Journal of Electromyography and Kinesiology xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Journal of Electromyography and Kinesiology

journal homepage: www.elsevier.com/locate/jelekin

Isometric hip abduction using a Thera-Band alters gluteus maximus muscle activity and the anterior pelvic tilt angle during bridging exercise

Sil-Ah Choi, Heon-Seock Cynn *, Chung-Hwi Yi, Oh-Yun Kwon, Tae-Lim Yoon, Woo-Jeong Choi, Ji-Hyun Lee

Applied Kinesiology and Ergonomic Technology Laboratory, Department of Physical Therapy, The Graduate School, Yonsei University, 1 Yonseidae-gil, Wonju-si, Gangwon-do 220-710, South Korea

ARTICLE INFO

Article history:
Received 7 February 2014
Received in revised form 3 June 2014
Accepted 1 September 2014
Available online xxxx

Keywords:
Bridging
Gluteus maximus
Preactivation
Thera-Band

ABSTRACT

The purpose of this study was to investigate the effects of bridging with isometric hip abduction (IHA) using the Thera-Band on gluteus maximus (GM), hamstring (HAM), and erector spinae (ES) muscle activity; GM/HAM and GM/ES ratios; and the anterior pelvic tilt angle in healthy subjects. Twenty-one subjects participated in this study. Surface EMG was used to collect EMG data of GM, HAM, and ES muscle activities, and Image J software was used to measure anterior pelvic tilt angle. A paired *t*-test was used to compare GM, HAM, and ES muscle activity; the GM/HAM and GM/ES ratios; and the anterior pelvic tilt angle with and without IHA during the bridging exercise. GM muscle activity increased significantly and the anterior pelvic tilt angle decreased significantly during bridging with IHA using the Thera-Band ($p < 0.05$). However, there were no significant differences in the activity of the HAM and ES and the GM/HAM and GM/ES ratios between bridging with and without IHA ($p > 0.05$). The results of this study suggest that bridging with IHA using the Thera-Band can be implemented as an effective method to facilitate GM muscle activity and reduce the anterior pelvic tilt angle.

1. Introduction

The gluteus maximus (GM) is one of the largest and strongest muscles in the body. The GM originates from the posterior sacrum and coccyx as well as the posterior gluteal line of the ilium and inserts on the iliotibial tract and gluteal tuberosity of the femur (Frank and Netter, 1987). The GM is a powerful extensor and external rotator of the hip, and the superior part of the GM acts as a hip abductor because muscle fibers in the GM are directed downward and outward (Frank and Netter, 1987; Long et al., 1993). Hip extensors, especially the GM, are important for many functional activities of daily living such as moving from sitting to standing, climbing stairs, and maintaining an upright posture during walking (Winter, 1991). Because the direction of the GM muscle fibers, especially deep sacral fibers of the GM, are perpendicular to the sacroiliac (SI) joint, GM contraction improves SI joint stability and plays a part in force transmission from the lower extremity to the pelvis during ambulation (Hossain and Nokes, 2005; Leinonen et al., 2000; Mooney et al., 2001).

However, the GM is frequently weak and lengthened because many people spend a great amount of time remaining seated (Sahrmann, 2002). Decreased activity of the GM is one cause of low back pain (LBP) and results in SI joint instability and dysfunction (van Wingerden et al., 2004). In addition, hamstring (HAM) tightness can be observed as a compensatory mechanism for a weak GM (Massoud Arab et al., 2011; van Wingerden et al., 2004). Also, excessive anterior pelvic tilt, lumbar lordosis with dominant erector spinae (ES), and lumbar rotation occur in place of a weak GM or delayed GM activation during hip extension (Chaitow, 1996; Sahrmann, 2002).

Bridging exercises are the most commonly used by people with weak hip extensors and trunk muscles in physical therapy programs. However, bridging exercises are associated with a risk of dominant HAM and ES activity and excessive anterior pelvic tilt as a compensation for GM weakness regardless of the type of bridging exercise performed. Therefore, bridging exercise with isometric hip abduction (IHA) using a Thera-Band (Hygenic Corp., Akron, OH, USA) was devised in this study. No previous studies have compared GM with HAM and ES muscle activity and pelvic kinematics during bridging with IHA using the Thera-Band. Thus, the purpose of this study was to investigate the effects of bridging

* Corresponding author. Tel.: +82 33 760 2427; fax: +82 33 760 2496.
E-mail addresses: silah88@naver.com (S.-A. Choi), cynn@yonsei.ac.kr (H.-S. Cynn), pteagle@yonsei.ac.kr (C.-H. Yi), kwonoy@yonsei.ac.kr (O.-Y. Kwon), free0829@gmail.com (T.-L. Yoon), cwj7354@gmail.com (W.-J. Choi), rapa60@naver.com (J.-H. Lee).

http://dx.doi.org/10.1016/j.jelekin.2014.09.005
1050-6411/