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RESEARCH REPORT

Pattern of changes in local and global muscle thickness among individuals with sacroiliac joint dysfunction

Leonard H. Joseph, PhD [a,b], Rizuana I. Hussain, MD [c], Amaramalar S. Naicker, MD [d], Ohnmar Htwe, MD [d], Ubon Pirunsan, PhD [a], Aatit Paungmali, PhD [a,*]

[a] *Department of Physical Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai 50200, Thailand*
[b] *Physiotherapy Program, School of Rehabilitation Sciences, Wellness and Rehabilitation Research Niche, Faculty of Health Sciences, University Kebangsaan Malaysia, Kuala Lumpur, Malaysia*
[c] *Department of Radiology, Faculty of Medicine, University Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia*
[d] *Department of Orthopaedics, Faculty of Medicine, University Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia*

KEYWORDS
local muscle;
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Abstract *Background:* Altered motor patterns of the local muscle system (LS) and global muscle system (GS) is reported among low back pain patients. However, the pattern of changes in the LS and GS among individuals with sacroiliac joint dysfunction (SJD) is not clear.
Objective: This study aimed to investigate the changes in the resting muscle thickness of LS and GS in SJD.
Methods: A total of 40 individuals (20 participants with SJD and 20 healthy participants as matched controls) participated in this study. The resting thickness of the LS and GS such as rectus abdominis (RA), external oblique (EO), internal oblique (IO), transverses abdominis (TrA), and lumbar multifidus (LM) was measured using real time ultrasonography and the data were compared between the ipsilateral side and contralateral side among participants with SJD as well as healthy participants. Parametric and nonparametric statistics were used to analyse the data as appropriate.
Results: The results showed that EO and IO were significantly reduced among SJD participants when compared with the contralateral side. Similarly, EO and LM were significantly reduced among the SJD group when compared with the controls.

* Corresponding author. Department of Physical Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, 110 Intawaroros Road, Sriproom, Moung, Chiang Mai 50200, Thailand.
E-mail address: aatit.p@cmu.ac.th (A. Paungmali).

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Conclusion: The findings of the study support a trend of reduced size in the resting thickness of the LS and GS in SJD.

Introduction

The stability of the pelvis is governed by the optimal functioning of the lumbopelvic region. The sacroiliac joint is surrounded by many muscles that act to compress the joint which enhances the pelvic stability during a variety of functional tasks [1—4]. Two important muscle systems are operational in the sacroiliac joint to create and maintain the optimum function and stability of the joint through a biomechanical concept called force closure [1,3,5]. Therefore, an efficient force closure system as dictated by the local and global muscle system is important to maintain the stability of the region [6]. The local muscle system refers to the deep intrinsic transversely oriented abdominal muscles such as transverses abdominis and multifidus [2,7,8]. The global muscle system related to lumbopelvic stability refers to the larger, longitudinally oriented superficial abdominal muscles such as rectus abdominis, internal oblique, and external oblique [2,9]. Thus an optimal contractile effect of the local and global muscle system works continuously to maintain the function and stability of the sacroiliac joint.

Pelvic girdle pain is reported to occur due to excessive as well as insufficient motor activation of the lumbopelvic and surrounding muscles [10]. Sacroiliac joint dysfunction (SJD) is a subgroup of pelvic girdle disorder where there is any altered or impaired functioning of the somatic framework of sacroiliac joint and its related components such as arthrodial, myofascial, ligamentous, vascular, lymphatic, and neurological, given that the articular surfaces are variable in anatomical shape not only from individual to individual, but from side to side [11]. Furthermore, SJD is also referred to as an altered position of the sacroiliac joint surfaces, which is created by repetitive stresses and is maintained by compressive and elastic forces of the ligaments and muscles [12]. In the dysfunctional state, the sacroiliac joint is reported to have altered biomechanical features, neural compression, and muscle spasms [13]. In other words, the biomechanics of the sacroiliac joint will be altered and compromised with regard to its function of load transference and motor control.

Any information on the changes on the motor control of these global and local muscles among individuals with SJD still remains unclear. A prior understanding on the normal functions of the local and global muscle system towards sacroiliac joint stability is prerequisite among clinicians to interpret and differentiate the changes in motor control that may occur in sacroiliac joint dysfunction. In normal sacroiliac joints, transverses abdominis (TrA) and middle part of internal oblique (IO) act to compress the sacrum between the ilia and maintain the stability of the sacroiliac joint [2]. Furthermore, preactivation of TrA, IO, lumbar multifidus (LM) and gluteus maximus (GM) is reported to induce posterior rotation of the innominate of illium relative to the sacrum and stabilize the sacroiliac joint [4]. The lumbar multifidus acts as a stabilizer of the lumbosacral region as it sends fibre over the sacrum to unite with sacrotuberous ligaments and stiffens the sacroiliac joint [14]. However, it is not clear what happens to the above said functions of the muscles among individuals with SJD.

Although the changes in the local and global muscle system are studied extensively among patients with low back pain, studies on the motor control of these muscles among patients with SJD are lacking. Therefore, the main aim of this study was to investigate the change in the muscle thickness of local and global muscles in SJD. The primary objective of this study was to compare the resting thickness of the local and global muscle system (RA, IO, EO, TrA, and LM) between symptomatic and asymptomatic sides among participants with SJD. The secondary objective was to compare the local and global muscles resting thickness between participants with SJD and healthy individuals as matched controls. Clinically, any alterations such as weakness or wasting of local or global muscles may alter the stability of the joint during some functional and locomotive tasks leading to musculoskeletal pathogenesis [15]. Thus, it was hypothesized in this study that the participants with SJD may have reduced resting thickness of the local and global muscles. The findings of the study may help clinicians to frame an appropriate exercise program to address local and global muscle system among patients with lumbopelvic disorders.

Methods

Participant characteristics

This study recruited a total of 40 participants ($n = 20$, participants with SJD and $n = 20$, matched controls). All the participants were recruited based on predefined selection criteria. The participants with SJD were recruited from an outpatient physiotherapy department from a university teaching hospital. The inclusion criteria for SJD participants were that they should test positive for the battery of clinical tests. The participants with SJD were recruited through a battery of clinical tests namely Gillet test, standing flexion test, prone knee flexion test, supine long sitting test, and palpation of posterior iliac spine asymmetry on sitting [16,17]. The participants were diagnosed with SJD if they showed positive responses to at least four of five clinical tests [16—18]. The healthy participants were recruited as controls from the hospital staff and primary care givers who accompanied the patients to the hospital. The healthy participants were matched as controls in terms of age, weight, height, and body mass index (BMI). Any patients who reported back