Small Sized Tibial Base Plates in Total Knee Arthroplasty: Does the addition of a stem improve patient outcomes?

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INTRODUCTION

- Tibial base plates are implants used during a total knee arthroplasty (TKA) and can be fitted with a stem on the inferior surface of the plate.
- Advantages of stems include reduced risk of tibial lift-off and micromotion, however disadvantages include increased risk of fracture and end-of-stem pain due to long-term decreases in bone density[1].
- Small-size tibial baseplates have a reduced area of contact with the tibia, suggesting a greater propensity for tibial lift-off.
- The primary aim of this study is to investigate if the addition of a stem for patients who require small-size tibial base plates experience improved postoperative outcomes than patients without a stem.

METHODS

- In this retrospective cohort study, patients who underwent primary, unilateral TKA requiring a Persona Size C or D (Zimmer Biomet) tibial base plate between 2014 and 2020 were included.
- Stemmed patients were assigned to group one and non-stemmed patients were assigned to group two.
- Outcome measurements were fractures, manipulations, and revision TKA within two years following surgery.
- Statistical analysis, with significance set to p<0.05, was conducted using binary regression analysis.

TABLES

Table 1
Patient Demographics

Characteristic	Stem (n=454)	Non-Stem (n=1132)	p-value
Age; mean ± SD	68.05 ± 9.71	67.23 ± 9.37	0.067
Sex; n (%)			0.171
Male	449 (98.9)	1108 (97.9)	
Female	5 (1.1)	24 (2.1)	
BMI; mean ± SD	34.42 ± 7.66	32.42 ± 6.24	<0.001
Tibial Baseplate Size; n (%)			0.196
C	98 (21.6)	279 (24.6)	
D	356 (78.4)	853 (75.4)	
Length of Surgery (mins); mean ± SD	88.83 ± 28.08	85.86 ± 23.35	0.613
Smoking Status; n (%)			0.292
Never	262 (57.7)	682 (60.2)	
Previous	162 (35.7)	396 (35.0)	
Current	30 (6.6)	54 (4.8)	
Alcohol Intake[a]; n (%)			0.646
None	242 (53.3)	595 (52.6)	
≤ 1	71 (15.6)	188 (10.4)	
2-7	33 (7.3)	104 (9.2)	
≥ 8	9 (2.0)	17 (1.5)	
Yes, Unknown Amount	99 (21.8)	228 (26.3)	
ASA[b] Classification; n (%)			<0.001
1	0 (0.0)	8 (0.7)	
2	116 (25.6)	403 (35.6)	
3	317 (69.8)	700 (61.8)	
4	21 (4.6)	21 (1.9)	

a. Number of standard drinks (equivalent to 12 ounces of beer) per week
b. American Society of Anesthesiology Score

Table 2
Univariate Analysis Postoperative Complications

Complication	Stem (n=454)	Non-Stem (n=1130)	p-value
Deep Vein Thrombosis	6 (1.3)	15 (1.3)	0.606
Pulmonary Embolism	4 (0.9)	5 (0.4)	0.292
Periprosthetic Fracture	4 (0.9)	2 (0.2)	0.060
Manipulation	3 (0.7)	27 (2.4)	0.023
Revision	0 (0.0	1 (0.1)	0.526

TABLES

Table 3
Binary Logistic Regression for Postoperative Complications

Complication	Unadjusted Odds Ratio 95% CI	Adjusted Odds Ratio 95% CI	p-value
Deep Vein Thrombosis	0.99 [0.39-2.59]	0.95 [0.36-2.49]	0.911
Pulmonary Embolism	2.00 [0.54-7.50]	1.63 [0.41-6.48]	0.485
Periprosthetic Fracture	5.02 [0.91-27.52]	4.76 [0.86-26.40]	0.074
Manipulation	0.27 [0.08-0.90]	0.283 [0.84-0.953]	0.042

Odds ratios are reported for stemmed patients with the reference group set to the non-stemmed patients. CI denoted confidence interval. P-values are reported for adjusted odds ratio.

RESULTS

- N=1586 TKA were included in this study (Group 1 = 454; Group 2 = 1132).
- The stem group had significantly higher BMI (34.42 ± 7.66) compared to the non-stem group (32.42 ± 6.24) (p<0.001)
- When adjusting for patient demographics, there was a significantly decreased risk of manipulation in the stem group compared to the non-stem group (aOR =0.283, 95% CI [0.84-0.953], p=0.042). There was no significant difference in fractures (aOR =5.37, 95% CI [0.96-30.01], p=0.056), deep vein thrombosis (aOR =0.697, 95% CI [0.34-1.44], p=0.329), or pulmonary emboli between stem and non-stem patients.

CONCLUSIONS

- The primary finding of this study was a significant decrease in the occurrence of manipulation within two years of TKA for patients requiring small tibial baseplates with stem compared to patients without a stem.
- However, there was no significant difference in the occurrence of fractures and revisions within two years of TKA between the two patient groups.
- Further prospective clinical trials are needed to investigate the impact using a stem in patients requiring small-sized tibial baseplates has on postoperative outcomes.

REFERENCES

1. Scott CE, Biant LC. The role of the design of tibial components and stems in knee replacement. J Bone Joint Surg Br. 2012;94(8):1009-1015. doi:10.1302/0301-620X.94B8.28289