

BILATERAL COMPARISONS OF ISOKINETIC KNEE STRENGTH IN UNILATERAL TOTAL KNEE REPLACEMENT INDIVIDUALS

¹John W. Chow, ¹Dana M. Otzel, ¹Mark D. Tillman, and ²Richard Vlasak

¹Department of Applied Physiology and Kinesiology, ²Department of Orthopaedics and Rehabilitation
 University of Florida, Gainesville, FL, USA; e-mail: jchow@hhp.ufl.edu

INTRODUCTION

Knee function after total knee replacement (TKR) has been studied extensively. Several studies compared isokinetic knee flexion and extension strength of TKR knees with the uninvolved knees in unilateral TKR subjects and healthy knees in control subjects [1,2,3] and the results were equivocal. For example, Berman et al. [1] found significantly lower peak knee extension torques for 60 °/s in TKR knees at 2-yr post-op. However, Walsh et al. [3] did not find any significant bilateral differences in peak knee extension torques in unilateral TKR subjects. They only reported significantly lower peak knee flexion torques for speeds of 90 and 120°/s in TKR knees at 1-yr post-op in their male subjects (no differences in their female subjects). Interestingly, the knee angles at which peak torques occurred were not reported in previous studies. The purpose of this study was to examine the knee strength at different isokinetic speeds and the peak torque angles in unilateral TKR individuals.

METHODS

Seven females and four males (age 67.6±10.9 years, height 168.7±8.0 cm, weight 876.3±218.5 N) with unilateral TKR knee (3.8±3.4 years post-op; 9 right involved knee, 2 left involved knee) participated in this study. Knee flexion and extension torques were assessed using a KinCom AP125 isokinetic dynamometer at speeds of 60, 180, and 240 °/s. Two maximum effort trials of three reciprocal repetitions were completed for each joint motion-speed-side condition. For each condition, the largest torque value among the six repetitions was identified as the *peak torque*. The *peak torque angle* was the knee flexion angle associated with a peak torque. T-tests with repeated measures were used to determine if bilateral differences exist (alpha = .05). No adjustment was made for multiple tests due to the exploratory nature of this study.

RESULTS AND DISCUSSION

Significantly lower peak knee extension torques were found in

the involved knees for the speeds of 60 and 180 °/s, but not in the 240 °/s (Table 1). On average, peak torques of the involved knees were 73% and 80% of the uninvolved knees for the 60 and 180 °/s, respectively. These results support the quadriceps deficit reported by Berman et al. [1].

No bilateral difference in peak knee flexion torque was found for any of the isokinetic speeds (Table 1). This is in contrary to the findings of Walsh et al. [3]. It should be emphasized that the different durations of post-operation may explain some of the differences in findings reported in different studies.

Trends were detected in peak torque angles associated with the peak knee flexion torques for 180 and 240 °/s (Table 1). However, the average differences are relatively small and probably do not carry any functional significance.

The average flexion/extension ratios for the involved knee were 0.55, 0.88, and 1.06 for speeds of 60, 180, and 240 °/s, respectively. The corresponding values for the uninvolved knees were 0.44, 0.70, and 1.08, respectively. These values are comparable to those reported in the literature.

CONCLUSIONS

Reduced knee extension strength seems to be common in TKR knees. Future studies should examine the possible causes of such a deficit.

REFERENCES

1. Berman AT, et al. *Clin Orthop* **271**, 106-113, 1991.
2. Huang CH, et al. *Clin Orthop* **328**, 147-154, 1996.
3. Walsh M, et al. *Phys Ther* **78**, 248-258, 1998.

ACKNOWLEDGEMENTS

Supported in part by the University of Florida Opportunity Fund.

Table 1: Means (standard deviations) of isokinetic peak torques (Nm) and peak torque angles (°).

	Flexion						Extension					
	60 °/s		180 °/s		240 °/s		60 °/s		180 °/s		240 °/s	
	Torque	Angle	Torque	Angle	Torque	Angle	Torque	Angle	Torque	Angle	Torque	Angle
Involved Knee	29.8 (16.4)	79.2 (16.3)	47.2 (17.1)	78.4 (5.0)	58.9 (16.2)	75.5 (10.1)	63.6 (22.5)	62.8 (12.3)	59.0 (24.6)	55.8 (14.4)	59.9 (21.7)	61.7 (7.7)
Uninvolved Knee	34.9 (13.8)	68.6 (32.9)	52.2 (24.8)	81.7 (4.5)	66.5 (25.0)	80.6 (6.4)	86.9 (40.1)	62.8 (13.3)	73.9 (24.9)	63.5 (13.0)	63.9 (25.9)	52.5 (24.1)
P-value	.344	.294	.318	.067 [#]	.161	.062 [#]	.043 [*]	.999	.047 [*]	.163	.554	.163

* Significant different at p < 0.05.

[#] Statistical trend.