients older than 65.¹ It is associated with several features, including cognitive impairment, decreased mobility, decreased bone density, and progressive ambulatory dysfunction.²⁻⁵ Medical management of PD may significantly improve symptoms and has increased the life expectancy of patients.¹

Through advances in care, patients with PD are able to live long and more active and functional lives. Consequently, they can also develop age-related musculoskeletal conditions, such as knee osteoarthritis, that may require total knee arthroplasty (TKA).⁵

Previous studies of TKA in patients with PD have focused on the difficulty of the surgery and on disease control during rehabilitation. In an early study, investigators reported postoperative disease progression and difficulty in completing necessary rehabilitation.⁶ Subsequent studies have shown that TKA can be successfully performed in this patient group.⁷⁻⁹ Because the stress of surgery and decreased postoperative mobilization have been linked to symptom worsening, early and aggressive postoperative rehabilitation is crucial to the successful recovery of these patients.^{7,10} The ability of postsurgical patients to participate in prompt rehabilitative therapy is enhanced by active perioperative medical management of their condition.^{8,11} For this reason, comprehensive neurologic consultation is recommended for the periods before and after joint replacement.⁸

Although neurologic follow-up and medical management have been repeatedly recommended for PD patients undergoing TKA, the impact of timely neurologic consultation has never been fully quantified. We conducted the present study to determine if immediate postsurgical neurologic consultation has an effect on primary TKA clinical outcomes in patients with PD.

MATERIALS AND METHODS

We retrospectively reviewed the cases of all patients with a preoperative diagnosis of PD who underwent primary TKA at one institution between January 1998 and October 2002. Thirty-four (17 male, 17 female) patients (39 knees) were included in the study. At time of TKA, mean age was 63 years (range, 54-73 years), mean body mass index (BMI) was 27.9 (range, 22.8-33.7), and mean weight was

Table I. Unified Parkinson's Disease Rating Scale

Category	Total Possible Points
Mood, mentation, behavior	16
Activities of daily living	51
Motor examination	132

178 pounds (range, 129-242 pounds). TKA was performed only on the left side in 13 patients (38%), only on the right side in 16 patients (47%), and bilaterally (and simultaneously) in 5 patients (15%). In all cases, spinal anesthesia and a cemented posterior stabilized prosthesis were used. Indications for TKA were osteoarthritis (28 patients, 82%), posttraumatic arthritis (4 patients, 12%), and avascular necrosis (2 patients, 6%). Revision TKAs were excluded from the study. There was no difference in terms of timing of surgery. All patients were mobilized on postoperative day 1. All patients received intensive physical therapy and were placed in continuous passive motion machines during their stay, starting in the recovery room. Patients were anticoagulated with either aspirin 325 mg twice a day or warfarin with a target international normalized ratio of 1.5 to 2.0 for 6 weeks. After acute hospitalization, all patients were discharged to an inpatient rehabilitation center.

The Knee Society scoring system was used to evaluate the knees.¹² Pain scores, Function scores, and range of motion (ROM) were measured at each preoperative and postoperative visit. The severity of each patient's PD symptoms was quantified with the Unified Parkinson's Disease Rating Scale (UPDRS).^{13,14} The UPDRS has 3 general categories: (1) mood, mentation, and behavior; (2) activities of daily living (ADLs); and (3) motor examination. Number of possible points ranges from 199 (complete disability) to 0 (no disability) (Table I). The UPDRS has been validated by neurologists and neurosurgeons as a preoperative and postoperative assessment tool for surgical patients with PD.¹⁵ Patients were assigned a UPDRS score for each preoperative and postoperative visit by a retrospective review of their orthopedic and neurology office notes by Dr. Mehta. By using the UPDRS scoring sheet during chart review, we were able to calculate UPDRS scores and detect

changes in symptoms and disease progression.

Patients were classified as having received an *immediate consultation* (ie, seen by a neurologist either preoperatively or on day of surgery) or a *delayed consultation* (ie, seen by a neurologist after the day of surgery or not seen by a consulting neurologist).

For the purpose of this study, Knee Society scores and UPDRS Severity scores were compared independently for each group for the preoperative and most recent follow-up visits. Statistical analysis was performed with a nonpaired *t* test to determine differences in patient demographics, length of hospital stay, Knee Society scores, and UPDRS scores using visit chronology and neurologic consultation category as independent variables. Statistical significance was set as *P*<.05.

RESULTS

Patients were divided into 2 groups: those who received an immediate consultation (IC) and those who received a delayed consultation (DC). Fourteen TKAs fell into the IC group and 25 in the DC group. Patients in the DC group initially had their PD managed by the orthopedic service in conjunction with a hospitalist or the medicine service. Of the 25 procedures in the DC group, 20 were eventually evaluated by a neurologist during their hospital stay. Mean time to consultation by a neurologist was 1.8 days. The remaining 5 (20%) were not evaluated during their hospital stay by a neurologist.

Mean follow-up for all TKAs was 36 months (range, 24-48 months). No patients were lost to follow-up. There was no statistical preoperative difference in patient age, BMI, knee pain, knee function, ROM, or disease severity (*P*>.05) between the IC and DC groups (Tables II, III).

Mean preoperative ROM was 104° (range, 10°-107°). At the latest postoperative visit, mean knee extension was 1.5° in the IC group and 1.75° in the DC group (*P* = .718). There was also no significant difference (*P* = .709) in knee flexion: 110° in the IC group, 108° in the DC group (Table II).

Mean preoperative Knee score was 32 (range, 20-45), and mean preoperative Function score was 29.5 (range, 20-50). At the latest postoperative visit, mean Knee score was 61 (range, 50-80) in the IC group and 42 (range, 30-70) in the DC group, and mean Function score was 65 (range,

Table II. Functional Knee Assessment

	All Knees	Consultation		<i>P</i>
		Immediate	Delayed	
Total knee arthroplasty	39	14	25	
Patient age (years)	63	70	65	.54
Body mass index	27.9	28.9	27.4	.765
Preoperative				
Range of motion (°)	104	103	105	.878
Knee score	32	34	31	.68
Function score	29.5	30.5	29	.72
Postoperative				
Range of motion (°)	107	108.5	106	.74
Knee score	49	61	42	.001
Function score	53	65	46	.002
Length of stay (days)	5.1	3.5	6	.001

Table III. Severity of Parkinson's Disease

	All Knees	Consultation		P
		Immediate	Delayed	
Preoperative UPDRS	63.8	67	62	.839
Postoperative UPDRS	42.2	39	44	.510
Change in UPDRS	21.6	28	18	.039
Activities of daily living	8.9	14	6	.02
Mood, mentation, behavior	7	7	7	.823
Motor examination	5.7	7	5	.420

Abbreviation: UPDRS, Unified Parkinson's Disease Rating Scale.

45-80) in the IC group and 46 (range, 35-70) in the DC group. The difference in postoperative Pain and Function scores was statistically significant (P s = .001 and .002, respectively) (Table II). Although the DC group's Knee scores improved since the preoperative assessment, this improvement was not as substantial as that experienced by patients in the IC group.

Mean post-TKA length of stay for all patients was 5.1 days. However, patients in the IC group were discharged to a rehabilitation facility 3.5 days after surgery, whereas patients in the DC group were discharged 6.0 days after surgery; the 2.5-day difference between the groups was statistically significant (P = .001).

Mean preoperative UPDRS Severity score for all patients was 63.8. There was no preoperative difference between the IC and DC groups (P = .839). At the latest postoperative visit, mean Severity score improved to 42.2. There was a statistically significant difference between the 2 groups (P = .039) with respect to change in severity from preoperative to postoperative assessment (Table III). The largest improvement was seen in ADLs, then in mood, mentation, and behavior and finally in motor examination. Mean ADL improvement was 8.9 points, followed by mood, mentation, and behavior (7 points) and motor examination (5.7 points). Of note, the only significant between-group UPDRS difference was found in ADLs. As with the Knee score, UPDRS Severity score improved in the DC group from preoperative baselines, but the improvement was not as substantial as that shown by the IC group.

DISCUSSION

Our study represents the largest series of post-TKA patients with PD.^{6,7,12} Our clinical results are comparable with those of Duffy and Trousdale⁷ and Insall and colleagues,¹² showing significant improvements in both Pain and Function scores for patients undergoing TKA. However, we noted a significant difference in outcomes based on whether patients were managed by a neurologist immediately after surgery. Patients who were managed with an immediate neurologic consultation exhibited more improvement in their Pain and Function scores than did patients who received a delayed neurologic intervention. This difference was sustained over 2 years. There was no difference in ROM.

Along with these measurable differences in Knee Society scores, we found the change in UPDRS Severity scores in

the IC group to be significantly larger than the change in the DC group. However, both groups actually showed global improvement in Severity scores, thus showing the systemic benefits of TKA in this patient population.

Improvement was seen in all 3 UPDRS categories, but the most improvement was seen in ADLs. The ADL difference between the IC and DC groups was significant, accounting for much of the UPDRS difference between the groups.

A UPDRS modification focusing on ADLs only may be a more useful measure of recovery for orthopedic procedures in patients with PD. Furthermore, this modified tool may provide a better assessment of preoperative and postoperative function in PD patients than the Knee Society scores, given the systemic nature of PD and the clear improvement that TKA provides for these patients. The elements of the Knee Society scores may not be appropriate for measuring functional recovery and outcomes in patients with systemic neurologic conditions. However, combining these scores with the UPDRS modification may help monitor outcomes of patients who have PD and are undergoing TKA.

In this study, patients who had their PD managed efficiently and aggressively by a neurologist immediately after surgery were noted to have a hospital stay that was significantly shorter (by 2.5 days) than that of patients who did not receive an immediate postoperative neurologic consultation. We attribute this shorter stay to decreased confusion and decreased severity of symptoms after surgery. Severity of PD symptoms is often increased by the stress of surgery.¹⁰

From a therapeutic standpoint, PD can be divided into 3 stages: early, nonfluctuating, and fluctuating. Although the same medications (ie, carbidopa-levodopa preparations, dopamine agonists, anticholinergic medications) are usually prescribed, their pattern of use, including frequency and dosing, varies according to the nature of the dominant symptoms and the stage of the disease. PD management requires familiarity with both the disease- and medication-related components. Optimal functional efficiency for the patient is gained through striking a delicate balance between the medication regimen and the disease-related components.¹⁶

Interventions by the neurologic consultation in our patients included, but were not limited to, changing the dosing and timing of the patient's existing PD medications, adding or deleting medication, managing narcotic admin-

istration, and offering prophylactic treatment regimens before physical therapy. It is likely that the aggressive PD management before and/or immediately after surgery led to the improved clinical results and shorter hospital stay.

Aside from 2 cases of superficial wound infections treated with hospitalization and intravenous antibiotics (1 in the IC group, 1 in the DC group) and 2 cases of aspiration pneumonia in the immediate postoperative period treated with intravenous antibiotics (both in the DC group), there were no major postoperative complications. Ten patients in the DC group and 2 patients in the IC group had episodes of confusion after surgery.

The retrospective nature of this study, with its limited control of multiple variables, was a drawback. Furthermore, neurologic assessments and UPDRS scores were ascertained in reviewing orthopedic office notes and neurologic consultation and clinic reports. UPDRS scores were calculated with the standard scoring system based on this retrospective review. Finally, the correlation between Knee Society and UPDRS scores was not easily explainable. Prospective evaluation with an emphasis on consistent, detailed evaluation of these 2 measures may provide some insight.

TKA is a viable option in patients with PD and provides a dramatic improvement in overall function. It is imperative that these patients have preoperative and immediate postoperative neurologic consultations in an effort to optimize the care that they receive while in the hospital. Optimizing these patients from a neurologic standpoint not only affects their clinical outcomes but also decreases length of stay in the hospital. However, our current outcome measures may not be valid assessment tools. Further evaluation of a modified UPDRS is warranted before its universal application in patients with PD after TKA.

AUTHORS' DISCLOSURE STATEMENT AND ACKNOWLEDGMENTS

Dr. Booth wishes to note that he is a paid consultant to Zimmer. Dr. Lotke wishes to note that he is a paid consultant

to DePuy and Stryker. Dr. Lonner wishes to note that he is a paid consultant to Zimmer and Mako Surgical. Dr. Mehta and Dr. VanKleunen report no actual or potential conflict of interest in relation to this article.

This study was performed at Pennsylvania Hospital and the Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania.

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