Angiogenic response to degradable lacto-capromer terpolymer dermis substitutes
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Introduction

A variety of chemical compositions and various bioactive surface modifications have been developed up to date to optimize the biocompatibility of biomaterials. However, the pore size, the interconnectivity of pores, and the porosity are still supposed to be fundamental structural factors that may decisively affect the ingrowth of blood vessels into biomaterials. A profound, and above all, rapid infiltration of the scaffolding matrix by fibrovascular tissue is needed to avoid ischemia, ensure the survival of cellular components and diminish the risk of infection after transplantation.

Here, we analyzed the angiogenic response of host skin muscle to novel degradable artificial dermis substitutes using the dorsal skinfold chamber model in mice.

Results

A transformation of mature microvasculature to a network bearing vessel sprouts was observed within the border zone of the implants in both groups. Increased concentration of perfused, newly developed microvessels at this site was already evident on day 5 post implantation. Quantitative analysis showed significant differences in FVD for implants on days 5 and 10 of the experiment in the border zone.

FVD in group 2 (day 5: 188±5 cm/cm²; day 10: 225±6 cm/cm²) was found to be significantly higher (Student’s t-test, p<0.05) in comparison to group 1 (day 5: 173±4 cm/cm²; day 10: 204±7 cm/cm²). Whereas the intravital microscopy showed a perfused neoformed microvessel network within the border zones in both groups, the FVD of the surrounding host tissue did not change significantly during the implantation period of 10 days.

Conclusion

The findings show that a sufficient vascularization of biomaterials mainly depends on pore geometry of their scaffolding matrix where the three-dimensional structure and especially the larger pore size seem to play a highly influential role. However, both terpolymer matrices investigated in this study did not have an effect on the microcirculation of the surrounding host tissue confirming their in-vivo biocompatibility that was also previously demonstrated in vitro.