

## THE KINETIC CHANGES OF GAIT ACROSS CALF MYOFASCIAL INTERVENTION

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### INTRODUCTION

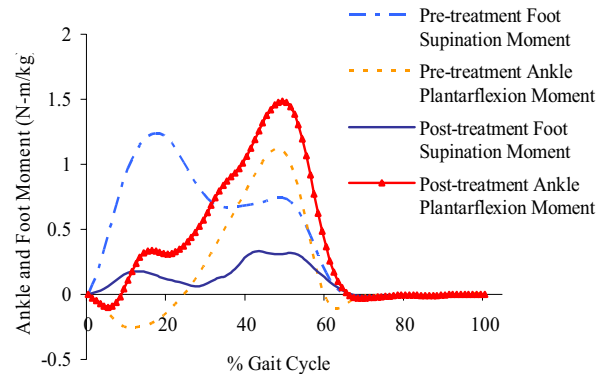
Myofascial pain syndrome (MPS) is a common clinical problem of muscle pain caused by myofascial trigger points (MTrPs). MTrP has been defined as the hyperirritable spot in a taut band of skeletal muscle fibers [1]. The majority of researches concerning the myofascial pain have been related to pain condition and the areas of head, neck, upper extremities, as well as back, but the lower extremity problems were generally overlooked. The purposes of this study were to investigate the influence of the chronic calf muscle tightness caused by myofascial pain syndrome on gait performance and the treatment effect in order to inform the clinical management of patients with inflexibility of calf muscles.

### METHODS

A female subject suffered from chronic knee and ankle pain for five years as a result of calf muscles myofascial pain syndrome. The pain intensity (Visual Analog Pain Scale), ranges of motion on ankle joints, and gait analysis were evaluated before and after myofascial pain therapy. The Expert Vision HiRes motion analysis system (Motion Analysis Corporation, CA, USA) equipped with 6 CCD cameras were synchronized with ground reaction forces measured by two forceplates (Kistler Instrument Corporation, NY, USA) and used to capture the subject's motion at 60 Hz sample rate. The 8-week calf myofascial treatment programs included manual techniques (deep myofascial release, deep friction massage, and proprioceptive neuromuscular facilitation stretching) and home program (self-stretching exercises).

### RESULTS AND DISCUSSION

There were significant improvements in the ankle-dorsiflexion ROMs of the affected leg after treatment ( $p < 0.01$ ). A trend of moderate improvement in pain conditions were recorded both in resting and after work. Although the kinematic data of gait analysis were quite similar across treatments except for improved knee flexion angles, the kinetic findings revealed significant effectiveness of myofascial treatments. The significantly decreased peak ground reaction forces ( $p < 0.001$ ), and significantly improved peak joint moments of ankle dorsiflexion ( $p = 0.008$ ), foot supination ( $p = 0.002$ ), and knee extension ( $p = 0.009$ ) were demonstrated during walking. This case study demonstrated the biomechanical abnormality of gait due to chronic myofascial pain in the calf muscles. This greater and prolonged dorsiflexion moment could be due to



**Figure 1:** The joint moments of ankle and foot across treatments throughout the gait cycle. (positive values: ankle plantarflexion and foot supination; negative values: ankle dorsiflexion and foot pronation).

greater demands of dorsiflexor muscles to maintain an appropriate heel strike as the result of the tightness of calf muscle. The significantly greater moments of foot supination in the stance phase before treatment may indicate that more supinator efforts to prevent excessive pronated foot that usually compensated for insufficient dorsiflexion flexibility [2]. The significantly greater knee extension moments caused the increase muscle loading of knee extensors and could be the result of excessive knee flexion angles during walking. The excessive knee flexion angles were the obligatory compensation for tight calf muscles in order to have a nearly normal ankle-foot motion. The myofascial treatments improved the clinical symptoms and kinetics of gait.

### CONCLUSIONS

The chronic muscle tightness caused by myofascial pain syndrome is a factor influencing the joint motion and easily ignored by clinicians. The quantitative gait analysis is valuable and necessary to clarify the influence of the chronic calf muscles tightness on ankle and knee joints and the effectiveness of myofascial treatments.

### REFERENCES

1. Simons DG, et al. *Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual*, Vol. 1. Ed. 2. Williams & Wilkins, Baltimore, 1999.
2. Gross M: *J Orthop Sports Phys Ther* **21**, 389-405, 1995.

**Table 1:** The pain intensity, joint angle, peak ground reaction force, and knee joint moment across myofascial treatments.

	Before treatment	After treatment	P
<b>Pain intensity</b> ankle resting pain / pain after work	3.1 / 3.8	0.5 / 1.5	
<b>Joint angle (°)</b> ankle dorsiflexion with knee extended (flexed)	10.3 ± 0.6(20.3 ± 1.5)	18.3 ± 2.1(29.7 ± 0.6)	0.003*(0.001*)
<b>Peak ground reaction force</b> (body weight)	1.75 B.W.	1.13 B.W.	< 0.001*
<b>Knee extension moment</b> (N-m/kg)	0.97 ± 0.07	0.42 ± 0.02	0.009*