

Results of unicondylar knee arthroplasty in Indian rural population. Should UKA be the first choice in surgical treatment for osteoarthritis in India?

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Abstract

Background: The Rural population makes 90 percent of India. Previously their access to modern methods of surgical treatment was limited. Now with wider skill set and training in rural surgeons, total knee arthroplasty has become a regular feature of treatment in rural population, although patterns of osteoarthritis in India mainly involve the medial compartment. It is pertinent to note that total knee arthroplasty has longer rehabilitation, morbidity, and costs. This may make it unaffordable to most Indians from rural population. Total knee arthroplasty of course remains the only choice in severe & tricompartmental arthritis.

We decided to investigate the possibility of using Unicondylar knee replacement for treatment of medial compartmental osteoarthritis in a tertiary care rural medical setup in western Maharashtra.

Methods: 41 patients were evaluated by our protocol at a mean of 11.5 month (1-2 year) following Unicondylar Knee Arthroplasty for medial joint OA. The mean age was 62.53(Range 55 to 69 year). All of these 41 patients with 61 operated knees were available for analysis using Oxford knee score questionnaire, VAS Score & a specific questionnaire for post operative compliance with rural lifestyle with questions not included in Oxford score.

Results: Postoperatively, we found functional outcome after UKA was extremely satisfactory for all patients in our study group measured with Oxford score and VAS score. There is improvement in from mean of 16.92 to 43.17 in Oxford score and for VAS score there is reduction from mean of 8.52 to 1.56. In addition, in our questionnaire we noted the ability to perform specific rural oriented tasks i.e. squatting, praying in cross-legged position, doing agricultural work, animal tending tasks which is not measured by standard western scoring systems. Patients reported high satisfaction levels in ability to perform above a high flexion activities. About 82 percent resumed complete prior routine & work schedule including sitting cross legged & animal & farm tending.

Conclusion: Patients satisfaction following UKA for pain relief, early return of physical activity, able to sit cross leg and squat is excellent. The routine practice of recommending total knee arthroplasty should be questioned in light of better comfort, earlier & more complete return to pre morbid activity & more compliant recovery with Indian rural lifestyle.

Level of evidence: 3

Keywords: Osteoarthritis, Unicondylar, Total knee Arthroplasty/Replacement, Rural India

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I. Introduction

The knee is the largest and strongest joint in body. OA is a progressive disease of joint that causes wear and tear in cartilage which reflects as pain, deformity, and functional limitations. The Burden of disease is likely to increase keeping in view increasing lifespan, busier lifestyles, lack of fitness etc.

So far, considering the predictability of outcome, standard & simple operating procedure, and considering just pain relief as the endpoint of treatment, total knee arthroplasty has been the routine choice, irrespective of stage of arthritis & location of involved compartment/ compartments.

However the time has come to question this routine choice.

The availability of precise Unicondylar knee arthroplasty instruments & implants, standardized operating techniques, earlier recovery, lower costs, longer survival studies, lower complication rates & postoperative morbidities & a fuller resumption of asian lifestyle habits which involve deep flexion & floor use are bringing the unicondylar knee arthroplasty more into focus & acceptance.

Results of UKA have been as good as expected with early return to activity, lesser rehabilitation and lesser hospital stay. Advocates of UKA cite it is less invasive^{1,2} with reduced morbidity, retention of the cruciate mechanism, which provides more natural kinematics,³ and the patellofemoral joint, which gives more normal contact force and pressures.⁴ Studies have shown that patients achieve a greater range of movement (ROM) after UKA,⁵⁻¹² and better perceived feel and function, particularly with demanding activities such as stair climbing.¹³⁻¹⁸ Some surgeons also believe that UKA has many merits over TKA such as a faster recovery, lower morbidity and mortality and better function. Therefore, they conclude that UKA should be undertaken whenever appropriate. In UKA anatomy of lateral compartment and ligaments are maintained therefore the kinematics after UKA will not change.³ Taking functional priorities in to account of rural population such as daily routine activities like sitting cross leg, squatting and early daily activity we used UKA over TKA. The burden of knee osteoarthritis (OA) is increasing. Epidemiological studies estimate that the lifetime risk of developing symptomatic arthritis of the knee is 50%, with 50% of cases being diagnosed by the age of 55 years¹⁹

The etiology of OA is proposed to be the genetic metabolic and mechanical loading. Other factors include age, obesity trauma and repetitive loading. International trends suggest that this number will continue to raise substantially, largely because of the ageing population and an increased prevalence of risk factors, particularly obesity²⁰. It is almost important that patients are offered a treatment which is safe and effective. For safe treatment, it should have minimum risk of major anaesthetic & surgical complications including myocardial infarction, thromboembolism, infection, postoperative stiffness & pain.

Over period of time and advances in implants UKA has increasing survival rate (94-100% at 10 year and 95% at 15 year)²¹⁻²⁴, reduced duration of hospital stay, rehabilitation and improved range of motion. For effective treatment, it should relieve the patient symptoms, allowing them to return to a normal life as early as possible and to allow their activities of daily living including recreational and social events.

In contrast to TKA, UKA preserves cruciate ligaments; with normal cruciate function maintained up to 10 years after surgery.^{25,26} These biomechanical properties of UKA allows early return of activity (67-95% for UKA²⁷⁻³⁰ verses 34-88% for TKA³¹⁻³³

II. Material and Methods

In our rural tertiary hospital in orthopaedic department, this retrospective analysis was undertaken based on a study population of 41 patients who underwent 61 unicondylar knee arthroplasty by either Oxford phase 3 medial UKA or Zimmer Unicondylar knee, using a minimally invasive approach for primary medial OA between January 2016 and November 2017. The range of deformities was from 7 degree varus to 16 degree varus on standing x ray. Concomitant flexion deformity ranged from 5 degree flexion to 15 degree flexion. The inclusion criterion was patients undergoing unilateral Oxford phase 3 medial UKA using a minimally invasive approach for primary medial OA of which 29 out of 41 patients had grade 3 and remaining 12 had grade 4 OA knee the Ahlbäck criteria (focusing on joint space narrowing) and the Kellgren & Lawrence classification for knee OA were used for diagnosing tibiofemoral OA.

The exclusion criteria were having tri-compartmental OA knee, present infection, deformities with bone loss, severe deformities i.e more than 15 degrees varus, & more than 15 degrees fixed flexion, concomitant spine conditions that could cause similar dermatomal pain, pelvic deformities, recent history of DVT. . Indications for surgery were similar to those published previously (Kozinn and Scott 1989)^{34, 35}. Based on the inclusion criteria, 41 patients were eligible for this study. The mean age of the patients was 62.53 (55 to 69) years, with 11 men and 30 women. 20 patients underwent single sitting bilateral Unicondylar knee arthroplasty. All patients were operated under spinal anesthesia with a tourniquet according to the technique recommended by the manufacturer. All patients received Oxford phase 3 UKA implants or Zimmer Unicondylar knee. The thigh was supported within lateral thigh support and was performed on the supine position with the knee flexed. A minimally invasive quadriceps-sparing approach was used. No soft tissue releases were performed intraoperatively.

In our study we have used New Oxford knee score Questionnaire (Appendix 1) and VAS score (Appendix 3) to see our functional outcome specific to rural lifestyle, we assessed by questions on ability to squat, sit cross legged, ability to tend to animals & working in the farm.

All of our patients who undergone UKA responded to telephonic questionnaire using New Oxford Knee Score Functional Questionnaire, in which 0 score is worst and 48 is best score. Interpretation in New Oxford Knee Score of 0-9 taken as poor, 20-29 as moderate, 30-39 as a good and 40-48 as excellent score (Appendix 2). Patients were specifically asked for presence or absence of medial joint pain, whether they can sit cross leg or squat but not allowed to squat on Indian commode and description of patients recorded accordingly. After recording description from patients we found that mean average for pre operative and post operative oxford knee score was 16.92 and 43.17 respectively similarly mean average of pre operative and post operative VAS score was 8.51 and 1.56 respectively. We have taken consent of each patient in our study group and there were no conflicts.

III. Results

We have used Wilcoxon Signed Ranks Test to evaluate our post op VAS and Oxford Knee score to check statistical significant difference at 5 % Level of Significance. Analysis is done using SPSS 16.0 Version (Student)

1. Wilcoxon Signed Ranks Test of Pre and Post Oxford Knee Score.

A Wilcoxon signed-rank test showed that UKA treatment was statistically significant for functional outcome according to Oxford knee score. ($Z = -5.583$ $p = 0.000$). Median Oxford Knee Score rating was 16 and 44 in pre-and post-treatment scores respectively.

Test Statistics ^b	
Z	Post Operative Oxford Knee Score - Pre Operative Oxford Knee Score -5.583 ^a
Asymp. Sig. (2-tailed)	0.000

a. Based on negative ranks, b. Wilcoxon Signed Ranks Test

2. Wilcoxon Signed Ranks Test of Pre and Post operative VAS Score.

A Wilcoxon signed-rank test showed that UKA treatment was statistically significant for medial knee joint pain according to VAS Score ($Z = -5.667$ $p = 0.000$). Median VAS Score rating was 8 and 2 in pre- and post-treatment scores respectively.

Test Statistics ^b	
Z	Post operative vas score – pre operative vas score -5.667 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks, b. Wilcoxon Signed Ranks Test



Fig. 1 : Photographs Showing Pre Operative, Post Operative and Post Operative Clinical Picture of UKA :
 a) Pre Operative X-ray of bilateral OA knee - AP View b) Post Operative X-ray of bilateral UKA knee – both metal backed & all polyethylene .AP View c) Post Operative X-ray lateral view of UKA knee d) Post Operative clinical photograph showing patient sitting crossed legged for meditation.

Table 1: Table showing male and female distribution

Sex	Male	Female	Total
Number of patients	11	30	41

Table 2: Graph showing sex distribution

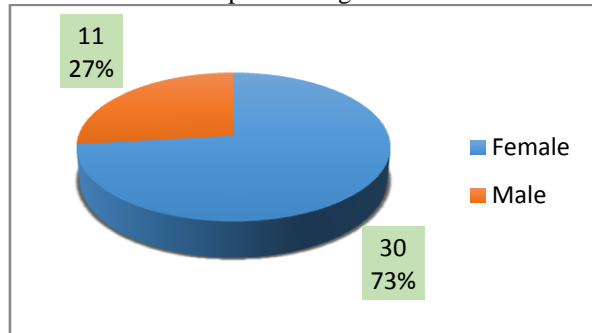


Table 3: Hospital stay cross tabulation

No. post of Days		Hospital Stay				Total
		2	3	4	5	
Side	Bilateral	10	8	1	1	20
	Unilateral	15	6	0	0	21
Total		25	14	1	1	41

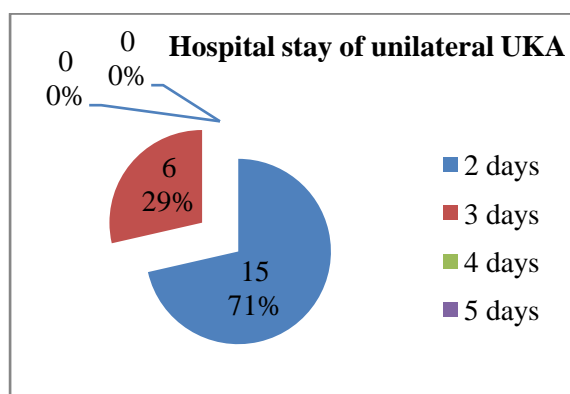
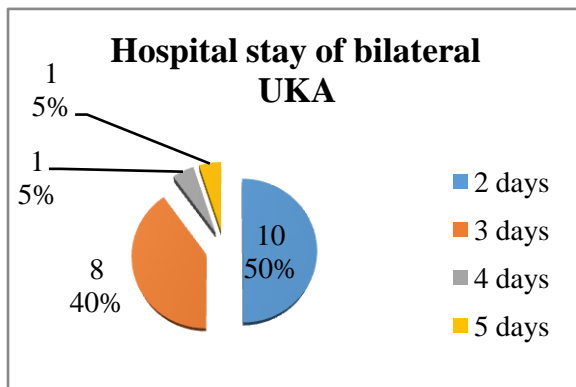


Table 4: Duration of Surgery in minutes Cross tabulation

Duration of Surgery (Minutes)		Duration of Surgery in minutes						Total	
		60	70	80	120	130	140		150
Side	Bilateral	0	0	0	4	9	6	1	20
	Unilateral	6	11	4	0	0	0	0	21
Total		6	11	4	4	9	6	1	41

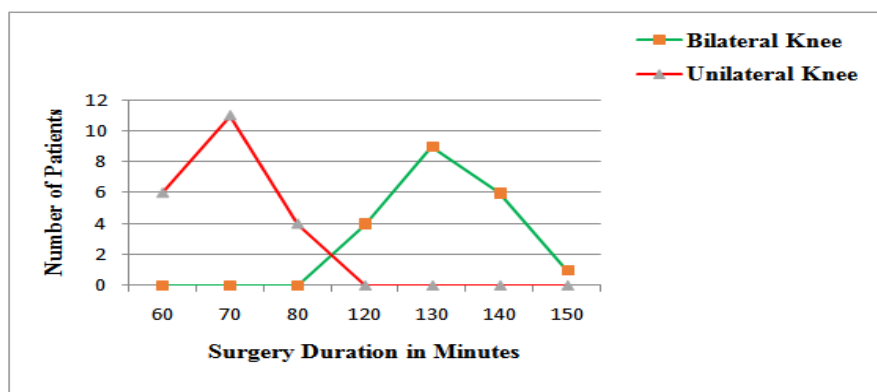


Fig. 2 Showing Duration of Surgery in Unilateral and Bilateral knee

IV. Discussion

OA is a progressive disease of joint that causes wear and tear in cartilage which reflects as pain, deformity, and functional limitations. Results of UKA have been as good as expected with early return to activity, lesser rehabilitation and lesser hospital stay. Advocates of UKA cite it is less invasive^{1,2} with reduced mortality and fewer structures, including the cruciate mechanism, which provides more natural kinematics,³ and the patellofemoral joint, which gives more normal contact force and pressures.⁴ Over period of time and advances in implants UKA has increasing survival rate (94-100% at 10 year and 95% at 15 year)²¹⁻²⁴, reduced duration of hospital stay, rehabilitation and improved range of motion.

In the present study mean age at surgery was 62.53 years (55-69 years), out of 41 patients 11(27%) were male and 30(73%) were female which is comparable to mean age 69 years (46-90 years), 196 were female (54%) and 168 were male (44%) as found by M. Edmondson et al³⁶ We found the mean duration of surgery was 69 minutes for unilateral UKA and 132 minutes for bilateral UKA which is comparable to 58 min for a unilateral knee, by Sanjiv KS Marya et al³⁷

In this study a median duration of hospital stay was 2 days for unilateral UKA and was 3 days for bilateral UKA compared to that of UKA patients duration of hospital stay 2 days in study by Drager J et al³⁸ and was 4 days for unilateral UKA and 6 days for bilateral UKA by Sanjiv KS Marya et al³⁷

We found that our functional outcomes, according to Oxford knee scores (average OKS 43.17) were comparable or better than other studies.^{39, 40, 41, 42, 43} Carr et al achieved excellent Oxford scores of 40.1 on average, in 121 patients – this was in a smaller cohort after mean follow up of 3.8 years.⁴³ Langdown et al reported good average OKS of 38 at a mean follow up of 5 years, this was in a total of 29 patients.⁴² Luscombe et al reported good average Oxford scores of 38.3 in 78 patients with a 2 year follow up.⁴¹ Although these studies had slightly lower Oxford scores on average at follow up they were either followed up for longer periods or consisted of smaller sample sizes than ours. Pandit et al reported mean Oxford scores post surgery of 39 and 41.3,^{39, 41} other than the fact that these results are from a specialist centre, it is noteworthy that all were performed through a minimally invasive approach. All the above studies have similar results like ours.

V. Conclusion

Our small study demonstrated excellent medium term results with the ‘Oxford Unicondylar Knee Arthroplasty’, 100% achieving ‘excellent’ Oxford scores. We accept that these results could be attributable to the relatively short term analysis. We also conclude that performing unicondylar knee arthroplasty more frequently would improve functional outcome of patients, this could be done by extending our indications and ignoring the presence of patella-femoral arthritis (if not clinically symptomatic) as suggested in the new guidelines by the Oxford group. The one those patients in our study reporting medial knee pain and DVT recorded Oxford scores of 41, and we feel that the presence of medial knee pain would be associated with poorer functional results in long term results. Furthermore, it is our experience that this symptom is a common complaint in early few post operative follow up, regardless of the alignment of the prosthesis. Although with this study, we find our patients exhibited significant satisfaction with the painless knee, early return of physical activity post operatively. We also noted significant correlation between grade of preoperative arthritis and post operative Oxford score or medial knee pain. Finally, we note that UKA has improved functional result of our study demonstrated a correlation between the post-operative VAS score and patients functional Oxford score.

Patients satisfaction following UKA specifically absence of medial joint pain, early return of physical activity, able to sit cross leg and squat is excellent. Patient satisfaction was close to 93 percent for resumption of painfree rural lifestyle. This is considerably higher than that reported for Total knee arthroplasty⁴⁴. In our study we conclude that UKA should be the first choice in surgical treatment for unicompartamental osteoarthritis in Rural India.

Limitation of our study is it is a retrospective study & evaluates midterm functional outcome. We have enlarged the scope of our study to increased number & duration of follow up of our patients..

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Appendix -1

NEW OXFORD KNEE SCORE QUESTIONNAIRE

Please answer the following 12 questions. Choose only one answer per question. The value for each answer is indicated to the right of the answer. Total up all of your answers to obtain a total score out of 48 points. Please only consider how you have been getting on during the past four weeks

Name:			
Date:			
Left or right Knee?			

<p>1. How would you describe the pain you have usually from your knee?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">None – 4 Very mild – 3 Mild – 2 Mild moderate – 1 Severe – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>8. Have you been able to do your own household shopping on your own?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Yes, easily – 4 With little difficulty – 3 With moderate difficulty – 2 With extreme difficulty – 1 No, impossible – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>
<p>2. Have you had any trouble with washing and drying yourself all over because of your knee?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">No trouble at all – 4 Very little trouble – 3 Moderate trouble – 2 Extreme difficulty – 1 Impossible to do – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>9. For how long have you been able to walk before the pain from your knee became severe (with or without a stick)?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">No pain, even after more than 30 minutes – 4 16-30 minutes – 3 5-15 minutes – 2 Around the house only – 1 Unable to walk at all – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>
<p>3. Have you had any trouble getting in and out of a car or using public transport because of your knee?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">No trouble at all – 4 Very little trouble – 3 Moderate trouble – 2 Extreme difficulty – 1 Impossible to do – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>10. Have you been able to walk down a flight of stairs</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Yes, easily – 4 With little difficulty – 3 With moderate difficulty – 2 With extreme difficulty – 1 No, impossible – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>
<p>4. If you were to kneel down could you stand up afterwards?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Yes, easily – 4 With little difficulty – 3 With moderate difficulty – 2 With extreme difficulty – 1 No, impossible – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>11. After a meal (sat at a table) how painful has it been for you to stand up from a chair because of your knee?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Not at all painful – 4 Slightly painful – 3 Moderately painful – 2 Very painful – 1 Unbearable – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>
<p>5. Have you been limping when walking because of your knee?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Rarely/never – 4 Sometimes or just at first – 3 Often, not just at first – 2 Most of the time – 1 All of the time – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>12. How much pain from your knee interfered with your usual work (including housework)?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Not at all – 4 A little bit – 3 Moderately – 2 Greatly – 1 Totally – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>
<p>6. Have you felt that your knee might suddenly give way or let you down?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">Rarely/never – 4 Sometimes or just at first – 3 Often, not just at first – 2 Most of the time – 1 All of the time – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>	<p>13. Have you been troubled by pain from your knee in bed at night?</p> <p style="text-align: right;">Score</p> <p style="text-align: center;">No nights – 4 Only 1 or 2 nights – 3 Some nights – 2 Most nights – 1 Every night – 0</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin-left: auto; margin-right: auto;"></div>

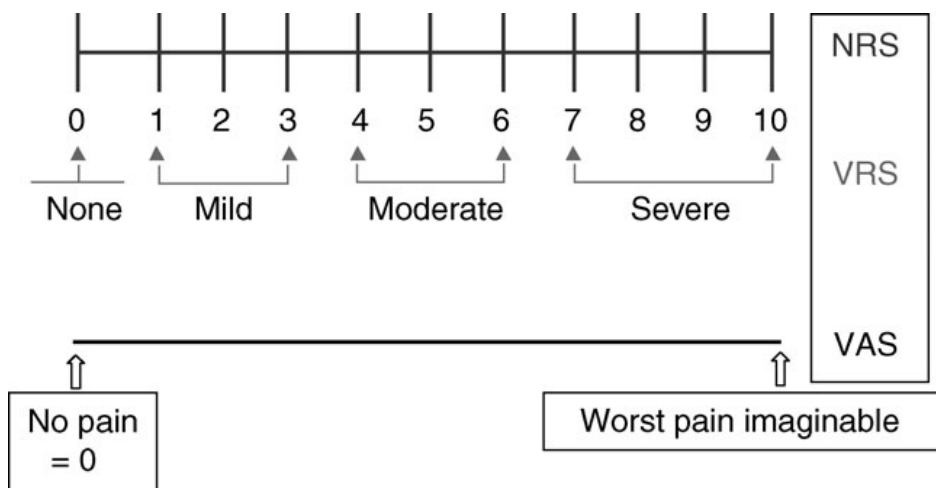
Total Score: /48

Appendix -2

Grading of Oxford Knee Score	
Score	Grade
0-19	Poor
20-29	Moderate
30-39	Good
40-48	Excellent

Appendix 3

Commonly used one-dimensional pain intensity scales: the 11-point NRS, the VAS from no pain (0) to worst pain imaginable [10] and the four-point categorical verbal rating scale (VRS).



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