

Abstract

Introduction: The subject of this thesis were two dynamic diagnostic methods of the musculoskeletal system: dynamic ultrasound examination and instrumental objectification of postural functions (measurement of the pressure produced by abdominal).

Methods and objectives: Based on literature review and consensus of international experts, the aim was to create comprehensive dynamic diagnostic protocols for joints that are currently not available in the literature. Another objective was to create research articles describing the most common interventions under ultrasound guidance and also original educational materials for beginners in musculoskeletal ultrasound. Another objective was to verify whether clinical tests of postural stability correlate with objectively measured pressure produced by abdominal wall in healthy subjects and then on subjects with low back pain. Another part of the study aimed to verify if there is a correlation between the pressure produced by abdominal wall and intrabdominal pressure measured by anorectal probe. The last part of the project compared the pressure produced by abdominal cavity in patients with low back pain before and after several weeks of physiotherapy.

Results: Dynamic diagnostic protocols and educational materials in the form of video galleries were created. Additionally, three research articles focusing on intervention procedures in the elbow and wrist area have been published. Further, a significant correlation between abdominal wall pressure values and palpation assessment was demonstrated in four out of five postural tests. In healthy subjects, the diaphragmatic test showed the strongest correlation ($r = 0.661$ and 0.75). In subjects with LBP, a significant moderate correlation ($r = 0.479$) was demonstrated in the diaphragmatic test. Significant strong correlation between abdominal wall pressure values and anorectal manometry was established in all measured tests. Resting breathing ($r = 0.735$), Valsalva maneuver ($r = 0.836$), Müller maneuver ($r = 0.651$), instructed breathing ($r = 0.708$), and breathing while holding a load ($r = 0.921$).

Summary: Within this doctoral thesis, dynamic diagnostic protocols and mnemonics aids for learning musculoskeletal ultrasound have been published. Reviews about the most common interventions in the elbow and wrist were also published. As part of the research on the objectification of postural functions, the DNS Brace device was developed, capable of measuring the pressure created by the abdominal wall against sensors placed on its surface. This thesis successfully demonstrated that intrabdominal pressure correlates with pressure produced by abdominal wall measured using the DNS Brace. Furthermore, correlations were demonstrated between abdominal wall pressure and clinical assessment of postural tests in three postural tests in healthy subjects and one postural test in subjects with LBP.