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ASSESSMENT OF FUNCTIONAL RECOVERY FOLLOWING PATELLAR RESURFACING GUIDED BY OSSEOUS ANATOMICAL LANDMARKS IN TOTAL KNEE ARTHROPLASTY PATIENTS

Nadeem Hassan[1*], Asfandyar Khan[2], Muhammad Azfar Khanzada[3], Abdul Samad Qureshi[4], Niaz Hussain Keerio[5], Sajjad Hussain Bhatti[6]

[1*]Senior Registrar Orthopaedics, Pakistan Institute of Medical Sciences Islamabad Pakistan. email: Fad1988@yahoo.com
[2]Assistant Professor Orthopaedics, Pakistan Institute of Medical Sciences Islamabad Pakistan. email: asfandyar.pims@gmail.com
[3]Orthopaedic Specialist, Dr Sulaiman Al Habib Medical Group Riyadh KSA. email: azfarkhanzada123@yahoo.com
[4]Assistant Professor Orthopaedics, Indus Medical College Hospital Tando Mohammad Khan Pakistan. email: asqureshi855@hotmail.com
[5]Assistant Professor Orthopaedics, Muhammad Medical College, Ibn-E-Sina University Mirpurkhas Pakistan. email: niaz_h@hotmail.com
[6]Assistant Professor Orthopaedics, Pir Abdul Qadir Shah Jillani Institute of Medical Sciences GIMS Gambat Khairpur mir's Pakistan. email: sajjadbhattier@gmail.com

***Corresponding author:** Nadeem Hassan
*Senior Registrar Orthopaedics, Pakistan Institute of Medical Sciences Islamabad Pakistan. email: Fad1988@yahoo.com

Abstract

Objective: The present study aims at the assessment of functional outcomes of patellar resurfacing using bony anatomical landmarks in patients undergoing total knee arthroplasty (TKA).

Study design: A descriptive case series study.

Place and Duration: This study was conducted in, Pakistan Institute of Medical Sciences Islamabad Pakistan Hospital for period of 3 years from January 2022 to January 2025.

Methodology: A descriptive case series was conducted at the department of Orthopaedics. The study involved 200 patients selected via non-probability purposive sampling. Patellar resurfacing was performed using bony landmarks, and patients were followed postoperatively. Follow-ups were biweekly for two months and monthly thereafter. Functional outcomes were classified as excellent, good, or poor. Patients also received guided knee mobilization and dynamic exercise training post-surgery.

Result: The mean age of patients was 58.5 ± 7.8 years. Of the 200 patients, 33% were male and 67% female; 67% were from urban areas. The average disease duration was 4.4 ± 2.1 years; 30.6% had diabetes, 52% had hypertension, and 24% were obese. At six months, 87% showed excellent and 13% good functional outcomes.

Conclusion: Patellar resurfacing guided by bony landmarks is a safe and effective technique in TKA, offering excellent functional recovery and improved quality of life. Better outcomes were linked with younger age and presence of comorbidities such as diabetes and hypertension.

Keywords: Patellar resurfacing, functional outcome, total knee arthroplasty, anatomical landmarks

Introduction

Total knee arthroplasty (TKA) is a widely accepted and effective surgical intervention for severe osteoarthritis, rheumatoid arthritis, and other degenerative joint diseases of the knee. It significantly improves pain, function, and overall quality of life in patients with advanced joint destruction [1,2]. One of the key components of TKA is the management of the patella, which remains a topic of ongoing debate in orthopedic surgery [3].

Patellar resurfacing, involving the replacement of the patellar articular surface with a prosthetic component, is commonly performed to alleviate anterior knee pain and improve patellofemoral biomechanics [4,5]. However, its routine use remains controversial due to varying functional outcomes, risk of complications, and implant-related issues such as loosening, maltracking, or fracture [6,7].

Several studies have suggested that using anatomical or bony landmarks during patellar resurfacing may enhance component alignment, patellar tracking, and overall postoperative outcomes [8,9]. These landmarks—such as the medial and lateral patellar facets, the patellar ridge, and the quadriceps tendon insertion—provide critical orientation to ensure proper rotational and medial-lateral positioning of the patellar button [10].

Functional outcomes following TKA with patellar resurfacing have been associated with improved range of motion, reduced anterior knee pain, and better Knee Society Scores (KSS) when compared to non-resurfacing techniques in certain patient populations [11,12]. However, improper placement of the patellar component can result in maltracking, instability, and persistent pain, underscoring the importance of precise surgical technique [13,14].

Despite advancements in prosthetic designs and surgical approaches, complications related to patellar management remain a significant cause of patient dissatisfaction and revision surgeries [15]. Therefore, evaluating the efficacy of using bony landmarks during patellar resurfacing in TKA is crucial to optimizing clinical outcomes, reducing complications, and guiding surgical decision-making.

This study aims to assess the functional outcome of patellar resurfacing using bony landmarks in patients undergoing TKA and to identify factors associated with improved postoperative recovery.

Methodology

This descriptive case series was conducted at the department of Orthopaedics. A total of 200 patients undergoing total knee arthroplasty (TKA) were enrolled using a non-probability purposive sampling technique. All participants provided informed written consent prior to inclusion. Patients aged between 45 and 70 years with advanced osteoarthritis of the knee, deemed suitable for patellar resurfacing by the surgical team, were included in the study. Exclusion criteria comprised patients with a history of prior knee surgery or trauma affecting bony landmarks, those with inflammatory arthropathies other than osteoarthritis, individuals with coagulopathies or surgical contraindications, and patients unable to comply with postoperative rehabilitation or follow-up protocols.

All procedures were performed by experienced consultant orthopedic surgeons following a standardized operative technique. Patellar resurfacing was carried out using bony anatomical landmarks such as the patellar ridge, medial and lateral facets, and the quadriceps tendon insertion to guide accurate component positioning. Cemented total knee prostheses were used in all cases. The accuracy of implant alignment was verified intraoperatively using visual and tactile assessments based on the identified landmarks.

Postoperatively, patients followed a uniform rehabilitation protocol. Knee mobilization exercises were initiated three weeks after surgery, followed by dynamic strengthening exercises, including isotonic and isokinetic training. Patients were reviewed biweekly for the first two months and monthly for the subsequent four months. During follow-up visits, both subjective symptoms and objective clinical findings were assessed and documented.

Functional outcomes were evaluated at six months postoperatively and classified as excellent, good, or poor. An excellent outcome was defined as full range of motion without anterior knee pain and normal patellar tracking. A good outcome included mild discomfort or limited mobility without significant functional limitation, while a poor outcome indicated persistent pain or compromised knee function. Demographic and clinical variables such as age, sex, BMI, disease duration, and comorbidities including diabetes and hypertension were also recorded. Data were analyzed using SPSS version 28.0. Descriptive statistics were used to summarize patient characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were reported as means with standard deviations. Associations between clinical variables and functional outcomes were assessed using chi-square and t-tests, with a p-value of <0.05 considered statistically significant.

Results

A total of 200 patients undergoing total knee arthroplasty with patellar resurfacing using bony landmarks were included in the study. The mean age of participants was 58.5 ± 7.8 years. Among them, 67% (n = 134) were female and 33% (n = 66) were male. Most patients (67%, n = 134) were from urban areas, while 33% (n = 66) resided in rural settings. The average disease duration before surgery was 4.4 ± 2.1 years. Regarding comorbidities, 30.6% (n = 61) of patients were diabetic, 52% (n = 104) had hypertension, and 24% (n = 48) were obese.

Functional outcomes were assessed at six months postoperatively. Of the total cohort, 87% (n = 174) achieved an excellent outcome, while the remaining 13% (n = 26) had a good outcome. No patients were categorized as having a poor functional outcome.

Cross-tabulation revealed no statistically significant difference in outcome based on gender (p = 0.999) or residential status (p = 0.796). However, age was significantly associated with outcome (p = 0.003); all patients aged 50 years or younger achieved excellent outcomes, while those older than 50 had a higher proportion of good outcomes. Similarly, no significant association was found between disease duration and functional outcome (p = 0.999).

Comorbidities showed a notable impact on outcomes. A significant association was found between diabetes and functional results (p = 0.001), with diabetic patients showing a higher rate of good outcomes. Hypertension also demonstrated a significant relationship with postoperative function (p = 0.002), with hypertensive patients more likely to have less optimal results. Obesity, however, was not significantly associated with outcome (p = 0.377).

These findings suggest that younger age and absence of comorbidities such as diabetes and hypertension are predictive of better postoperative functional recovery following patellar resurfacing during total knee arthroplasty.

Table 1: Cross-tabulation of functional outcome versus study parameters (n = 200)

Study Variables	**Functional Outcome**		**P value**
	Excellent	**Good**	
Gender			0.999
Male (n = 66)	58	8	
Female (n = 134)	116	18	
Age Groups			0.003
≤ 50 Years (n = 56)	56	0	
> 50 Years (n = 144)	118	26	
Residential Status			0.796

Rural (n = 66)	57	9	
Urban (n = 134)	117	17	
Disease Duration			0.999
≤ 2.5 Years (n = 61)	53	8	
> 2.5 Years (n = 139)	121	18	
Diabetes			0.001
Yes (n = 61)	36	25	
No (n = 139)	138	1	
Hypertension			0.002
Yes (n = 104)	82	22	
No (n = 96)	92	4	
Obesity			0.377
Yes (n = 48)	40	8	
No (n = 152)	134	18	

Discussion

The present study evaluated the functional outcomes of patellar resurfacing using bony landmarks in patients undergoing total knee arthroplasty (TKA). Our results demonstrated that 87% of patients achieved excellent functional outcomes, and 13% showed good outcomes, with no patients classified as having a poor outcome. These findings are in line with several previous studies that have explored the efficacy of patellar resurfacing in TKA, providing evidence supporting its favorable functional outcomes.

The significant proportion of excellent outcomes in this study is comparable to the results reported by Rand et al., who found that patellar resurfacing in TKA led to high satisfaction rates and a reduction in anterior knee pain [16]. Similarly, Graves et al. demonstrated a 90% rate of excellent or good outcomes in patients undergoing patellar resurfacing, which aligns closely with the current study's results [17]. In contrast, Kooijman et al. reported a slightly lower success rate of 75% in their cohort, primarily due to complications such as patellar maltracking and loosening [18]. This discrepancy could be attributed to variations in surgical techniques, including the methods used for component alignment and the degree of reliance on anatomical landmarks.

Our study found no significant differences in functional outcomes based on gender, which concurs with the findings of Pakos et al., who also observed no gender-related disparities in the effectiveness of patellar resurfacing [19]. However, Mihalko et al. found a slightly higher rate of anterior knee pain in female patients following patellar resurfacing, suggesting that hormonal factors or differences in quadriceps function could contribute to these subtle variations [20]. In the present study, no such gender-based differences were observed, possibly due to the standardized surgical and rehabilitation protocols followed across all participants.

The association between younger age and improved functional outcomes was consistent with prior research, as younger patients tend to have better postoperative recovery and a reduced risk of complications. Nizard et al. similarly concluded that younger patients undergoing patellar resurfacing experienced better functional results compared to older cohorts, likely due to a greater capacity for rehabilitation and improved tissue healing [21]. In contrast, Burnett et al. found that age did not significantly impact long-term outcomes in patients aged 60 and older, suggesting that factors such as the degree of osteoarthritis severity and comorbid conditions may play a more substantial role in determining outcomes than age alone [22].

Comorbidities such as diabetes and hypertension were found to significantly affect functional outcomes in our study. Diabetic patients showed a higher rate of good outcomes, which may reflect the impact of diabetes on wound healing and muscle strength, as reported by Waters et al., who found that diabetes delayed recovery and was associated with poorer functional results in TKA patients [23]. Hypertension also demonstrated a significant relationship with postoperative function, with hypertensive patients more likely to have less optimal results [24]. Obesity, however, was not

significantly associated with outcome (p = 0.377), which contrasts with the findings of Mihalko et al., who did not find any statistically significant impact of obesity on functional outcomes after patellar resurfacing [20]. This discrepancy may be attributed to differences in the patient population and the duration of follow-up in each study. The current study included a higher proportion of patients with a longer disease duration, which may have exacerbated the effects of obesity on postoperative recovery.

This study contributes to the growing body of evidence supporting the use of bony landmarks during patellar resurfacing in TKA, which ensures more accurate implant positioning and alignment. Kayani et al. demonstrated that precise positioning of the patellar component using anatomical landmarks led to improved patient satisfaction and reduced rates of patellar maltracking, further validating our approach [25]. Moreover, Teeter et al. observed that utilizing bony landmarks resulted in a lower incidence of postoperative patellofemoral complications, suggesting that this method enhances overall joint biomechanics [26].

Conclusion

Patellar resurfacing using bony landmarks in total knee arthroplasty has proven to be a safe and effective procedure, yielding excellent functional outcomes in the majority of patients. The results of this study highlight the positive impact of younger age, absence of comorbidities, and precise surgical techniques on postoperative recovery. Given the high proportion of excellent outcomes observed, our findings support the continued use of bony landmark-based resurfacing techniques to enhance the functional recovery and quality of life in patients undergoing total knee replacement.

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Conflict of Interest: None

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