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Evaluation of Clinical, Radiological and Functional Outcomes Following Unicondylar Knee Arthroplasty in Medial Compartment Osteoarthritis of The Knee

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Conflict of interest: Nil

Abstract

Background: Osteoarthritis (OA) of the knee is a chronic degenerative disease that primarily affects the elderly, causing pain, stiffness, and reduced mobility. When the disease is confined to a single compartment, Unicondylar Knee Arthroplasty (UKA) offers an effective surgical alternative to total knee arthroplasty (TKA) or high tibial osteotomy (HTO).

Aims and Objectives: To evaluate the clinical, radiological, and functional outcomes of patients undergoing UKA for medial compartment osteoarthritis of the knee.

Materials and Methods: A prospective study was conducted in the Department of Orthopaedics, Nil Ratan Sircar Medical College and Hospital, Kolkata, from March 2020 to August 2021. Twenty patients with classical medial compartment osteoarthritis of the knee meeting inclusion criteria underwent UKA. Clinical parameters (range of motion and time to ambulation), radiological parameters (Hip-Knee-Ankle Axis Angle [HKAAA], Femorotibial Angle [FTA], Posterior Slope Angle [PSA]), and functional outcomes (Oxford Knee Score [OKS], WOMAC, SF-12, and Visual Analogue Scale [VAS]) were evaluated preoperatively, at 6 weeks, and at 6 months postoperatively.

Results: Postoperative results showed a statistically significant improvement in knee range of motion, correction of deformity, and enhancement of functional scores. Mean ROM improved from 96° preoperatively to 120.8° at 6 months. Mean HKAAA improved from 7.7° varus to 2.5° varus, and FTA improved from 2.3° valgus to 7.2° valgus. All functional outcome measures (OKS, WOMAC, SF-12, and VAS) showed significant improvement ($p < 0.05$).

Conclusion: Unicondylar knee arthroplasty provides excellent short-term outcomes with faster recovery, better knee kinematics, and minimal morbidity compared to more invasive alternatives. It remains a viable and effective option in appropriately selected patients with unicompartmental disease.

Keywords: Osteoarthritis, Knee, Unicondylar Knee Arthroplasty, Medial Compartment Osteoarthritis, Unicompartmental Osteoarthritis

Introduction

Osteoarthritis (OA) is the most prevalent chronic degenerative joint disorder worldwide, characterized by articular cartilage loss, subchondral bone sclerosis, osteophyte formation, and synovial inflammation. It is particularly common among the elderly and is a leading cause of disability. The prevalence of OA in India ranges between 22% and 39%, with knee involvement being most common and women disproportionately affected.

In advanced stages of medial compartmental disease, surgical management is often required. Unicondylar Knee Arthroplasty (UKA) replaces only the affected compartment, preserving cruciate ligaments and the patellofemoral joint, thereby maintaining near-normal knee kinematics. Compared to Total Knee Arthroplasty (TKA) and High Tibial Osteotomy (HTO), UKA offers reduced morbidity, faster rehabilitation, and better postoperative joint proprioception.

This study aimed to assess the clinical, radiological, and functional outcomes following UKA in patients with medial compartment osteoarthritis.

Materials And Methods

Study Design and Setting

A prospective observational study was conducted in the Department of Orthopaedics, Nil Ratan Sircar Medical College and Hospital, Kolkata, between March 2020 and August 2021.

Study Population

Twenty patients with medial compartment osteoarthritis of the knee fulfilling the inclusion criteria underwent UKA.

Inclusion criteria:

- Medial compartmental osteoarthritis
- ROM between 0°– 90° to 140°
- Mechanical knee alignment ≤ 10° varus
- Fixed flexion contracture < 15°
- Intact cruciate ligaments

Exclusion criteria:

- Inflammatory arthritis
- Contralateral compartment degeneration
- Symptomatic patellofemoral pain
- Ligament insufficiency
- Previous high tibial osteotomy

Surgical Technique

All patients underwent medial parapatellar incision and Oxford Unicompartmental Knee Arthroplasty using standard surgical protocol. Postoperative physiotherapy was initiated from the first day, and all patients were mobilized with full weight-bearing as tolerated. [Figure 1]

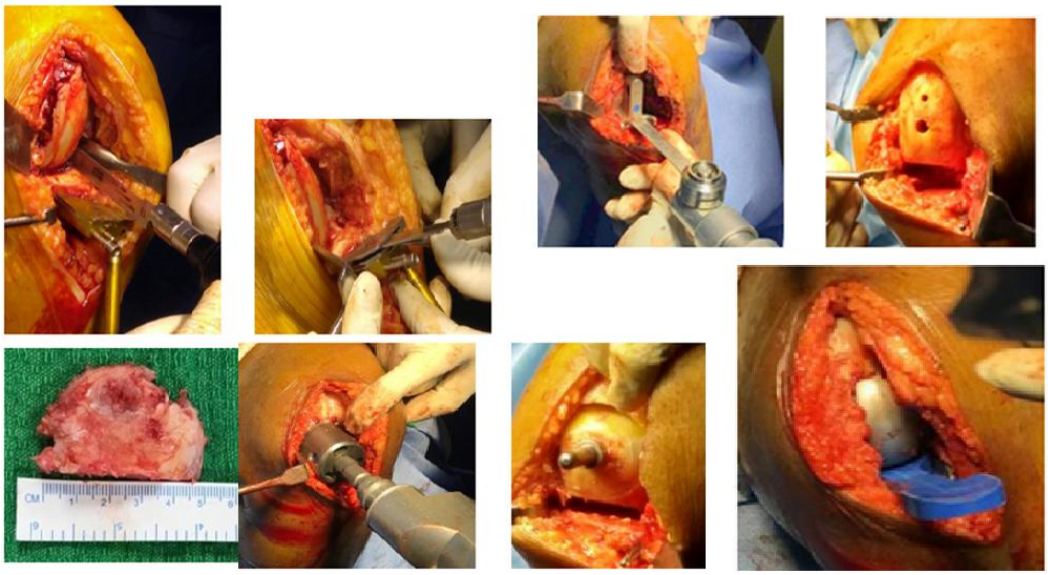

Figure 1: Intraoperative Steps; Femoral Cuts, Tibial Cuts and Final implantation

Outcome Parameters

- **Clinical:** Range of motion (ROM), time to walk postoperatively
- **Radiological:** HKAAA, FTA, PSA
- **Functional:** Oxford Knee Score (OKS), WOMAC, SF-12, and VAS [Figure 2]

Evaluations were performed preoperatively, 6 weeks, and 6 months postoperatively. Data were analyzed statistically using paired t-tests, with $p < 0.05$ considered significant.

Figure 2: Comparison of Preoperative and Postoperative parameters

Results

The results of the study showed a statistically significant improvement in knee range of motion, correction of deformity, and enhancement of functional scores. Mean ROM improved from 96° preoperatively to 120.8° at 6 months. Mean HKAAA improved from 7.7° varus to 2.5°

varus, and FTA improved from 2.3° valgus to 7.2° valgus. All functional outcome measures (OKS, WOMAC, SF-12, and VAS) showed significant improvement ($p < 0.05$).

Table 1: Comparison of Clinical, Radiological, and Functional Parameters between Pre-operative and 6 Weeks Post-operative Periods

Parameter	Time	Mean	SD	Mean Difference	P value
Clinical Parameter					
ROM (°)	Pre-op	96.0	5.2	13.2	0.000*
	6 weeks Post-op	109.2	5.6		
Radiological Parameters					
HKAAA (° varus)	Pre-op	7.7	1.0	5.5	0.000*
	6 weeks Post-op	2.2	0.9		
FTA (° valgus)	Pre-op	2.3	0.9	4.6	0.000*
	6 weeks Post-op	6.9	2.1		
PSA (°)	Pre-op	8.4	1.0	1.6	0.000*
	6 weeks Post-op	6.8	0.6		
Functional Parameters					
OKS	Pre-op	18.0	2.3	14.4	0.000*
	6 weeks Post-op	32.4	1.6		
WOMAC	Pre-op	62.2	5.1	32.6	0.000*
	6 weeks Post-op	29.6	4.1		
SF-12	Pre-op	22.8	1.6	3.1	0.000*
	6 weeks Post-op	19.7	1.9		
VAS	Pre-op	79.0	8.5	54.0	0.000*
	6 weeks Post-op	25.0	12.3		

Table 2. Comparison of Clinical, Radiological, and Functional Parameters between 6 Weeks and 6 Months Post-operative Periods

Parameter	Time	Mean	SD	Mean Difference	P value
Clinical Parameter					
ROM (°)	6 weeks Post-op	109.2	5.6	11.6	0.000*

Parameter	Time	Mean	SD	Mean Difference	P value
	6 months Post-op	120.8	9.1		
Radiological Parameters					
HKAAA (° varus)	6 weeks Post-op	2.2	0.9	0.3	0.331
	6 months Post-op	2.5	2.2		
FTA (° valgus)	6 weeks Post-op	6.9	2.1	0.3	0.331
	6 months Post-op	7.2	1.7		
PSA (°)	6 weeks Post-op	6.8	0.6	0.0	NS
	6 months Post-op	6.8	0.6		
Functional Parameters					
OKS	6 weeks Post-op	32.4	1.6	7.5	0.000*
	6 months Post-op	39.9	2.7		
WOMAC	6 weeks Post-op	29.6	4.1	9.5	0.000*
	6 months Post-op	20.1	4.3		
SF-12	6 weeks Post-op	19.7	1.9	2.2	0.000*
	6 months Post-op	17.5	2.2		
VAS	6 weeks Post-op	25.0	12.3	17.3	0.000*
	6 months Post-op	7.7	3.1		

Significant at $p < 0.05$.

ROM: Range of Motion, HKAAA: Hip Knee Ankle Axis Angle (Varus Angle), FTA: FemoroTibial Angle, PSA: Posterior Slope Angle, WOMAC: Western Ontario and McMaster Universities Arthritis Index, SF-12: Short Form-12, VAS: Visual Analogue Scale.

Discussion

The present study demonstrated significant clinical, radiological, and functional improvement following UKA in patients with medial compartment osteoarthritis. Mean postoperative ROM increased from 96° to 120.8°, consistent with results from Laurencin et al. (1991) and Kim et al. (2007), who reported postoperative ranges above 120°.

Radiologically, the mean HKAAA improved from 7.7° varus to 2.5° varus, and FTA from 2.3° to 7.2° valgus, aligning with findings by Mullaji et al. [8] and Emerson et al.[10], indicating restoration of near-normal limb alignment.

Functionally, OKS, WOMAC, and SF-12 scores improved significantly over 6 months, suggesting substantial enhancement in patient quality of life and pain relief. Early postoperative ambulation was achieved in 80% of patients by the first postoperative day, confirming

rapid recovery and minimal morbidity, consistent with Berger et al. [5].

Minor complications occurred in 10% of cases (one infection and one implant failure), more than the range reported in global literature (< 1–2%), which may be related to the smaller sample size. [Figure 3]

Limitations include small sample size (n = 20) and short follow-up duration (6 months). Long-term outcomes, survivorship analysis, and progression of contralateral compartment degeneration require further evaluation.

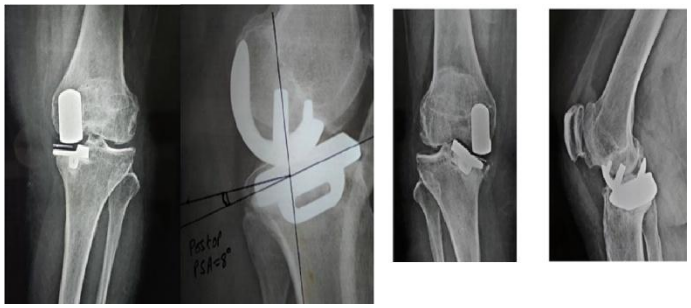

Figure 3: Preoperative X Rays showing proper implantation and implant subsidence (complication)

Conclusion

Unicondylar Knee Arthroplasty is a safe, effective, and minimally invasive procedure for isolated medial compartment osteoarthritis. It offers faster rehabilitation, improved range of motion, and significant radiological and functional improvement, preserving native knee kinematics. Appropriate patient selection remains the key determinant of success.

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