

# Good clinical outcomes of patellofemoral arthroplasty for isolated patellofemoral osteoarthritis: a case-matched cohort comparative study of PFA with TKA

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## Research article

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# Abstract

**Background:** Severe isolated patellofemoral osteoarthritis is usually treated by total knee arthroplasty (TKA) in the majority of the world but patellofemoral arthroplasty (PFA) has been a viable alternative for many years although there have been concerns about implant longevity. The purpose of this research was to compare the clinical outcome of patients with isolated patellofemoral osteoarthritis who received PFA or TKA.

**Methods:** From January 2015 to December 2017, 42 patients with isolated patellofemoral osteoarthritis who received PFA were included in the PFA group. In this period, a matched cohort of 42 patients with isolated patellofemoral osteoarthritis who received TKA (TKA group) was chosen for comparison. The results of the two groups were compared before surgery and at last follow-up using Tegner Activity Scale, Range of motion of the knee, Oxford Knee Score and Short Form 36 Health Survey. Differences were considered statistically significant at  $p < 0.05$ .

**Results:** The mean follow-up time was  $3.5 \pm 0.3$  and  $3.4 \pm 0.3$  years in the PFA and TKA groups ( $p = 0.13$ ), respectively. No significant difference in preoperative knee scores were found between the two groups ( $p > 0.05$ ). However, postoperative, compared with Tegner Activity Scale, Range of motion, Oxford Knee Score and Short Form 36 Health Survey, the PFA group performed significantly better results ( $p < 0.05$ ). The Kaplan-Meier implant survivorship with 95% confidence intervals was 94.12 % in the PFA group and 94.74% in the TKA group ( $p = 0.49$ ).

**Conclusions:** The patients with isolated patellofemoral osteoarthritis who underwent PFA had shown better clinical outcomes and higher quality of life. We believed that for the treatment of isolated patellofemoral osteoarthritis, the PFA was a less invasive procedure with improved patient satisfaction and range of motion at medium term follow-up.

## Background

The typical characteristics of isolated patellofemoral osteoarthritis (PFOA) are anterior knee pain, stiffness and impaired function [1]. Epidemiological studies have shown that about 10% of people over 40 years old are affected by the PFOA [2]. Isolated degeneration of the patellofemoral joint was also reported in 11% of men and 24% of women over 55 years of age with symptoms of knee arthritis [3]. These patients are usually younger, more active and have higher knee requirements [4]. The wear of end-stage PFOA often involving femoral trochlea, patellar facet, or both. The pathological factors of patellofemoral articular degeneration are various, besides the joint diseases related to aging and trauma, trochlear dysplasia is also an inducing factor [5]. In addition, femoral anteversion and patellar instability also aggravate the progress of PFOA [6]. However, the treatment for isolated PFOA is still controversial and challenging, especially in relatively younger patients.

Autogenous chondrocyte implantation, bone and/or soft tissue reconstruction, tibial tubercle osteotomy, and other operations may alleviate early symptoms and delay the progress of the disease, but in the long

run, the situation is worrying [7]. Therefore, especially in the end-stage of isolated PFOA, the main surgical intervention is arthroplasty [8]. For the treatment of isolated PFOA, the selection of patellofemoral arthroplasty (PFA) or total knee arthroplasty (TKA) is still controversial. More than 85% of TKA patients will get good postoperative results, but their satisfaction is not always as expected [9]. In contrast, the PFA can retain the intact tibiofemoral bone, and compared with the failed TKA, it allows faster recovery and simpler revision [10]. With the development of more and more anatomical PFA prosthesis designs, it can achieve better clinical results, higher patients satisfaction and prosthesis survival rate [11]. In the past four years, the second generation Zimmer gender PFA has been the most widely used patellofemoral prosthesis in Australia, with a 3-year cumulative revision rate of 5.3% [12]. As obesity and exercise-related injuries are expected to increase, more and more patients will need knee arthroplasty. For the treatment of isolated PFOA, the choice between PFA and TKA is still challenging for surgeons, because of the balance of the potential benefits of PFA with the concern of higher revision rates.

Therefore, the purpose of this comparison research is to compare the clinical outcomes and quality of life of patients between PFA and TKA groups. It is assumed that patients with isolated PFOA who received PFA had better postoperative results than patients with isolated PFOA who received TKA.

## Methods

Institutional Review Board Approval was obtained before the study commenced. From January 2015 to December 2017, 42 patients with isolated PFOA who received PFA were included in PFA group. Matching at a 1:1 ratio based on age, sex, body mass index (BMI), follow-up time, we selected 42 patients with isolated PFOA who received TKA (TKA group) for comparison. Radiologically, the patellofemoral joint had to bone-on-bone contact on a skyline view and the tibiofemoral joint had to preserve joint lines on a positive weight-bearing view of the knee (Figure.1). Intraoperative findings of significant tibiofemoral osteoarthritis resulted in exclusion from the study [13]. During the last follow up, radiographs were taken to assess the tibiofemoral osteoarthritis progression or implant loosening. Evaluation of trochlear dysplasia by Dejour classification [14]. All operations were performed in our center by the same senior orthopaedic surgeon using the same surgical techniques.

## Surgical technique

In both groups, as described by Odgaard et al [15], the PFA was performed through a standard medial parapatellar approach. But, in our study, the patella were not replaced, instead the patellar surface was only reshaped to fit the prosthesis. All PFA prostheses used the Zimmer Gender Solutions PFA (onlay, Zimmer Inc, Warsaw, IN, USA) and all the TKA prosthesis used the cruciate-retaining mobile bearing implant (LINK, Germany, Gemini MK II). All patients received the same postoperative pain control and rehabilitation programs.

## Outcome evaluation

Assessments were performed by a senior orthopaedic surgeon who was not part of the initial operating team for the PFA or the TKA. All patients were required to use the Tegner activity scale (TAS) to define their activity level before and at the last follow-up [16]. TAS assesses activities in daily life, entertainment and competitive sports at a scale of 0 to 10. Range of motion (ROM) of the knee was evaluated by goniometer.

The Oxford Knee Score (OKS) was assessed before surgery and at last follow-up. The OKS provides a brief and accurate scale for the self-assessment of preoperative and postoperative knee function outcomes. This system includes 12 questions that assess patient movement and pain, with a maximum score of 48 (for every question, 0 was the worst and 4 was the best).

The Short Form 36 Health Survey (SF-36) was assessed before surgery and at last follow-up. The SF-36 was evaluated for subjective patients' outcome [17]. SF-36 is a common questionnaire for patients to report, which is used to investigate QOL related to health. It has two summary scores, physical component summary (PCS) and mental component summary (MCS), and ranges from 0 to 100 points. High SF-36 scores denote good health, on the contrary, low scores represent a poor health status of the respondent.

## Statistical analysis

Normality of continuous variables were checked with Shapiro-Wilks test. If the data were normally distributed, the two groups were compared using student t-test; on the contrary, a non-parametric test was selected. Categorical variables were checked with chi-square test or Fisher's exact test. The data were analyzed with SPSS 19.0 (SPSS, Chicago, Illinois, USA). Differences were considered statistically significant at  $p < 0.05$ . Implant survivorship was estimated using the Kaplan-Meier method with 95% confidence intervals (CI).

## Results

No statistically significant differences were found between the PFA and TKA groups by the presence/absence of trochlear dysplasia ( $p = 0.48$ ) (Table 1). There were no statistically differences in regard to age ( $p = 0.48$ ), gender ( $p = 0.81$ ), BMI ( $p = 0.36$ ), and the mean follow-up time was  $3.5 \pm 0.3$  and  $3.4 \pm 0.3$  years ( $p = 0.13$ ) between the two groups (Table 2).

In the two groups, no differences were found in the median TAS, ROM and OKS scores before surgery. However, at the last follow-up, the median TAS of PFA patients was significantly higher ( $p = 0.03$ ) than TKA patients. The mean ROM of PFA group ( $117.2^\circ \pm 10.3$ ) at the last follow-up was significantly better than the TKA group, ( $108.7^\circ \pm 14.2$ ,  $p = 0.02$ )

The mean OKS score was statistically significantly better in the PFA ( $39.4 \pm 3.1$ ) than the TKA group ( $36.9 \pm 3.4$ ,  $p = 0.04$ ) at the last follow-up, although this does not exceed the minimal clinically important difference for the OKS of 3 points. In the PFA group, the SF-36 results showed that both the physical

component score ( $33.6 \pm 11$ ,  $34.1 \pm 10$ ,  $p = 0.03$ ) and mental component score ( $52.6 \pm 8.3$ ,  $48.1 \pm 16.2$ ,  $p = 0.02$ ) achieved better results than in the TKA group (Table 3).

The postoperative complications between the two groups are listed in Table 4. In the PFA group, 1 patient underwent revision because of persistent anterior knee pain. In the TKA group, one patient underwent revision because of periprosthetic fracture, and three patients had persistent anterior knee pain (2.4 % vs 7.1 %,  $p = 0.64$ ), but no revision was performed. During the last follow-up, excluding revision patients, no clinical or radiological signs of prosthetic loosening were found in the PFA group (Figure. 2). At 4 years, due to any cause, keeping revision as an endpoint, the Kaplan-Meier implant survivorship with 95% confidence intervals was 94.12 % in the PFA group and 94.74% in the TKA group, there was no notable difference between the two groups ( $p = 0.49$ ) (Figure 3).

## Discussion

The most important finding of this research was that the patients with isolated PFOA who received PFA achieved better clinical outcomes and higher quality of life than patients with isolated PFOA who received TKA. As far as we know, few studies compared the two procedures of patient reported outcomes and quality of life.

In this study, our primary indications for PFA surgery were based on clinical symptoms, examination findings, and radiographic evidence of isolated PFOA. Great strength is transmitted through the patellofemoral joint, especially the anterior knee pain when going down stairs or downhill, which is a key symptom [18]. Anterior knee pain is closely related to isolated PFOA when it is the main appeal [19]. The positive results of patellar grind test and patellar facet pain all support the diagnosis. Radiographic evidence of PFOA with well maintained tibiofemoral components is a key indicator. Patients diagnosed with trochlear dysplasia had the best results after PFA surgery [20]. An excellent scholar [21] proposed that those with trochlear dysplasia or patellar fracture may be more suitable candidates for PFA, with less chance for progression of tibiofemoral arthritis. In our study, most of the patients in each group showed patellar alta and trochlear dysplasia on preoperative radiographic imaging. These two conditions were common in patients with patellar instability, which might aggravate the development of PFOA. In the present study, these patients achieved better clinical results and higher quality of life after surgery compared with patients who received TKA.

Although PFA has existed for 30 years, it is still controversial because of the high failure rate in the early design of trochlear prosthesis [22]. The improved second generation of PFA, such as Zimmer PFA [12], which achieved better clinical results and higher prosthesis survival. We found that the new implant jigs developed for this prosthesis was easy to use, accurate and reproducible. No complications related to the design of the prosthesis occurred in the trochlear or patellar side. In general, early failure of all PFA implants is related to patellar instability or patellar maltracking, while long-term failure is related to the progression of tibiofemoral OA [23]. Errors in surgical techniques are also one of the causes of early failure in PFA [24]. The similar results can be found in our study. However, in all of the PFA revisions, the

conversion was very simple and was performed using non-stemmed TKA implant. For the second generation of PFA implants, other authors have noted the ease of conversion to TKA [25, 26].

Although the survivorship and postoperative results of the current second-generation prosthesis have made great progress, some scholars still believe that TKA is suitable for isolated PFOA. Lonner et al. [27] followed an average of 7.9 years of 32 TKAs in patients under 40 years or younger, and showed that 91% of patients achieved excellent objective results. Vasta et al. [28] showed that the survivorship of TKA for isolated PFOA is 99.5% at a mean follow-up of 42.7 months. However, in terms of the Knee Society Score, 50% of the patients achieved poor functional results. In addition, 52% of TKA patients reported limited functional activity (playing tennis, carrying loads, turning, lateral movement), while only 22% of the age-matched patients felt knee comfort [29]. For the treatment of isolated PFOA, up to 7–19% of patients reported residual anterior knee pain [30]. Engh [31] studied the impairment of knee ligament balance, stability, and kinematics of the knee at the sacrificing of anterior cruciate ligament in TKA. Most published studies suggest that patients who received PFA are younger, and TKA may not be a good choice [32]. In addition, PFA can conserve bone, preserve the tibiofemoral joint, meniscus and ligament, and the postoperative rehabilitation time is shorter, thus improving the knee joint kinematics [33, 34].

Leadbetter et al. [35] made gait analysis in PFA showed that the correction of preoperative pathological pattern was close to the normal knee kinematics, and the improvement was slightly better than TKA. Ackroyd et al. [36] followed 306 PFA for 5 years, the survival rate of the prosthesis was 96.4%, and the clinical score was significantly improved. Leadbetter et al. [37] showed in a multicenter study that 84% of the patients receiving PFA had excellent results, and 90% of them without pain. Another study showed that the incidence of anterior knee pain is 19% in patients with isolated PFOA who received TKA [38]. The similar results can be found in our study as well. In our study, the patients with isolated PFOA who received PFA achieved significantly better results in TAS, ROM, OKS and SF-36 scores. These might contribute to the patient's higher willingness and motivation in the rehabilitation process, which could lead to excellent clinical results observed in present study.

One of the limitations of this research is the relatively small sample size and retrospective design. Another limitation is that only short-term to medium-term follow-up can be conducted now, and further follow-up of patients is needed to prove the long-term advantages of PFA. With the lapse of time, the progression of arthritis in the rest of the joint may result in impaired outcomes.

## **Conclusion**

The patients with isolated PFOA who underwent PFA had shown better clinical outcomes and higher quality of life. We believed that for the treatment of isolated PFOA, PFA was a less invasive procedure with improved patient satisfaction and range of motion at medium term follow-up.

## **Declarations**

## **Ethics approval and consent to participate**

This study was approved by the Third Hospital of Hebei Medical University and followed the Declaration of Helsinki. Written informed consent was obtained from all the patients.

## **Consent for publication**

Not applicable

## **Availability of data and material**

The detailed data and materials of this study are available from the corresponding author via e-mail on reasonable request.

## **Competing interests**

The authors declare that they have no competing interests.

## **Funding**

Not applicable.

## **Authors' contributions**

FW designed the study. WL, JC, and YKD performed the experimental work. JHN, CYF, and WL evaluated the data. WL wrote the manuscript. All authors read and approved the final manuscript.

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## **Abbreviations**

TKA, total knee arthroplasty; PFA, patellofemoral arthroplasty; PFOA, patellofemoral osteoarthritis; TAS, Tegner activity scale; ROM, Range of motion; OKS, Oxford Knee Score; SF-36, Short Form 36 Health Survey.

## **References**

1. Duncan R, Peat G, Thomas E, Wood L, Hay E, Croft P. Does isolated patellofemoral osteoarthritis matter? *Osteoarthritis Cartilage*. 2009, 17:1151–1155.
2. Davies AP, Vince AS, Shepstone L, Donell ST, Glasgow MM. The radiologic prevalence of patellofemoral osteoarthritis. *Clin Orthop Relat Res*. 2002, 402:206-12.

3. Walker T, Perkinson B, Mihalko WM. Patellofemoral arthroplasty: the other unicompartmental knee replacement. *J Bone Joint Surg Am.* 2012, 94(18):1712-1720.
4. Dahm DL, Al-Rayashi W, Dajani K, Shah JP, Levy BA, Stuart MJ. Patellofemoral arthroplasty versus total knee arthroplasty in patients with isolated patellofemoral osteoarthritis. *Am J Orthop.* 2010, 39(10):487-91.
5. Kamikovski I, Dobransky J, Dervin GF. The Clinical Outcome of Patellofemoral Arthroplasty Vs Total Knee Arthroplasty in Patients Younger Than 55 Years. *J Arthroplasty.* 2019, 34(12):2914-2917.
6. Post WR, Teitge R, Amis A. Patellofemoral malalignment: looking beyond the viewbox. *Clin Sports Med.* 2002, 21(3):521-46,x.
7. Mihalko WM, Boachie-Adjei Y, Spang JT, Fulkerson JP, Arendt EA, Saleh KJ. Controversies and techniques in the surgical management of patellofemoral arthritis. *Instr Course Lect.* 2008, 57:365-80.
8. Gupta RR, Zywiell MG, Leadbetter WB, Bonutti P, Mont MA. Scientific evidence for the use of modern patellofemoral arthroplasty. *Expert Rev Med Devices.* 2010, 7 (1):51-66.
9. Noble PC, Conditt MA, Cook KF, Mathis KB. The John Insall Award: patient expectations affect satisfaction with total knee arthroplasty. *Clin Orthop Relat Res.* 2006, 452:35-43.
10. Lonner JH. Patellofemoral arthroplasty. *The Journal of the American Academy of Orthopaedic Surgeons.* 2007, 15(8):495-506.
11. Morris MJ, Lombardi Jr AV, Berend KR, Hurst JM, Adams JB. Clinical results of patellofemoral arthroplasty. *J Arthroplasty.* 2013, 28:199e201.
12. Osarumwense D, Syed F, Nzeako O, Akilapa S, Zubair O, Waite J. Patellofemoral Joint Arthroplasty: Early Results and Functional Outcome of the Zimmer Gender Solutions Patello-Femoral Joint System. *Clin Orthop Surg.* 2017, 9(3):295-302.
13. Fredborg C, Odgaard A, Sørensen J. Patellofemoral arthroplasty is cheaper and more effective in the short term than total knee arthroplasty for isolated patellofemoral osteoarthritis: cost-effectiveness analysis based on a randomized trial. *Bone Joint J.* 2020, 102-B(4):449-457.
14. Tecklenburg K, Dejour D, Hoser C, Fink C. Bony and cartilaginous anatomy of the patellofemoral joint. *Knee Surg Sports Traumatol Arthrosc.* 2006, 14(3):235-240.
15. Odgaard A, Madsen F, Kristensen PW, Fabrin J. The Mark Coventry Award: Patellofemoral Arthroplasty Results in Better Range of Movement and Early Patient-reported Outcomes Than TKA. *Clin Orthop Relat Res.* 2018, 476(1):87-100.
16. Tegner Y, Lysholm J. Rating systems in the evaluation of knee ligament injuries. *Clin Orthop Relat Res.* 1985, 198:43-49.
17. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992, 30:473-483.
18. Middleton SWF, Toms AD, Schranz PJ, Mandalia VI. Mid-term survivorship and clinical outcomes of the Avon patellofemoral joint replacement. *Knee.* 2018, 25(2) :323-328.

19. Utting MR, Davies G, Newman JH. Is anterior knee pain a predisposing factor to patellofemoral osteoarthritis? *Knee*. 2005, 12(5):362-5.
20. Nicol SG, Loveridge JM, Weale AE, Ackroyd CE, Newman JH. Arthritis progression after patellofemoral joint replacement. *Knee*. 2006, 13(4):290-5.
21. Delanois RE, McGrath MS, Ulrich SD, et al. Results of total knee replacement for isolated patellofemoral arthritis: when not to perform a patellofemoral arthroplasty. *Orthop Clin North Am*. 2008, 39(3):381-388, vii.
22. Lonner JH. Patellofemoral arthroplasty: the impact of design on outcomes. *Orthop Clin North Am*. 2008. 39:347e54.
23. Dahm DL, Kalisvaart MM, Stuart MJ, Slettedahl SW. Patellofemoral arthroplasty: outcomes and factors associated with early progression of tibiofemoral arthritis. *Knee Surg Sports Traumatol Arthrosc*. 2014, 22:2554-9.
24. Leadbetter WB, Ragland PS, Mont MA. The appropriate use of patellofemoral arthroplasty: an analysis of reported indications, contraindications, and failures. *Clin Orthop Relat Res*. 2005, 436:91-9.
25. Ahearn N, Metcalfe AJ, Newman JH, et al. The journey patellofemoral joint arthroplasty: a minimum 5 year follow-up study. *Knee* 2016, 23:900–4.
26. Ajnin S, Buchanan D, Arbuthnot J, Fernandes R. Patellofemoral joint replacement-mean five year follow-up. *Knee*. 2018, 25(6):1272-1277.
27. Lonner JH, Hershman S, Mont M, Lotke PA. Total knee arthroplasty in patients 40 years of age and younger with osteoarthritis. *Clin Orthop Relat Res*. 2000, (380): 85-90.
28. Vasta S, Papalia R, Zampogna B, Espregueira-Mendes J, Amendola A. Current design (onlay) PFA implants have similar complication and reoperation rates compared to those of TKA for isolated PF osteoarthritis: a systematic review with quantitative analysis. *J ISAKOS Jt Disord Orthop Sport Med*. 2016, 1:257–68.
29. Noble PC, Gordon MJ, Weiss JM, Reddix RN, Conditt MA, Mathis KB. Does total knee replacement restore normal knee function? *Clinical Orthopaedics and Related Research*. 2005, (431):157-65.
30. Mont MA, Haas S, Mullick T, Hungerford DS. Total knee arthroplasty for patellofemoral arthritis. *J Bone Joint Surg Am*. 2002, 84-a(11):1977-81.
31. Engh GA. Advances in knee arthroplasty for younger patients: traditional knee arthroplasty is prologue, the future for knee arthroplasty is prescient. *Orthopedics*. 2007, 30(8 Suppl):55-7.
32. Leadbetter WB. Patellofemoral arthroplasty in the treatment of patellofemoral arthritis: rationale and outcomes in younger patients. *Orthop Clin North Am*. 2008, 39:363–80 vii.
33. Ahearn N, Murray J. Patellofemoral joint arthroplasty. *Orthop Trauma*. 2017, 31:16–24.
34. Hollinghurst D, Stoney J, Ward T, Pandit H, Beard D, Murray DW. In vivo sagittal plane kinematics of the Avon patellofemoral arthroplasty. *The Journal of arthroplasty*. 2007, 22(1): 117-23.

35. Leadbetter WB. Patellofemoral arthroplasty in the treatment of patellofemoral arthritis: rationale and outcomes in younger patients. *The Orthopedic clinics of North America*. 2008, 39(3):363-80, vii.
36. Ackroyd CE, Chir B. Development and early results of a new patellofemoral arthroplasty. *Clinical Orthopaedics and Related Research*. 2005, 436:7-13.
37. Leadbetter WB, Kolisek FR, Mont MA, et al. Patellofemoral arthroplasty: a multicentre study with minimum 2-year follow-up. *Int Orthop*. 2009, 33(6):1597-601.
38. Parvizi J, Stuart MJ, Pagnano MW, Hanssen AD. Total knee arthroplasty in patients with isolated patellofemoral arthritis. *Clin Orthop Relat Res*. 2001, (392):147–52.

## Tables

Table 1. Incidence and Severity of Trochlear Dysplasia between the two groups

Grade of Trochlear Dysplasia	PFA Group	TKA Group	p value
A	14 (33.3%)	16 (38.1%)	-
B	10 (23.8%)	11 (26.2%)	-
C	8(19%)	5 (11.9%)	-
D	3(7.1%)	2(4.7%)	-
Total	35/42 (83.3%)	34/42 (81%)	0.48

PFA, patellofemoral arthroplasty; TKA, total knee arthroplasty.

Table 2. Patient demographics in the two groups

	PFA Group(n = 42)	TKA Group(n = 42)	p value
Age(years)	60±6.9	59.2±6.8	0.48
Sex, n (%)			0.81
Female	31□73.8%□	30□71.4%□	-
Male	11□26.2%□	12□28.6%□	-
BMI(kg/m <sup>2</sup> )	27.8 ± 2.2	28.1 ± 2.6	0.36
Follow-up(years)	3.5 ± 0.3	3.4 ± 0.3	0.13

PFA, patellofemoral arthroplasty; TKA, total knee arthroplasty; BMI, body mass index; mean±standard deviation.

Table 3. The clinical and functional outcomes in the two groups

	PFA Group (n = 42)	TKA Group (n = 42)	p value
<b>TAS [median(min-max)]</b>			
Preoperative	2 (1-4)	2 (0-4)	0.17
Last Follow-up	4 (2-6)	3(1-6)	0.03
<b>OKS</b>			
Preoperative	19.2 ± 2.6	17.9 ± 2.2	0.24
Last Follow-up	39.4 ± 3.1	36.9 ± 3.4	0.04
<b>ROM</b>			
Preoperative	103.6 ± 14.6	104.2 ± 11.4	0.41
Last Follow-up	117.2 ± 10.3	108.7 ± 14.2	0.02
<b>Short-Form 36</b>			
Physical Component Score	33.6 ± 11	34.1 ± 10	0.03
Mental Component Score	52.6 ± 8.3	48.1 ± 16.2	0.02

PFA, patellofemoral arthroplasty; TKA, total knee arthroplasty; TAS, Tegner Activity Scale; OKS, Oxford Knee Score; ROM, range of motion; mean±standard deviation.

Table 4. The postoperative complications in the two groups

	PFA Group	TKA Group	p value
Patellar maltracking, n (%)	1(2.4%)	2(4.8%)	0.56
Superficial infection, n (%)	1(2.4%)	1(2.4%)	1
Postoperative stiffness, n (%)	1(2.4%)	3(7.1%)	0.64
anterior knee pain, n (%)	1(2.4%)	3(7.1%)	0.64
Any revision, n (%)	1(2.4%)	2(4.8%)	0.56

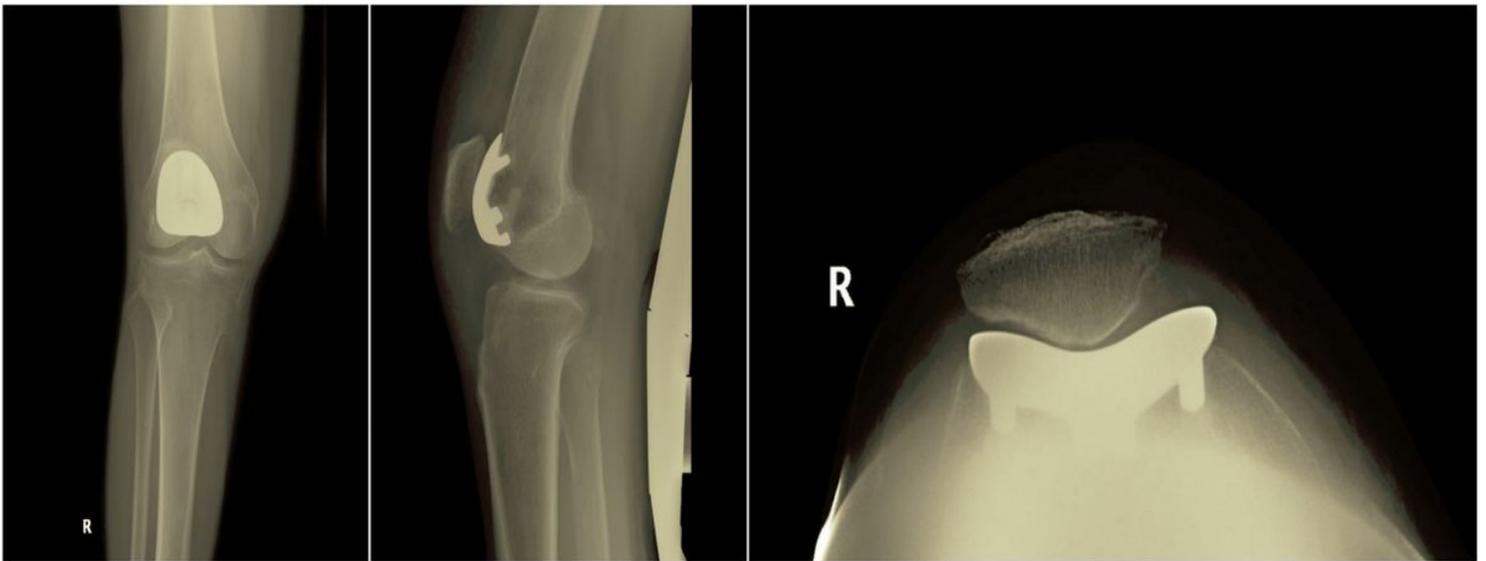
PFA, patellofemoral arthroplasty; TKA, total knee arthroplasty.

## Figures



**Figure 1**

Preoperative radiographs of the knee showing PFOA: positive view, lateral view and skyline view.



**Figure 2**

Postoperative radiographs following the Zimmer PFA: positive view, lateral view and skyline view.

# Kaplan-Meier survivorship curve

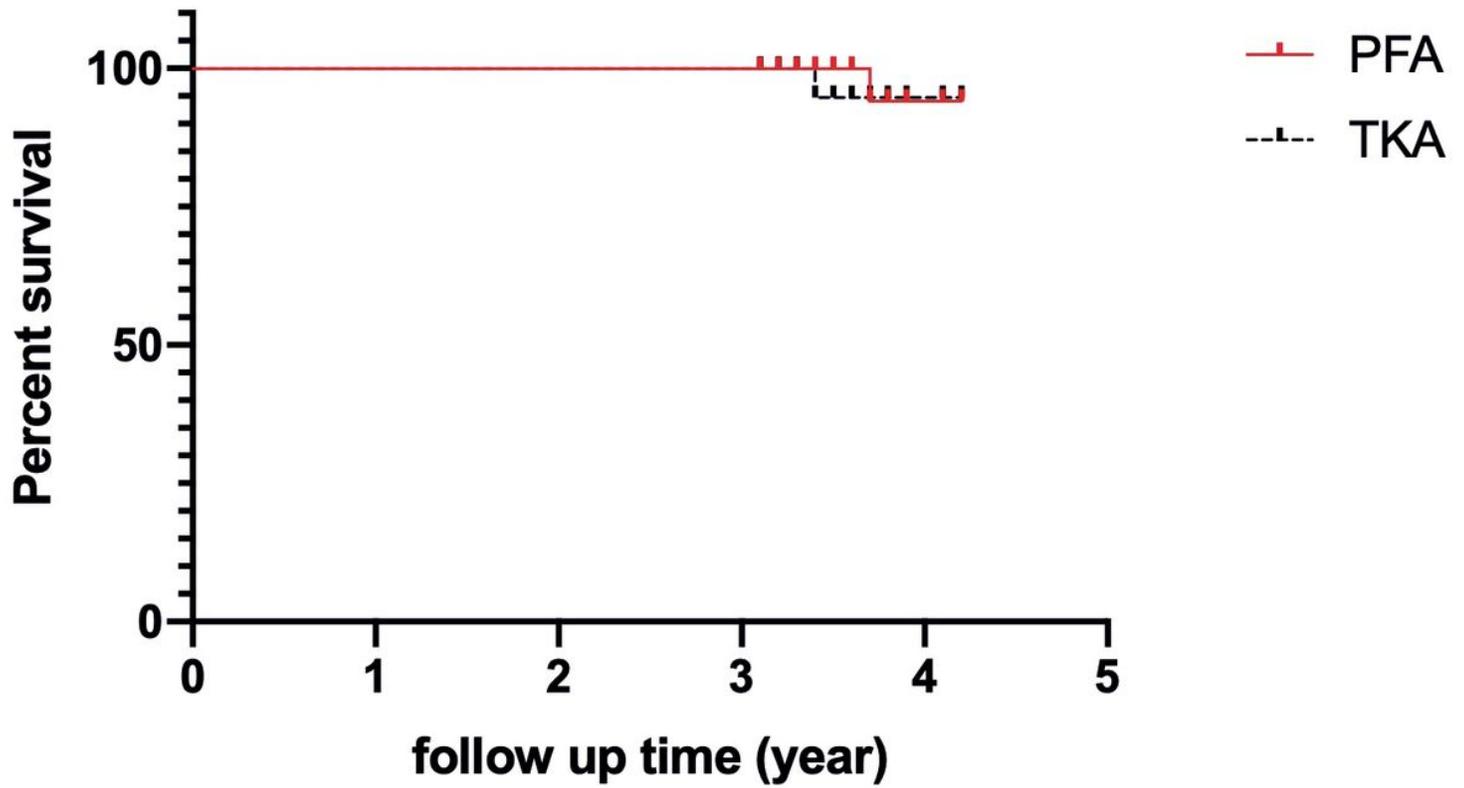


Figure 3

The Kaplan-Meier implant survivorship curve of patients between the two groups