Does Generalized Joint Laxity Affect Postoperative Alignment and Clinical Outcomes Following Medial Opening-Wedge High Tibial Osteotomy?

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Conflict of interest

Jang HJ, MD.
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We have no financial conflict to disclose.

Introduction

- A close relationship between effects of soft tissue laxity on the alignment and clinical features of MOWHTO has been well established *DeMeo PJ 2010 Am J Sports Med*
- Most studies on soft tissue laxity in MOWHTO have been limited to the effect on the soft tissue of the knee joint *Na YG 2021 Knee Surg Relat Res*
- Generalized joint laxity (GJL), also called hypermobility syndrome or joint hyperlaxity, is generally reported at a rate of 10–30%. *Russek LN 2016 Clin Rheumatol*

Introduction

- Various studies have reported associations between GJL and several types of joint surgeries, including soft tissue procedures and ligament reconstruction

Mouton C 2015 Am J Sports Med

- Soft tissue containing ligaments plays an important role in the amount of weight shift following MOWHTO

→ Limited studies have examined the relationship between GJL and postoperative alignment and clinical results

Na YG 2021 Knee Surg Relat Res

Purpose

- **The purpose of this study was to investigate whether GJL affects the postoperative alignment and clinical outcomes after MOWHTO.**

- We hypothesized that patients with GJL would have more overcorrection than patients without GJL following MOWHTO.

Materials and Methods

- **March, 2015 ~ March, 2020 : Total 198 MOWHTO cases**
- **The Beighton and Horan criteria (GJL: 4 or more out of 9)**

(1) Right & left passive dorsiflexion of the little fingers beyond 90° (2 points)

(2) Right & left passive apposition of the thumbs to te flexor aspect of the forearm (2 points)

(3) Right & left hyperextension of the elbows beyond 10° (2 points)

(4) Right & left hyperextension of the knees beyond 10° (2 points)

(5) Forward flexion of the trunk with the knees straight so the palms of the hands rest easily on the floor (1 point).

Materials and Methods

- ◆ Radiographic assessment
  - ➢ Weight bearing full-length hip-to-ankle radiographs
  - ✓ Preoperative & Postoperative 2 years
    - Mechanical axis
    - Weight bearing line (WBL) ratio
    - Acceptable WBL range: 62.5% ± 7.5%
    - Joint line convergence angle (JLCA)
- ◆ Clinical assessment
  - ➢ WOMAC score

Demographic and Preoperative data

	Non-GJL group (n = 147)	GJL group (n = 51)	p-value
Demographics			
Age (years)	56.0 ± 8.3	57.2 ± 5.3	0. 348
Sex (% female)	132 (89.8%)	42 (82.4%)	0.211
Operation side (%, right)	80 (54.4%)	26 (51.0%)	0.745
BMI (kg/m^2)	26.3 ± 3.7	25.6 ± 3.3	0.243
OA (K-L grade)			0.875
≤ 2	39 (26.5%)	14 (27.5%)	
3	86 (58.5%)	28 (54.9%)	
4	22 (15.0%)	9 (17.6%)	
ASA grade			
1	53 (36.1%)	19 (37.3%)	0.868
2	94 (63.9%)	32 (62.7%)	
Active smoker (%)	6 (4.1%)	6 (11.8%)	0.081
Active drinker (%)	5 (3.4%)	4 (7.8%)	0.240

WBL ratio, HKA angle, JLCA

	Non-GJL group (n = 147)	GJL group (n = 51)	p-value
Preoperative			
HKA angle (°)	Varus 7.0 ± 2.9	Varus 6.8 ± 2.8	0.763
WBL ratio (%)	18.9 ± 12.1	19.6 ± 13.2	0.605
JLCA (°)	2.4 ± 1.2	4.0 ± 1.5	< 0.001
JLCA valgus	-0.3 ± 1.4	-1.2 ± 1.4	< 0.001
JLCA varus	4.7 ± 1.6	6.4 ± 2.4	< 0.001
Postoperative 2 years			
HKA angle (°)	Valgus 1.1 ± 2.1	Valgus 1.8 ± 2.3	0.044
WBL ratio (%)	56.0 ± 7.6	58.6 ± 7.8	0.046
JLCA (°)	1.9 ± 1.3	1.8 ± 1.2	0.584

WBL ratio & Clinical outcome

	Non-GJL group (n = 147)	GJL group (n = 51)	p-value
Postoperative 2 years			0.032
Undercorrection (< 55%)	35 (23.8%)	8 (15.7%)	
Normocorrection (55%–70%)	106 (72.1%)	36 (70.6%)	
Overcorrection (> 70%)	6 (4.1%)	7 (13.7%)	

	Preoperative			Postoperative 2 years		
	Non-GJL group (n = 149)	GJL group (n = 51)	p-value	Non-GJL group (n = 149)	GJL group (n = 51)	p-value
WOMAC†	53.9 ± 30.8	56.9 ± 27.0	0.547	26.7 ± 18.4	26.0 ± 19.8	0.826
Pain	10.7 ± 6.5	11.2 ± 5.2	0.598	5.0 ± 4.2	5.5 ± 5.0	0.507
Stiffness	4.2 ± 3.0	4.6 ± 2.8	0.347	2.6 ± 2.0	2.0 ± 1.9	0.100
Function	39.0 ± 22.5	41.1 ± 20.0	0.582	19.1 ± 13.5	18.5 ± 14.5	0.781

Conclusion

- ***Medial opening-wedge HTO***

- GJL demonstrated significantly affected postoperative overcorrection of alignment
- There was no significant difference in PRO between patients with and without GJL after MOWHTO

Reference

1. DeMeo PJ, Johnson EM, Chiang PP, Flamm AM, Miller MC. Midterm follow-up of opening-wedge high tibial osteotomy. Am J Sports Med 2010;38:2077e84.
2. Kang BY, Lee DK, Kim HS, Wang JH. How to achieve an optimal alignment in medial opening wedge high tibial osteotomy? Knee Surg Relat Res 2022;34: 3e13.
3. Kim HJ, Shin JY, Lee HJ, Park KH, Jung CH, Kyung HS. Can medial stability be preserved after open wedge high tibial osteotomy? Knee Surg Relat Res 2020;32:51e4.
4. Otsuki S, Ikeda K, Wakama H, Okuno N, Okamoto Y, Okayoshi T, et al. Preoperative flexion contracture is a predisposing factor for cartilage degeneration at the patellofemoral joint after open wedge high tibial osteotomy. Knee Surg Relat Res 2020;32:55e60.
5. Pipino G, Indelli PF, Tigani D, Maffei G, Vaccarisi D. Opening-wedge high tibial osteotomy: a seven - to twelve-year study. Joints 2016;4:6e11.
6. Song IS, Kwon J. Analysis of changes in tibial torsion angle on open-wedge high tibial osteotomy depending on the osteotomy level. Knee Surg Relat Res 2022;34:17e23.
7. Sharma L, Song J, Felson DT, Cahue S, Shamiyeh E, Dunlop DD. The role of knee alignment in disease progression and functional decline in knee osteoarthritis. Jama 2001;286:188e95.
8. Sprenger TR, Doerzbacher JF. Tibial osteotomy for the treatment of varus gonarthrosis. Survival and failure analysis to twenty-two years. J Bone Joint Surg Am 2003;85:469e74.
9. Kim MS, Koh IJ, Choi KY, Kim BS, In Y. Changes in joint space width over time and risk factors for deterioration of joint space width after medial opening-wedge high tibial osteotomy. Arch Orthop Trauma Surg 2021;142:2513e24.
10. Marti CB, Gautier E, Wachtl SW, Jakob RP. Accuracy of frontal and sagittal plane correction in open-wedge high tibial osteotomy. Arthroscopy 2004;20: 366e72.
11. Na YG, Lee BK, Choi JU, Lee BH, Sim JA. Change of joint-line convergence angle should be considered for accurate alignment correction in high tibial osteotomy. Knee Surg Relat Res 2021;33:4e13.

Reference

12. Lee DH, Park SC, Park HJ, Han SB. Effect of soft tissue laxity of the knee joint on limb alignment correction in open-wedge high tibial osteotomy. Knee Surg Sports Traumatol Arthrosc 2016;24:3704e12.
13. Lee DK, Wang JH, Won Y, Min YK, Jaiswal S, Lee BH, et al. Preoperative latent medial laxity and correction angle are crucial factors for overcorrection in medial open-wedge high tibial osteotomy. Knee Surg Sports Traumatol Arthrosc 2020;28:1411e8.
14. Ogawa H, Matsumoto K, Ogawa T, Takeuchi K, Akiyama H. Preoperative varus laxity correlates with overcorrection in medial opening wedge high tibial osteotomy. Arch Orthop Trauma Surg 2016;136:1337e42.
15. Jacobs JW, da Silva JA. Hypermobility syndromes from the clinician's perspective: an overview. Acta Reumatol Port 2014;39:124e36.
16. Remvig L, Jensen DV, Ward RC. Epidemiology of general joint hypermobility and basis for the proposed criteria for benign joint hypermobility syndrome: review of the literature. J Rheumatol 2007;34:804e9.
17. Russek LN, Errico DM. Prevalence, injury rate and, symptom frequency in generalized joint laxity and joint hypermobility syndrome in a "healthy“ college population. Clin Rheumatol 2016;35:1029e39.
18. Mouton C, Theisen D, Meyer T, Agostinis H, Nührenb€orger C, Pape D, et al.
Noninjured knees of patients with noncontact ACL injuries display higher average anterior and internal rotational knee laxity compared with healthy knees of a noninjured population. Am J Sports Med 2015;43:1918e23.
19. Park KH, Lee JW, Suh JW, Shin MH, Choi WJ. Generalized ligamentous laxity is an independent predictor of poor outcomes after the modified brostr€om procedure for chronic lateral ankle instability. Am J Sports Med 2016;44: 2975e83.