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In Vitro Models of Soft Tissue Damage by Implant-Associated Frictional Shear Stresses

A study investigating the relationship between commercially available breast implants surfaces and the tissular physical disruption created following the insertion and further new implant-breast tissue interactions

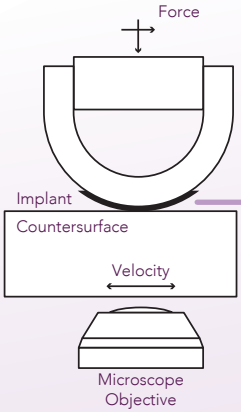
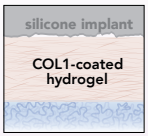
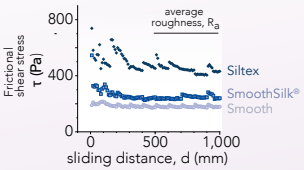


Illustration of biotribometer configuration

• Collagen hydrogel surface



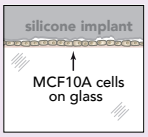
a) Representation of the interaction between implant and collagen.



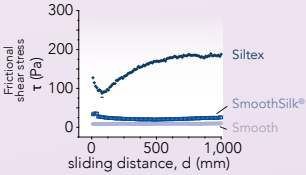
b) Frictional shear stress as a function of sliding distance for the implants against collagen hydrogel.

c) Collagen removed from the hydrogel substract after the interaction with implants.

• Healthy breast epithelial cells (MCF10A)



a) Representation of the interaction between implant and MCF10A cells.



b) Frictional shear stress as a function of sliding distance for the implants against MCF10A cells.

Showing:

1. Breast implants with an increased surface roughness led to significantly greater removal of collagen substrate as the frictional shear stress, and contact pressure increased when compared to smooth surfaces (Ra: <10µm).

2. With smooth breast implants (Ra: <10µm), the breast epithelial cells remained alive and retained their normal cellular morphology (making indistinguishable the cells within and outside the sliding path). Conversely, the microtextured device left delaminated areas with dead cells in the most prominent surface features.

3. Smooth silicone elastomer breast implants (Ra: <10 µm) result in lower frictional shear stress, moderate collagen removal, and no visible damage to breast epithelial cells.

These results suggest that Motiva SmoothSilk® surface has superior implant-breast tissue cellular physical interactions, potentially reducing foreign body response, chronic inflammation, and soft-tissue damage compared to microtextured devices.

Source: Rosas JM, Atkins DJ, Chau AL, et al. In vitro models of soft tissue damage by implant-associated frictional shear stresses. Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology. 2022;0(0). doi:10.1177/13506501221132897