

Silicone Gel Sheeting for the Prevention and Management of Evolving Hypertrophic and Keloid Scars

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BACKGROUND. Hypertrophic scars and keloids remain a problem for surgeons. Topical and intralesional corticosteroids, positive pressure dressings, cryotherapy, and laser therapy are helpful but not uniformly successful.

OBJECTIVE. To document the effectiveness of silicone gel sheeting in the prevention and/or reduction of evolving hypertrophic scars and keloids.

METHODS. Silicone gel sheeting was placed over evolving scars in 20 cases. The dressing was worn for at least 12 hours a day. Biopsies were examined for the presence of silica in the tissue.

RESULTS. Lesions improved during the treatment period in 85% of the cases. The mechanisms of action are unknown. Positive pressure was not necessary. No silica from the dressing was found at the wound site.

CONCLUSION. Daily treatments with silicone gel sheeting should begin as soon as an itchy red streak develops in a maturing wound. The dressing is effective in reducing the bulk of these lesions. *Dermatol Surg* 1995;21:947-951.

The management of evolving hypertrophic scars and keloids is difficult. Once the lesions begin to appear, there has been very little that can be done to control the natural life cycle. The lesions tend to enlarge over several months and, in some cases, then gradually disappear. In other cases, they enlarge and may last forever. Early recognition of the potential development of the hypertrophic scar or keloid is critical in its management. If they can be recognized early and treated, resolution may be possible. The current treatments consist of intralesional corticosteroid injections, topical flurandrenolide tape applications, and positive pressure with a chin strap or similar garment.¹ Cryotherapy and laser therapy have also been used.² This study reviews the use of an alternate dressing, silicone gel sheeting, which does not require concomitant use of topical corticosteroid tape or positive pressure.³⁻⁶ The use of this sheet provides an improvement in the management of these evolving lesions.

Methods

Twenty cases were chosen that either had evolving spontaneous hypertrophic scars or keloids after skin trauma or where

fresh wounds were induced in known hypertrophic scar or keloid formers. In the former group of cases, the application of the silastic dressing was instituted as soon as a persistent erythematous, pruritic lesion became evident. In the cases where fresh wounds were induced on known keloid formers a careful ellipse excision was done of a lesion or previous keloid. The wound was closed without tension by undermining and suturing in two or three layers. Usually, a subcuticular 4-0 or 5-0 polyglactin 910 (Vicryl) suture was used as a buried mattress. In addition, superficial interrupted or running polypropylene (Prolene) sutures were used for 7-10 days to achieve epidermal approximation. Approximately 1 week after the epidermal sutures were removed, the silicone gel dressing was used over the wound. Whenever possible adjacent scars or evolving lesions served as controls.

The silicone gel sheet (Epi-derm; Biodermis, Las Vegas, NV) was cut approximately 1-2 cm larger than the area in question and applied over the top of the evolving scar and held in place with cloth tape. The dressing was worn 12-24 hours a day. It was taken off and gently washed in clear water and left beside the basin during the rest period. The silicone sheet was reapplied on a daily basis. One silicone dressing usually lasted 10-12 days before it began to come apart. The sheet was then replaced and the use of silicone sheeting was continued for approximately 8-12 weeks or until the lesion resolved. In some persistent cases (7/20), intralesional triamcinolone hexacetonide (2.5 or 5 mg/ml) (Aristospan; Fujisawa Pharmaceutical Co., Deefield, IL) was also injected into the center of the keloid periodically. No topical corticosteroid cream or corticosteroid tape was used.

Treated and control scars were rated clinically by both the patient and the investigator at monthly intervals as to texture, color, thickness, and pruritus. The result was graded as good, average, or poor. A 35-mm camera with a 100-mm macrolens was used to photograph treated and control scars initially and after 2 months of treatment.

Silica Analysis

To document possible silicone penetration from the silastic sheets into the tissue, three hypertrophic scars that had been treated for 4 weeks and adjacent untreated control sites were scrubbed clean with ethanol. Full-thickness 3-mm punch biopsies of the treated and control sites were frozen and sent for silica analysis. The silica per gram of tissue was reported as the percent of total trace metals in the burnt ash of the samples (Pacific Spectrochemical Co., Los Angeles, CA).

Results

The results were often dramatic. Either the silastic gel stopped the development and softened the hypertrophic lesion or resolved it in 17 of the 20 cases (Table 1). Resolution was possible regardless of the cause. The

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Table 1. Characteristics and Response of Patients

Case	Age (Years)/Sex/Race	Cause	Site	Score	Depot Steroids	Comments
1	42/F/Iranian-Hypertrophic Same case-Keloid	Chemical peel Incision	Lower eyelid Elbow	Good Poor	No Yes	Complete resolution Lesion recurred
2	72/M/White-Hypertrophic	Chemical peel	Lower eyelid	Good	No	Complete resolution
3	81/F/White-Hypertrophic	Dermabrasion	Right cheek	Fair	Yes	Loss of skin texture
4	35/F/White-Keloid	Ear piercing	Left earlobe	Good	No	Complete resolution
5	49/F/White-Hypertrophic	Chemical peel	Lower eyelid	Fair	No	Hypopigmented line
6	21/M/Spanish-Hypertrophic	Dermabrasion	Chest tattoo	Good	No	Complete resolution
7	53/F/White-Hypertrophic	Incision	Submental	Good	No	Complete resolution
8	70/F/Spanish-Keloid	Face lift	Cheek	Fair	Yes	Small residual nodules
9	44/F/Oriental-Keloid	Chemical peel	Chin	Good	Yes	Residual flat scar
10	35/F/Spanish-Hypertrophic	Abrasion	Knee	Fair	No	Hyperpigmentation
11	27/F/Spanish-Keloid	Incision	Right arm	Good	No	Complete resolution
12	38/F/Oriental-Hypertrophic	Incision	Breasts	Fair	No	Hyperpigmentation
13	63/F/White-Keloid	Chemical peel	Chin	Fair	Yes	Loss of texture
14	35/F/White-Keloid	Spontaneous	Chest	Fair	No	Small residual nodules
15	21/F/Philipino-Keloid	Spontaneous	Chest	Poor	Yes	Lesion recurred
16	37/M/White-Keloid	Acne scar	Back	Poor	No	Lesion recurred
17	65/F/White-Keloid	Herpes after peel	Face	Good	Yes	Residual flat scar
18	26/F/Oriental-Hypertrophic	Incision	Knee	Good	No	Hyperpigmentation
19	35/F/Spanish-Keloid	Herpes after peel	Face	Fair	No	Residual nodules
20	24/M/White-Keloid	Acne scar	Jawline	Fair	No	Residual nodules

Eighty-five percent of the patients demonstrated good to fair results. There were three treatment failures.

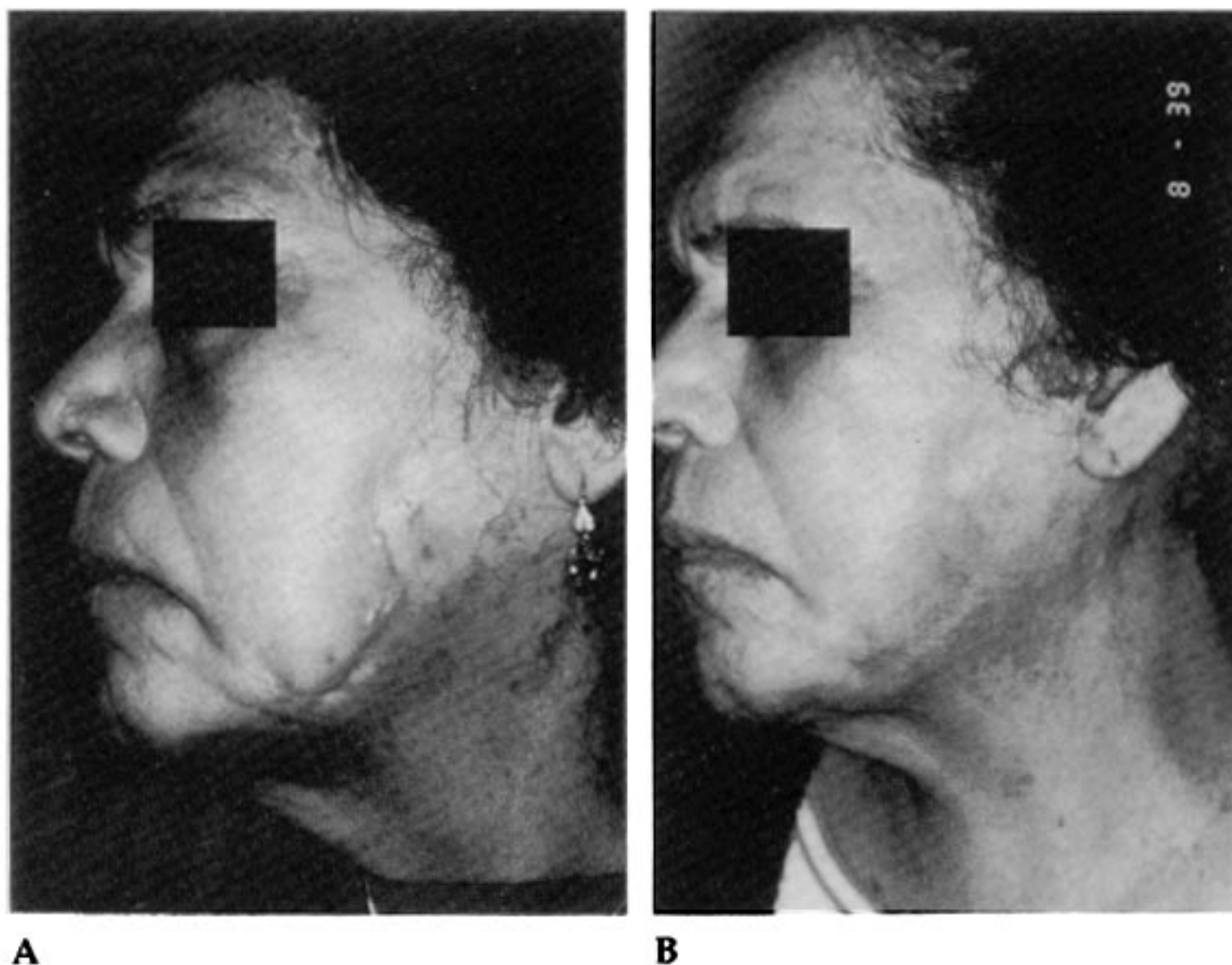


Figure 1. Case F.R. Keloids on the left cheek A) before and B) after 4 months of daily silicone gel treatment.



A



B

Figure 2. Case M.G. A) A large hypertrophic area developed in the perioral area following a herpes flare-up after a phenol peel. B) This inflammation gradually resolved over 6 months with intralesional triamcinolone and silicone gel sheeting.

thinning of surrounding tissue from the use of topical corticosteroid ointments or extensive intralesional corticosteroid injection was not present. The extensive telangiectasias seen with corticosteroid treatments was also absent. Several case histories will illustrate the treatment course.

Case History F.R.

This 70-year-old Spanish patient developed several facial keloids after a combination Baker-Gordon phenol peel and face lift (Figure 1A). The keloids were located in the mid-cheek area and behind each ear. The patient was referred to us for treatment 6 months after the lesions began. The silicone gel sheeting was applied 12 hours daily to the left cheek lesions. Keloids behind both ears were untreated. Gradually, over the next 4 months, there was a reduction in the mid-facial keloids

(Figure 1B). However, the keloids behind the ear continued to grow.

Case History M.G.

This 65-year-old white female underwent a face lift and a perioral phenol peel. Healing was progressing well until the 10th day, when she developed malaise and fever. The next day herpes simplex virus lesions erupted in the perioral area and ulcers developed. In spite of accelerated wound management, a hypertrophic scar began to develop (Figure 2A). Daily treatment with silicone gel sheeting was begun. Intralesional corticosteroids were used monthly in selected hypertrophic areas. The inflammation and induration gradually disappeared over 6 months of silicone gel treatment (Figure 2B).

Case History C.P.

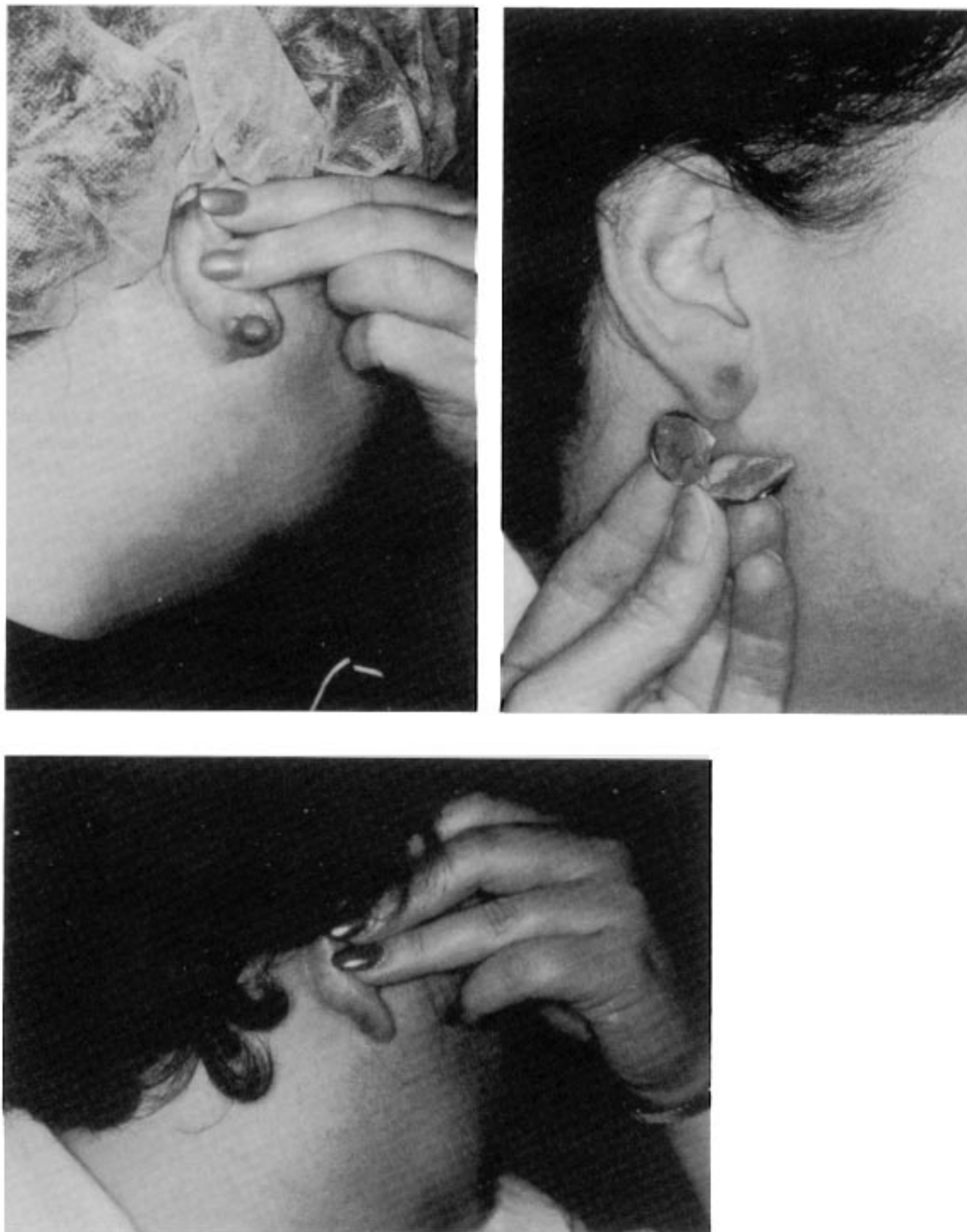
This 35-year-old patient developed keloids following ear piercing (Figure 3A). These lesions were unresponsive to intralesional steroids. The keloids were partially excised down to the level of the posterior ear lobe skin. Following re-epithelization, positive pressure was applied with a compression earring (Figure 3B). The paddle was covered with silicone gel sheeting. The lesion completely resolved and the remissions have remained over the last 4 years (Figure 3C). No intralesional corticosteroid injections were necessary.

Silica Analysis

The spectrographic analysis for silica in the samples of full-thickness skin biopsies did not demonstrate any more silica in the treated sites than the control, nontreated sites (Table 2). Low levels of silica were present in all the biopsies of skin at both treated and nontreated sites.

Discussion

These 20 cases demonstrate the effectiveness of silicone gel sheeting for the management of evolving hypertrophic and keloid scars. In 85% of the cases the lesions softened and diminished during the treatment period. In several cases this resolution came in spite of increasing size and growth of adjacent lesions. The mechanism of action of this resolution is unknown. Investigators have speculated that the thick sheeting applies pressure to the wound, reduces oxygen availability, increases the underlying temperature, increases skin hydration, or has a direct chemical effect.³⁻⁶ We could not demonstrate the obvious possibility that silicone was diffusing from the gel into the skin and directly affecting the



C

Figure 3. Case C.P. A) An ear lobe keloid that developed following ear piercing. The lesion was partially excised. B) Silicone gel sheeting was applied on a compression earring during the wound healing phase. The lesion completely resolved.

fibroblasts or collagen metabolism. Further research is indicated.

The use of this silicone gel sheeting reduces the necessity for extensive corticosteroid therapy. Only one or two steroid injection sessions were required in seven of 20 cases. It was not necessary to push the intralesional injections to the point of adjacent skin atrophy. The

silicone gel treatment also appeared to inhibit blood vessel neoangiogenesis as telangiectasias was not prominent over the triamcinolone injection sites. The lesions of six cases (Table 1; nos. 4, 6, 8, 11, 19, and 20) were unresponsive to corticosteroid injections before the institution of the daily use of the silicone gel sheeting. Then, the lesions resolved. In one case (no. 8), cortico-

steroid injections were continued into the evolving keloids behind the ears. These continued to enlarge while the cheek lesions resolved under the silicone gel sheeting. It was apparent that the combination of corticosteroid therapy and silicone gel sheeting is more effective than corticosteroid injections alone.

Our failures to inhibit hypertrophic scars developed in areas of extreme tissue mobility and stretching. For example, the case of hypertrophic scar recurrence at the elbow developed in spite of silicone gel sheeting, positive pressure with an Ace bandage, and intralesional corticosteroid injections. The second case was a mid-back lesion. The individual played beach volleyball during the postoperative period. This movement released the deep subcutaneous sutures and the keloid returned. The third case was a mid-chest lesion that recurred. The expectations of the physician and patient in the treatment of these areas should be limited.

We recommend the use of deep retaining sutures for repairing potential hypertrophic lesion. This support retards wound stretching. We believe this discourages keloid formation. The use of silicone dressing is instituted immediately after the initial wound healing in predisposed cases. The sheeting should be in place before the last stage of wound remodeling begins. It is apparent that positive pressure was not necessary. Simple paper tape is adequate to hold the silicone sheet in place. We prefer the use of the more adhesive silicone gel sheeting compared to the original, nonsticky Silastic dressings as it is easier to keep in place on angular areas such as the corner of the eye or in areas of extreme movement such as the elbows. The silicone gel sheeting has become an integral part of our wound healing tools and its benefit has given us the confidence to operate on predisposed individuals.

Any delay in wound healing may predispose to keloid formation.^{7,8} Attention to the details of wound healing are important. Any persistent crust formation may extend the wound deeper and result in keloids.¹ In

Table 2. Trace Metal Analysis at Treated and Untreated Sites

	Treated Sites			Untreated sites		
	Ia	Ila	Illa	Ib	Ilb	IIIb
Si	8.7%	7.5%	5.5%	7.5%	5.3%	8.5%
Mg	1.0%	1.1%	.70%	1.1%	1.3%	.86%
Fl	.91%	2.1%	.83%	2.1%	.58%	1.3%
AL	.54%	.80%	.96%	.80%	.58%	2.1%
Ti	5.4%	5.3%	4.7%	5.3%	6.3%	7.0%
CA	1.1%	2.0%	3.1%	2.0%	1.9%	4.1%
Ca	.082%	.11%	.083%	.038%	.083%	.14%
NA	20%	19%	19%	19%	19%	12%
Others	Nil	Nil	Nil	Nil	Nil	Nil

After treatment with silicone gel sheeting there was no more silica in the tissue of the treated sites than the untreated sites.

our series a herpes simplex flare-up after a chemical peel (two cases) resulted in keloids. Routine incisions (five cases) and the inflammatory nodules of acne (two cases) can also develop into problems. The key to our success was early recognition and treatment. Any persistent red streak with associated pruritis was treated as an impending keloid to prevent its progression.

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