

Accuracy of Femoral Component Sizing and the Effect of Sizer Rotation

Luis Grau, MD¹; Ali Alhandi, MBBS¹; Charles Lawrie, MD¹; Evan Trapani, BS¹; Yesenia Brito, BS²; Jaime Carvajal, MD¹; Michaela Schneiderbauer, MD¹

¹Orthopaedic Surgery Department, University of Miami, Miami FL, ²Florida International University, Miami FL.

Introduction

Accurate femoral sizing in total knee replacement (TKR) is important to avoid either oversizing or undersizing of the femoral component. This study looks at the accuracy of femoral component sizing and the effects of rotation of the femoral sizer on size measured using various manufacturers' instrumentation.

Methods

Eight cadaveric femurs were dissected of all soft tissue. The distal cut was made using a distal femur cutting block (ATTUNE® Knee System, Depuysynthes, Warsaw, IN 46582). A 9 mm thickness of the distal femur was cut. Posterior referencing tools from three companies were utilized for taking measurements 1. Attune® posterior-up femoral component sizer 2. Persona® posterior-up sizer 3. Triathlon® Knee system – MIS sizer. All three tools used required a distal cut and had pedals rested on the posterior condyle. Eight investigators with varying levels of experience attempted to measure the femoral size. They were asked first to measure the bone size as they would normally use the three tools. Then they measured the size nine times using nine predetermined points marked on the anterior aspect of the cortex (Figure 1). Each investigator was asked to measure each point at 0, 3, and 5 degrees of rotation using the three measuring tools (Figure 2). To determine the actual size of the bone we used the most agreed upon size in each tool when the investigators first measured without the use of the grid. An ANOVA multiple comparison test with Bonferroni correction was used to compare the effect of external rotation in each measuring tool to the actual size measurement. The point most frequently closest to the actual bone size was also investigated



Figure 1: Nine point grid used for measurements in the study. The lateral column showed the least amount of variation. Point G was the most accurate point for measurement, point D came after in accuracy.

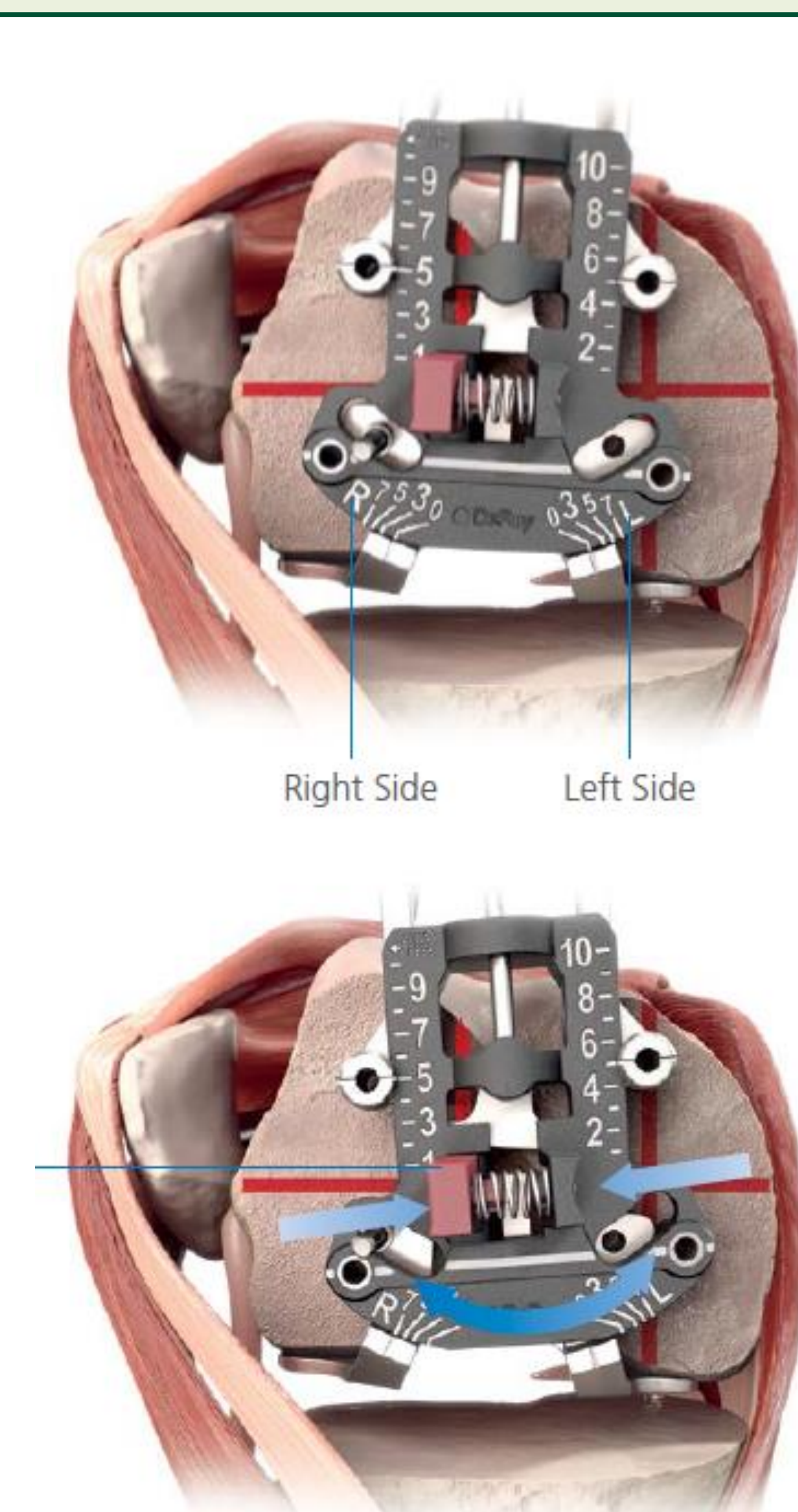


Figure 2: Example of external rotating the measurement device. Attune® posterior-up femoral component sizer shown below

Results

Size selected increased with external rotation using the Depuy-Synthes and the Stryker posterior referencing tools ($P < 0.001$), no change was found using the Zimmer sizer ($P > 0.05$). Looking at one point on the grid (Point G, figure 1), the size read increased with external rotation but was only significant using the Depuy-Synthes tool ($P < 0.001$). Point G was the closest to the actual size, predicting it 60% of the time; point D predicted it the remaining 40% of the time. There was a significant increase in size measurements going from medial to lateral and proximal to distal, regardless of the tool used or degree of rotation ($P < 0.005$).

Discussion

Surgeons should be aware of the design of the instrumentation they use when sizing their femoral component as well as how the degree of external rotation affects size measured. Measurements with sizers with a central or posterior pivot point for rotation selection like Depuy and Stryker are affected by the degree of rotation whereas sizers with rotation selection mechanisms that are independent of the sizer boom are not. Variations in morphology do not allow for a single most accurate sizing point.

Significance

This study sheds light on the effect of external rotation on sizing distal femurs for TKR.

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