The role of 3D-printing technologies in the management of breast cancer patients.

Valic Eugeniu [1], Mereuta Ion [1,2,3]
[1]*Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova, Chisinau, Republic of Moldova.
[2]Physiology and Sanocreatology Institute, State University of Moldova, Chisinau, Republic of Moldova.
[3]*Gheorghe Țîbîrnă* Academy of Medical Sciences of Republic of Moldova, Chișinau, Republic of Moldova.

Introduction. Breast cancer represents a current problem due to high morbidity, mortality and disability. About 685,000 women worldwide die from breast cancer annually. Only 1.3% are detected in the early stages, while 24% in the late stages. Although mastectomy is an important and definitive treatment option for some patients, it is often associated with substantial psychological, social, and sexual sequelae, as well as a significant distortion of body image. Along with the development of personalized medicine, the principles and methods of diagnosis and treatment, 3D printing technologies have a promising role, aimed at improving the management of breast cancer patients by creating anatomical models of tumors for explanatory and operational purposes, as well as of safe, compatible and easily tolerated breast implants.

Materials and methods. A literature review was performed using scientific articles from PubMed, NCBI, Frontiersin, 3D Printing in Medicine, databases for a period of 5 years. Keywords used in the search: breast cancer, bioprinting, 3D printing, 3D implants, personalized medicine.

Results. This review of scientific articles highlights the main achievements in the field of 3D printing in the management of breast cancer patients. Scanning and subsequent three-dimensional printing of tumors allows the detailed explanation of the tumor process to patients. Also, it facilitates the choice of an appropriate and personalized therapeutic tactic. New printing technologies, including bioprinting, allow the modeling and creation of mammary gland implants using hypoallergenic, durable and compatible materials with the formation of patient-specific bio-absorbable matrices (scaffolds). Different types of stem cells and growth factors can be seeded on the scaffolds, similar to the extracellular matrix, ensuring the processes of cell growth and angiogenesis. These scaffolds, which are later resorbed by the body, keep the injected adipose tissue safe and minimize the significant volume loss of breast adipose tissue typically seen in the lipofilling technique.

Conclusion. Although 3D printing technologies are in development and testing stages yet, they represent an important chain in the appropriate future of personalized medicine in the management of breast cancer patients.

Keywords: Breast cancer, bioprinting, 3D printing, 3D implants, personalized medicine