Thesis Project Portfolio

Investigation of Potential Benefits of Dermal Hydrogels to Promote Microvasculature Angiogenesis into Acellular Dermal Scaffolds

(Technical Report)

How Social Media Has Changed the Landscape for Women Battling Breast Cancer

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Breast cancer is a debilitating illness, with innumerous challenges, both from a disease and treatment perspective as well as a societal perspective. Advancements into improving treatment of the disease is necessary to improve patient outcomes. Additionally, understanding how the disease affects these women in their day to day lives and in society as a whole is crucial to ultimately improving their lives. My technical research involves aiding in addressing issues associated with breast reconstruction surgery following mastectomy. Most breast reconstruction surgeries today utilize an acellular dermal scaffold to fully or partially surround the breast implant. This scaffold provides support to the overlying breast tissue, decreasing certain complications, and helps to facilitate the growth of new tissue. However, scaffold usage is also associated with increased infection and skin necrosis. These complications often arise due to incomplete contact between the overlying breast tissue and the dermal scaffold. As such we predicted that the use of a flowable hydrogel can be injected in between these two layers, to facilitate increased contact and improve healing characteristics. To test this hypothesis, a hydrogel was synthesized using decellularized porcine dermal tissue. The hydrogel had the desired characteristics of initial injectability followed by gelation *in vivo*. The hydrogel was tested using a subcutaneous implant model in mice, where one group received only the scaffold and the other received the scaffold and the hydrogel. Histology and flow cytometry were used for analysis. Results indicated that the hydrogel facilitated increased vascular growth, density, and maturity, as well as decreasing fibrotic development. Further investigations into the effects radiation therapy has on these results are currently being conducted.

Furthering the clinical component is vitally important, but it is only one side of the issue. There are many societal issues surrounding breast cancer in modern day society. In my socieotechincal report, I aimed to understand how social media and the internet at large has

affected breast cancer patients. My analysis was conducted through the lense of the STS framework Social Construction of Technology. Social media has become a widely prevalent platform in today's society that allows people from across the globe to easily communicate. Breast cancer patients have used this platform to facilitate connections and spark a dialogue with other people affected by breast cancer. Other patients can help provide valuable insights into the disease and treatments. Social media also provides an avenue to build relationships and find emotional support. Additionally, the increased reach of these platforms allows for organizations to spread awareness and crowdsource funding for research and treatments. As with any technology, there are many downsides to consider. Social media can lead to the propagation of misinformation that can lead these patients to make poor treatment decisions. Social media also provides a way for greedy corporations to profit off of donations rather than progressing cancer research. Social media has thoroughly changed the landscape for breast cancer patients.

Together, my technical and sociotechnical report provide insights into the struggles of the disease and lay the foundation for a potential new clinical solution. Advancements in our knowledge and understanding of the disease as a whole can ultimately lead to improvements for those suffering from breast cancer.