Long-term outcomes of subvastus and medial parapatellar approach for total knee arthroplasty: a 10 years follow-up study

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INTRODUCTION:

The surgical approach for Total knee arthroplasty (TKA) affects the degree of soft tissue disruption, quadriceps muscle trauma, patellar eversion or subluxation, and ultimate implant positioning and alignment. The most commonly used technique is the medial parapatellar approach, providing good surgical field visualization for installing prosthetic components. However, this approach could damage the quadriceps tendon and possibly form painful scar tissue, leading to a weakening of the extensor mechanism. Moreover, an incision near the patella may damage the vascularity of the patella, which induces anterior knee pain and patellar fracture. The subvastus approach was later introduced as a less invasive approach, preserving the intact patella's vascular supply and the knee's extensor mechanism. This approach was shown to be associated with minimized soft tissue damage and pain, faster recovery, and early movement of joints. However, some other studies have reported some complications for the subvastus approach, such as component malalignment, skin injuries, hematoma, and peroneal nerve injury, leading to concerns among surgeons.

Based on the literature, there has been no research on the long-term outcomes of these two methods. Therefore, we aimed to compare the long-term functional outcomes of conventional medial parapatellar and subvastus approaches in primary TKA after a minimum of 10 years of follow-up.

METHODS:

In a longitudinal follow-up study, patients who were candidates for primary TKA between September 2008 and December 2013, were evaluated. The patients were divided into two groups: one undergoing TKA with the subvastus approach (SV) and the other with the conventional medial parapatellar approach (MP). Postoperatively, the patients were followed up for 10 to 15 years. This study's primary outcome measure was the patients' long-term functional outcomes. Patients were assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Knee Society Score (KSS), and Visual Analog Scale (VAS) index for pain. The knee range of motion (ROM) and the straight leg raising (SLR) were chosen as the evaluation indices for rehabilitation of the extensor mechanism.

Statistical analysis was performed using SPSS software version 29. Students' t-tests were used to analyze normally distributed continuous variables. In addition, we used the Mann-Whitney U test for analyzing not normally distributed continuous variables. The Pearson Chi-Square test was used for categorical variables analysis. P values less than 0.05 were considered statistically significant

RESULTS:

In total, 60 patients were evaluated in this study and assigned into two groups, including 30 in the MP group and 30 in the SV group. There was also no significant difference between groups regarding age, gender, and BMI (P>0.05). Both groups had similar preoperative pain and functional scores (P>0.05) (Table 1).

Patients in the SV group performed active straight leg raise (SLR) significantly faster than the MP group (p <0.001). The subvastus group had higher total blood loss than the MP group, but the difference was not statistically significant (p-value=0.61) (Table 2). Operation time and length of hospitalization were not significantly different between the two groups (Table 2).

Table 3 compares WOMAC subscales and overall scores between the two groups. They were significantly different in terms of pain, physical function, and overall scores one year after the operation. These scores were significantly lower in the subvastus group (P < 0.05). However, the results of the final follow-up showed no significant difference regarding WOMAC subscales and overall scores. The comparison of KSS scores between the two groups showed no significant difference at any time except for the functional score one year after the surgery, which was significantly better in the SV group (p <0.001) (Table 3). Knee ROM after 12 months of surgery was not significantly different between the two groups (MP group: 112.1 ± 18.6° vs. SV group: 111.1 ± 16.7°, p-value= 0.86). The VAS pain scores were not significantly different between the two groups in the 12-month and the last follow-ups.

The SV and MP group had one and two superficial surgical site infections (SSI), respectively. One patient in the SV group developed a myocardial infarction 12 weeks postoperatively. Venous thromboembolic events, pulmonary embolism (PE), neurovascular complications, wound complications, periprosthetic joint infection (PJI), and periprosthetic fractures were not detected in any group.

DISCUSSION AND CONCLUSION:

In the present study, we evaluated the long-term functional outcomes between the groups, and the subvastus approach seems to provide an early advantage over the medial parapatellar approach. Patients in the subvastus approach had faster recovery of physical function, SLR, and less pain. However, the evaluated outcomes and complications did not differ significantly between both methods at final long-term follow-up.

Table 1 Preoperative pain and functional scores

Variable		MP Group (n=30)	SV Group (n=30)	P-value
Knee (degree)	ROM	84.7 ± 8.1	84.0 ± 7.3	0.94
VAS		8.6±1.0	8.8±0.6	0.26
WOMAC				
Pain		15.4±3.2	14.4±2.8	0.46
Stiffness		6.5±2.1	6.7±1.4	0.73
Physical Function		36.3±11.7	38.6±10.4	0.28
Overall Score		58.2±11.5	59.7±8.6	0.51
KSS		50.3±7.2	53.1±8.1	0.24
KFS		53.4±4.3	54.4±6.5	0.35

ROM: Range of motion, VAS: Visual Analogue Scale, WOMAC: Western Ontario and McMaster Universities Osteoarthritis, KSS: Knee Society Score, KFS: Knee Function Score, MP: Medial parapatellar, SV: Subvastus, * Statistically significant

Table 2 Operative and early postoperative variables between the two groups (mean ± SD)

Variable	MP Group (n=30)	SV Group (n=30)	P-value
Operation time (min)	78.7 ± 4.6	74.3±6.3	0.45
Tourniquet time (min)	54±6.8	50±4.7	0.46
Length of hospitalization (day)	8.4±0.3	8.3±0.4	0.27
Time to active SLR (days)	3.6±1.5	1.8±1.3	<0.001*
Length of surgical scar (cm)	11.8±0.7	12.1±0.8	0.97
Total blood loss (mL)	586±98.4	602±85.9	0.61
Blood transfusion (mL)	367±89	386±74	0.37

MP: Medial parapatellar group, SV: Subvastus group, SLR: straight leg raise

* Statistically significant

Table 3 Postoperative pain and functional scores of the patients (Mean ± SD)

Variables	MP Group (n=30)	SV Group (n=30)	P-value
1 year			
VAS pain	3.2±0.6	2.9±0.5	0.16
WOMAC			
Pain	3.7±1.1	2.8±0.9	**0.02***
Stiffness	4.1±1.6	3.9±1.3	0.24
Physical Function	10.5±4.2	7.6±3.7	**<0.001***
Overall Score	18.4±5.3	14.5±5.5	**0.008***
KSS	83.0±5.4	85.4±3.8	0.09
KFS	83.7±2.3	93.8±7.1	**<0.001***
Last Follow-up			
VAS pain	2.5±0.4	2.5±0.3	0.33
WOMAC			
Pain	1.0±0.04	1.6±0.2	0.25
Stiffness	1.5±0.5	1.4±0.4	0.40
Physical Function	3.2±0.1	3.4±0.2	0.84
Overall Score	6.2±1.2	6.3±1.3	0.69
KSS	93.1±6.8	95.0±3.2	0.42
KFS	94.5±5.5	95.3±6.1	0.44

VAS: Visual Analogue Scale, WOMAC: Western Ontario and McMaster Universities Osteoarthritis, KSS: Knee Society Score, KFS: Knee Function Score, MP: Medial parapatellar, SV: Subvastus