A novel anti-scar peptide for cutaneous wound repair
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INTRODUCTION: Fibromodulin (FMOD) is required for fetal scarless healing and adult skin repair. Previously, we have demonstrated that FMOD not only augments dermal fibroblast migration and contraction to aid rapid wound closure and reduce scar size, but also enhances endothelial cell invasion to aid adequate angiogenesis. We aim to isolate the functional domain of FMOD responsible for the scar reduction properties and related cellular function, and adapt it for clinical use.

METHODS: After detailed structural analysis, a 40 amino acid length FMOD-based peptide, F06-C40 which is short enough to be manufactured using a peptide synthesizer, was created. Effects of F06-C40 on rat dermal fibroblast (RDF) were firstly analyzed in vitro. Additionally, both rodent and porcine cutaneous wound models were used to evaluate the anti-scar properties of F06-C40 in vivo. Gross visual assessment was performed with an adaptation of Visual Analogue Scale. Picrosirius red staining coupled with polarized light microscopy was used to assess scar size reduction, while antibody against von Willebrand factor was used to evaluate angiogenesis. In addition, the load to failure was documented for tensile strength measuring.

RESULTS: F06-C40 alone promoted RDF proliferation, migration, and contraction in vitro. Moreover, like the FMOD whole protein, the peptide F06-C40 significantly improved gross visual appearance, reduced scar size (by 30-50%), enhanced new blood vessel generation, and maintained wound tensile strength.

CONCLUSIONS: We successfully developed a FMOD-based peptide, F06-C40 that can undergo rapid and inexpensive production with the equivalent anti-scar effects as FMOD whole protein to benefit cutaneous wound healing.