MedicalXpress

Breast implants could become safer thanks to cell-friendly surface

March 19 2015

Scientists at The University of Manchester have created an enhanced surface for silicone breast implants which could reduce complications and make them less likely to be rejected by the body.

In the US alone almost 400,000 cosmetic breast augmentations and reconstructions are carried out each year, and the number is growing. Some of these cases are for reconstruction after surgery for breast cancer and can have important psychological benefits.

However, around one in five people who has a breast implant suffers from capsular contracture where scar tissue forms and can shrink after the surgery - causing pain, deformity and the need for further surgery. Fluid from the body can also build up, (known as a seroma) and the scar tissue can also cause leaks in the implants.

Capsular contracture is caused by the body resisting the implantation of a foreign object. It has previously been shown that rougher surfaces (also known as textured surfaces) reduce the amount of scar tissue formed around breast implants, but the Manchester scientists felt that they could improve this by creating a pattern which mimicked body's own surface, such as the basal layer of the skin, providing a better environment for the cells to grow on.

"The surfaces of breast implants in use today have relatively large features on their surface, which have no discernible correlation with biological features required for cells to interact with. Importantly, the

micro environment created by the features of a breast implant is critical for breast tissue cells to adhere to that surface and grow on," said Dr Ardeshir Bayat, from the University's Institute of Inflammation and Repair, who led the study.

"Compared to the size of the cells, these bumps on existing implants are so large that they're effectively a smooth cliff face compared to the dimensions required for the cell to interact with.

"Our approach was to create a novel surface which mimics the basal layer of the skin, which the body's cells are more likely to recognise and interact with favourably."

The tests were carried out in the lab over a period of one week - a critical early period after surgery, and while the researchers acknowledge that much more work is yet to be done, the new surface reduced the foreign body reaction of the cells when compared to the smooth and larger textured surfaces currently available on the market.

These findings suggest that it this unique surface may help to reduce the likelihood of adverse inflammation and subsequent scarring in the form of so-called breast capsular fibrosis.

Dr Bayat added: "Some of the surfaces seen on implants today were designed originally in the 60s and 70s and therefore there is an unmet need for delivering the next generation of biomimetic breast implant surfaces.

"The original designers found that surface features so-called 'bumps' on the existing surfaces had an adverse effect, but what we did was to reduce the size, dimension and appearance of these bumps down from the size of say, a hill, to that of a pebble.

"This makes interaction at the cellular level much better. Nevertheless, we need to do a lot more work to bring this to the clinic, and the increasing numbers of women having these operations means, that it is an important process to go through."

More information: "Development and functional evaluation of biomimetic silicone surfaces with hierarchical micro/nano-topographical features demonstrates favourable in vitro foreign body response of breast-derived fibroblasts," *Biomaterials*, Volume 52, June 2015, Pages 88-102, ISSN 0142-9612, dx.doi.org/10.1016/j.biomaterials.2015.02.003

Provided by University of Manchester