The application of new biosynthetic artificial skin for long term temporary wound coverage

王先震

Hsian-Jenn Wang;Trong-Duo Chou;Tai-Li Tsou;Tim-Mo Chen;Shiao-Liang Chen

摘要

Abstract

Temporary dressings protect wounds from desiccation and infection. In our previous study, we used meshed acellular porcine dermis (APD) to enhance wound healing and decrease wound contraction; however, the wounds showed meshed scar. In this study, we produced an artificial skin composed of a cross-linked silicon sheet on the surface of APD which we have called silicone acellular porcine dermis (SAPD). This new artificial skin can protect the wound long enough to promote wound healing either by second intention or covered long enough until cultured epithelium autograft (CEA) or autologous skin graft can be harvested for permanent coverage. We delivered 4 cm x 5 cm full-thickness wound on the back of 350 g Sprague-Dawley rats. Thirty-six rats were divided into two groups. Eighteen rats had SAPD and the other 18 were covered with Biobrane. The wounds were first examined 2 weeks after grafting and followed weekly for an additional 4 weeks to evaluate the wound and study pathological changes by using H.E. and Masson's stains. Wound size was calculated by ruler and analyzed by Student's t-test. At the 2-week inspection, both SAPD and Biobrane showed tight adherence to the wound with no change of wound size. Both the SAPD and Biobrane dermal templates were pink. In the Biobrane-covered group, the wounds contracted soon after the tie-over dressing was removed. Its dermal layer is a layer of thin porcine dermal substance, which was promptly digested by tissue hyaluronidase and provides no real dermal template. In the SAPD-covered group however, the wound size was maintained significantly from third to sixth week after grafting ($p<0.001$). SAPD was designed with thick epidermal silicone and a well-organized porcine dermis so that it incorporates into the recipient wound. Clinically the silicone layer of SAPD dislodged from APD about 6-7 weeks after grafting and was followed by dermal matrix exposure and infection. In pathological examination,

much like a human skin graft, new vessels were found in APD about 1 week after grafting with minimal inflammatory cells infiltrated in the graft and wound. Six weeks after grafting, the collagen of APD incorporated into the wound, showing palisade arrangement and no sign of rejection. In the Biobrane group however, the wounds showed severe inflammation, the porcine dermal matrix was digested and disappeared 3 weeks after coverage. In conclusion, SAPD is a thick biosynthetic artificial skin, which protects the rat wound significantly longer than Biobrane and prevents contraction. We expect that using of SAPD for temporary wound coverage will provide enough time to grow autologous-cultured epithelium or to reharvest skin grafts.