

Ultrasound Elastography for the Evaluation of the Elastic Properties of Fascia and Muscle

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BACKGROUND: The myofascial pain syndrome (MPS) is mostly caused by Trigger Points (TrPs) of the fascia and muscles. TrPs are inelastic areas, exquisitely painful to pressure with pain radiation. Treatments are focused on TrP areas aiming at tissue softening with subsequent pain reduction. Palpatory assessment can render fairly reliable results in superficial but not in deeper tissue layers. Conventional imaging shows structural lesions but not the elastic properties of the tissues. Ultrasound - Elastography (UE) has been shown since 1999 [1] that it has the potential to identify soft tissue fibrosis und myofascial TrPs.

HYPOTHESIS 1: UE technologies can be applied to fascia and muscle to assess the elastic properties.

HYPOTHESIS 2: Areas with significantly reduced elasticity have a lower pain threshold tested with pressure algometry (PA) compared to areas with higher elasticity.

METHODS: In a practice setting 40 consecutive patients - 28 females and 12 males -, medium Age 54 years, with a history of MPS were examined. Selected testing sites were left and right Trapezius, TLF, Hip and legs. All sites were tested with UE and PA with a 1 cm² surface. Shearwave UE (S-UE) was done with Aixplorer (Supersonic), and Aplio 500 (Toshiba), vibrational- (V-UE), and compression- elastography (C-UE) with Ultrasonix Tablet (Analogic) and Aplio 500 (Toshiba). Sequential hypothesis testing (SHT) with no fixed sample size was performed. Prior to the exams the different UE systems were tested on gel phantoms with fascia and muscle inclusions to compare the imaging qualities.

RESULTS:

Hypothesis 1: Gel-phantom and in vivo testing with shearwave- and vibration-elastography showed a significant number of artifacts. Compression-elastography produced consistent results with the gel-phantom and in vivo.

Sequential hypothesis analysis showed an early rejection of hypothesis 1.

Hypothesis 2: With compression- UE and PA the null hypothesis was rejected after 12 tests but the study was continued to include more sites.

CONCLUSION: C-UE is to be able to identify anisotropic inelastic tissue like fascia and muscle. Pressure algometry in inelastic fascia and muscle has a significantly reduced pain threshold. C-UE can be used to identify hardened inelastic fascia- and muscle- TrPs for treatment selection.

LITERATURE

1. Bauermeister, W., Das Rückenfit-Programm : die Therapierevolution gegen Schmerzen. 2002, München: Südwest. 96 S.