

Functional Outcome of Uni-Knee Arthroplasty in Asians with six-year Follow-up

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Background

Uni-knee arthroplasty (UKA) remains controversial despite of increasing numbers of favorable results.

UKA is the most suitable option for medial compartment osteoarthritis and arthropathy of the knee.

Minimal invasive quadriceps-sparing technique permits rapid recovery, early discharge and better function.

UKA showed good to excellent results with 85% to 98% survival in 10 to 21 years of follow-up.

Purpose

Uni-knee arthroplasty (UKA) suits better for the activities of daily living in Asian life style. However, very little addressed the functional outcome of UKA.

The purpose of this study was to evaluate the functional outcome of UKA for medial compartment arthropathy of the knee in Asian patients with 6 years follow-up.

Inclusion Criteria

1. Clinical criteria –

Pain and tenderness localized to medial joint line.

Knee flexion more than 90°.

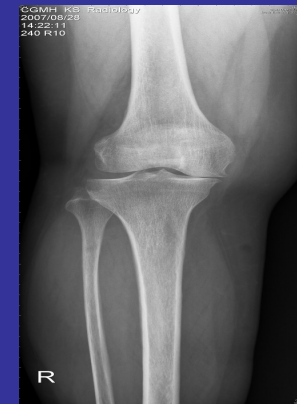
Fixed knee flexion deformity less than 10°.

2. Radiographic criteria -

Isolated medial compartment OA with complete loss of cartilage, ON of MFC, varus deformity less than 15°, and insignificant degenerative changes in other compartments.

3. Intra-operative criteria –

Correctable varus deformity under anesthesia, intact ACL, full thickness cartilage wear on anteromedial half of medial tibia plateau.



In Clinical Practice

The severity of cartilage damage can not be accurately assessed by clinical and radiographic examinations. X-rays of the knee showed mild to moderate OA changes (A). However, arthroscopy revealed advanced stage IV OA changes of the medial compartment of the knee (B).



Exclusion Criteria

Body mass index (BMI) of greater than 30.

Prior high tibia osteotomy of the knee.

Full thickness patellar cartilage loss.

Degenerative changes involving other compartments (lateral and patellofemoral compartments).

Severe angular deformity and flexion contracture.

Patient demographic characteristics

Numbers of patients/knees	58/62
Bilateral knees	4
Average age (range) years	66 (43–81)
Gender (female/male)	42/16
Diagnosis	
Osteoarthritis (medial compartment)	53 (85%)
Osteonecrosis (MFC)	9 (15%)
Average body weight (range) (kg)	68 (51–92)
Average BMI (range in body wt/body ht in %)	28 (21.6–31.4)
Average follow-up (range in months)	72 (16–130)

Patients and Methods

This prospective study cohort consisted of 58 patients with 62 UKA.

Only one type of prosthesis (Zimmer, Warsaw, IN, USA) was used, and all components were cemented.

Postoperative rehabilitations included ambulation with weight bearing as tolerated, range of motion and muscle strengthening exercises until full recovery.

The average follow-up time was **72.0±24.0 months** (range 16-130 months).

Surgical Tips

Minimal invasive medial parapatellar approach with quadriceps spared, lateral displacement of patella, but not everted, avoidance of incidental fracture of the vertical tibia cut, minimal or none soft tissue release, equal flexion/extension gaps, replication of tibia slope, centering of the femur component on tibia component to reduce the edge loading effect postoperatively and allow 2 mm medial laxity of the prosthesis, and cement all components.

Evaluation Parameters

Functional assessment for pain, givingway, stair climbing, squatting, kneeling and jogging.

Knee Society Knee and Functional scores.

International Knee Document Committee (IKDC) subjective and objective scores.

Radiographic examination of the knee.

Functional Score, IKDC Score and Range of Knee Motion

	Preoperative	Postoperative	<i>p-value</i>
Functional score (range)	48.3 ± 18.9 (10–75)	87.8 ± 14.3 (50–100)	<0.001
IKDC (range)	30.3 ± 9.3 (15–50)	84.7 ± 13.1 (54–100)	<0.001a
Range of knee motion (range)	110° ± 15.0° (0°–125°)	125° ± 12.0° (0°–145°)	<0.001a

P-values were obtained by Wilcoxon Signed-Ranks test.

Functional Outcomes

Overall clinical outcome:

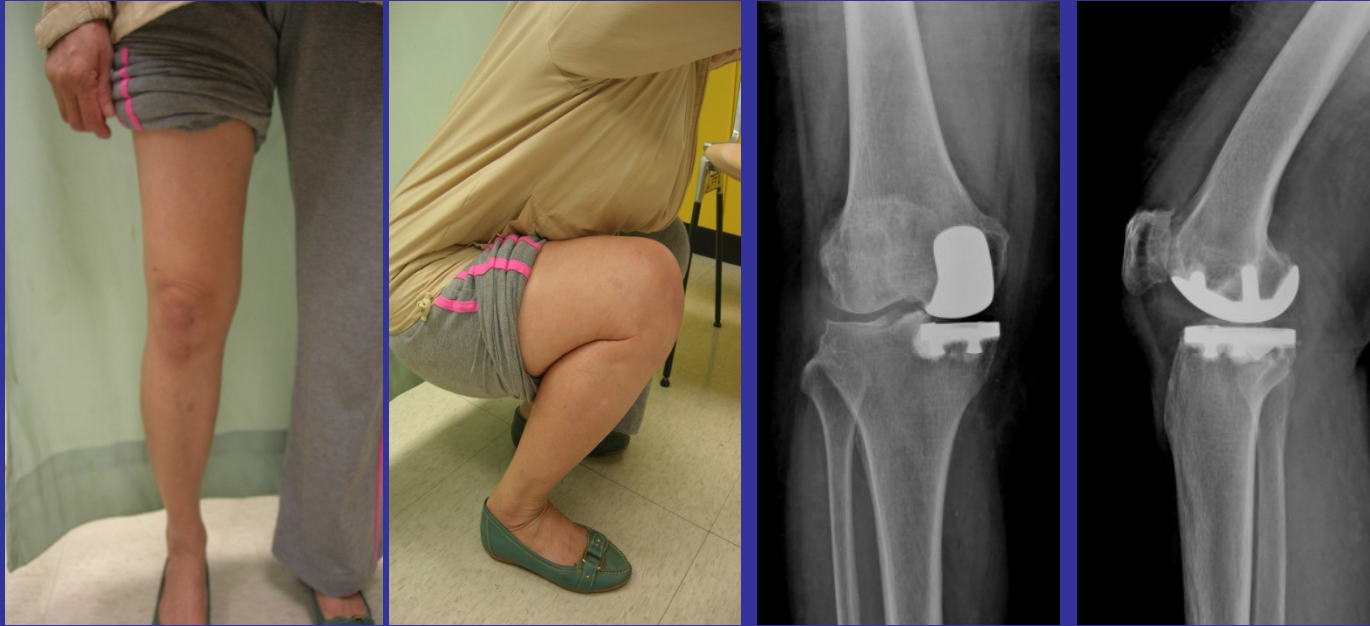
Normal knee	51.6% (32/62)
Nearly normal knee	37.1% (23/62)
Abnormal knee	8.1% (5/62)
Severely abnormal knee	3.2% (2/62)

Functional participation:

Stair climbing	96.8% (60/62)
Squatting	75.8% (47/62)
Jogging	71.0% (44/62)
Kneeling	77.4% (48/62)

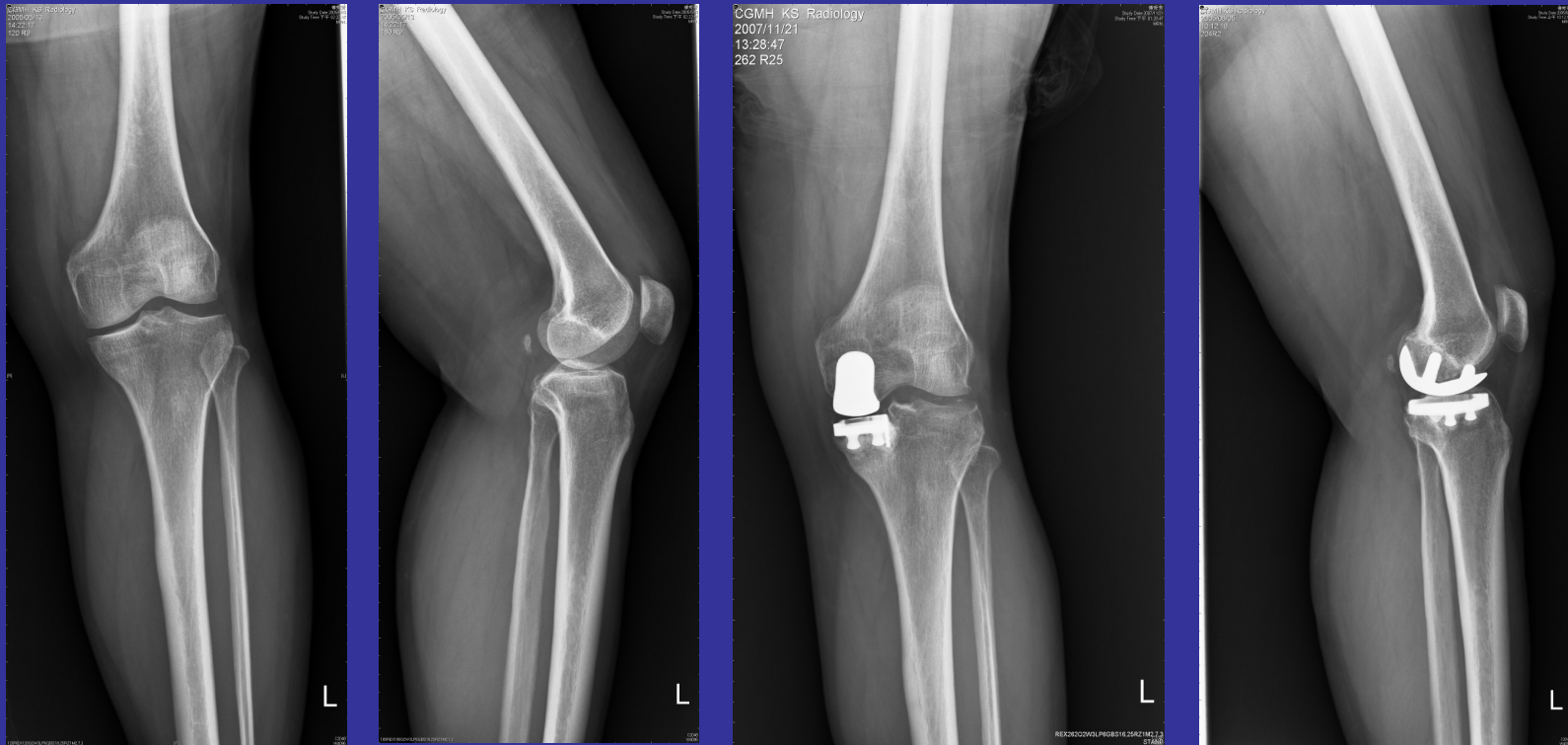
Approximately 96% of patients were satisfied with the operation.

Good Result



Two year post right UKA, right knee is pain free and patient is fully active for ADL including squatting.

Bad Result



57 years old female complained of constant pain around the left knee despite satisfactory range of motion (0/120°) at one and half years after UKA. RLL and edge loading were noted on tibia component at last follow-up.

Radiographic Evaluations

Femorotibia alignment	Preoperative	Postoperative	P-value
Average	177.27° ± 2.23°	178.0° ± 2.43°	<0.001 ^a
(range)	(170.7°–179.9°)	(174.1°–179.2°)	
Tibial slope	85.5 ± 6.46	88.19 ± 4.42	<0.001 ^a
(range)	(74.7–97.9)	(77–97.1)	
Patellar tilt*	12%	13%	1.0 ^b
Radiolucency		3% (2/62)	
Cement protrusion		9.7% (6/62)	
Component position			
Centered		79% (49/62)	
Medial (femur on tibia)		19% (12/62)	
(Average)		2.18 ± 0.55 mm.	
(Range)		1.35–3.0 mm.	
Lateral (femur on tibia)		2% (1/62)	
		(3.5 mm)	
Degenerative changes			
Lateral compartment	0%	3.2% (2/62)	0.500 ^b
P/F compartment	29% (18/62)	34% (21/62)	0.250 ^b

^aThe p-values are obtained statistically by Wilcoxon signed-ranks test.

^bThe p-values are obtained by McNemar's test

Functional Outcome vs P/F Osteoarthritis

Osteoarthritis:	P/F comp.	Lat. comp.
Preoperative	29%	0
Postoperative	34%	3.2%

Functional outcomes showed no significant difference between knees with and without patellofemoral arthritis that was identified intra-operatively. It appears that UKA is not contraindicated in knees with mild P/F OA.

Functional participation vs P/F osteoarthritis

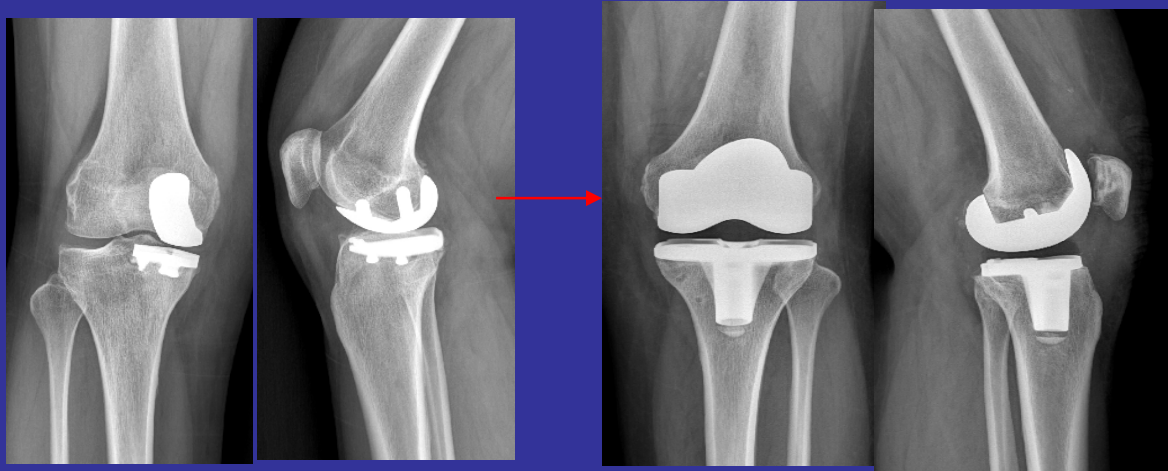
	Preoperative	Postoperative	P-value ¹
Functional score			
With P/F OA	40.1 ± 16.6 (25–71)	89.8 ± 15.7 (50–100)	0.001
Without P/F OA	51.4 ± 19.0 (10–75)	89.8 ± 15.(50–100)	<0.001
p-Value ²	0.065	0.057	
Kneeling			
With P/F OA	17% (3/18)	76% (16/21)	<0.001
Without P/F OA	20% (9/44)	80% (33/41)	<0.001
p-Value ²	0.517	0.736	
Squatting			
With P/F OA	11% (2/18)	67% (14/21)	<0.001
Without P/F OA	14% (6/44)	71% (29/41)	<0.001
p-Value ²	0.576	0.742	
Sit to stand			
With P/F OA	17% (3/18)	100% (21/21)	<0.001
Without P/F OA	23% (10/44)	95% (39/41)	<0.001
p-Value ²	0.739	0.737	
Abbreviation: P/F OA: Patellofemoral arthritis; p-value ¹ : Comparison of preoperative and postoperative data within the same group; p-value ² : Comparison of data between two groups			

Complications

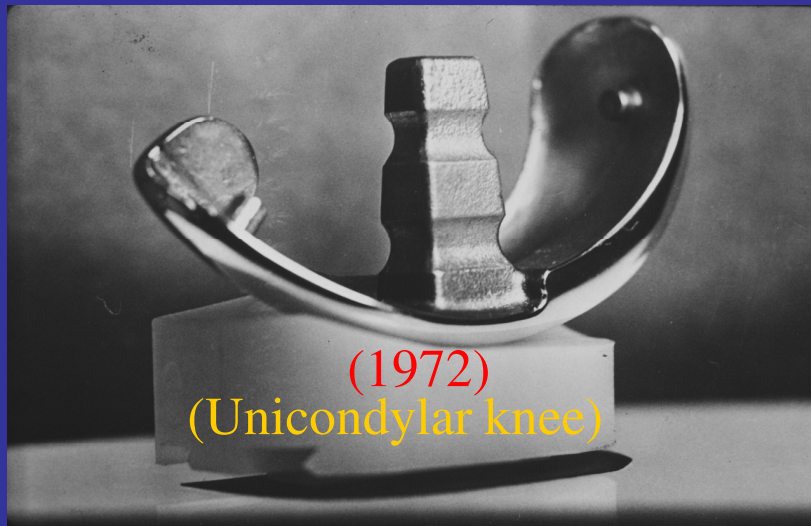
There was no infection or DVT in this series.

One knee has non-specific and un-determined source of pain around the knee postoperatively.

Two knees have symptoms due to component malposition. One knee underwent conversion of UKA to TKA, and the other revision is pending.



Discussion (1)



Uni-knee arthroplasty is a reborn knee prosthesis since its introduction in early 1972 with modification in design and material.

Discussion (2)

Nearly normal biphasic gait pattern and similar kinematic profiles of normal knee were reported after UKA. The gait velocity and muscle strength after UKA are superior to that after HTO.

UKA improved ROM, shortened rehabilitation time and immediate weight bearing than HTO. However, HTO showed ability to maintain higher level of activity without potential wear of arthroplasty components. Overall, UKA showed slightly better results in survivorship between 96% to 98% at 7 to 10 years.

Pandit H et al. JBJS 2006;88B:54; Murray DW et al. JBJS 1998;80B:983-989.

Price AJ et al. JBJS 2005 87B:1488-1492; Berger RA et al. JBJS 2005;87A:999-1006.

The results of current study showed high levels of functional participation including stair climbing in 96%, squatting in 76%, jogging in 71%, and kneeling in 77%. The revision rate is 4% and the survival rate is 96% at 6-year follow-up.

Discussion (3)

One concern of UKA is the progression of OA changes in lateral and P/F compartments and ultimately necessitated TKA. Progression of OA was reported 18% in lateral compartment and 14% in P/F compartment in 10 years. The cumulative revision rate for UKA is 22% for patients younger than 60 years.

Berger RA et al. JBJS 2005;87A:999-1006

The results of the current study showed that OA rate was 29% before and 34% after surgery for P/F compartment, and 0 before and 3.2% after surgery for lateral compartment. The functional outcomes showed no difference in knees with or without patellofemoral arthritis that was identified intra-operatively. Therefore, UKA is not contraindicated in knees with mild P/F osteoarthritis.

Discussion (4)

Advantages: The complications associated with TKA such as infection, DVT, stiffness etc are rare after UKA. Higher patient satisfaction after revision of a failed UKA than after revision of a failed TKA.

Rougraff BT et al. Clin Orthop 1991;273:157. Newman JH et al. JBJS 1998;80B:862. Ansari S et al. J Arthroplasty 1997;12:599. Robertsson O. et al. Acta Orthop Scand 2000;71:262.

Disadvantages: Cumulated revision rate for UKA is 22% for patients younger than 60 years.

Harrysson OLA et al. Clin Orthop 2004;421:162.

In the current series, there was no infection or DVT. The revision rate was 4% and the survival rate 96% at 6-year follow-up. Conversion of UKA to TKA was performed in one case and one revision is pending.

Discussion (5)

Patient selection is the key to success in UKA.

UKA is contraindicated in knee with greater than 10° of flexion contracture, varus deformity exceeding 15° or not correctable under anesthesia, posteromedial wear of the tibia plateau and patients with BMI more than 32.

Selection of implant is equally important. All-poly flat tibia component with no keel is associated with higher early failure rate.

The technique of UKA is exacting and proficient.

Conclusions

UKA demonstrates excellent functional outcome and high patient satisfaction in Asian patients with 6-year follow-up.

The maximal functional participations include kneeling, squatting, and sitting on the floor that most suits the requirements of Asian life style.

The MIS technique allows a shorter hospital stay, faster recovery and less effort in rehabilitation. The survival rate was 96% at 6-year follow-up.

Proper patient selection and precise surgical technique are the keys to successful UKA.