Fibrin-E in a Synthetic Dermal Scaffold Enhances EPC Function in Skin Wound Healing

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Introduction
Dermal skin substitutes that enhance wound healing have become a standard of care in the treatment of burn. Fibrin-E is a fibrin fragment that confers migratory/adhesive properties on endothelial cells 1. Endothelial progenitor cells (EPCs) are bone marrow-derived cells that are recruited to angiogenic sites and incorporate (vasculogenesis) and activate neo-vessel formation (angiogenesis). During wound healing EPC improve wound vascularization and scarring 2. Aims: to test the effect of Fibrin-E on EPC. To compare the angiogenic/vasculogenic and wound healing potential of different dermal substitutes (collagen-scaffold, Integra; and Fibrin-E scaffold, Smart-Matrix).

Materials and Methods
EPCs were isolated from chord blood as previously described 3. In vitro, EPC adhesion, proliferation and differentiation assays were performed in 24-well plates coated with different substrates. In vivo excisional wounds were performed as previously described2 and implanted with different dermal substitutes, with or without EPC administration. Wound closure was assessed and at day 10 post-surgery, wounds were excised and evaluated for contraction, epithelization and microvessel density.

Results
Freshly isolated EPC show increased adhesion (Fig 1A) and endothelial differentiation potential (CD31/vWF, Fig 1B) when plated in Fibrin-E. In vivo, Smart Matrix scaffold showed faster wound closure compared to Integra scaffolds. In the latter, all mice died after 1 week, showing infectious panniculitis in the wound bed. Interestingly, EPC inoculation into wounded mice increased wound closure in control and Smart Matrix scaffold treated wounds (Fig 1C).

Discussion and Conclusions
Fibrin-E fragment increases EPC adhesion and differentiation. In vivo, Smart-Matrix is beneficial in wound closure when compared to Integra. The improved wound closure and vascularisation from administration of EPC further increases Smart-Matrix scaffold efficacy via angiogenic and vasculogenic effects.

References

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