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Comparison of muscle activities of abductor hallucis and adductor hallucis between the short foot and toe-spread-out exercises in subjects with mild hallux valgus[1]

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Abstract.
BACKGROUND AND OBJECTIVE: Muscle imbalance between the abductor hallucis (AbdH) and adductor hallucis (AddH) has been demonstrated in hallux valgus (HV). Clinically, the short-foot (SF) is performed for strengthening foot intrinsic muscle. The toes-spread-out (TSO), the newly introduced, was devised to correct HV deformity. However, there was no study to determine which exercise is effective in balancing the ratio of activation between AbdH and AddH muscles. The purpose of this study was to compare the muscle activities of the AbdH and AddH between SF and TSO exercises in subjects with mild HV.
METHODS: Eighteen subjects with mild HV participated. The muscle activity of AbdH and AddH and the angle of first metatarsophalangeal (MTP) joint in the horizontal plane were measured during the SF and TSO exercises. Values of dependent variables were compared using a paired t-test between the SF and TSO exercises.
RESULTS: The TSO exercise showed significantly greater activation of the AbdH than did the SF exercise (mean difference = 44.96% of maximum voluntary isometric contraction; $p < 0.001$). There was no significant difference between the SF and TSO exercises in activating the AddH (mean difference = 8.28% of maximum voluntary isometric contraction; $p = 0.271$). The ratio of AbdH to AddH muscle activity was significantly higher in the TSO exercise than in the SF exercise (mean difference = 0.54; $p = 0.001$). The angle of the first MTP joint in the horizontal plane during the TSO was significantly greater than that in the SF exercise (mean difference = 9.60°; $p < 0.001$).
CONCLUSIONS: These results suggest that the TSO exercise can be recommended for preventing or correcting HV deformity at an early stage.

Keywords: Hallux valgus, muscle imbalance, short-foot exercise, toes-spread-out exercise

1. Introduction

Hallux valgus (HV) is a progressive toe deformity characterized by lateral deviation of the great toe at the metatarsophalangeal (MTP) joint that may lead to a painful prominence of the medial aspect of the first metatarsal head [18]. The etiology of HV is multifactorial. Constrictive shoes with high heels and point-

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[1]The protocol for this study was approved by the Institutional Review Board of Yonsei University.

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