

Silicone Gel Sheeting in Scar Therapy

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The purpose of this study was to analyze the efficacy of silicone gel sheeting in the treatment of fresh and long-standing hypertrophic and keloid scars. All subjects applied the gel sheeting in the same fashion and wore it for twelve to twenty-four hours per day for at least two months. After at least six months' follow-up, twenty of thirty-six (56 percent) chronic scars were improved. Eleven of fourteen fresh hypertrophic scars (79 percent) did not recur after surgery during a similar follow-up period. Side effects were minimal. Silicone gel sheeting is safe and effective treatment for hypertrophic and keloid scars. The mechanism of action is not completely understood.

Silicone gel sheeting is indicated for use in both old and new hypertrophic or keloid scars. It is a soft, semioclusive scar cover made of cross-linked polydimethylsiloxane polymer. It was first reported in 1982 to be an effective treatment for burn scars and contractures.¹ Thought to be due to pressure effects initially, Quinn found that silicone gel sheeting's efficacy was unrelated to pressure.² In a three-year clinical trial, seventy-five of ninety-two patients with chronic hypertrophic or keloid scars were found to show some improvement with use of silicone gel sheeting after two months' treatment.³ In another study, forty of forty-six chronic keloid scars were found to improve when treated with silicone gel sheeting for six months.⁴ When compared to pressure therapy alone, silicone gel sheeting was found to be more effective. In a prospective, controlled trial, Ahn et al found that silicone gel sheeting produced significant improvement in eleven of fourteen chronic hypertrophic scars when evaluated by elastometry and photography.⁵

Although confirmed in its efficacy for treatment of chronic hypertrophic and keloid scars, only recently has silicone gel sheeting been found to prevent these scars. In a controlled analysis of fresh surgical incisions, silicone gel sheeting was found to inhibit the formation of hypertrophic scars significantly when used for at least twelve hours a day for two months.⁶ In the first report in the dermatologic literature, the author confirmed the efficacy of silicone gel sheeting in both the treatment and prevention of hypertrophic and keloid scars.⁷

I report here the results of a follow-up study of the treatment of both fresh and long-standing hypertrophic and keloid scars with silicone gel sheeting.

Materials and Method

Patients were instructed to apply silicone gel sheeting to all scars in the same fashion. Each received a sterile tray of gel sheeting and were to trim a piece to fit the scar (overlapping surrounding normal skin) (Figure 1). The shiny surface of the sheeting (not fabric mesh) was placed in contact with the skin and attached with Dermicel[®] tape. Patients were asked to wear the gel sheet for at least twelve hours and preferably for twenty-four hours a day. The material was washed daily with a soap and water solution and replaced at seven- to ten-day intervals when it began to deteriorate. All patients wore the gel sheet for at least two months.

Clinical Assessment

Scars were photographed before and after two months of silicone gel sheeting treatment. Evaluations were performed by two physicians and the patients themselves, based on change in scar redness, elevation, and subjective complaints (pruritus or pain).

Results

Silicone Gel Sheeting and Chronic Scars—This arm of the study included only chronic hypertrophic or keloid scars of at least three months' duration. Most scars had been present for at least one year. Thirty-six scars in thirty-four patients were evaluated after treatment with silicone gel sheeting for at least two months. Twenty scars were improved and sixteen were unchanged (Figure 2). Follow-up evaluation for at least six months showed no change in these results.

Silicone Gel Sheeting and Fresh Scars—This group consisted of patients having only fresh scars (present for less than three months). Fourteen scars in fourteen patients were evaluated after treatment with silicone gel sheeting for at least two months. Five patients had a history of hypertrophic scar, and silicone gel sheeting treat-

Dr. Fisher's Note—It should be emphasized that this type of topical silicone therapy is not associated with any allergic or irritant reaction. Although silicone breast implants are suspect and intralésional silicone injections occasionally have been reported to produce pruritic papules and nodules at the sites of injection, the topical silicones widely used in cosmetics, various sprays, and adhesives have not been reported to cause any allergic or irritant reactions. Indeed, silicone hearing aids are considered hypoallergenic, and even silicone-coated needles have not caused any problems.

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FIGURE 1. Measuring silicone gel sheeting to fit an abraded scar.

ment was begun within two months of recent surgery to prevent recurrence. In nine cases, long-standing hypertrophic scars were completely excised and repaired with W-plasties. Scarabrasion was performed eight weeks later.⁹ In most cases, silicone gel sheeting therapy began as soon as re-epithelialization occurred. In eleven of fourteen cases, hypertrophic scarring was not found after at least six months of follow-up (Figure 3).

Complications—Three cases of minor irritant dermatitis occurred. This problem cleared when Dermicel[®] tape was replaced with paper tape or use of silicone gel sheeting was discontinued for a day or two. In two instances, a foul smell from the gel was remedied when the gel was washed daily.

Comments

Hypertrophic and keloid scars have been treated with a variety of modalities including steroid injection, surgical revision, radiation, laser, cryotherapy, compression, and combination therapy. Many of these treatments have been associated with high rates of recurrence⁹ and can be painful

or expensive. Because of its simplicity, ease of use, and relatively low cost, silicone gel sheeting and other "contact media" have been the subject of attention recently. Research and clinical experience will determine whether these materials are any more beneficial than previously used therapies.

In this investigation, twenty of thirty-six chronic scars treated with silicone gel sheeting showed improvement (56 percent). Although a majority of scars responded to treatment, this is lower than the 70 to 80 percent response rate reported in the literature.^{3,4,10} The reasons for this variation are unclear.

Hypertrophic scars usually occur within the first six to eight weeks after skin re-epithelialization, with gradual "maturation" over the next one to two years.³ For therapy to be effective, this sequence of events should be altered.

Within the group of fresh scars treated with silicone gel sheeting in this study, eleven of fourteen hypertrophic scars did not recur (79 percent). Given these results, it appears that silicone gel sheeting is effective in the prevention of hypertrophic scarring when applied early in the wound healing process.

The mechanism of action of silicone gel sheeting is unclear. The physical and chemical effects of silicone gel sheeting on scarring have been explored.²³ Using pressure transducers, it was found that silicone gel sheeting exerted negligible pressures compared to the 15 to 40 mmHg required by pressure garments to achieve their effect. The therapeutic effect of silicone gel sheeting is thus not dependent on pressure. Changes in temperature and oxygen tension were also investigated and no differences were noted between treated scars and normal skin. Results of studies of the bacteriologic action and mechanics of the gel sheet itself were noncontributory, and effects due to occlusion were also ruled out.

The water vapor transmission rate of silicone gel sheeting was found to be about half that of skin. A dramatic increase in water loss from the scar is noted upon removal of the gel from skin. Silicone gel sheeting may therefore work by affecting scar hydration. The reduction in water vapor loss is postulated to decrease capillary activity, thereby reducing collagen deposition and scar hypertrophy.¹¹



FIGURE 2. A. Chronic hypertrophic scar before the application of silicone gel sheeting. B. Flattening of the scar after four months of silicone gel sheeting use.



FIGURE 3. A. Hypertrophic scar of the chest before excision, w-plasty repair, scarabrasion, and application of silicone gel sheeting for two months. B. Close-up view of A. C. No recurrence of hypertrophic scar nine months after silicone gel sheeting use was discontinued.

The possibility of release of low-molecular-weight silicone fluid into tissues has been raised,² but histologic analysis of biopsy specimens from silicone gel sheeting-treated scars showed no evidence of silicone leakage.³

Several minor complications have been described with use of silicone gel sheeting. Superficial maceration or erosion of the scar has occurred, usually due to excessive pressure. Occasional pruritus and rash have also occurred, usually due to poor local hygiene. These problems have resolved when the gel sheeting was removed temporarily or duration of use was reduced to twelve hours per day.

Summary

Silicone gel sheeting is a safe and effective treatment for hypertrophic and keloid scars. In long-standing scars, improvement in appearance is seen with use of this material. In fresh scars, silicone gel sheeting appears to be effective in reducing the rate of recurrence of hypertrophic scars after full-thickness surgical revisions and scarabrasion. Adverse effects are minor and transient.

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