Fibroblast attachment onto novel titanium mesh membranes for guided bone regeneration

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Abstrak

Titanium mesh is used in orthopedic surgery as a barrier membrane, as it offers suitable characteristics, which allow mechanical support during the formation of new bone. An ideal membrane would facilitate cell attachment onto its surface, thereby helping to stabilize the blood clot and integrate the membrane into the tissue. However, currently available titanium mesh has millimeter-level pore sizes, which lead to soft tissue ingrowth through the pores. Therefore, the aim of this study was to investigate the fibroblast attachment and migration on different designs of novel titanium mesh with micrometer pore size for guided bone regeneration treatment. Six types of novel titanium mesh membrane and three groups of commercially available membranes were used in this study. Fibroblasts were isolated from 4-day-old green fluorescence protein rats and seeded onto membrane surfaces. At 24 h, the cells attached to the membrane surfaces were fixed and stained with DAPI. The blue-stained nuclei on membrane surfaces, and both upper and lower sides were counted. It was shown that different membrane materials, structure and design differ considerably in their capacity for cell attachment to the membrane surface. The novel membranes, especially mesh with 12 pores compared with mesh with multi-pores, allowed the fibroblast attachment on the membrane surface, but hindered the fibroblast migration through the pores into the lower side of the membrane, which is associated with the defect area in the clinical condition.