

# Return to Activities After Patellofemoral Arthroplasty

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## Abstract

Patellofemoral arthroplasty (PFA) is used to treat isolated patellofemoral arthritis, but little is known about post-PFA activity levels and functional outcome scores.

We reviewed 48 consecutive cases (39 patients) of PFAs performed between 2009 and 2014. Three validated patient-reported outcome measures (Kujala score, Lysholm score, International Knee Documentation Committee score) were used to evaluate knee function before and after surgery.

Patient-reported outcome measures were significantly improved after surgery. Return to previous preferred activity was reported by 72.2% of patients, and 52.8% of patients reported returning to the same activity level or to a higher level.

Historically, the literature evaluating knee arthroplasty outcomes has focused on implant survivorship, pain relief, and patient satisfaction. Our findings show that patients who undergo PFA have a high rate of return to their preferred activities. These findings can be used to inform patients who want to remain active after PFA.

Compared with total knee arthroplasty (TKA), single-compartment knee arthroplasty may provide better physiologic function, faster recovery, and higher rates of return to activities in patients with unicompartmental knee disease.<sup>1-3</sup> In 1955, McKeever<sup>4</sup> introduced patellar arthroplasty for surgical management of isolated patellofemoral arthritis. In 1979, Lubinus<sup>5</sup> improved on the technique

and design by adding a femoral component. Since then, implants and techniques have been developed to effect better clinical outcomes. Patellofemoral arthroplasty (PFA) has many advantages over TKA in the treatment of patellofemoral arthritis. PFA is less invasive, requires shorter tourniquet times, has faster recovery, and spares the tibiofemoral compartment, leaving more native bone for potential conversion to TKA. Regarding activity and function, the resurfacing arthroplasty (vs TKA) allows maintenance of nearly normal knee kinematics.

Despite these advantages, the broader orthopedic surgery community has only cautiously accepted PFA. The procedure has high complication rates. Persistent instability, malalignment, wear, impingement, and tibiofemoral arthritis progression can occur after PFA.<sup>6</sup> Although first-generation PFA prostheses often failed because of mechanical problems, loosening, maltracking, or instability,<sup>7</sup> the most common indication for PFA revision has been, according to a recent large retrospective study,<sup>8</sup> unexplained pain. More than 10 to 15 years after PFA, tibiofemoral arthritis may be the primary mechanism of failure.<sup>9</sup> Nevertheless, compared with standard TKA for isolated patellofemoral arthritis, modern PFA does not have significantly different clinical outcomes, including complication and revision rates.<sup>6</sup>

Numerous patient factors influence functional prognosis before and after knee arthroplasty, regardless of surgical technique and

## Take-Home Points

- PFA improved knee function and pain scores in patients with isolated patellofemoral arthritis.
- The majority (84.2%) of patients undergoing PFA were female.
- Regardless of age or gender, 72.2% of patients returned to their desired preoperative activity after PFA, and 52.8% returned at the same or higher level.
- The rate of conversion from PFA to TKA was 6.3%.
- PFA is an alternative to TKA in active patients with isolated patellofemoral arthritis.

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Table 1. Patient Characteristics

Characteristic	Mean	SD	Range
Age at surgery, y	51.6	10.3	32.9-73.3
Body mass index, kg/m <sup>2</sup>	26.3	6.3	18.1-42.3
	n	%	
Body mass index			
<30 kg/m <sup>2</sup>	25	71.4	
≥30 kg/m <sup>2</sup>	10	28.6	
Sex			
Male	6	15.8	
Female	32	84.2	
Diagnosis			
Primary osteoarthritis	36	76.6	
Posttraumatic arthritis (instability)	11	23.4	

implant used. Age, comorbidities, athletic status, mental health, pain, functional limitations, excessive caution, “artificial joint”-related worries, and rehabilitation protocol all influence function.<sup>10</sup> Return to activity and other quality-of-life indices are important aspects of postoperative patient satisfaction.

## Methods

We conducted a retrospective cohort study to describe functional status after PFA for patellofemoral arthritis. We identified 48 consecutive PFAs (39 patients) performed by a team of 2 orthopedic surgeons (specialists in treating patellofemoral pathology) between 2009 and 2014.

Three validated patient-reported outcome measures (PROMs) were used to determine preoperative (baseline) and postoperative functional status: Kujala score, Lysholm score, and International Knee Documentation Committee (IKDC) score. The Kujala score is a measure of knee function specific to the patellofemoral joint; the Lysholm score focuses on activities related to the knee; and the IKDC score is a general measure of knee function. Charts were reviewed to extract patients’ clinical data, including preoperative outcome scores, medical history, physical examination data, intraoperative characteristics, and postoperative course. By telephone, patients answered questions about their postoperative clinical course and completed final follow-up questionnaires. They were also asked which sporting or fitness activity they had preferred before surgery and whether they were able to return to that activity after surgery.

Statistical analysis included the study population’s descriptive statistics. Means and SDs were reported for continuous variables, and frequencies

and percentages were reported for categorical variables. Paired *t* tests were used to analyze changes in PROM scores. For comparison of differences between characteristics of patients who did and did not return to their previous activity level, independent-samples *t* tests were used for continuous variables. Chi-square tests or Fisher exact tests were used to compare discrete variables. Statistical significance was set at  $P \leq .05$ . All analyses were performed with SPSS Version 22.0 (IBM).

## Results

Thirty-nine patients underwent PFA at our institution between 2009 and 2014. Mean age was 51.6 years. Of these patients, 84.2% were female, 28.6% had a body mass index of 30 kg/m<sup>2</sup> or higher, and 23.4% had PFA for posttraumatic arthritis related to prior patellofemoral instability. **Table 1** lists the study cohort’s demographic data.

**Table 2** lists self-reported activities limited by the affected knee before surgery, and **Table 3** lists activity levels after surgery. Return to previous preferred activity was reported by 72.2% of patients, and 52.8% of patients reported returning to the same activity level or to a higher level. There were no differences in age ( $P = .978$ ) or sex ( $P = .232$ ) between patients who returned to the same or a higher activity level and patients who did not. However, mean BMI was significantly ( $P = .016$ ) higher in patients who returned to the same or a higher activity level (28.6 kg/m<sup>2</sup>) than in patients who did not (23.7 kg/m<sup>2</sup>). Although the rate of posttraumatic arthritis (26%) was higher than the rate of primary osteoarthritis (19%) in patients who returned to the same or a higher activity level, this difference was not statistically significant ( $P = .724$ ).

Postoperative knee-specific PROM scores and general pain score (reported by the patient on a scale of 0-10) were statistically significantly improved ( $P < .001$  for all measures) over preoperative scores (**Table 4**). Mean follow-up was 26 months (range, 5-57 months). Kujala score improved a mean of 19.5 points; Lysholm score, 28.9 points; and IKDC score, 23.5 points. Mean general pain score improved from 6.3 before surgery to 2.8 after surgery. All PROM and pain score improvements were substantially larger than the minimal clinically important differences. Postoperative PROM scores and general pain score were significantly more improved in patients who returned to the same or a higher activity level than in patients who did not ( $P < .05$  for all measures).

After surgery, 1 patient (2.6%) developed a



pulmonary embolus, which was successfully identified and treated without incident. Five patients (10.4%) had another surgery on the same knee. Three patients (6.3%) underwent conversion to TKA: 1 for continued symptoms in the setting of newly diagnosed inflammatory arthritis, 1 for arthritic pain, and 1 for patellofemoral instability. Two patients (4.2%) underwent irrigation and débridement: 1 for hematoma and 1 for suspected (culture-negative) infection.

**Discussion**

Historically, the literature evaluating knee arthroplasty outcomes has focused on implant survivorship, pain relief, and patient satisfaction. Since the advent of partial knee arthroplasty options, more attention has been given to functional outcomes and return to activities after single-compartment knee resurfacing. TKA remains the gold standard by which newer, less invasive surgical options are measured. In a large prospective study, 97% of patients (age, >55 years) who had TKA for patellofemoral arthritis reported *good* or *excellent* clinical results, the majority being *excellent*.<sup>11</sup> Post-TKA functional status and activity levels may not be rated as highly. After TKA, many patients switch to lower impact sports or reduce or stop their participation in sports.<sup>12</sup> A small study of competitive adult tennis players found high levels of post-TKA satisfaction, ability to resume playing tennis, pain relief, and increased or continued enjoyment in playing.<sup>13</sup> In a study of 355 patients (417 knees) who had undergone TKA, improvement in Knee Society function score showed a moderate correlation to an increase in weighted activity score ( $R = 0.362$ ).<sup>14</sup>

Unicondylar knee arthroplasty (UKA) is becoming a popular treatment option for single-compartment tibiofemoral arthritis. A systematic review of 18 original studies of patients with knee osteoarthritis found that overall return to sports varied from 36% to 89% after TKA and from 75% to 100% after UKA.<sup>15</sup> In another study, return-to-sports rates were similar for UKA (87%) and TKA (83%); the only significant difference was UKA patients returned quicker.<sup>16</sup> The authors of a large meta-analysis conceded that significant heterogeneity of data prevented them from drawing definitive conclusions, but UKA patients seemed to return to low- and high-impact sports 2 weeks faster than their TKA counterparts.<sup>10</sup> Overall, UKA and TKA patients (age, 51-71 years) had comparable return-to-sports rates at an average of 4 years after surgery.<sup>10</sup> A smaller study corroborated faster

**Table 2. Question: “What Did Your Knee Limit You From Doing Before Surgery?”**

Answer	n	%	Valid %
No answer	5	12.8	12.8
Activities of daily living, “I couldn’t do anything”	1	2.6	2.6
Aerobic exercise, golf	1	2.6	2.6
Daily activities	1	2.6	2.6
Everything	3	7.7	7.7
Everything past walking	1	2.6	2.6
Everything, progressively worsened over time	1	2.6	2.6
Exercising, running	1	2.6	2.6
Hiking, boxing	1	2.6	2.6
Riding a bicycle, playing tennis, skiing, running	1	2.6	2.6
Riding horses	1	2.6	2.6
Running	1	2.6	2.6
Running, squatting	1	2.6	2.6
Running, stairs, walking	1	2.6	2.6
Running, stairs, walking, dance	1	2.6	2.6
Sitting, walking, stairs	1	2.6	2.6
Skiing, running	1	2.6	2.6
Sleeping, daily activity	1	2.6	2.6
Squatting	1	2.6	2.6
Stairs	3	7.7	7.7
Stairs, biking, running	1	2.6	2.6
Stairs, running	2	5.1	5.1
Stairs, walking	1	2.6	2.6
Tennis	1	2.6	2.6
Walking	2	5.1	5.1
Walking, running	1	2.6	2.6
Walking, squatting	1	2.6	2.6
Walking, stairs	1	2.6	2.6
Walking, standing for long periods of time	1	2.6	2.6
Total	39	100	100

return to sports for UKA over TKA patients and also found that, compared with TKA patients, UKA patients participated in sports more regularly and over a longer period.<sup>17</sup> On the other hand, Walton and colleagues<sup>18</sup> found similar return-to-sports

rates but higher frequency of and satisfaction with sports participation in UKA over TKA patients.

A large retrospective study found no differences in rates of return to sports after TKA, UKA, patellar resurfacing, hip resurfacing, and total hip arthroplasty.<sup>19</sup> Pain was the most common barrier to return. UKA patients who returned to sports tended to be younger than those who did not.<sup>20</sup> Naal and colleagues<sup>3</sup> found that 95% of UKA patients returned to their activities—hiking, walking, cycling, and swimming being most common. Although 90.3% of patients said surgery maintained or improved their ability to participate in sports, participation in high-impact sports (eg, running) decreased after surgery.

Outcomes of PFA vary because of evolving patient selection, implant design, surgical technique, and return-to-activity expectations.<sup>21,22</sup> Most PFA outcome studies focus on implant survivorship, complication rates, and postoperative knee scores.<sup>23-28</sup> PFA studies focused on return to activities are limited. Kooijman and colleagues<sup>7</sup> and

Mertl and colleagues<sup>29</sup> reported *good* or *excellent* clinical results of PFA in 86% and 82% of patients, respectively. Neither study included a comprehensive analysis of postoperative functional status. Similarly, De Cloedt and colleagues<sup>30</sup> reported *good* PFA outcomes in 43% of patients with degenerative joint disease and in 83% of patients with instability. Specific activity status was not described. Dahm and colleagues<sup>31</sup> and Farr and colleagues<sup>32</sup> suggested postoperative pain resolution motivates some PFA patients not only to resume preoperative activities but to start participating in new, higher level activities after pain has subsided. However, the studies did not examine the characteristics of patients who returned to baseline activities and did not examine return-to-sports rates.

### Study Strengths and Limitations

Our study focused on the PFA patient population of a surgical team of 2 fellowship-trained orthopedic surgeons (specialists in treating patellofemoral pathology). Although generalization of our findings to other surgeons and different implants may be limited, the study design standardized treatment in a way that makes these findings more reliable. The 100% follow-up strengthens these findings as well. Last, though the patient population was relatively small, it was consistent with or larger than the PFA patient groups studied previously.

### Conclusion

In this study, PROM and pain scores were significantly improved after PFA. That almost 75%

**Table 3. Question: “Did You Return to Your Preferred Activity After Surgery?”**

Answer	n	%	Valid %
No	36	10	27.80
Yes			
Lower level	36	7	19.40
Same level	36	8	22.20
Higher level	36	11	30.60

**Table 4. Preoperative and Postoperative Patient-Reported Outcome Measures and Pain Scores**

PROM	n	Mean	SD	95% CI	P <	MCID
Kujala						
Pre	38	51.3	18.3	45.3-57.3	.001	7.0-14.0
Post	38	70.8	16.2	65.8-75.7		
Lysholm						
Pre	38	44.8	17.8	39.0-50.7	.001	10.1
Post	38	73.7	14.7	69.2-78.3		
IKDC						
Pre	36	36.5	15.5	31.3-41.8	.001	3.19-16.7
Post	36	60.0	19.1	54.0-66.0		
Pain						
Pre	38	6.3	2.9	5.3-7.2	.001	35% reduction = minimal 67% reduction = moderate
Post	38	2.8	2.7	2.0-3.6		

Abbreviations: CI, confidence interval; IKDC, International Knee Documentation Committee; MCID, minimal clinically important difference; PROM, patient-reported outcome measure; SD, standard deviation.

of patients returned to their preferred activities and >50% of patients returned at the same or a higher activity level provides useful information for preoperative discussions with patients who want to remain active after PFA. Prospective studies are needed to evaluate the longevity and durability of PFA, particularly in active patients.

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