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Original article

Effect of the pelvic compression belt on the hip extensor activation patterns of sacroiliac joint pain patients during one-leg standing: A pilot study☆

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ABSTRACT

As a means of external stabilization of the sacroiliac joint (SIJ), many clinicians have often advocated the use of the pelvic compression belt (PCB). The objective of this pilot study was to compare the effects of the PCB on hip extensor muscle activation patterns during one-leg standing in subjects with and without sacroiliac joint pain (SIJP).

Sixteen subjects with SIJP and fifteen asymptomatic volunteers participated in this study. Surface electromyography (EMG) data [signal amplitude and premotor reaction time (RT)] were collected from the gluteus maximus and biceps femoris muscles of the supporting leg during one-leg standing with and without the PCB.

Compared to that of the asymptomatic individuals, the EMG amplitude of the biceps femoris was significantly decreased in individuals with SIJP upon the application of the PCB ($p < 0.05$). Furthermore, on using the PCB, in individuals with SIJP, the RT of the gluteus maximus was significantly decreased; however, the RT of the biceps femoris was increased ($p < 0.05$).

Thus, our data support the use of the PCB to modify the activation patterns of the hip extensors among patients with SIJP.

1. Introduction

The sacroiliac joint (SIJ) is a potential source of low back pain (LBP) (Schwarzer et al., 1995; Slipman et al., 2001), and the prevalence of sacroiliac joint pain (SIJP) is reported to be 13–30% in patients with non-specific LBP (Schwarzer et al., 1995; Maigne et al., 1996). The main function of the SIJs has been often described to transfer the load of the upper body weight to the legs, and transmit ground reaction force from the lower limbs to the trunk (Vleeming et al., 1992; Hossain and Nokes, 2005). These functions can differ depending on the patient's anatomical articular stability (form closure) and optimal neuromuscular stability (force closure) during performance of various activities (De Groot et al., 2008). Sturesson et al. (2000) showed that, the form closure and force closure mechanisms provide and control functional stability of the SIJs; the stability was measured using radiostereometric analysis during one-leg standing. Therefore, disruption of these mechanisms has been frequently hypothesized to lead to pain or dysfunction during load transfer through the lumbopelvic region (Snijders et al., 1998; Mens et al., 1999).

Weight bearing on the symptomatic side during standing or walking may aggravate the symptoms of SIJP (Slipman et al., 2001); this probably occurs due to asymmetrical shear loading through the lower extremities or the pelvis (Prather and Hunt, 2004; Zelle et al., 2005). Moreover, one-leg standing on the symptomatic side contributes to the forward rotation of the ilium with resulting flexion at the contralateral hip (Hu et al., 2010), which may be a potential factor to make the SIJ unstable during load transfer (Hungerford et al., 2004).

One-leg stance is a necessary sequence for dynamic transitions of body weight during walking (Rogers and Pai, 1993), and it is often used to assess the capability of the SIJ to maintain lumbopelvic stability during the transmission of load between the lower extremities and the spine (Lee, 2004). Muscular effort is required to stabilize the lumbopelvic region and to control the supporting leg (Hossain and Nokes, 2005). A previous study found that patients with SIJP exhibit altered activation patterns of the biceps femoris and gluteus maximus during one-leg standing (Hungerford et al.,

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