

# COMPARISON OF FUNCTIONAL OUTCOME IN MEDIAL PARAPATELLAR VERSUS MIDVASTUS APPROACH AFTER TOTAL KNEE ARTHROPLASTY

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## Abstract

**Objective:** To compare early postoperative recovery, functional outcomes, and complication rates between the medial parapatellar and midvastus approaches in primary total knee arthroplasty.

**Study Design:** Randomized clinical trial.

**Place and Duration of Study:** Department of Orthopaedic Surgery, Bahawal Victoria Hospital, Bahawalpur, from July 2025 to October 2025.

**Methodology:** A total of 60 patients with severe knee osteoarthritis undergoing primary total knee arthroplasty were enrolled and randomly allocated into two groups: medial parapatellar approach (n = 30) and midvastus approach (n = 30). Early recovery parameters, postoperative pain scores, length of hospital stay, operative time, and Knee Society Scores at two and twelve weeks were recorded.

**Results:** Baseline demographic and clinical characteristics were comparable. The midvastus approach demonstrated earlier straight leg raising ( $2.6 \pm 0.7$  vs  $3.9 \pm 0.8$  days,  $p < 0.001$ ), lower postoperative pain scores on day one ( $4.8 \pm 0.8$  vs  $6.1 \pm 0.9$ ,  $p < 0.001$ ) and day three ( $3.6 \pm 0.6$  vs  $4.5 \pm 0.7$ ,  $p < 0.001$ ), and shorter hospital stay ( $4.9 \pm 0.9$  vs  $6.2 \pm 1.1$  days,  $p < 0.001$ ). Knee Society Scores were significantly higher in the midvastus group at two weeks ( $69.8 \pm 6.9$  vs  $62.3 \pm 7.4$ ,  $p < 0.001$ ) and twelve weeks ( $82.9 \pm 6.3$  vs  $78.6 \pm 6.8$ ,  $p = 0.01$ ). Operative time was slightly longer in the midvastus group ( $102.6 \pm 12.5$  vs  $96.4 \pm 11.2$  minutes,  $p = 0.04$ ).

**Conclusion:** The midvastus approach in primary total knee arthroplasty offers better early recovery and superior short-term functional outcomes compared to the medial parapatellar approach, without increasing complication rates.

**Keywords:** Total knee arthroplasty; Medial parapatellar approach; Midvastus approach; Knee Society Score

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## INTRODUCTION

Total knee arthroplasty (TKA) is considered to be among the most effective surgical procedures that have been implemented in order to alleviate pain and provide functional recovery in patients who experience end-stage knee osteoarthritis. As populations have grown older and the life expectancy is growing, the need to carry out a TKA has grown significantly in the rest of the world [1]. The outcomes after TKA are not only related to the design and alignment of the implant, but also to the operation method employed to reach the knee joint which may either affect the postoperative pain, the rate of recovery after surgery, and functional rehabilitation directly [2]. Sufficient surgical exposure is vital in TKA and it is necessary to facilitate proper bone incisions, correct positioning of implants, and restoration of limb position and joint biomechanics [3]. Conventionally, medial parapatellar (MPP) has been regarded as the best method of the knee arthroscopy because of its quality exposure and reproducibility [4]. It is easy to patellar evert and the joint surfaces can be easily seen, but the technique requires the division of the quadriceps tendon and the destabilization of the extensor mechanism, which can adversely influence early postoperative recovery and the strength of the quadriceps [5]. Fears of delayed rehabilitation, and enhanced postoperative pain and the deformity of the extensor mechanism function using the medial parapatellar approach have led to the development of alternative

quadriceps-sparing procedures [6]. One of them, the midvastus (MV) technique has become popular because of its objective to preserve the integrity of the quadriceps but still offer adequate exposure to fit the implants [7]. Midvastus is a technique that divides the fibers of the vastus medialis obliquus, but does not separate the muscle and the patella, which in theory preserves the continuity of the extensor mechanisms and leads to faster functional results [8].

It has been argued in a number of studies that the midvastus method is linked to less postoperative pain, sooner straight leg raises, decreased hospitalization and a quicker functional recovery compared to the medial parapatellar method [9]. Early mobilization after TKA is one of the primary factors of patient satisfaction, decreased complication rates and general procedure success [10]. Maintaining quadriceps activity is at the center of attainment of these objectives especially in the initial postoperative phase where rehabilitation is of the utmost importance. Alongside the advantages proposed, the midvastus technique has also been linked to some restrictions such as the technically challenging exposure, the chance of muscle ischemia and the possibility of obese patients or severely deformed patients to have a hard time doing the procedure [11]. As a result, the performance of the two methods has been debated and studies have shown inconclusive results on functional outcomes, pain management and long-term performance [12]. Majority of literature available comparing medial parapatellar and midvastus technique is based on Western population and there is relative dearth of information in the South Asian context. The existence of a difference in patient demographics, body habitus, severity of diseases, and availability of rehabilitation can impact the results of the surgery and constrain international results to local populations [13].

### **Objective**

To compare early postoperative recovery, functional outcomes, and complication rates between the medial parapatellar and midvastus approaches in primary total knee arthroplasty.

## **METHODOLOGY**

This was a randomized clinical trial conducted at the Department of Orthopaedic Surgery, Bahawal Victoria Hospital, Bahawalpur, from July 2025 to October 2025. The study included 60 patients diagnosed with severe knee osteoarthritis who were planned for primary total knee arthroplasty. The sample size was calculated using OpenEpi for a randomized clinical trial, based on an expected good outcome of 71.6% in the midvastus approach and 24% in the medial parapatellar approach, with 80% power and a 95% confidence level. The required sample size was 60 patients, with 30 allocated to each group. Non-probability consecutive sampling was used.

### **Inclusion Criteria**

- Patients of either gender aged 50 to 75 years
- Diagnosed cases of severe knee osteoarthritis (Kellgren–Lawrence grade III or IV)
- Patients planned for primary total knee arthroplasty
- Patients fit for surgery under spinal or general anesthesia
- Patients willing to provide informed consent

### **Exclusion Criteria**

- Body mass index greater than 30 kg/m<sup>2</sup>
- History of previous knee trauma or high tibial osteotomy
- Bleeding or clotting disorders
- Severe varus deformity greater than 15 degrees or valgus deformity
- Presence of neuromuscular insufficiency
- Mentally incapacitated patients
- Substance abuse
- Active infection of the knee joint

### **Data Collection**

Data were collected using a structured, pre-designed proforma. Preoperative baseline demographic variables were taken in terms of age, gender, and body mass index. The patients were randomly divided into two groups with the help of a lottery that included sealed, opaque envelopes: Group A received a total knee arthroplasty with the medial parapatellar approach, and Group B received surgery with the assistance of the midvastus approach. The measured procedures were carried out by one orthopaedic surgeon who is well trained in knee arthroplasty to reduce inter-operative variability. Visual analogue scale (VAS) was used to measure postoperative pain. The recovery time to straight leg raising was noted on a daily basis until the patient was in a position to raise the operated limb to 30 degrees and hold onto it ten seconds. The Knee Society Score was used as the measure of functional outcome at the two weeks and twelve weeks after the operation. Hospital stay was also recorded. A physiotherapist who was not aware of the operative procedure-initiated physiotherapy on the first postoperative day.

### **Statistical Analysis**

Data were analyzed using SPSS version 23.0. Quantitative variables such as age, hospital stay, recovery time to straight leg raising, pain scores, and Knee Society Score were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparison between the medial parapatellar and

midvastus groups was performed using independent sample t-test for continuous variables and chi-square test for categorical variables. Data were stratified for age, gender, and body mass index, and post-stratification chi-square testing was applied where appropriate. A p-value of  $\leq 0.05$  was considered statistically significant.

## RESULTS

The mean age of patients in the medial parapatellar (MPP) group was  $62.4 \pm 6.1$  years, while the midvastus (MV) group had a mean age of  $61.8 \pm 5.9$  years, with no statistically significant difference between the groups ( $p = 0.68$ ). Female patients constituted the majority in both groups, accounting for 60.0% in the MPP group and 63.3% in the MV group, whereas males represented 40.0% and 36.7%, respectively ( $p = 0.79$ ). The mean body mass index was comparable at  $27.1 \pm 2.3$  kg/m<sup>2</sup> in the MPP group and  $26.8 \pm 2.5$  kg/m<sup>2</sup> in the MV group ( $p = 0.57$ ). Severe osteoarthritis (Kellgren–Lawrence grade IV) was present in 70.0% of patients in the MPP group and 66.7% in the MV group ( $p = 0.78$ ), while bilateral knee involvement was observed in 46.7% and 43.3% of patients, respectively ( $p = 0.80$ ). Preoperative functional status was similar, with mean Knee Society Scores of  $41.2 \pm 6.5$  in the MPP group and  $42.0 \pm 6.1$  in the MV group ( $p = 0.62$ ).

**Table 1. Baseline Demographic and Preoperative Clinical Characteristics of Study Participants (N = 60)**

Variable	MPP Group (n = 30)	MV Group (n = 30)	p-value
Age (years), Mean $\pm$ SD	$62.4 \pm 6.1$	$61.8 \pm 5.9$	0.68
Gender			
Male	12 (40.0)	11 (36.7)	0.79
Female	18 (60.0)	19 (63.3)	
BMI (kg/m <sup>2</sup> ), Mean $\pm$ SD	$27.1 \pm 2.3$	$26.8 \pm 2.5$	0.57
Kellgren–Lawrence Grade IV	21 (70.0)	20 (66.7)	0.78
Bilateral knee osteoarthritis	14 (46.7)	13 (43.3)	0.80
Preoperative Knee Society Score, Mean $\pm$ SD	$41.2 \pm 6.5$	$42.0 \pm 6.1$	0.62
Preoperative VAS pain score, Mean $\pm$ SD	$7.6 \pm 0.9$	$7.5 \pm 1.0$	0.71

The mean operative time was significantly longer in the MV group at  $102.6 \pm 12.5$  minutes compared to  $96.4 \pm 11.2$  minutes in the MPP group ( $p = 0.04$ ). Mean tourniquet time did not differ significantly, recorded at  $72.1 \pm 9.8$  minutes in the MPP group and  $75.4 \pm 10.3$  minutes in the MV group ( $p = 0.21$ ). Intraoperative complications were infrequent in both groups, occurring in 10.0% of patients in the MPP group and 6.7% of patients in the MV group, with no statistically significant difference between the approaches ( $p = 0.64$ ).

**Table 2. Intraoperative Surgical Characteristics and Complications**

Variable	MPP Group (n = 30)	MV Group (n = 30)	p-value
Operative time (minutes), Mean $\pm$ SD	$96.4 \pm 11.2$	$102.6 \pm 12.5$	0.04
Tourniquet time (minutes), Mean $\pm$ SD	$72.1 \pm 9.8$	$75.4 \pm 10.3$	0.21
Any intraoperative complication	3 (10.0)	2 (6.7)	0.64

The mean duration of hospital stay was also significantly shorter in the MV group at  $4.9 \pm 0.9$  days, compared to  $6.2 \pm 1.1$  days in the MPP group ( $p < 0.001$ ). Postoperative pain scores were consistently lower in the MV group, with mean visual analogue scale scores of  $4.8 \pm 0.8$  on postoperative day one and  $3.6 \pm 0.6$  on postoperative day three, compared to  $6.1 \pm 0.9$  and  $4.5 \pm 0.7$ , respectively, in the MPP group ( $p < 0.001$  for both comparisons).

**Table 3. Early Postoperative Recovery and Pain Outcomes**

Outcome	MPP Group (n = 30)	MV Group (n = 30)	p-value
Time to straight leg raising (days), Mean $\pm$ SD	$3.9 \pm 0.8$	$2.6 \pm 0.7$	$<0.001$
Hospital stay (days), Mean $\pm$ SD	$6.2 \pm 1.1$	$4.9 \pm 0.9$	$<0.001$
Postoperative Day-1 VAS, Mean $\pm$ SD	$6.1 \pm 0.9$	$4.8 \pm 0.8$	$<0.001$
Postoperative Day-3 VAS, Mean $\pm$ SD	$4.5 \pm 0.7$	$3.6 \pm 0.6$	$<0.001$

At two weeks postoperatively, the mean Knee Society Score was  $69.8 \pm 6.9$  in the MV group compared to  $62.3 \pm 7.4$  in the MPP group, representing a statistically significant difference ( $p < 0.001$ ). At twelve weeks, functional improvement remained significantly higher in the MV group, with a mean score of  $82.9 \pm 6.3$  versus  $78.6 \pm 6.8$  in the

MPP group ( $p = 0.01$ ). At two weeks, excellent functional outcomes were observed in 20.0% of MV patients compared to 6.6% in the MPP group, while poor outcomes were less frequent in the MV group (6.7% vs 16.7%), with the overall distribution showing statistical significance ( $p = 0.04$ ). By twelve weeks, excellent outcomes were achieved by 73.3% of patients in the MV group compared to 60.0% in the MPP group ( $p = 0.03$ ).

**Table 4. Functional Outcomes and Postoperative Complications**

Variable	MPP Group	MV Group	p-value
Knee Society Score at 2 weeks, Mean $\pm$ SD	62.3 $\pm$ 7.4	69.8 $\pm$ 6.9	<0.001
Knee Society Score at 12 weeks, Mean $\pm$ SD	78.6 $\pm$ 6.8	82.9 $\pm$ 6.3	0.01
Functional outcome at 2 weeks			
• Poor (<60)	5 (16.7)	2 (6.7)	
• Fair (60–69)	14 (46.7)	9 (30.0)	
• Good (70–79)	9 (30.0)	13 (43.3)	
• Excellent ( $\geq 80$ )	2 (6.6)	6 (20.0)	0.04
Functional outcome at 12 weeks			
• Good (70–79)	12 (40.0)	8 (26.7)	
• Excellent ( $\geq 80$ )	18 (60.0)	22 (73.3)	0.03
Wound complications	2 (6.7)	1 (3.3)	0.55
Knee stiffness	3 (10.0)	1 (3.3)	0.30

## DISCUSSION

This randomized clinical trial proved that the midvastus technique of primary total knee arthroplasty is linked with better early postoperative outcome and short-term functional result when compared to the medial parapatellar technique, and no higher number of intraoperative or postoperative complications. There was no significant difference in the two groups in term of baseline demographic and clinical characteristics such as age ( $62.4 \pm 6.1$  vs  $61.8 \pm 5.9$  years), body mass index, osteoarthritis severity and preoperative Knee Society Scores ( $41.2 \pm 6.5$  vs  $42.0 \pm 6.1$ ), which means that differences in outcomes were mostly due to the method used to carry out the surgery rather than confounding factors. These results are in line with other studies conducted in the past that have suggested the significance of baseline comparability in surgical outcome studies [14][15]. The average time spent in the operation using the midvastus technique ( $102.6 \pm 12.5$  minutes) was also higher than that of the medial parapatellar technique ( $96.4 \pm 11.2$  minutes), which is associated with higher technical demands of quadriceps-sparing methods, and the same has also been reported in other studies in the past without sacrificing surgical safety [16]. The midvastus approach was shown to be better in early postoperative recovery as evidenced by the use of much earlier straight leg raising ( $2.6 + 0.7$  vs  $3.9 + 0.8$  days), lower postoperative pain rating on the first day ( $4.8 + 0.8$  vs  $6.1 + 0.9$ ) and third day ( $3.6 + 0.6$  vs  $4.5 + 0.7$ ) and short hospital stay ( $4.9 + 0.9$  vs  $6.2 + 1.1$  days) Such results are in line with the past studies that have attributed higher rates of recovery and less pain to the maintenance of the quadriceps mechanism and the lessening of the trauma of the soft tissues [17][18].

The benefits of the midvastus technique were also supported by the functional outcomes. The knee society scores were found to be significantly higher in midvastus group at two weeks ( $69.8 \pm 6.9$  vs  $62.3 \pm 7.4$ ) and twelve weeks ( $82.9 \pm 6.3$  vs  $78.6 \pm 6.8$ ). More patients also had high functional results at two weeks (20.0% vs 6.6%), and twelve weeks (73.3% vs 60.0%) in the midvastus approach, which is also in line with the previous reports of higher functional grade progression with the use of quadriceps-sparing techniques. Notably, the incidence of complications was low and similar between groups and intraoperative complications were 6.7% with midvastus and 10.0% with medial parapatellar and no significant difference in postsurgery wound complications or knee stiffness [19][20]. Generally, this is why it can be concluded that midvastus approach is a safe and effective option of the medial parapatellar approach in all patients, especially those in whom early functional correction and speed of recovery are of high concern.

## CONCLUSION

It is concluded that the midvastus approach for primary total knee arthroplasty provides superior early postoperative recovery and improved short-term functional outcomes compared to the medial parapatellar approach. Patients undergoing the midvastus approach achieved earlier straight leg raising, experienced lower postoperative pain scores, had shorter hospital stays, and demonstrated higher Knee Society Scores at both two and twelve weeks

postoperatively. Although the midvastus approach was associated with a slightly longer operative time, it did not result in increased intraoperative or postoperative complication rates.

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