



ORIGINAL RESEARCH

Reliability of ultrasound thickness measurement of the abdominal muscles during clinical isometric endurance tests



Shabnam ShahAli, PhD, PT ^{a,*}, Amir Massoud Arab, PhD, PT ^{a,*},
Saeed Talebian, PhD, PT ^b, Esmail Ebrahimi, PhD, PT ^c,
Andia Bahmani, MSc, PT ^{a,1}, Nouredin Karimi, PhD, PT ^{a,1},
Hoda Nabavi, MSc in Biomedical Engineering ^d

^a Department of Physical Therapy, University of Social Welfare and Rehabilitation Sciences, Evin, Koodakyar Avenue, P.O Box 1985713834, Tehran, Iran

^b Department of Physical Therapy, Rehabilitation Faculty, Tehran University of Medical Sciences and Health Services, Tehran, Iran

^c Rehabilitation Faculty, Iran Medical Sciences University, Tehran, Iran

^d Department of Biomechanics and Sport Engineering, Amirkabir University of Technology, Tehran, Iran

Received 6 March 2014; received in revised form 23 May 2014; accepted 24 May 2014

KEYWORDS

Ultrasound;
Reliability;
Abdominal muscles;
Physical endurance

Summary The study was designed to evaluate the intra-examiner reliability of ultrasound (US) thickness measurement of abdominal muscles activity when supine lying and during two isometric endurance tests in subjects with and without Low back pain (LBP). A total of 19 women (9 with LBP, 10 without LBP) participated in the study. Within-day reliability of the US thickness measurements at supine lying and the two isometric endurance tests were assessed in all subjects.

The intra-class correlation coefficient (ICC) was used to assess the relative reliability of thickness measurement. The standard error of measurement (SEM), minimal detectable change (MDC) and the coefficient of variation (CV) were used to evaluate the absolute reliability. Results indicated high ICC scores (0.73–0.99) and also small SEM and MDC scores for within-day reliability assessment. The Bland-Altman plots of agreement in US measurement of the abdominal muscles during the two isometric endurance tests demonstrated that 95% of the observations fall between the limits of agreement for test and retest measurements. Together the results indicate high intra-tester reliability for the US measurement of the

* Corresponding authors. Tel.: +989122069111; fax: +982122180039.

E-mail addresses: shabnamshahali@yahoo.com (S. ShahAli), ara.physio@yahoo.com (A.M. Arab).

¹ Tel.: +989122069111; fax: +982122180039.

thickness of abdominal muscles in all the positions tested. According to the study's findings, US imaging can be used as a reliable method for assessment of abdominal muscles activity in supine lying and the two isometric endurance tests employed, in participants with and without LBP.

© 2014 Elsevier Ltd. All rights reserved.

Introduction

Today, LBP is one of the most common musculoskeletal disorders. About 70–80% of the people have at least one LBP episode during their lifetime (Ehrlich, 2003).

Abdominal wall muscles have an essential role in spinal stability and functional deficits in these muscles in individuals with LBP have been reported (Hodges and Richardson, 1998, 1999; Ferreira et al., 2004; Kiesel et al., 2008; Koppenhaver et al., 2009).

Abdominal muscles divide into the antero-lateral abdominal wall, consisting of the transversus abdominis (TrA), internal oblique (IO) and external oblique (EO); and the anterior wall, consisting of rectus abdominis (RA) muscle and associated fascia. The TrA muscle and posterior part of the IO muscle are part of a deep muscle cylinder that has an important role in spinal stability (Richardson et al., 1999). The RA and EO are considered as a part of a 'global' muscle system that controls spinal orientation, balances the external loads that influence the spine and transmits load from the thorax to the pelvis (Bergmark, 1989). Proper activation of the abdominal muscles is considered to be a protective mechanism for the lumbar spine (Hodges and Moseley, 2003).

Several factors have been correlated with the development of LBP. One of these factors is muscle endurance. Studies have shown abdominal muscular endurance is less in subjects with low back pain compared with normal healthy subjects (Foster and Fulton, 1991; Ito et al., 1996; Moffroid, 1997; Corin et al., 2005; Malliou et al., 2006; Arab et al., 2007).

Assessing abdominal muscles and measuring the pattern of their activity seem to be important since it might provide better comprehension of pain behavior in LBP patients in the clinical setting. Recently, US imaging has been used increasingly by physical therapists to assess the abdominal wall muscles in subjects with or without LBP. Real time US imaging is a feasible and cost effective method for measuring muscle thickness and monitoring muscle contraction and movement (Hodges and Moseley, 2003; Ferreira et al., 2004; McMeeken et al., 2004; Teyhen et al., 2007; Costa et al., 2009; Arab et al., 2010, 2013; Rasouli et al., 2011). It is a reliable and valid technique that is used by physical therapists to evaluate muscle structure function and activation patterns (Hodges and Moseley, 2003; McMeeken et al., 2004; Costa et al., 2009; Arab and Chehreghazi, 2011).

The supine isometric chest raise test and supine double straight-leg raise test are commonly used to assess trunk muscles endurance (Arab et al., 2007). The supine isometric chest raise test (T1) has been described by Ito et al. (1996),

Moffroid (1997) and McIntosh et al. (1998). The supine double straight-leg raise test (T2), described by McIntosh et al. (1998), is performed to assess the endurance of the lower abdominal muscles.

For evaluating the thickness measurement of abdominal muscles during T1 and T2, in healthy and LBP subjects, it is first necessary to assess the reliability of US imaging in thickness measurement of the abdominal muscles during these tests.

Reliability of a test refers to how stable its results remain over time and it is a psychometric property (Domholdt, 2005). Representing acceptable reliability is necessary for all types of measurement and for making valid assessments. Reliability of US imaging of abdominal muscles has been assessed in several studies (Norasteh et al., 2007; Koppenhaver et al., 2009; Gnat et al., 2012; Arab et al., 2013) and several studies have been investigating the reliability of US for measuring abdominal muscle thickness (McMeeken et al., 2004; Teyhen et al., 2005; Rasouli et al., 2011). Some authors have confirmed its reliability in healthy subjects (McMeeken et al., 2004; Brown and McGill, 2010; Chon et al., 2010; Gnat et al., 2012) and others have confirmed it in LBP subjects (Ferreira et al., 2004; Teyhen et al., 2005; Norasteh et al., 2007; Mannion et al., 2008; Koppenhaver et al., 2009). A review of the literature revealed that the reliability of the antero-lateral abdominal wall muscles thickness has mostly been assessed at rest or during voluntary abdominal muscle contraction such as abdominal hollowing and bracing maneuvers (Teyhen et al., 2005, 2008, 2012; Mannion et al., 2008; Arab and Chehreghazi, 2011; Pulkovski et al., 2012). To our knowledge, no study has directly evaluated the reliability of US thickness measurement of the abdominal muscles during T1 and T2. The purpose of this study was to evaluate the intra-examiner reliability for the US measurement of thickness in TrA, IO, EO and RA muscles during supine lying and two isometric endurance tests (T1, T2) in subjects with and without LBP, measurements to be made during two separate sessions.

Method

Subjects

Nineteen female volunteers (9 with chronic LBP, 10 without LBP) aged between 18 and 35 years old participated in this study. Subjects with LBP were recruited from patients treated in an orthopaedic and/or physiotherapy outpatient clinic. Patients were included if they had a history of LBP for more than six weeks before the study (Nourbakhsh and

Download English Version:

<https://daneshyari.com/en/article/2618656>

Download Persian Version:

<https://daneshyari.com/article/2618656>

[Daneshyari.com](https://daneshyari.com)