

Percutaneous Collagen Induction: An Alternative to Laser Resurfacing

In percutaneous collagen induction, an alternative to laser resurfacing, the skin receives multiple punctures with a drum-shaped device that has fine protruding needles, to encourage the production of collagen and elastin. According to the author, advantages include preservation of the epidermis, thicker skin, a short healing phase, and use of local anesthetic alone. (*Aesthetic Surg J* 2002;22:315-317.)

Many clinicians believe that laser resurfacing is the most effective treatment for rejuvenation of facial skin. The laser is used to destroy the epidermis, resulting in normal posttraumatic inflammatory reaction. My contention is, "Why destroy the epidermis to make the skin smoother?"

The epidermis is a complex, highly specialized organ that, although only 0.2-mm thick, is our first layer of protection from the environment. We should never damage the epidermis unless the risks associated with leaving it intact are greater than those associated with its removal. Wrinkles are not a good excuse to destroy this wonderfully complex interface with the environment.

To appear rejuvenated, we need a youthful, healthy, evenly colored, smooth, perfused, and hydrated epidermis. The first step toward skin health is to topically replace photosensitive vitamin A and other antioxidant vitamins, such as C, E, and carotenoids that are normally lost by exposure to light. However, vitamins alone cannot adequately build up the collagen and elastin in the dermis.

As an alternative to laser, we need a technique that preserves the epidermis, yet stimulates collagen deposition. Orentreich and Orentreich¹ and I² independently described "subcision" as a way of building up connective tissue beneath retracted scars and wrinkles, but this technique cannot be applied to the whole face and other anatomic areas. Camirand used a tattoo gun to treat scars with "needle abrasion."³ Although this technique

can be used on large areas, it is slow, laborious, and yields holes that are too close and shallow. In these techniques, the needles break old collagen strands that tether the bed of the scar to the top layer of the dermis while the injury promotes removal of damaged collagen and induces more collagen deposition immediately under the epidermis. Based on these principles, I developed a new technique, percutaneous collagen induction⁴ (PCI) (Table 1).



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Technique

Patients prepare their skin with topical vitamin A, Environ Proactive (Tretin-Care Products, Park Kenilworth, Cape Town, South Africa), and C, Environ C-Boost (Tretin-Care Products), and other antioxidants for at least 3 weeks. I closely puncture the skin by using a drum-shaped device with very fine protruding needles that I designed (Figure 1). A simple tattoo-artist's gun may also be used. The patient may be under topical, local, or general anesthesia.

The needles penetrate the epidermis but do not remove it, so the epidermis is cleft only and will rapidly heal. The skin bleeds for 30 seconds to 2 minutes, which is less than normal clotting time. Multiple microbruises develop in the dermis. I use wet gauze swabs to soak up any fluid ooze and cover the skin with a vitamin C preparation, ascorbyl tetra-isopalmitate (Environ C-Boost). I advise against using ascorbic acid. The patient is encouraged to shower the same night or the following day.

Dynamics

PCI is a natural response to wounding the skin (although the wound is minuscule). A single needle prick through the skin would be insignificant; however, a different pic-



Figure 1. Drum-shaped device with very fine protruding needles is used to puncture the skin.

ture emerges when thousands of fine pricks are placed side-by-side. The needles penetrate about 1.5 mm into the dermis and automatically initiate a complex chemical cascade including numerous growth factors, such as fibroblast growth factor, platelet-derived growth factor, and transforming growth factors alpha and beta, which result in an invasion of fibroblasts. This surge of activity inevitably leads to the production of more collagen and elastin by the fibroblasts. Keratinocytes migrate across the epidermal defect and proliferate, thickening the epidermis.

Five days after injury a fibronectin matrix is laid down along the axis in which fibroblasts are aligned and along which collagen will also be laid down. This collagen is deposited in the upper dermis just below the basal layer of the epidermis. Collagen type III is the dominant form in the early wound-healing phase. Tissue remodeling continues for months after the injury and is accomplished primarily by the fibroblast. Collagen type III is gradually replaced by Collagen I over a period of a year or more.

Postsurgical Treatment

Immediately after the treatment the skin looks bruised but, because treatment is a series of pinpricks, bleeding is minimal and there is only a small serum ooze that soon stops (Table 2). The patient is encouraged to use topical vitamin A and vitamin C cream (Environ Ionzyme C-Quence and Crème 2001, Tretin-Care Products) to promote better healing and greater colla-

Table 1. Indications for PCI

- To restore skin tightness in the early stages of facial aging. This relatively minor procedure may be recommended to patients who are worried about surgery. The arms, abdomen, thighs, and buttocks may also be treated with PCI.
- To diminish fine wrinkles.
- To avoid dermabrasion for acne scarring. Skin becomes thicker and results are superior to dermabrasion.
- To avoid laser treatment.
- To give "white" scars more flesh tones.

Table 2. Advantages and disadvantages of PCI

Advantages

- PCI does not permanently damage the skin.
- Thicker skin.
- Short healing phase.
- Less expensive than laser resurfacing.
- Skin does not become sun-sensitive.
- Can be used after laser resurfacing or in those with very thin skin.
- Possible elimination of telangiectasia.
- Easy-to-master technique with a tool that has been specially designed.
- Can be performed with topical anesthesia.

Disadvantages

- Exposure to blood.
- Less intense deposition of collagen than laser resurfacing, but repeatable treatments that may last just as long.
- When using a tattoo gun, over-aggressive needling may cause scarring.
- Hyperpigmentation is a potential although rare complication. Tattoos hardly ever hyperpigment, even in darker-skinned people.

gen production. The skin feels tight and may look uncomfortable, but it is not. Although the skin appears very bruised initially, because of the smallness of the bruises, it appears only moderately bruised the next day. By day 4 to 5, the skin has a moderate pink flush that can be concealed with make-up, and about this time iontophoresis and sonophoresis of vitamin A and C will maximize the induction of healthy collagen. Iontophoresis also tends to reduce skin swelling.



Figure 2. **A,** Pretreatment photo of a 45-year-old woman. **B,** Post-treatment view after 8 weeks demonstrates reduction of wrinkles and tightening and thickening of the skin.



Figure 3. **A,** Pretreatment photo of lips of a 50-year-old woman. **B,** View of lips approximately 4 years after 3 PCI treatments.

This is a simple technique; with an appropriate tool it is an easy, fast procedure to thoroughly puncture any skin. Although one treatment may not result in the same smoothing as seen with laser resurfacing, the epidermis is left virtually intact. If the result is not adequate it can be repeated. Additionally, PCI may be used on areas that are not suitable for peeling or laser resurfacing.

I have been working with this idea since 1997 and have been using the roller since 1998. I have performed PCI on the lips of several hundred patients and on the entire face and neck areas in about 40 or 50 patients. I have used PCI on the arms of 3 or 4 patients and the abdomen of 1 patient (Figure 2). My associate has used PCI on the thighs of 8 patients. My longest follow-up of results is from 1997 to 2002. With that patient, the results of the PCI I performed on her upper lip in 1997 have not deteriorated (Figure 3). ■

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specifically for percutaneous collagen induction and created a company to market it; he is the major shareholder. He also designed a range of skin care products to deal with vitamin depletion from sun-exposure that are also marketed under the name of Environ.

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