ART IN DERMATOLOGY

3D MODELING OF BREAST TISSUE SUBTYPES USING MRI DATA: A PROOF OF CONCEPT STUDY FOR THE USE OF PERSONALIZED 3D MEDICINE WITH IMPLICATIONS FOR DERMATOLOGY

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Introduction: Breast cancer can have dermatologic consequences. It can present with overlying skin changes that allow dermatologists to be the primary diagnosticians. Additionally, in women who undergo breast reconstruction, there are often subsequent skin deformities that may benefit from dermatologic interventions. 3D imaging and modeling may be a tool for dermatologists to contribute to improving skin defects in breast cancer patients, as well as a tool for skin defects in general.

Objective: The purpose of this study is to serve as a proof-of-concept of the use of MRI sequencing and Amira software to generate a 3D model of breast ducts, fat, and fibroglandular tissue. This type of personalized 3D medicine could be expanded to include areas such as graft and flap modeling for defects after skin resections.

Methods and Materials: Two cadaveric breasts underwent MRI with and without gadolinium contrast injected through the duct openings at the nipple. MRI data uploaded into Amira – a 3D modeling software – where individual tissue types were segmented and rendered three-dimensionally.

Results: MRI data was successfully segmented into three types of breast tissue – fat, fibroglandular tissue, and ducts. The computer data was then 3D printed. Therefore, this is a proof-of-concept for the use of MRI data and Amira to obtain 3D images and models of breast tissue subtypes, which can be applied to future studies and different tissues of interest.

Conclusions: The 3D computer models created in this study contribute to the available

knowledge of breast anatomy. This study supports future efforts in using personalized 3D medicine to find solutions to 3D problems. These types of problems are not limited to breast cancer, and include skin defects that require grafts or flaps, which may benefit from pre-procedure planning using 3D modeling specific to a patient's defect or anticipated defect.