

# Determining an optimal medial-lateral resection angle for varus patients undergoing a total knee arthroplasty

Megan Aanstoos<sup>1,2</sup>, David F. Scott<sup>2,3</sup>, Roy Bloebaum<sup>1,2</sup>

<sup>1</sup>Bone and Joint Research Lab, Veterans Affairs Health Care System, Salt Lake City, UT; <sup>2</sup>University of Utah, Salt Lake City, UT; <sup>3</sup>Spokane Joint Replacement Center, Spokane, WA

**Statement of Purpose:** Current practice for orthopedic surgeons is to realign a varus tibia patient to a neutral angle during total knee arthroplasty (TKA). By realigning to a neutral angle, ligaments, especially the medial collateral ligament, need to be rebalanced 50% of the time or more<sup>[1]</sup>. An alternative is to resect the proximal tibia at a small varus angle. This has been done clinically and surgeons had little to no need for ligament balancing. However, there is a concern that mechanical strength could be compromised with a varus resection angle. This study examined whether the compressive strength of the proximal tibia was different between a 2° varus and neutral resection angle, between regions of the specimen from a 2° varus or neutral resection angle and also examined trabecular orientation and degree of anisotropy when a varus patient was resected with a 2° varus cutting block. We hypothesized that there would be no difference between the varus and neutral resection angles for compressive strength and that the degree of anisotropy would also show no difference.

**Methods:** IRB approval was obtained in both WA and UT. Each varus patient undergoing TKA that consented to participate in the study had one specimen sent to the Bone and Joint Research Laboratory (BJRL). Patients were over the age of 18, had no previous surgeries on the knee being examined, had a tibia between 2-7° varus and had OA. Specimens were cleaned and radiographed before being analyzed. MicroCT images of each specimen were obtained to examine trabecular orientation and degree of anisotropy. Specimens were also mechanically tested using a modified osteopenetrometer<sup>[2-4]</sup> to determine compressive strength.

**Results:** Mechanical testing data showed no difference between the varus and neutral resection angles. There was also no difference between the medial and central regions although the lateral region showed significance. However, clinically the lateral region difference is too small to affect implant stability. Also, degree of anisotropy measurements showed no difference between varus and neutral resection angles.

Table 1. Degree of Anisotropy for Whole Specimen comparison of resection angle.

Degree of Anisotropy	Neutral <sup>a</sup> Mean (Range: SD)	Varus <sup>a</sup> Mean (Range: SD)	p-values <sup>b</sup>
a1/a3 <sup>c</sup>	1.49 (1.13-2.15; .23)	1.42 (1.11-1.82; .19)	1.00
a2/a1 <sup>d</sup>	0.83 (0.62-0.99)	0.81 (0.64-0.98)	0.96
a2/a3 <sup>e</sup>	1.23 (1.06-1.73)	1.16 (1.01-1.61)	0.35

Table 1. This table shows the mean and range of anisotropic values obtained when all varus and all neutral specimens were compared. No significance was found.

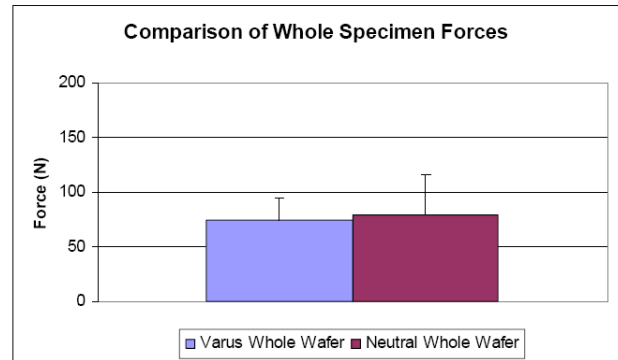


Figure 1. Comparison of mean force values between neutral and varus resection angles. The standard deviation of the varus was ±19.51 N and the standard deviation for the neutral was ±37.91 N. The p-value was 0.55 and thus no difference was observed between the two resection angles. Similar results were found for the central and medial region comparisons.

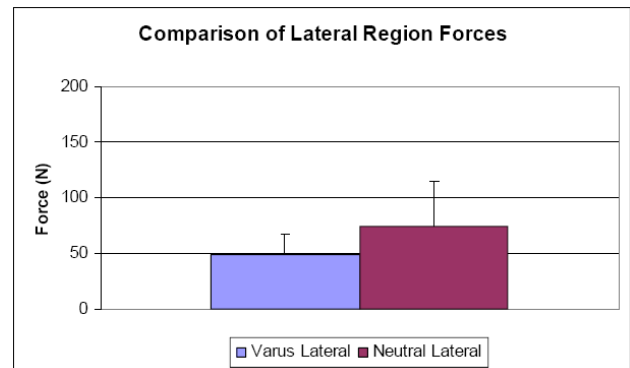


Figure 2. Comparison of mean lateral force values between resection angles. The standard deviation of the varus was ±19.20 N and the standard deviation for the neutral was ±41.12 N. The p-value was 0.06. This was significant with the preset alpha value of 0.10. This suggests that the varus lateral region was slightly weaker the neutral lateral region.

**Conclusions:** This study concluded that cutting the proximal tibia at a 2° varus angle during a primary TKA of a varus patient does not compromise the compressive strength of the proximal tibia component in TKA. Furthermore, using the 2° varus cutting block may reduce the need for ligament balancing while reducing surgical time, and without compromising implant fixation.

**References:**

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