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Most Patients Can Kneel After Total Knee Arthroplasty

Sara J.S. Wallace, MD, MPH *, Richard A. Berger, MD

Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL

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ABSTRACT

Background: Patients commonly report difficulty kneeling after total knee arthroplasty (TKA). The purpose of this study was to retrospectively assess patients' ability to kneel after TKA and to prospectively determine whether patients with reported difficulty can be taught to kneel.

Methods: Attempts were made to reach 307 consecutive TKAs in 255 adult patients who were 18-24 months after surgery. Patients were surveyed for their ability to kneel. Those who reported difficulty kneeling were offered participation in a kneeling protocol. At the conclusion of the protocol, participants were surveyed again for their ability to kneel.

Results: Of the 307 consecutive TKAs, 288 knees (94%) answered the survey. Of them, 196 knees (68%) could kneel with minor or no difficulty without any specific training. And 77 knees (27%) reported at least some difficulty kneeling and were eligible for participation in the protocol. Pain or discomfort was the most commonly reported reason for difficulty kneeling. Of these 77 knees, 43 knees (56%) participated. Thirty-six knees (84%) completed all or most of the protocol. All patients who completed all or most of the protocol were then able to kneel, and none reported significant difficulty kneeling. On average, participants improved 1.4 levels.

Conclusion: In this cohort, 68% of knees could kneel after TKA without any specific training. Of those who had at least some difficulty kneeling, all who participated were able to kneel after a simple kneeling protocol, although 44% of eligible patients did not participate. This study suggests that kneeling should be included in postoperative TKA rehabilitation.

Patients commonly report difficulty kneeling after total knee arthroplasty (TKA) [1–4]. This is concerning, as the majority of patients list kneeling as one of the most important functional activities after TKA [4]. Little work has been done to understand kneeling after TKA. Biomechanical studies have made efforts to understand the reported difficulty in kneeling by exploring differences in patellar mechanics during kneeling in the native knee vs the prosthetic knee [5]. While there may be biomechanical differences, these differences do not necessarily preclude kneeling on the prosthetic knee. Schai et al [1] observed that patients' perceived ability to kneel after TKA may be less than their observed ability and suggest that patient misperceptions may contribute to perceived difficulty in kneeling. For this reason, in addition to the shifting paradigm encouraging the use of patient-reported outcome measures, focus should primarily be given to changing patients' perceived ability to kneel, while also potentially improving their actual ability to kneel.

Traditional rehabilitation protocols after TKA focus generally on range of motion, stretching, strengthening, and endurance exercises. Functional training programs now also include the performance of everyday activities, such as stair climbing and descending, walking, and chair stands, with the more recent inclusion of balance and movement control [6]. Still, to our knowledge, kneeling is rarely included in these protocols. We are unaware of any protocols focused on kneeling after TKA.

The purpose of this study was to retrospectively assess patients' ability to kneel after TKA and to prospectively determine whether

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Present address for Sara J.S. Wallace: Department of Orthopaedic Surgery and Rehabilitation Medicine, University of Chicago Medical Center, 5841 S. Maryland Avenue, MC 3079, Chicago, IL 60637.

* Reprint requests: Sara J.S. Wallace, MD MPH, Department of Orthopaedic Surgery, Rush University Medical Center, 1611 West Harrison Street, Suite 300, Chicago, IL 60612.

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patients with reported difficulty kneeling can be taught to kneel by implementing a simple kneeling protocol.

Materials and Methods

All TKAs were performed by a single surgeon. An anterior-based incision was used in line with the medial border of the patella and tibial tubercle. Cruciate-retaining implants were used in almost all patients, unless they did not have a competent posterior cruciate ligament, in which case a posterior-stabilized implant was used. Postoperative physical therapy was initiated immediately after surgery and continued for 6 to 9 weeks; orders did not include instruction on kneeling.

Attempts were made to reach 307 consecutive TKAs in 255 adult patients who were 18-24 months after surgery. Surgeries took place between February 2016 and July 2016. Patients were surveyed over the phone regarding their ability to kneel and were asked to choose 1 of 4 categories: no or minor difficulty, some difficulty, significant difficulty, or unable to kneel. This method of assessing kneeling ability, used in similar studies [2,7,8], was modeled off a single item regarding kneeling on the Oxford Knee Score [9], a scoring system which has been found to be a sensitive measure of outcomes after TKA. Those who reported some or significant difficulty kneeling or inability to kneel were invited to participate in an independent kneeling protocol over the following 6 weeks. Those who were unsure about their ability to kneel were encouraged to try kneeling and reassigned based on their experience when possible. Those who elected to participate received a copy of the consent form and protocol by email or by mail and were instructed to begin the kneeling protocol within a week (Table 1). The protocol is novel, as no validated kneeling protocols designed for postoperative rehabilitation were identified in the literature. It progresses from chair to floor in a similar manner as the protocol used by Hassaballa et al [10] to study actual kneeling ability. It was thought that chair kneeling would be approachable for those with other musculoskeletal limitations and progressing from softer to more firm kneeling surfaces would allow for gradual desensitization.

Patients were emailed weekly reminders about their participation in the study. After 6 weeks, patients were contacted and surveyed again regarding completion of the protocol and ability to kneel. Patients were excluded if they had a history of hip arthroplasty within the last year, delayed wound healing or infection after TKA, revision TKA, extensor mechanism injury, or fracture after TKA. Patients who had both knees replaced sequentially within the study interval were included.

A descriptive analysis was performed using the initial survey data. As patients completed the kneeling protocol, rate of completion, complications, and changes in ability to kneel were quantified.

Results

Ninety-four percentage of the TKAs performed during the study period were reached by phone and participated in the study (288 knees in 237 patients). Sixty-eight percentage could kneel with minor or no difficulty (196 knees in 163 patients; Fig. 1). Seventy-seven knees (66 patients) reported some difficulty, significant difficulty, or inability to kneel and were thus eligible for enrollment in the kneeling protocol (Fig. 1). Fifteen knees were unsure about their ability to kneel and declined when encouraged to attempt kneeling.

Of those who reported difficulty with kneeling or inability to kneel, 76% (68 knees) could kneel before TKA and 44% (37 knees) had prior surgery on the knee. The overwhelming majority expressed a desire to be able to kneel (77 knees, 84%). Reasons provided for difficulty kneeling included pain (37 knees), discomfort (15 knees), fear of damaging the implant (11 knees), stiffness (10 knees), sensitivity of the skin/scar (9 knees), and recollection of having been told not to kneel (3 knees). For 7 knees, no reason was given for difficulty with kneeling or for not kneeling.

Of the 77 knees (66 patients) who were offered enrollment in the kneeling protocol, 56% (43 knees in 38 patients) elected to participate. Eighty-four percentage of knees (36 knees in 31 patients) completed or attempted to complete the protocol. Reasons for not completing the protocol included lack of time, illness, and pain elsewhere in the body. No patients cited difficulty with kneeling as the reason for not completing the protocol. No complications were reported during participation in the protocol.

Eighty-one percentage of knees (29 knees) who completed all or most of the protocol could kneel with minor or no difficulty (Fig. 2). Of the remaining 19% (7 knees), all could kneel with only some difficulty. No knees who participated were unable to kneel at the conclusion of the protocol, and none reported significant difficulty kneeling. On average, participants improved 1.4 levels (range, 0-3 level improvement).

Discussion

In our experience, while most patients participate in a structured physical therapy program after TKA, kneeling is generally not addressed. This study is consistent with prior studies [4] in that it suggests that most patients want to be able to kneel after TKA. This study also suggests that while the most patients can kneel after TKA without specific training, a significant percentage of patients may have difficulty doing so. In this study, 27% of patients reported at least some difficulty kneeling, a significant yet more modest figure than in other similar studies [1–3,7,10]. This raises a question as to why kneeling has commonly been left out of postoperative rehabilitation protocols. One prior study was identified which used a "*one-off* 30-minute physical therapy intervention designed to provide verbal and written information on kneeling" with similar improvement in patients' perceived ability to kneel as compared to this study, although the study involved only partial knee

Table 1
Kneeling Protocol.

Week 1	Kneel 10 min a day on the couch.
Week 2	Kneel 10 min a day on a couch cushion on the floor.
Week 3	Kneel 10 min a day on a thin pillow on the floor or on thick carpet.
Week 4	Kneel 10 min a day on a thin carpet or rug.
Week 5	Kneel on the floor or on the ground outside.
Week 6	We will call you to see how you are doing.

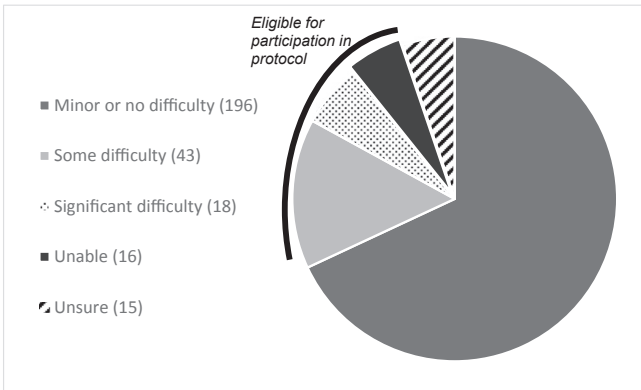

Fig. 1. Reported kneeling ability 18-24 months after total knee arthroplasty.

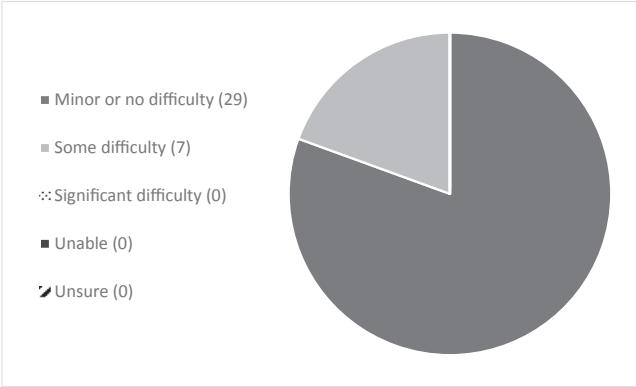

Fig. 2. Reported kneeling ability after completion of a 6-week kneeling protocol.

arthroplasties and no specific kneeling protocol was included [8]. This study is the first to our knowledge to suggest that kneeling ability after TKA can be improved with a simple kneeling protocol.

While other studies have compared patients' perceived ability to kneel to their actual observed ability to kneel [1,10], it is the opinion of the authors that the patient's perception of their abilities is more relevant than the observer's. If a patient has significant pain while kneeling, for example, one might argue that this should not be considered a functional outcome.

While this study used a simple and intuitive protocol, the protocol has not been validated in larger and more diverse groups of patients. Further work should be done to determine whether this kneeling protocol is successful in other patient populations or to determine the most effective protocol (and timing) for teaching patients to kneel after TKA. It may not be advisable for patients to kneel on the incision within the first several weeks postoperatively as the incision heals. As patients are finishing their postoperative therapy and the incision is healed, as suggested in the study by Jenkins et al [8], there may be an opportunity to teach patients about kneeling and reassure patients that kneeling is generally possible over time. Future studies should assess whether an active kneeling protocol or education alone is more effective in improving patients' perceived ability to kneel. Further analysis of the population of patients who are unsure of their ability to kneel or who decline participation in a kneeling protocol may also be revealing.

All TKAs included in this study were performed by a single surgeon, and thus most had similar implants, incision placement, preoperative teaching, and postoperative management. Although we do not suggest that these factors contribute to kneeling ability, other studies should be done to determine which factors may contribute to successful kneeling in most patients but difficulty in others.

The study is also limited in that results were obtained by survey, thus introducing response bias. One other limitation of this study is the potential for participation bias. The inclusion of a comparison group in future studies could reduce the potential for bias. Furthermore, future research might incorporate a physical assessment of kneeling capacity before, during, and after the protocol. Patients' perception of their ability to kneel and their physical ability to kneel are likely closely linked, and it is unclear whether perception or ability is the limiting factor in kneeling after TKA. Although it is unclear whether this program influenced patients' perception or their physical ability, the improved functional result remains the same.

Conclusions

In this cohort, 68% of knees could kneel after TKA without any specific training. Of those who had at least some difficulty kneeling, pain in the knee was the most common reason. Of these patients, 81% could kneel with a simple home program. This study concludes that many, if not most, patients can be taught to kneel with a relatively simple protocol. It follows that kneeling should be taught as part of the postoperative rehabilitation process. Further research should be done to determine the most effective kneeling protocol.

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