Scar Treatment Using Energy Devices

Taro Kono, Kotaro Imagawa, Tadashi Akamatsu

Department of Plastic Surgery, Tokai University, Tokyo, Japan

Laser treatment of scars was first reported in 1980s. The lasers that were used were the continuous wave carbon dioxide (CO_2), argon, and neodymium:yttrium-aluminum-garnet(YAG) lasers. The outcomes depended on the operator. Scar recurrence or worsening was often observed. A more recent approach that has been investigated is fractional photothermolysis. In nonablative fractional resurfacing, a parallel column of heated (but not ablated) tissue extends down into the dermis. This concept was expanded to produce ablative fractional resurfacing; for this, the carbon dioxide wavelength of 10,600 nm was used. Compared to the nonablative fractionated devices, the fractional ablative lasers heat the tissue much more intensely, causing vaporization of the tissue while significantly heating the adjacent dermal collagen. The immense volume of collateral heating causes thermal alterations to the helical structure of collagen molecules and results in tissue tightening. The depth of the heated tissue is determined by the pulse energy. Fractional radio-frequency is now available. It associates with a minimal risk of bleeding and dyspigmentation. Notably, hypertrophic scars associate with an early increase in microcirculatory perfusion. Selective photothermolysis of this vasculature *via* pulsed-dye laser (PDL) may prevent scar hypertrophy by decreasing the cellular function/nutrition in the scar. Moreover, the hypoxia induced by the laser destruction of capillaries may alter the collagen metabolic balance such that collagen catabolism becomes dominant. In terms of depressed scars, they can be improved by hyaluronic acid injection. In fact, a combination of subcision, hyaluronic acid injection, and fractional laser therapy yields good results and patient satisfaction.