Similar to bone graft, treatment of skin wounds includes the use of autografts, allografts (usually taken from cadavers), or xenografts. Autografts like in bone graft is the gold standard due to its low risk of rejection. Dermal skin substitutes are often made of biomaterials without any incorporated cell (acellular grafts), these scaffolds act primarily as a conduct for fibroblasts and endothelial cell's migration. Cellular skin substitutes are produced using fibroblasts (dermal grafts), keratinocytes (epidermal grafts), or both (dermo-epidermal grafts). Like bone grafts, skin scaffolds are made of either natural polymers: collagen, gelatin, chitosan, fibrin, glycosaminoglycans–GAGs, and HA; or synthetic polymers: PEG, PLGA, PLACL. Like bone composites, synthetic polymers can be combined with natural polymers to produce bio-functional composite materials with desired mechanical properties and high biocompatibility. Chronic wounds are characterized by the presence of persistent infections. Artificial skin grafts have been made of polymer matrix reinforced with antimicrobial nanoparticle. In addition, some of these grafts have been pre-seeded with stem cells for promotion of neuroregeneration. Adjustments to the scaffold pore size, shape and interconnectivity are made to mediate their angiogenic tissue response, and to influence cell differentiation and propagation.

Vascularization is critical in skin graft and bone repair (Mercado-Pagán et al.) to supply oxygen, promote healing, prevent infection, and sloughing of the implant and sepsis . Angiogenic growth factors could be incorporated to improve angiogenesis such as PDGF, VEGF or fibroblast growth factor (bFGF). HUVECS combined with fibroblasts, keratinocytes in a collagen matrix, in-vitro developed into a vascular network (similar result was obtained with HUVECS + collagen I + fibronectin + Bcl-2). Using the same design in bone tissue engineering, a PLGA and alginate-based microsphere scaffold significantly improved angiogenic response when loaded with GFs. In the long term, 3D bio-printing which allows for patient-customized and on-demand of skin substitutes with either incorporated autologous or allogeneic stem cells could play in important role in skin tissue engineering.