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Poster Presentation

Combination of two stem cell therapy and tissue engineering technologies, the production of a three-dimensional decellularized amniotic membrane scaffold containing activated allogeneic adipose tissue derived mesenchymal stem cells

Banafsheh Heidari[1], Kavosh Zandsalimi[2*], Mehrangiz Totonchi[1], Koorosh Kamali[3], Azadeh Soltani[4]

1. *Department of Photo Healing and Regeneration, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran*
2. *Department of Medical Laser (MLRC), Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran*
3. *Department of Epidemiology, Zanjan University of Medical Sciences, Zanjan, Iran*
4. *Reproductive Biotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran*

[*]Corresponding author email: kavosh.bme@yahoo.com

Background and Objective: Compared to synthetic materials, natural polymers such as biological tissues/membranes have more advantages in tissue engineering and regenerative medicine. This study was aimed to design a 3D biological scaffold composed of decellularized amniotic membrane containing allogeneic mesenchymal stem cells (MSCs) derived from adipose tissue to replace and facilitate the regrowth of damaged tissues.

Material and Methods: In the study, MSCs were isolated from human adipose tissue and confirmed using flow cytometry and differentiation potential assays. Amniotic membrane was also separated from placenta and decellularized by NaOH, NH4Cl, EDTA. According to the converging and centrality scattering pattern, activated allogeneic MSCs were cultured on the decellularized amniotic membrane for 16±3 hours at 37°C, 5% CO2. The structural, mechanical, biological, and physicochemical integrity of 3D scaffold was confirmed using SEM, FTIR, MTT, and Acridine Orange staining methods.

Findings: We succeeded in designing a 3D biological scaffold composed of acellular amniotic membrane containing allogeneic MSCs derived from adipose tissue with a diameter of 20-25 µm. This scaffold contains activated MSCs with a transverse diameter of 1.8-2.8µm with 100% viability. The health of mechanical, biological and chemical structures of 3D amniotic membrane scaffold before and after propagation of allogeneic MSCs was confirmed using SEM, MTT, FTIR and Acridine Orange staining methods. The implantation and penetration of MSCs on the 3D amniotic membrane scaffold was confirmed using SEM and Image J software. Activated allogeneic MSCs penetrated not only in the superficial layer of the scaffold, but also in the deeper layers up to 18µm.

Conclusion: Three-dimensional decellularized amniotic membrane containing allogeneic MSCs as a 3D biological scaffold has potential to be used in tissue engineering and regenerative medicine.

Keywords: 3D biological scaffold, Amniotic membrane, Adipose tissue, Mesenchymal stem cell, Regenerative medicine, Tissue engineering.