Fixed Bearing Total Ankle Arthroplasty: Clinical Results at a Mean of 11 Years

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INTRODUCTION:

In the past decade, total ankle arthroplasty (TAA) has increased dramatically for the treatment of end-stage ankle arthritis. However, there is limited literature on the long-term outcomes of modern TAA systems. This study reports on the largest long-term clinical and functional outcomes of a modern fixed-bearing TAA by a single surgeon.

METHODS: We followed up the 78 patients (81 ankles) from our previous five-year mid-term study who had a TAA between September 2007 and June 2012. Patients underwent clinical exam and radiographic evaluation at their most recent office appointment. Radiographs were evaluated for signs of subsidence, lucency, or aseptic loosening. All radiographs were analyzed by two fellowship-trained orthopaedic surgeons for lucency around the tibial and talar components and reported according to the previously described zones (1). Additionally, patients completed standardized questionnaires including the Visual Analog Scale (VAS) for pain, the Short Musculoskeletal Functional Assessment (SMFA) score, the Short Form 36v2 (SF-36v2) score, and the Foot and Ankle Disability (FADI) score.

RESULTS:

Of the 78 patients, 16 patients (17 ankles) passed away, and 14 were lost to follow up. The mean follow up for the remaining 48 patients (50 ankles) was 11 years (range, 8 to 14 years). Eight patients were contacted by telephone, six of which denied any additional complications or surgery to the ankle. Two patients required an outside revision. Radiographic evaluation was available in 32 patients (33 ankles). The mean age was 64 years at the index TAA (range, 44 to 81 years). Implant survival was 88% when metallic component revision or resection was used as an endpoint at a mean of 11 years from the index TAA (Figure 1). Six patients underwent revision TAA (four additional since the previous five-year report). One patient had two subsequent revision procedures following the index TAA, ultimately requiring an explant and an antibiotic spacer due to a deep infection from the revision procedure. Two of the other revisions were performed by outside surgeons due to relocation of those patients. Three patients required an exchange of the polyethylene liner at a mean of eight years postoperatively. Ten patients had evidence of aseptic loosening, four of which remained asymptomatic. The six patients that underwent revision displayed evidence of aseptic loosening leading to subsidence (two talar, four tibial). Mean preoperative total range of motion (ROM) was 36°, one-year postoperative mean was 39°, and final 10-year ROM mean was 36° (p = 0.23) (Table I). Only dorsiflexion had a statistically significant difference between any of the three respective timepoints, where it decreased from 11° at one-year to 7° at 10-year evaluation (p < 0.001). Preoperative radiographic coronal deformity ranged from 18° valgus to 17° varus. Five-year coronal deformity ranged from 3° valgus to 6° varus and final radiographic coronal deformity ranged from 4° valgus to 5° varus (p = 0.33) (Table II). Patient-reported outcome measures revealed good to excellent results with a mean VAS score of 17.0, FADI of 78.4, and SMFA of 20.5 and 18.9 for the function and bothersome index, respectively (Table III). There was no statistically significant difference in any of the respective outcome scores between the five and 10-year marks. Preoperative scores were not available. Radiographic analysis of 32 patients (33 ankles) indicated that certain zones are prone to have lucencies although most of them remained asymptomatic (Table IV).

DISCUSSION AND CONCLUSION:

Modern fixed-bearing TAA preserves preoperative ROM and has excellent long-term survival with low rates of revision or other complications. Patient-reported outcome measures revealed good to excellent long-term results, that remained stable over the long-term.

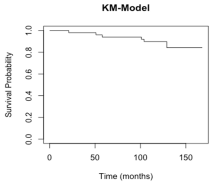

Table I. Range of Motion

Measurement	Preoperative	5-Year	10-Year	P-Value
Dorsiflexion (deg)	9 ± 6.2 (-6 to 28)	11 ± 4.4 (0 to 20)[a]	7 ± 5.0 (-6 to 20)[a]	**0.010***
Plantar flexion (deg)	27 ± 9 (10 to 40)	28 ± 8 (8 to 40)	29 ± 10 (13 to 65)	0.49
Total Range of Motion (deg)	36 ± 12 (15 to 60)	39 ± 9 (20 to 55)	36 ± 11 (20 to 65)	0.23

* Post-Hoc test revealed that dorsiflexion for 1-year was significantly greater than 10-year DF (P < 0.001)

Table II. Radiographic Measurements

Measurement	Preoperative	5-Year	10 Year	p-value
Tibial coronal angle (deg)	1 ± 8 (-18 to 17)	2 ± 2.5 (-6 to 8)	1 ± 2 (-4 to 5)	0.33
Tibial sagittal angle (deg)	-	81 ± 4.1 (to 13)	5 ± 4.4 (-6 to 14)	**0.003***
Talar sagittal angle (deg)	-	3 ± 5 (9 to 12)	7 ± 4 (-4 to 17)	**< 0.001***
Anterior talar height (mm)	-	30 ± 3 (2 to 35)	7 ± 9.1 (to 15)	**< 0.001***
Posterior talar height (mm)	-	32 ± 6 (4 to 38)	32 ± 6 (4 to 39)	0.49

Table III. Patient Reported Outcome Measures

Outcome	5-Year Value	10-Year Value	p-value
VAS Pain	21.1 ± 18.3 (0 to 67)	17.0 ± 17.3 (0 to 60)	0.66
SF-36			
Physical Function	39.4 ± 10.1 (21.3 to 54.9)	43.2 ± 10.4 (19.2 to 54.9)	0.65
Role Physical	46.5 ± 10.2 (17.7 to 56.9)	47.2 ± 9.6 (25.0 to 56.9)	0.73
Body Pain	45.8 ± 10.4 (19.9 to 62.1)	46.0 ± 9.4 (29.2 to 62.1)	0.53
General Health	51.1 ± 7.9	51.0 ± 8.5 (35.3 to 63.9)	0.78
Social Function	49.5 ± 8.7 (29.0 to 56.8)	48.3 ± 9.5 (24.1 to 56.9)	0.56
Role Emotional	47.2 ± 19.6 (17.9 to 55.9)	47.9 ± 11.8 (13.1 to 55.9)	0.43
Vitality	50.1 ± 10.2 (35.9 to 64.6)	51.6 ± 7.5 (34.2 to 67.7)	0.15
Mental Health	51.7 ± 8.3 (30.3 to 64.1)	52.2 ± 9.8 (35.9 to 64.1)	0.79
MCS	52.8 ± 8.3 (32.6 to 66.7)	53.6 ± 8.4 (36.0 to 65.5)	0.86
PCS	43.4 ± 8.8 (20.9 to 57.03)	44.8 ± 8.8 (30.0 to 58.6)	0.38
SMFA			
Function Index	19.6 ± 13.6 (0.7 to 57)	20.5 ± 15.3 (0.7 to 55.7)	0.56
Bother Index	19.5 ± 14.0 (0.0 to 45.8)	18.9 ± 12.8 (0.0 to 45.8)	0.83
FADI	79.2 ± 15.7 (39.6 to 98.1)	78.4 ± 18.0 (21.7 to 100)	0.43

Table IV Radiographic Zones of Lucency

Anteroposterior Radiograph	No. (%)	Kappa
Tibia		
Zone 1	12 (46%)	0.35
Zone 2	23 (67%)	0.65
Zone 3	22 (67%)	0.49
Zone 4	2 (6%)	0.64
Talus		
Zone 5	10 (30%)	0.08
Zone 6	4 (12%)	0.25
Zone 7	12 (46%)	0.31
Lateral Radiograph		
Tibia		
Zone 1	10 (30%)	0.11
Zone 2	16 (48%)	0.64
Zone 3	2 (6%)	1.0
Zone 4	3 (9%)	1.0
Zone 5	3 (6%)	0.34
Zone 6	21 (64%)	0.50
Zone 7	19 (58%)	0.16
Talus		
Zone 8	9 (27%)	0.37
Zone 9	3 (9%)	0.48
Zone 10	10 (30%)	0.26