Pressure effects on the growth of human scar fibroblasts

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摘要

Abstract

Although pressure therapy is the mainstay of treatment for hypertrophic scars, its actual mechanism remains unknown. An in vitro study was designed to investigate the effects of positive pressure on the growth of human scar-derived fibroblasts through its transforming growth factor beta1 (TGF-beta1) secretion. A pneumatic pressure system connecting to a cell culture chamber was designed. Six-well cultured plates with fibroblasts implanted were treated with different pressure settings. Cells were treated with constant pressure 20 mm Hg above atmosphere pressure (group A n = 18) or with 40 mm Hg above atmosphere pressure (group B n = 18) daily for nine successive days. Cells without pressure were treated as the control study (group C n = 6). Each experimental group was divided into daily pressure applied at 24 hours (n = 6), 18 hours (n = 6), and 12 hours (n = 6). Cell counting was performed on the 2nd, 4th, 7th, 9th, 11th, and 14th day after implantation. On day 4, the concentration of transforming growth factor beta1 was measured, and cell doubling time was calculated. Compared with the control group, there was a significant decrease in cell count and the concentration in the 18-hour and 24-hour 20 mm Hg or 40 mm Hg pressure treated group. The cell doubling time was significantly increased in the 24-hour 20 mm Hg or 40 mm Hg pressure treated groups, and the 18-hour 40 mm Hg pressure treated group. ($P < .05$) Pressure inhibits the growth and activity of human scar fibroblasts, and a higher pressure application can shorten the daily application period. There should be an optimal pressure level corresponding to a daily application period to achieve the most effective results on pressure therapy for scars.