

Are There Differences in Short-Term to Mid-Term Functional Outcomes Among Different Total Knee Arthroplasty Approaches?

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Response/Recommendation:

Current literature revealed no significant clinical or statistical differences in early functional outcomes (six months post-surgery) among these approaches compared to the medial parapatellar (MP) approach. However, extended follow-up (exceeding 1.5 years) indicated that both the quadriceps sparing (QS) and mid-vastus (MV) approaches resulted in clinically and statistically significant improvements in functional outcomes compared to the MP approach, with the MV approach demonstrating superior results in mid-term follow-up analyses.

Level of Evidence: high

Rationale:

Different total knee arthroplasty (TKA) approaches including the medial parapatellar (MP), mini medial parapatellar (mini-MP), sub-vastus (SV), mini sub-vastus (mini-SV), mid-vastus (MV), mini mid-vastus (mini MV) and quadriceps-sparing (QS) demonstrate variations in incision length and intra-operative factors such as blood loss and tourniquet time. Due to their similar incision techniques, the mini-SV approach was grouped with the QS approach (7). Similarly, the mini-MV and MV approaches were grouped due to their similar technique and the limited number of papers reporting results for the MV approach. The MP approach was chosen as the reference group, representing most RCTs' traditional and standard TKA approach (8, 9). Therefore, this method

enabled us to do a comprehensive comparison of four different approaches (ie. SV, MV, QS and Mini-MP) to MP approach. The Minimum Clinically Important Difference (MCID) is appointed at 5-6 for the KSS, 4-5 for the OKS, and greater than 5 degrees for the ROM (1, 10). The previous studies had limitations, primarily the comparison of endpoint scores without accounting for baseline variations, potentially masking treatment effects. In this analysis, these limitations were addressed by comparing the improvement (delta) in functional outcomes between approaches at endpoint. This method offers a more accurate evaluation of treatment effects.

A comprehensive network meta-analysis (NMA) was conducted, encompassing all RCTs from 2000 onwards that reported patient-reported outcomes (PROMs) at least six months after surgery. The analysis included 51 RCTs that reported on Knee Society Score (KSS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Oxford Knee Score (OKS), and knee range of motion (ROM). The findings indicate that there were no significant variations in PROMs between different TKA approaches at the six-month mark compared to the MP approach (Table 1).

However, at the one-year follow-up, the QS and MV approaches demonstrated superior PROMs compared to the MP approach. Specifically, the QS approach resulted in greater improvement in the KSS knee compared to the MP approach, and both the QS and MV approaches showed greater improvement in KSS function compared to the MP approach. While these differences were statistically significant, none exceeded the minimal clinically important difference (MCID) for KSS, which is approximately 5.5 points (1). Nonetheless, the MV approach improved clinically and statistically for OKS compared to the MP approach.

In the final analysis, encompassing data from over 1.5 years of studies, three approaches, including QS, MV, and mini-medial parapatellar (mini-MP), demonstrated superior results compared to the

MP approach. Regarding improvement in KSS function, both the QS and MV approaches showed significantly and clinically better results than the MP approach. Moreover, the mini-MP, MV, and QS approaches led to a more considerable ROM enhancement than MP, while the mean differences were deemed clinically significant only for mini-MP and MV.

An evaluation of a recent 5-year meta-analysis of RCTs demonstrated consistent results. Yang et al. reported that there was no significant difference in KSS at the early follow-up (6 months) between MP and MV (2). However, the KSS was better in the MV group at the one-year follow-up. Bouché et al. conducted a NMA and found in the early follow-up, all the approaches exhibited similar PROMs, except for ROM, in which the SV approach showed superior results (3). They also reported that there were no significant differences between approaches in the mid-term follow-up for PROMs except in KSS, where the mini-MP showed superior results (3). An NMA by Zhang et al. revealed no significant differences between different approaches regarding KSS at the short-term follow-up (4). Another meta-analysis by Yuan et al. found that the QS approach improved KSS more significantly than MP at the mid-term follow-up (5). A meta-analysis by Berstock et al. examining KSS at the short-term follow-up found no significant differences between MP and SV approaches (6).

Table 1: Comparing different TKA approaches with MP approach

PROMs	6 months	1 year	>1.5 year
KSS knee	No differences	QS > MP (MD = 3.94, CI: 95% [0.68; 7.20], P = 0.01)	No differences
KSS function	No differences	MV > MP (MD = 3.60, CI: 95% [1.67; 5.54], P = 0.00) QS > MP (MD = 2.32, CI: 95% [0.61; 4.02], P = 0.00)	MV > MP (MD = 8.28, CI: 95% [3.37; 13.19], P = 0.00) QS > MP (MD = 5.13, CI: 95% [1.88; 8.38], P = 0.00)

ROM	No differences	No differences	mini-MP > MP (MD = 6.21, CI: 95% [4.42; 8.01], P = 0.00) MV > MP (MD = 5.46, CI: 95% [3.08; 7.83], P = 0.00) QS > MP (MD = 4.78, CI: 95% [2.71; 6.85], P = 0.00)
OKS	No differences	MV > MP (MD = 4.40, CI: 95% [0.61; 8.19], P = 0.02)	No differences
WOMAC	No differences	No differences	-

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