Dermal Regeneration

- Matrix Degradation
- Wound Contraction

Combined Summary of:

1. **Dermal regeneration in native non-cross-linked collagen sponges with different extracellular matrix molecules**
   De Vries H.J.C., Middelkoop E., Mekkes J.R., Dutrieux R.P., Wildevuur H.R., Westerhof W. Wound Rep Reg 1994, 2: 37-47
2. **Reduced wound contraction and scar formation in punch biopsy wounds. Native collagen dermal substitutes. A clinical study**
   De Vries H.J.C., Zeegelaar J.E., Middelkoop E., Gijsbers G., van Marle J. Wildevuur H.R., Westerhof W. British Journal of Dermatology 1995, 132: 690-697

SUMMARY
In a porcine wound model and in a human punch biopsy wound model dermal regeneration of full-thickness skin wounds after implantation of collagenous matrices were studied. Native collagen matrices with elastin reduced the amount of fibroblasts and myofibroblasts, lead to a more randomized collagen fibre orientation, and contributed to dermal regeneration and reduced wound contraction.

Treatment Regimen:

I. STSG[i] alone (control tissue)
II. STSG[i] + native collagen + elastin matrix (MatriDerm®)

RESULTS

1. Porcine wound model: wound contraction was reduced in the MatriDerm® treated wounds and the dermal regeneration was completed. Compared to control tissue, collagen + elastin matrix (MatriDerm®) achieved a better result in wound healing time and wound contraction.

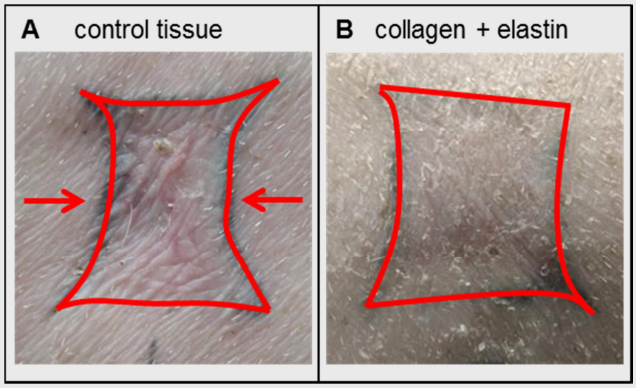

Figure 1: Cosmetic appearance two month after the operation in control tissue (A), and in MatriDerm® (native collagen + elastin) treated tissue (B). Healed wound area is surrounded with red lines; wound contraction is demonstrated by arrows. (2-month outcome[a,b], with friendly permission and courtesy of the authors)

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2. Human wound model: regenerated collagen bundles of the control tissue (STSG[i] alone) were unidirectional parallel to the epidermis (typical histological appearance of scar tissue) (Fig. 2A). In contrast, in the MatriDerm® group a more random organization of the collagen bundle network was observed (Fig. 2B), similar to normal skin (Fig. 2C).

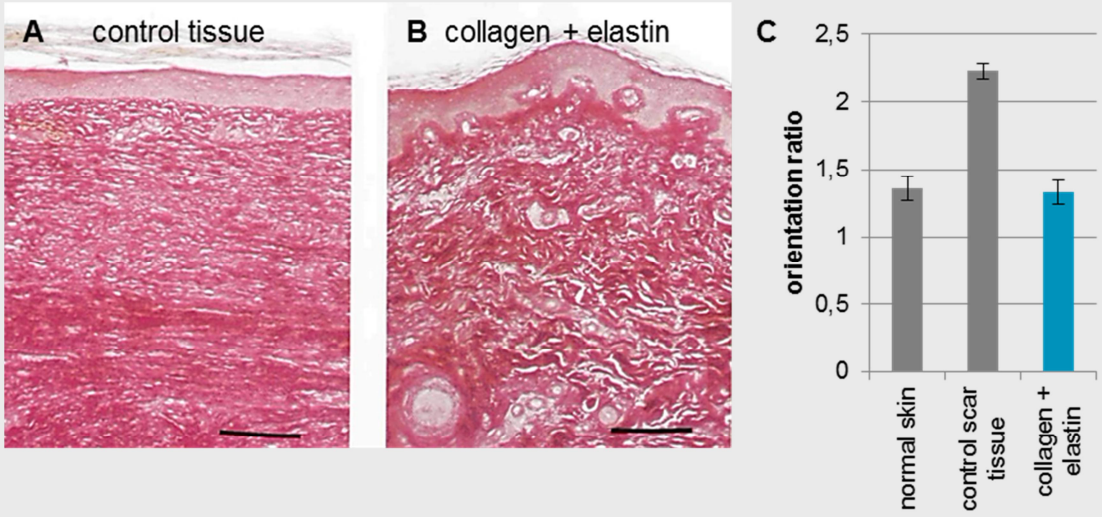

Figure 2: Dermal regeneration after three months of a control tissue (A) and of a MatriDerm® (collagen + elastin) treated wound (B). Mature collagen fibres were stained with picrosurius red staining; scale bar 50 µm. C: Quantification of collagen bundle orientation by scattered light.

1./ 2. Additionally, the authors conclude from the histological analysis that six weeks after implantation no collagen fibres from the dermal matrices could be detected (data not shown). The rate of degradation is an important factor in the stimulation of dermal regeneration.

TAKE HOME MESSAGE

- Six weeks after implantation MatriDerm® is degraded.
- MatriDerm® stimulates formation of a new extracellular matrix of mature collagen fibres.
- The use of MatriDerm® reduces (myo)fibroblast accumulation. This could result in the improved randomization of the collagen fibre network limiting scar formation and wound contraction.

[i] STSG: split-thickness skin graft

[a] Boekema et al., J Mater Sci Mater Med. 2014; 25(2)
[b] Akershoek et al., Cell Tissue Res. 2016; 364(1)

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