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Editorial

Tissue engineering in breast reconstruction: a look into the future

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Breast cancer is the most common cancer worldwide with an estimated 2.3 million new cases and lead to 6.9% of deaths according to GLOBOCAN 2020 [1]. Surgical management of breast cancer has evolved significantly over the last decades allowing surgeons to perform more advanced cosmetic procedures. These surgical procedures are aimed at maximal tissue preservation (resections) or substitution of the breast with other tissues or material. The two most common possibilities for breast reconstruction are with autologous tissue (flaps) and artificial implants. The two methods have their own advantages and disadvantages. Free flaps can be performed in a limited number of patients,

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generally are more complicated and require a team of oncological and plastic surgeons who are capable in microsurgery. The complications of this procedure include fat necrosis, mastectomy flap necrosis, abdominal flap necrosis, *flap* loss, wound infection etc. [2]. Subcutaneous mastectomy with simultaneous implant reconstruction is a more common and relatively easy to perform procedure. The main limitations include changes in appearance and sensation. Complications include contractures, skin necrosis, seromas, hematomas, malrotations etc. [3]. Another important point is that flaps implants remain in their specific location and shape, while flaps tend to change with the persons' overall health and constitution. Meaning that flaps can change size as the patient gains or loses weight. As the two methods both have limitations and do not allow reconstruction similar to a natural breast, there is continuous search for improvement.

Advances in 3D printing technologies increased interest for its application in the medical field. This technology can also be applied for breast reconstruction. One of the possible methods is creation of biodegradable matrix that closely resembles natural breast and provides a space that can be filled with autologous fat. Bio printing allows the construction of a tissue that consists of living cells and biolinks that resemble normal human tissue. Although this is a more complicated procedure, in this case the breast can be reconstructed to its maximal biological potential. However, most researchers agree that the main goal is the cosmetic result [4]. A number of material have been proposed for breast 3D printing such as polycaprolactone, methacrylamide-modified gelatin, methacrylated κ-carrageenan, etc. In 2016, the first study on tissue engineering for human breast reconstruction was carried out in Australia [5]. These first results demonstrated that the texture was hard, and the cosmetic assessment was poor [4, 5]. A number of other attempts have been performed to develop this approach [6, 7]. A possible modification of this technique it to provide 3D-printed carcass that can be filled with autologous fat. Total lipofilling after mastectomy has been proposed as one of the procedures for breast reconstruction with good cosmetic result [8]. The carcass can degrade over time leaving only the left tissue at a specific place.

Another possibility for breast 3D printing is the potential of a scaffold to release constant concentration of certain drugs. This method can be used as an alternative to conventional chemotherapy and the regimen can be optimized to the specific needs of the patients [9].

The emergence of 3D printing has great potential opportunities for breast reconstruction. Combination of this method with 3D scanners can results in personalization of each surgical procedure for the benefit of the patient. We have to overcome several important obstacles for further advance of this method. There are still a number of questions regarding the optimal materials for scaffold and matrix as well as the method that provides the best cosmetic result for the patient [4].

1. CONFLICT OF INTERESTS

The authors have no conflict of interest to declare. The authors declared that this study has received no financial support.

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