

Histotopographic study of the human breast tissue

Veronica Macchi¹, Andrea Porzionato¹, Cesare Tiengo¹, Diego Guidolin¹, Carla Stecco¹, Gloria Sarasin¹, Anna Rambaldo¹, Andrew Maidment², Predrag Bakic² and Raffaele De Caro¹

¹ Institute of Human Anatomy, Department of Molecular Medicine, University of Padova, Padova, Italy

² Department of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania, USA

Breast tissue simulation is of importance for developing anthropomorphic phantoms used for preclinical testing or optimization of imaging systems or image analysis methods. Recently a new breast anatomy simulation method performs a direct calculation of the Cooper's ligaments (i.e., the borders between simulated adipose compartments), using arbitrary selected values for the size of adipose lobuli and the thickness of the fibrous septa (Cooper's ligaments) enveloping these lobuli. The aim of the present study was to perform anatomo-microscopic study of the structure of the human breast to improve the realism of simulation. Surgical samples during procedure for breast reduction (45 and 38 y-old) or breast mastopexy in ex-obese patients (52 and 39 y-old) were sampled. In 2 un-embalmed cadavers (53 and 68 y-old) mastectomy were performed. The samples were full thickness specimens from the skin to the deep fascia, one for each quadrant of the breast. From the histo-topographic point of view the breast tissue showed a stratigraphic organisation, with the following layer: skin, superficial fibro-adipose tissue, superficial fascia, deep fibro-adipose tissue and glandular tissue. On slides stained with azan-Mallory morphometric evaluation was performed with image analysis software. The values of the adipose tissue (AT) lobules area and axial ratio were 0.84 ± 0.04 cm³ and 2.02 ± 0.14 at the level of subcutaneous AT compartments, 0.94 ± 0.07 cm³ and 2.91 ± 0.30 at the level of deep AT, and 0.26 ± 0.01 cm³ and 2.04 ± 0.12 at the level of periglandular AT. The values of the volume fraction of the connective tissue and of the mean thickness of the connective tissue branches delimiting the lobules were 12.3 ± 1.4 % and 289.2 ± 13.0 μm. Our data were comparable with the value (400 micron) that has been used in the new breast anatomy simulation method which showed realistic appearance of synthetic images. Preclinical validation is of particular interest in development of systems for early breast cancer screening.

Keywords: Dissection, breast, morphometry, topography.