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Single cell mechanics

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Introduction
The field of cell mechanics investigates how cells generate, sense and respond to mechanical loads. The mechanical properties of cells are a direct consequence of their protein structure and thus intimately related to their biochemistry and genetics. The aim of our study is to investigate the response of individual muscle cells under compression (figure 1) in order to get more insight in muscle damage during pressure sore development.

Methods
Cell Visualization
Cell deformation and structural changes are observed using a confocal laser scanning microscope (CLSM). With the aid of custom made image analysis software, geometric quantities such as volume and surface area are calculated (figure 2).

Cell compression
A loading device has been designed which compresses single cells statically or dynamically and measures their stress-strain relationships (figure 3).

Results
The device has been characterized thoroughly and first experiments are conducted on single C2C12 myoblasts. During these experiments a cell was deformed until it bursted. A typical example is shown in figure 5.

Discussion and Future Work
First experiments demonstrated that the developed techniques are capable of deforming single cells and quantifying cellular shape changes during compression. Future experiments will include both force and long term measurements, which will give us more insight in muscle damage processes as a result of compression.