Comparison of Relative Thickness of the Iliotibial Band Following Four Self-Stretching Exercises

Hyun-sook Kim¹, PhD, PT, Tae-lim Yoon², MA, PT
¹Dept. of Physical therapy, Yeoju Institute of Technology,
²Dept. of Physical Therapy, The Graduate School, Yonsei University

Abstract

The aim of this study was to investigate the effectiveness of self-stretching exercises for iliotibial band (ITB) (Side-lying; right hip and knee were flexed to support the pelvis while left hip was extended and adducted, Standing A: side-bending of the trunk on standing with crossed leg, Standing B: same as Standing A, except the hands were clasped overhead and shifted right side, and Standing C: same as Standing B, except moving the arms diagonally downward) to help determine the most effective self-stretching method to stretch ITB. Twenty-one healthy subjects who do not have ITB shortness from Yonsei University (14 men and 7 women) between the ages of 18 to 28 years voluntarily participated. Ultrasound was performed to measure the thickness of the ITB along the long axis of the ITB and the level parallel to the lateral femoral epicondyle during four self-stretching exercises. All data were found to approximate a normal distribution. We used a one-way repeated-measures analysis of variance (ANOVA) to compare the thickness of the ITB among all self-stretching exercises. The level of significance was set at α=.05. The ANOVA was followed by Bonferroni’s correction. The overall mean of ITB thickness was 1.14±.4 mm (± standard deviation) in resting status. The change in the ITB thickness in percentages between the tested position of each self-stretching exercises and resting status was significant (p<0.05) (Side-lying 35.62±10.18% with 96% confidence interval [CI]=21.99~31.25% Standing A 29.46±16.19% with 96% CI=22.00~36.84% Standing B 44.06±14.82% with 96% CI=37.31~50.81% Standing C 53.76±12.1% with 96% CI=48.25~59.29%). Results indicated significant differences among four self-stretching exercises except Side-lying versus Standing A (p<.01). Based on these findings, the Standing C self-stretching exercise was the most effective in stretching the ITB thickness among four types of ITB self-stretching exercises. Additionally, the Side-lying self-stretching exercise using gravity to stretch the ITB is recommended as a low-load (low-intensity), long-duration stretch.


Key Words: Iliotibial band friction syndrome; Side-lying; Snapping hip; Ultrasound.

Introduction

The iliotibial band (ITB) is a longitudinal thickening of the lateral distal deep fascia latae and the superficial one-quarter of the fibers of the gluteus maximus (Fairclough et al, 2006; Muhle et al, 1999), the ITB is a dense fibrous connective tissue that passes distally along the thigh (Fairclough et al, 2006). Proximal to the knee joint, the ITB has attachments to the intermuscular septum and the supracondylar tubercle of the femur; it continues distally to insert on the Gerdy tubercle at the anterolateral aspect of the proximal tibia (Fairclough et al, 2006; Muhle et al, 1999). As it approaches the knee,
the ITB separates into two functional components, the iliotibial band and the iliotibial tract, which attach to the Gerdy’s tubercle of the lateral tibia condyle and the lateral patella retinaculum, respectively (Evans, 1973; Terry et al, 1986).

The tightness of ITB could be a reason for musculoskeletal disorders, such as iliotibial band friction syndrome (ITBFS) and snapping hip. ITBFS was first specifically described by Renne (1975) as a pain felt on the lateral aspect of the knee in lower limb activities, such as running and cycling (Renne, 1975). ITBFS is the second most common injury from overuse and the most commonly diagnosed in running, soccer, basketball, triathlons, and field hockey (Barber and Sutker, 1992; Kirk et al, 2000; Noble, 1989; Strauss et al, 2011). Friction of the ITB against the lateral femoral epicondyle during repetitive flexion and extension activities compresses the fat and connective tissue deep into the ITB (Strauss et al, 2011). Patients with ITBFS complain of severe burning at the area around and under the lateral epicondyle, secondary to tightness, frictional irritation, and inflammation of the posterior fibers of the ITB and the peristeum of the epicondyle (Nishimura et al, 1997; Orchard et al, 1996). Furthermore, external snapping hip is present when the tightened iliobibial tract and/or the anterior boder of gluteus maximus slide over the greater trochanter (Allen and Cope, 1995; Brignall and Stainsby, 1991; Choi et al, 2002; Yoon et al, 2009). Symptomatic external snapping hip is a painful condition affecting physical function in people between 15 and 40 years (Provencher et al, 2004). Symptoms are often long-standing, and musculoskeletal pain and activity limitations often dominate the clinical picture (Allen and Cope, 1995; Provencher et al, 2004).

Most rehabilitation plans for managing ITBFS and snapping hip include stretching exercises to increase ITB flexibility as a beneficial treatment (DeFranca, 1998; Jones and James, 1987; Lee et al, 2005; Orchard et al, 1986; Suh et al, 2006). Began after acute inflammation subsides, stretching exercise is commonly used to increase the length and extensibility of soft tissues (Fredericson et al, 2000; Fredericson and Wolf, 2009). Self-stretching is a one of stretching type, enables a patient to maintain or improving flexibility independently, and is often an essential component of a home exercise program (Kisner and Colby, 2007). Applying an effective and practical self-stretching exercise is essential to stretch the ITB and re-establish functional tissue length. A previous study compared the effectiveness of three common variations of the ITB self-stretching, but only in a standing position (Fredericson et al, 2002). Other ITB self-stretching exercise in side-lying positions, similar position of Ober test, has never been investigated by ultrasound (US) (Strauss et al, 2011; Wang et al, 2006).

US is a real-time, high-resolution, noninvasive imaging tool to assess ITB (Bonaldi et al, 1998; Goh et al, 2003; Wang et al, 2008). Compared with Magnetic resonance imaging, US is a more suitable tool for defining morphologic changes in the ITB in conjunction with the Ober or modified Ober test because of its dynamic examination capability (Wang et al, 2006). A study calculated the length of the extensor carpi radialis muscle from the muscle thickness (Shi et al, 2009). Also, other study conclude that US is a reliable means to directly assess the real-time effects of stretching exercises (Wang et al, 2008).

Stretching exercises for the ITB has an important role in maintaining the flexibility of soft tissue. In particular, self-stretching exercises are highlighted in education about home exercise. Therefore, this study should be investigated further to ensure the most effective exercise for stretching the ITB and ameliorating its tightness. Our research objective was to investigate the effectiveness of self-stretching exercises for ITB to help determine the most effective method for ameliorating ITB tightness. This study hypothesized that the changes of ITB thickness in percentage caused by four self-stretching exercises would show statistical differences.