Single versus Double Component Revision Total Knee Arthroplasty: A Mid-Term Analysis of Clinical Outcomes and Survivorship.

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INTRODUCTION: The burden of revision total knee arthroplasty (TKA) continues to increase as the number of primary TKA increases. In certain cases with a single component contributing to the necessity for a revision, the question of single or double component revision arises. Historically, it was believed that malrotation, gap mismatch, or loosening of the retained implant were not adequately addressed by a single component revision and thus a double component revision was necessary. However, double component revision is associated with increased blood loss and operative time which can affect outcomes following revision TKA. At the same time increased component utilization can add to the cost burden of revision TKA. Recent case series have shown that isolated tibial revision in cases of tibial loosening may have acceptable survivorship and clinical outcomes. There have been contrasting evidence with some studies advocating a single component while others advocating a double component revision when comparing the two. A recent systematic review comparing single versus double component revisions concluded that the poor quality of the studies precluded sound conclusions. As a result, the question continues to remain regarding single and double component in revision TKA. The aim of our study is to compare a) the clinical outcomes and survivorship of single versus double component revision TKA for all indications, and b) the clinical outcomes and survivorship of single versus double component revision TKA for isolated tibial loosening.

METHODS:

After Institutional Review Board approval, we retrospectively reviewed our prospectively collected institutional database at a single tertiary care center. We identified all patients undergoing single component (either femoral or tibial) revision TKA with a minimum 1 year follow-up available. We identified 34 single component revision TKA. These were then matched 1:1 based on age, sex and indication for revision to a double component (both femoral and tibial) revision TKA. Thus, we had two groups, single component revision TKA group (Group S) and double component revision TKA group (Group D). We compared clinical outcomes using three patient reported outcome measures: Knee Society Score (KSS), Western Ontario & McMaster Osteoarthritis Index (WOMAC) and Veterans-Rand 12 Item Health Survey (VR-12) score. We calculated survivorship in each group with revision surgery as an endpoint.

RESULTS:

All Indications:

The indications for surgery were aseptic loosening of tibia (58.9%), aseptic loosening of femur (11.8%), stiffness (8.8%), instability (5.9%), tibial component failure (5.9%), tibial component malalignment (2.9%), unexplained pain (2.9%) and patellar instability (2.9%). The mean follow-up was 4.92 (range 1-13) years in Group S and 4.03 (range 1-12) years in Group D. There was no difference in preoperative BMI ($p=0.82$) or time to final follow-up ($p=0.29$). The distribution of components used are outlined in Table 1. There was no difference in preoperative KSS ($p=0.65$), WOMAC ($p=0.32$) or VR-12 physical ($p=0.28$) or mental ($p=0.89$) score between the two groups. At final follow-up, the WOMAC ($p=0.02$) and VR-12 physical score ($p<0.001$) were higher in Group S, while there was no difference in KSS ($p=0.85$) or VR-12 mental score ($p=0.68$) between the two groups. (Table 2) The re-revision rate was 5.9% in Group S, with 2 patients requiring a re-revision, one for peri-prosthetic fracture and one for instability. There were no re-revisions in Group D.

Isolated tibial loosening:

There was no difference in preoperative BMI ($p=0.47$) or time to final follow-up ($p=0.06$). The distribution of components used are outlined in Table 1. Interestingly, up to 90% of the patients undergoing isolated tibial revision required a femoral stem in Group D as opposed to none in Group S. There was no difference in preoperative KSS ($p=0.22$), WOMAC ($p=0.74$) or VR-12 physical ($p=0.63$) or mental ($p=0.26$) score between the two groups. At final follow-up, the VR-12 physical score ($p=0.001$) was higher in Group S, while there was no difference in KSS ($p=0.86$) or VR-12 mental score ($p=0.19$). (Table 2) There was no statistical difference in the total WOMAC ($p=0.06$) at final follow-up, but the WOMAC function sub-score was higher ($p=0.01$) in Group S (77.48 vs 60.78). Additionally, the mean difference in the total WOMAC between the two groups was 11.47, being higher in Group S, and may not have been statistically significant due to the small numbers for this analysis. This difference is larger than the MCID reported in literature for WOMAC total score. There were no revisions in either group at final follow-up.

DISCUSSION AND CONCLUSION:

At mid-term follow-up, patients undergoing single component revision TKA, had comparable clinical scores as compared to double component revision TKA. However, the re-revision rate for all causes was higher in the single component revision TKA group (5.9% vs 0%). When indicated, surgeons could consider a single component revision as an acceptable option in patients undergoing revision TKA.

Table 1: Comparison of Implant used between the two groups.

	Group S %	Group D %
All Indications		
Tibial Stem	64.7%	97.1%
Tibial Augments	29.4%	38.2%
Tibial Sleeve / Cone	29.4%	20.6%
Femoral Stem	29.4%	94.1%
Femoral Augments	23.5%	88.2%
Femoral Sleeve / Cone	8.8%	5.9%
Level of Constrained		
Posterior Stabilized	50.0%	55.9%
Varus Valgus Constrained	47.1%	41.2%
Hinge	2.9%	2.9%
Isolated tibial loosening		
Tibial Stem	90%	95.5%
Tibial Augments	40%	54.5%
Tibial Sleeve / Cone	45%	22.7%
Femoral Stem	-	90.9%
Femoral Augments	-	86.4%
Femoral Sleeve / Cone	-	0%
Level of Constrained		
Posterior Stabilized	60%	59.1%
Varus Valgus Constrained	40%	40.9%

Table 2 : Comparison of PROMs between the two groups.

	Group S Mean (SD)	Group D Mean (SD)	P value
All Indications			
KSS			
Preoperative	92.96 (28.37)	89.22 (32.04)	0.65
Final follow-up	154.90 (43.91)	156.83 (33.39)	0.85
WOMAC			
Preoperative	42.91 (11.99)	70.93 (22.28)	0.32
Final follow-up	39.71 (12.39)	59.05 (18.67)	0.02
VR-12 Physical			
Preoperative	28.77 (6.24)	30.69 (6.66)	0.28
Final follow-up	38.10 (8.21)	31.38 (7.47)	<0.001
VR-12 Mental			
Preoperative	51.19 (10.75)	50.86 (7.14)	0.89
Final follow-up	52.06 (12.42)	50.84 (11.72)	0.68
Isolated tibial revision			
KSS			
Preoperative	97.38 (15.86)	86.33 (32.13)	0.22
Final follow-up	160.32 (46.83)	162.72 (31.49)	0.86
WOMAC			
Preoperative	43.37 (12.46)	41.93 (13.01)	0.74
Final follow-up	72.46 (21.08)	60.99 (15.62)	0.06
VR-12 Physical			
Preoperative	29.37 (7.27)	30.52 (6.58)	0.63
Final follow-up	39.79 (7.67)	32.05 (6.47)	0.001
VR-12 Mental			
Preoperative	53.83 (10.46)	50.30 (7.70)	0.26
Final follow-up	53.57 (11.74)	48.66 (11.58)	0.19