Application of real-time ultrasound scanning in lumbar core stabilization fitball program for patients with chronic low back pain

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Introduction
Transversus Abdominis (TrA) is a key muscle for lumbar spine stability and it is often dysfunctional in patients with chronic low back pain (LBP). Learning to activate this core stabilizer is advocated as a contemporary physiotherapy management of LBP. However, LBP patients always find difficulties to precisely recruit TrA. Hence, a new model in adopting ultrasound (US) scanning into a standardized fitball program was introduced in out-patient Physiotherapy Department since 2013.

Objectives
To review the effectiveness of using real-time US scanning in lumbar core stabilization training and a standardized fitball program for patients with chronic LBP

Methodology
This study was a pre and post-test design. Patients suffering from chronic LBP (12 weeks or above from onset) with poor TrA function were recruited. Exclusions criteria were prior spinal surgery, pregnancy, radiating pain below knee, neurological or rheumatic conditions, and prolong sick-leave (>1year) due to LBP. Individualized motor control training of the TrA through US scanning as an instantaneous feedback was provided a priori. The acquired TrA control was further consolidated and strengthened in five consecutive weekly sessions of 60 minutes standardized fitball stabilization program. The program consisted of series of different postures and activities with progressive difficulties and challenges for core muscles. TrA muscle thickness (both relaxed and contracted states), Numeric Pain Rating Scale (NPRS), Numeric Global Rate of Change Scale (NGRCS) and Roland-Morris Disability Questionnaire (RMDQ) were measured in the first and last sessions, and paired T-test
was used for comparison with level of significance at p< 0.05.

**Result**

Forty-three subjects, with mean age 49 years old (18 to 65 years old) and 95% females, were recruited from June 2013 to Dec 2014. Significant improvements were found in all outcomes. The muscle thickness representing TrA function in relaxed (p=0.028) and contraction (p=0.015) states were greatly enhanced. Back pain intensity in NPRS (p=0.003), subjective improvement in NGRCS (p<0.001) and functional score in RMDQ (p<0.001) were also improved. It was also encouraging to have the majority (86%) of the subjects equipped their own fitballs and continued self-exercise after discharge. In conclusion, the new model of incorporating real-time US scanning into a standardized fitball program effectively enhanced TrA function, reduced chronic LBP and improved daily function.