BREAST TISSUE ENGINEERING: INNOVATIONS, METHODS, AND FUTURE PERSPECTIVE

Popova Daria[1], Iordachescu Rodica[2], Verega Grigore[3], Jian Mariana[4], Nacu Viorel[4], Stoian Alina[5]
[1] State University of Medicine and Pharmacy *Nicolae Testemitanu*, General Medicine, MD student, Chisinau, Republic of Moldova.
[2] Institute of Emergency Medicine, Department of Septic Traumatology, Chisinau, Republic of Moldova.
[3] State University of Medicine and Pharmacy *Nicolae Testemitanu*, Head of Department Plastic Surgery, Chisinau, Republic of Moldova.
[4] State University of Medicine and Pharmacy, Tissue Engineering and Cell Cultures Laboratory, Chisinau, Republic of Moldova.
[5] University Health Network, Toronto General Hospital Research Institute, Toronto, Canada.

Introduction. The incidence of breast cancer, based on L.Wilkinson et al. in 2020, has reached 2.26 million cases worldwide, with mastectomy remaining the primary surgical approach. The critical importance of breast reconstruction following mastectomy lies not only in restoring the physical appearance of the breast but also in significantly improving the psychological and emotional well-being of patients. Autologous and alloplastic techniques used in breast reconstruction aim to enhance the quality of life for the patient and reduce the multifaceted impact of breast cancer. Tissue engineering in breast reconstruction has made significant progress, with several methods and techniques developed to improve outcomes and overcome the limitations of existing methods. This abstract discusses promising methods of breast reconstruction using tissue engineering.
Materials and methods. The articles were searched on PubMed using combination of keywords: breast cancer, mastectomy, tissue engineering, acellular matrices, 3D printing, cells. The selection was limited to English-language articles published in the past 10 years.
Results. In the past 25 years, tissue engineering has become a highly promising field in breast reconstruction. The main approaches used in this area are: (i) Scaffold-based approaches, (ii) Cell-based therapies, and (iii) 3D bioprinting. Advancements in these fields have led to the development of acellular matrices, which are now used in clinical settings. Additionally, multiple studies have focused on using decellularization methods to obtain acellular breast scaffolds and acellular nipple-areolar complex, aiming not only to restore the aesthetic aspects of the breast but also its function. Progenitor cells, such as adipose-derived stem cells, are used for breast contouring, restoring natural sensation, and improving skin quality after radiotherapy. Furthermore, 3D printing-based studies are revolutionizing the creation of customized scaffolds and tissues, enabling the precise restoration of breast shape, volume, and symmetry. These developments have brought us closer to providing patients with more natural, functional results and improved overall recovery.
Conclusions. Advancements in breast tissue engineering hold promise for developing functional breast tissues. However, challenges remain in vascularization, tissue integration, and ensuring long-term viability. Ongoing research aims to address these issues, moving towards clinical applications in breast reconstruction and augmentation.