# New method to predict skin stretchiness could help burn victims grow new skin

September 22 2016

Human skin structure. Credit: Wikipedia

Researchers at Binghamton University, State University of New York have developed a method to measure the limit to which human skin can be stretched, which could help to grow new skin for burn victims.

"Surgeons use a variety of techniques to grow skin for tissue expansion

procedures designed to grow skin in one region of the body so that it can be auto-grafted on to another site [sometimes used for burn victims]," said Guy German, assistant professor of biomedical engineering within the Thomas J. Watson School of Engineering and Applied Science at Binghamton University. "This procedure stretches the skin, typically, by inflating a balloon with air or silicone under the surface. Skin grows more in regions where it is stretched—during pregnancy, for instance—but stretch it too much and the tissue might break. Our predictive technique could be employed in this field as a method of predicting the limit to which the skin could be stretched."

The outermost layer of skin, the stratum corneum, regulates water loss from the body and protects underlying living tissue from germs and the environment, in general. It is pretty tough, protecting the body from extreme temperatures, rough surfaces, and most paper edges.

"Most people think skin is smooth and flat just like a Photoshopped advertisement. It isn't," said German. "If you look at the back of your hand, skin has small triangular patterns on it. These shapes are caused by small canyons in the skin. Those canyons act just like notebook perforations when you tear a page out; they are weak points. We wanted to see how these topographical features acted as weak points of the skin."

Overall, the study touched on four major points:

1. First, assuming skin is smooth and without major cracks, researchers looked how the toughness of skin varied significantly in relation to its water content. They found dry skin is brittle and easier to break than hydrated skin

2. Second, researchers used advanced imaging to track skin deformation and stretching which, combined with the structure of the skin itself,

correlates to where cracks in skin begin. This can help scientists and doctors predict where fractures may occur in the future.

3. Next, scientists found that cracks in the skin are not straight; instead they follow topographical ridges of skin, which have triangular patterns.

4. Finally, researchers proved that most fractures propagate along cell-cell junctions rather than breaking the cells themselves. This does not always happen, but it suggests that cell junctions are structurally the weakest points of the skin.

The results could help create new topical medical creams, soaps and cosmetic products. It may also be used in more extreme cases.

This work also sets the stage for a variety of future studies assessing changes in skin composition, environmental pH, or bacterial colonization on skin's toughness, said German.

The safety razor company Schick funded parts of the research.

Graduate students Xue Liu and Joseph Cleary were co-authors of the work.

The paper, "The global mechanical properties and multi-scale failure mechanics of heterogeneous human stratum corneum" was published in *Acta Biomaterialia*.

**More information:** X. Liu et al. The global mechanical properties and multi-scale failure mechanics of heterogeneous human stratum corneum, *Acta Biomaterialia* (2016). DOI: 10.1016/j.actbio.2016.07.028

Provided by Binghamton University