Towards an Instrumented Tissue Expander

Abstract:

Tissue expansion is a surgical procedure to grow additional skin per controlled mechanical stretch. Despite the progress of this reconstructive treatment, there are still some limitations. Both, the inflation protocol and the filling volume vary for every patient. The aim of this paper is to present a first attempt of a sensor featured tissue expander. This so-called instrumented tissue expander provides the treating surgeon a sensory feedback to enhance a successful treatment. The implementation of a pressure sensor enables the display of both, the current expander pressure and the pressure over time. Based on the progress of the pressure curve, the inflation time points are triggered. The skin growth is maximized and adjustable to each individual patient. This new way of tissue expansion is simulated with a finite element model. The skin growth is implemented as a strain-driven process. In addition, a first feasibility prototype is built. Based on the pressure-time diagram the condition of the skin can be deduced from the first derivative. Additionally the user is always enabled to observe or rather check the current pressure inside the tissue.
expander. Moreover, the risk of necrosis or pressure-induced ischemia is minimized. Thanks to the technical data the treatment is simplified for less experienced surgeons. Experienced doctors can train less experienced surgeons by monitoring and comparing both the appearance of the skin and the pressure data.

Stichworte:
tissue expansion; medical device

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