

## The Relationship Between Polyethylene Size and Complications in Total Ankle Arthroplasty

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### Purpose

As technology improves, total ankle replacement is becoming a more and more common procedure. For more complex deformity correction, larger polyethylene inserts have been used to help realign the ankle into anatomic position. We predict that with larger inserts, there will be an increase in the amount of perioperative complications.

### Methodology

Available charts were reviewed for patients who underwent total ankle arthroplasty during a 5-year period. Patients were divided into 2 groups based on insert size. Group 1 included patients with a polyethylene insert size of less than 10. Group 2 included polyethylene insert sizes 10 and greater. Patient demographics, polyethylene insert size, implant used, concomitant procedures, and postoperative complications were recorded. All joint replacement procedures were performed by the senior author, JMC.

### Demographics

Age (mean, range)	68.4(23-85)
Follow up in months (mean, range)	31.3 (10-60)
Gender	Male: 52 (52%) Female: 48 (48%)
Polyethylene Size	<10 (6-9): 63 (63%) ≥10(10-15): 37(37%)
Concomitant Procedures	100 (100%)

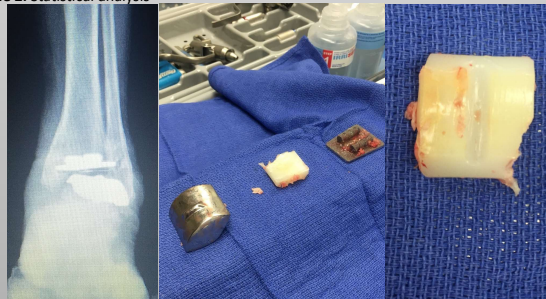
Table 1. Patient demographics

### Results

221 patients underwent total ankle replacement between March 2012 and July 2017. Data from 100 patients was available at follow-up. The average follow-up was 35.2 months for group 1 (range 10-60), and 27.4 months for group 2 (range 10-56). Group 1 consisted of 29 females and 34 males. Group 2 had 19 females and 18 males. The average age in group 1 was 68 years (range 23-85) and 68.7 years in group 2 (range 35-84). The complication rate for group 1 was 11.1% (7), and 16.2% (6). This was not found to be statistically significant (p=0.469). All patients underwent at least one concomitant procedure at the time of surgery.

	N	Complication Rate	P value
Group 1	63	7/63 (11.1%)	0.469
Group 2	47	6/47 (16.2%)	
Total	100	13/100 (13%)	

Table 2. Statistical analysis



Figures 1-3. Failed 6mm polyethylene insert



Figure 4. AP postoperative radiograph showing a large polyethylene insert utilized in severe varus deformity correction.

### Literature Review

Polyethylene was first introduced in orthopedic surgery by Charnley in 1961 in hip surgery.<sup>1</sup> It has since evolved as technology has improved, decreasing osteolysis and other complications inherent to early use. Polyethylene wear varies greatly when comparing hip, knee, and ankle replacement. Hip wear is due to micro-adhesion and micro-abrasion in a highly congruent ball and socket articulation<sup>2</sup> knee wear involves rolling, rotational forces, and sliding across the polyethylene<sup>3</sup>, and ankle wear involves flexion and extension, varus and valgus motion and some rotation. No present study has examined the impact of polyethylene size in TAR. In their study on total knee arthroplasty, Lanting et al noted a statistically significant decrease on the ability to achieve full extension with larger polyethylene inserts. Additionally, size directly correlated to coronal plane stability, suggesting larger polyethylene inserts may provide increased stability in the knee.<sup>4</sup>

### Analysis & Discussion

Our study found an increase in the amount of complications with larger polyethylene insert. This is likely due to the larger inserts being used in more complex cases involving deformity correction. Surprisingly, this increase in complications was not found to be statistically significant. To our knowledge, no study has looked at this correlation to date.

### References

1. Charnley J. Arthroplasty of the hip. A new operation. *Lancet*. 1961;1:1129-1132.
2. McKellop H, Campbell P, Park S. The origin of submicron polyethylene wear debris in total hip arthroplasty. *Clin Orthop Relat Res*. 1995;311:3-20.
3. Chajrabarty G, Vashishtha M, Leeder D. Polyethylene in knee arthroplasty: a review. *Journal of Clinical Orthopedics and Trauma*. 2015;6:108-112.
4. Lanting B, Snider M, Chess D. Effect of Polyethylene Component Thickness on Range of Motion and Stability in Primary Total Knee Arthroplasty. *Orthopedics*. 2012;35:170-174.