

Identification of viscoelastic parameters skin with scar in vivo.

H. Vránová, Mgr., J. Zeman Mgr., Prof. Ing. S. Otáhal, CSc.

Department of Anatomy and Biomechanics, Faculty of Physical Education and Sport
Charles University in Prague, Czech Republic, José Martího 31, Prague 6, 160 00, Phone :

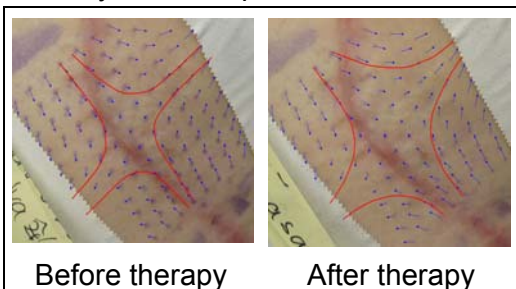
+420 777831799, +420224320235 h.vranova@centrum.cz,

otahal@ftvs.cuni.cz, zeman@hydronet.cz

Prof. RNDr. Stanislav Ďoubal, CSc, doubal@faf.cuni.cz

BACKGROUND: Human body is normally a perfectly balanced complex system[1]. A large impact (e.g. large scar after modified radical mastectomy) can disbalance it and cause some impairment that are often not being related to the impact (surgery in this case). We focus on large area scars, on their biomechanical impact on soft tissue and other human systems. In a normal condition all viscoelastic parameters of a skin and forces that go along with its deformations related to a body movement are balanced. A scar remaining after incision has substantially changed viscoelastic parameters through which it negatively influences even quite distant regions of a body. Scars are often treated by a physiotherapeutical soft-tissue techniques[3]. Scar healing processes are mostly controlled by subjective experience of therapists. As a consequence of its subjectiveness, this method is often marginalized. Our goal is to develop experimental methods capable of objective determination of the process of healing of scar.

METHOD: The first proposed method identifies the viscoelastic parameters of a skin based on a dynamic response of a small local deformation[2]. The skin is locally deformed through



depressing a test stylus into it using a constant force, which is then rapidly decreased. From the character of the return movement of the stylus are derived mechanical properties of the tested skin. The other proposed method is based on an identification of a 2D tensor of a static deformation of skin in response to a large area strain. This method is based on an identification of stretchability of a skin and of mutual shiftability of skin layers. The

results are depicted on the pictures above.

RESULTS: We succeeded to develop two objective experimental methods (laboratory condition), which already deliver the first results.

CONCLUSION: The first described method has so far clearly shown that the skin behavior and mechanical properties are dependent on the history of loading. A significant set of observed indicators did statistically prove a difference, i.e. the measurement method detected a change of condition of the observed tissue in a consequence to the performed therapy. Also the second method is showing a similar ability to indicate a change of skin condition although it is more difficult to process obtained data and interpret the results.

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