Are Patients With Valgus Alignment the Same as Varus Alignment Prior to TKA?

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Introduction

While it is common practice to assess alignment prior to total knee arthroplasty (TKA), preoperative knee alignment and its effect on patient-reported outcomes (PROs) after surgery has not been well studied. Previous studies have reported that BMI, degree of arthritis, marital status, prior surgeries, living in poorer areas, gender, anxiety, preoperative PROs, and other medical comorbidities are predictors of outcome PROs following TKA. Identifying patient phenotypes that affect PROs could help establish risk adjustment methodologies for alternative payment models.

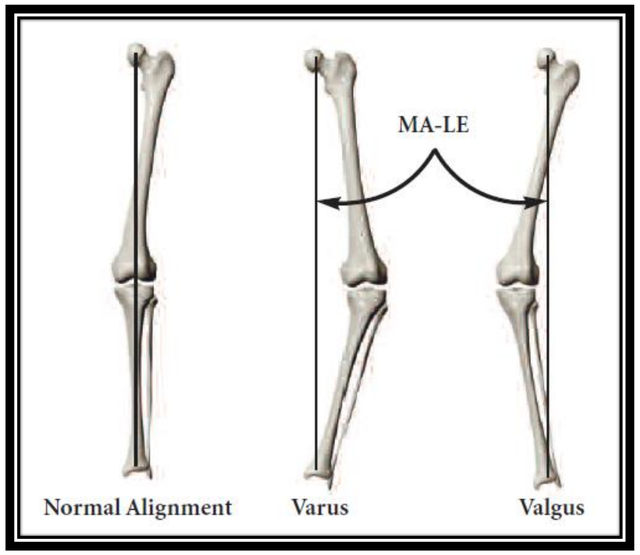

Figure 1: Normal mechanical alignment and mechanical axis of the lower extremity in common deformities. Picture from Krackow K, "The measurement and analysis of axial deformity at the knee."

Objective

The purpose of this study is to determine if there are differences in PROs with valgus (knock-knee) and varus (bow-legged) patients. Also, to assess the baseline differences between these two groups preoperatively.

Methods

This was a retrospective chart review of TKA surgeries performed by a single fellowship-trained orthopedic surgeon at a university-based practice from June 2013 to June 2016. Overall alignment of the index knee was measured using digital x-ray templating software as a standard method for determining alignment of the knee. (Figure 1).[1]

Data derived from patient charts included age, sex, race, height, weight, BMI, knee alignment, KL score, and two PRO measures (the Knee injury and Osteoarthritis Outcome Score [KOOS] and Patient-Reported Outcomes Measurement Information System [PROMIS 29 Profile V10]).

PROs were assessed before surgery and at five scheduled follow up visits over the first year following surgery (2 weeks, 6 weeks, 3 months, 6 months, and 12 months).

Table 1: Patient demographic and clinical characteristics

	Valgus (n=53)	Varus (n=143)	p value
Sex, % (n)			0.0008
Male	15.1 (8)	40.6 (58)	
Female	84.9 (45)	59.4 (85)	
Race, % (n)			0.636
Black	36.6 (19)	34.8 (47)	
White	61.5 (32)	59.3 (80)	
Other	1.9 (1)	5.9 (8)	
Age (years), mean (SD)	68.1 (8.3)	68.2 (8.5)	0.901
Height (cm), mean (SD)	166.9 (9.7)	168.5 (10.4)	0.342
Weight (kg), mean (SD)	83.4 (17.6)	89.9 (18.4)	0.028
Body mass index (kg/m^2), mean (SD)	29.9 (5.6)	31.6 (5.4)	0.056
KL Score			0.567
0	0 (0)	0 (0)	
1	0 (0)	0.7 (1)	
2	0 (0)	4.2 (6)	
3	18.9 (10)	16.8 (24)	
4	81.1 (43)	78.3 (112)	
X-Ray			
Femur deformity (degrees), mean (SD)	6.6 (2.4)	5.6 (1.9)	0.006
Tibia deformity (degrees), mean (SD)	2.3 (1.7)	5.3 (2.7)	<0.0001
Overall deformity (degrees), mean (SD)	6.6 (4.4)	8.6 (4.8)	0.010

KL=*Kellgren Lawrence; SD = standard deviation.*

Table 2: Postoperative patient-reported outcomes*

	Deformity Type (DT)		Fixed Effects		
	Valgus (n=53)	Varus (n=143)	DT	Time	DT*Time
KOOS			---------- p value ----------		
Symptoms	62.8(2.8)	65.1(1.5)	0.467	<.0001	0.778
Pain	66.5(2.8)	62.6(1.6)	0.229	<.0001	0.762
Activities of daily living	66.6(2.8)	67.7(2.8)	0.716	<.0001	0.950
Quality of life	49.1(3.2)	49.5(1.8)	0.908	<.0001	0.521
PROMIS					
Fatigue	48.4(1.4)	50.8(0.8)	0.145	<.0001	0.095
Anxiety	48.9(1.4)	50.0(0.8)	0.517	<.0001	0.914
Depression	46.9(1.2)	47.7(0.7)	0.550	<.0001	0.564
Physical Function	40.1(1.1)	39.2(0.7)	0.471	<.0001	0.960
Pain Interference	55.7(1.5)	57.7(0.8)	0.238	<.0001	0.632
Sleep	50.4(1.4)	51.7(0.8)	0.398	<.0001	0.499
Social Role & Activities	45.0(1.5)	46.0(0.8)	0.550	<.0001	0.738
Pain	3.2(0.4)	3.7(0.2)	0.177	<.0001	0.434

*Values are least square means (standard error) adjusted for sex, BMI and overall deformity.
KOOS= Knee injury and Osteoarthritis Outcome Score;
PROMIS= Patient-Reported Outcomes Measurement Information System; SD=standard deviation.

References

1. Krackow K, Rauh M. The measurement and analysis of axial deformity at the knee. *Homer Stryker Center*. 2008.
2. Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KD. Patient satisfaction after total knee arthroplasty: Who is satisfied and who is not? Clinical Orthopaedics and Related Research®. 2010;468(1):57-63.
3. Mancuso CA, Sculco TP, Wickiewicz TL, et al. Patients' expectations of knee surgery. J Bone Joint Surg Am. 2001;83-A(7):1005-1012.

Results

A total of 220 surgeries were performed. After exclusion, a sample of 196 available for analysis. Data analyses were based on the TKA surgery which had associated preoperative x-rays indicating either a valgus (n=53) or varus (n=143) deformity. The study found that a higher percentage of valgus patients were female (84.9%), as opposed to varus (59.4%). The varus group tended to have a higher BMI than the valgus group. The overall deformity was less in the valgus patients than in varus patients—6.6° (4.4) versus 8.6° (4.8) (P = .010). Preoperative KOOS symptoms differed significantly between the two groups (P = .033) demonstrating 35.5 (17.7) for valgus and 43.1 (20.5) for varus. In general, all patients reported improved PRO scores over the postoperative period (P < .0001). The improvement did not differ between patients who had a valgus or varus deformity type as none of the deformity-type-by-time interactions were significant.

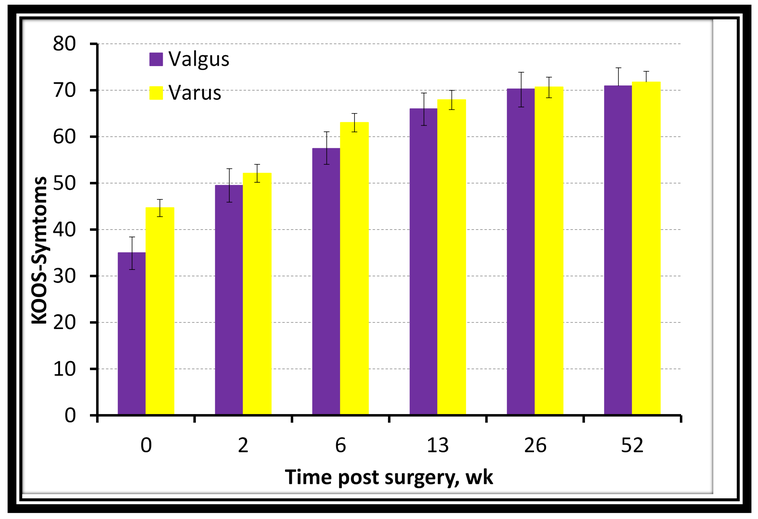

Figure 2: KOOS symptoms from preoperative to study completion.

Conclusions and Future Directions

The data from this study shows some varus and valgus patient differences at presentation for TKA. Further studies would need to be conducted to determine if these factors correlate with the general population with OA.

Patients with a preoperative valgus deformity reported worse knee symptoms prior to undergoing TKA. After adjusting for this and other baseline differences, preoperative alignment did not predict PROs one year after TKA.

Patient satisfaction has become an increasingly more important measure of procedural efficacy. Satisfaction cannot be determined by most PROs. Preoperative radiographs and patient education about modifiable and non-modifiable risk factors such as alignment may be important as baseline lower PROs lead to lower satisfaction.[2,3]