

KHAN Aadil EOI 2022 – ICR

Project title: Immunoengineering strategies for biomimetic silicone implant design to mitigate the risk of radiotherapy-induced capsular contracture in implant-based breast reconstruction

Project Summary:

Implant-based reconstruction remains one of the most prevalent techniques for breast reconstruction after mastectomy. However, silicone breast implants (SBIs) are at higher risk of developing complications such as capsular contracture (CC), a fibrotic hardening around the implant, after radiotherapy (RT). CC causes chronic pain, visible deformity and incurs further surgeries, often with diminishing gains and no prospect of cure without total removal of the implant reconstruction. Previous work from our group has shown the central role of macrophages in directing the fibrotic response after RT and how this can be mitigated by manipulating macrophage signalling with therapeutic intent.

In this project, we aim to investigate whether an immunoengineering approach can be utilised to reduce the risk of CC after RT by disrupting macrophage activation. Specifically, the project will explore whether manipulating the surface chemistry of SBIs, through silane modification, can reduce macrophage activation and the fibrotic foreign body response after RT. Using a high-throughput methodology, combinatorial libraries of diverse chemistries will be screened to rapidly identify lead candidate monomers that inhibit macrophage activation. Lead candidates from this screen will be taken forward to more deeply profile their effects on macrophage signalling in vitro. Finally, modified SBIs will be irradiated in vivo and their effect on capsule formation evaluated.

The direct translational benefit of this work is the design of biomimetic SBIs that are more durable against RT for breast cancer treatment.

Supervisory Team:

- Mr Aadil Khan, Radiotherapy & Imaging, Institute of Cancer Research
- Dr Adam Celiz, Assistant Professor in Bioengineering, Imperial College London
- Dr Sheeba Irshad, CRUK Clinician/Scientist, King's College London
- Prof Kevin Harrington, Institute of Cancer Research

Clinical Specialities: Plastic surgery, Breast surgery, General surgery