Role of silicone derivative plus onion extract gel in presternal hypertrophic scar protection: a prospective randomized, double blinded, controlled trial

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ABSTRACT

Use of silicone derivative and onion extract had been reported in the prevention of hypertrophic scarring. Our experience showed the preventive use of silicone derivative plus onion extract gel on hypertrophic scars after median sternotomy. In a randomized, double blinded, placebo-controlled study, 60 patients after median sternotomy incisions were separated into two groups. All patients were treated either with silicone derivative plus onion extract gel (Cybele® scagel) or placebo gel twice daily for a total treatment period of 12 weeks. During each visit, pain and itching scores were graded by the patients and scar characteristics were observed by surgeons using the Vancouver scar scale. Pain and itch score values from patients' who applied silicone derivative plus onion extract gel was less than another group ($P < 0{\cdot}05$). Pigmentation was significantly different between two groups ($P < 0{\cdot}05$) and the reduction of scores on vascularity, pliability, height in treated group was not superior to the untreated group. No adverse events were reported by any of the patients. A silicone derivative plus onion extract gel is safe and effective for the preventing the hypertrophic scarring after median sternotomy.

Key words: Hypertrophic scar • Median sternotomy • Onion extract • Silicone derivative

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Key Points

- hypertrophic scar treatment remains a challenging problem for clinicians
- in this article, we present our experience in the preventive use of silicone derivative plus onion extract gel for hypertrophic scars after median sternotomy
- from August 2009 to April 2011, patients of age over 18 years, who underwent median sternotomy, were enrolled in the study
- the patients did not receive other treatments before participating in the study
- the silicone derivative plus onion extract gel (Cybele Scagel, Bangkok Botanica, Bangkok, Thailand) in semi-liquid gel form is formulated from medical-grade silicone derivative and onion extract as main ingredients
- the placebo gel is a composite of water, acrylate, C10–30 alkyl acrylate crosspolymer, polysorbate20 and fragrance that was similar in colour and consistency as that of active gel

INTRODUCTION

Hypertrophic scar treatment remains a challenging problem for clinicians. One epidemiological study showed that 30–50% of patients from Asian ethnicity who undergo median sternotomy developed hypertrophic scars, whereas the frequency of occurrence in Caucasian patients is only 10–20% (1). When scars are formed, physical conditions and emotions are affected. They may also cause significant functional and cosmetic impairment (2). Patients may suffer loss in mobility and their ability to perform job functions because of morbidity. Hypertrophic scars tend to cause itch and pain symptoms, which are responsible for a reduction in quality of life (3). Cost of treatment for these scars may also be expensive depending on individual factors such as genetic, type of wound and infection. The normal duration for treatment of scars is approximately 6 months and it may extend to 1–2 years so scar prevention therapy is an interesting alternative in the management of scars.

Although the mechanism of silicone in the improvement of hypertrophic scar still is unclear, it is recommended in the treatment hypertrophic scarring (4). Mustoe's (5) study reviewed several of the products available and the clinical evidence of their efficacy in preventing excessive scarring and improving scars formation. Results from clinical trials suggest that the efficacy of silicone gel is equivalent to that of traditional silicone gel sheeting but is easier to use. Quercetin from onion extract is found in various scar treatment products. It has anti-inflammatory, bacteriostatic and collagen down-regulatory properties (6). Topical agents, with a composition of silicone derivative plus onion extract in semi-liquid gel form, may improve hypertrophic scarring. In this article, we present our experience in the preventive use of silicone derivative plus onion extract gel for hypertrophic scars after median sternotomy.

PATIENTS AND METHODS

From August 2009 to April 2011, patients of age over 18 years, who underwent median sternotomy, were enrolled in the study. All the wounds were subcuticular stitched with Dexon 4-0. The patients did not receive other treatments before participating in the study. Patients with underlying factors that may influence wound healing process such as usage of steroids, immunosuppressant or patients who did not comply with the study protocol such as those who did not attend follow-up visits were excluded from the study. Consent forms, which conformed to the ethical guidelines of the 1975 Declaration of Helsinki, were accepted and signed by each patient.

The silicone derivative plus onion extract gel (Cybele® Scagel, Bangkok Botanica, Bangkok, Thailand) in semi-liquid gel form is formulated from medical-grade silicone derivative and onion extract as main ingredients. The placebo gel is a composite of water, acrylate, C10-30 alkyl acrylate crosspolymer, polysorbate20 and fragrance that was similar in colour and consistency as that of active gel. In both groups, application was carried out twice daily, once in the morning and once in the evening. Topical application was initiated at day 7 after surgery. Approximately 3 g of the topical agents were used each time and was enough for covering the wound. Patients applied the gel on the wounds and gently rubbed in until the gel is absorbed. Massaging the wound during the day after the gel application is not required.

Patients were assigned at random to two groups, each group comprising of 30 patients. Either silicone derivative plus onion extract gel (Cybele® Scagel) or placebo gel was applied for total treatment period of 12 weeks. The gels (both Cybele® Scagel and placebo gel) had similar appearance and were packed into similar looking containers. Scar assessments were performed at the beginning and 2, 4, 8, 12 weeks after treatment by three experienced burns doctors. The results evaluation by these doctors was blinded as well.

At each visit, the scars were photographed and evaluated using the Vancouver scar scale to determining scar pigmentation, vascularity, pliability and height (Table 1) (7). Pruritus and pain scores were graded by patients. The maximum score of 10 indicates that the patient has severe symptoms while the minimum of 0 implies that she has no symptom. This evaluation was carried out after topical application for 30 minutes.

Demographic data was analysed by using two-tailed unpaired student *t*-test and chi-square test. Categorical data was reported in frequency and percentage while continuous data was presented in mean and standard deviation. Repeated measures analysis of

Table 1 Vancouver scar scale

	Score					
Assessment	0	1	2	3	4	5
Vascularity	Normal	Pink	Red	Purple	–	–
Pigmentation	Normal	Hypopigmentation	Mixed	Hyperpigmentation	–	–
Pliability	Normal	Supple	Yielding	Firm	Ropes	Contracture
Height	Flat	<2 mm	2–5 mm	>5 mm	–	–

variance was used to compare the scores between the study and control group during each visit. Classification of scar characteristics was analysed by Fisher's exact test. Probability levels of less than 0·05 were considered significant. All statistical data analysis was performed with STATA 10.

RESULTS

Fifty-four patients completed this study; 30 were male and 24 were female. Six patients were excluded because of discontinued follow-ups [four because of distance (two from study group and two from control group) and two because of heart failure in control group]. There were no significant differences in baseline characteristics. The results of demographic data are shown in Table 2.

At the first visit (start of study, after surgical procedure approximately 1 week), there were no differences in all scar scores between two groups. During the follow-up (2, 4, 8 and 12 weeks after starting treatment), pain and itch score were significantly lower in the silicone derivative plus onion extract gel group when compared with the control group (Figure 1). In the repeated measure analyses, all parameters of Vancouver scar score assessment improved in the treatment group especially pigmentation. Hyperpigmentation faded significantly at all the time point ($P < 0{\cdot}05$). No side effects of the silicone derivative plus onion extract gel were noted in any case. The topical agent was convenient to use and it could be removed easily.

Table 2 Demographic data

	SDG	Placebo	*P* value
Gender: male	17 (60·7%)	13 (50%)	0·429
Age	51·39 ± 12·50	48·46 ± 14·47	0·428

SDG, silicone derivative plus onion extract gel.

DISCUSSION

Our results show the role of silicone derivative plus onion extract gel in preventing hypertrophic scar after median sternotomy excision. Pigmentation was improved in the treated group, while there were no significant differences between the study and control group for pliability, height and vascularity. Patients who applied silicone derivative plus onion extract gel experienced less pain and pruritus than those using placebo gels.

After skin injuries, the healing process, which can be categorized into the inflammatory phase, the proliferative phase and the maturation phase, is initiated in order to close the wound by epithelization. In the normal maturation phase, the swelling and redness of the wound will soften and flatten out because of collagen synthesis and degradation and the connective tissue elements will degenerate in 6 months to 1 year after injury but this process collapses in hypertrophic scar. Patient with abnormal wound healing would have experience pain, itch on affected area. Hyperpigmentation, scar contractures, hypertrophy can occur and may affected patient's morbidity. Even at the present day, hypertrophic scar is difficult to treat and it can recur even after excision; so prevention is recommended in scar management. This includes the use of pressure garments, microporous adhesive tape support, silicone gel and massages.

There are hypothesis on the various mechanisms of action on hypertrophic scars by topical silicone materials. Silicones are believed to decrease scar via wound hydration (8–12), increased static charge (13,14), and higher than normal body temperature. Mustoe (5) described that dehydration of the stratum corneum is signalled to keratinocytes perhaps via an osmotic gradient to produce cytokines, which in epidermal–dermal signalling activate dermal fibroblasts to synthesize and

Key Points

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- patients who applied silicone derivative plus onion extract gel experienced less pain and pruritus than those using placebo gels
- silicones are believed to decrease scar via wound hydration, increased static charge, and higher than normal body temperature

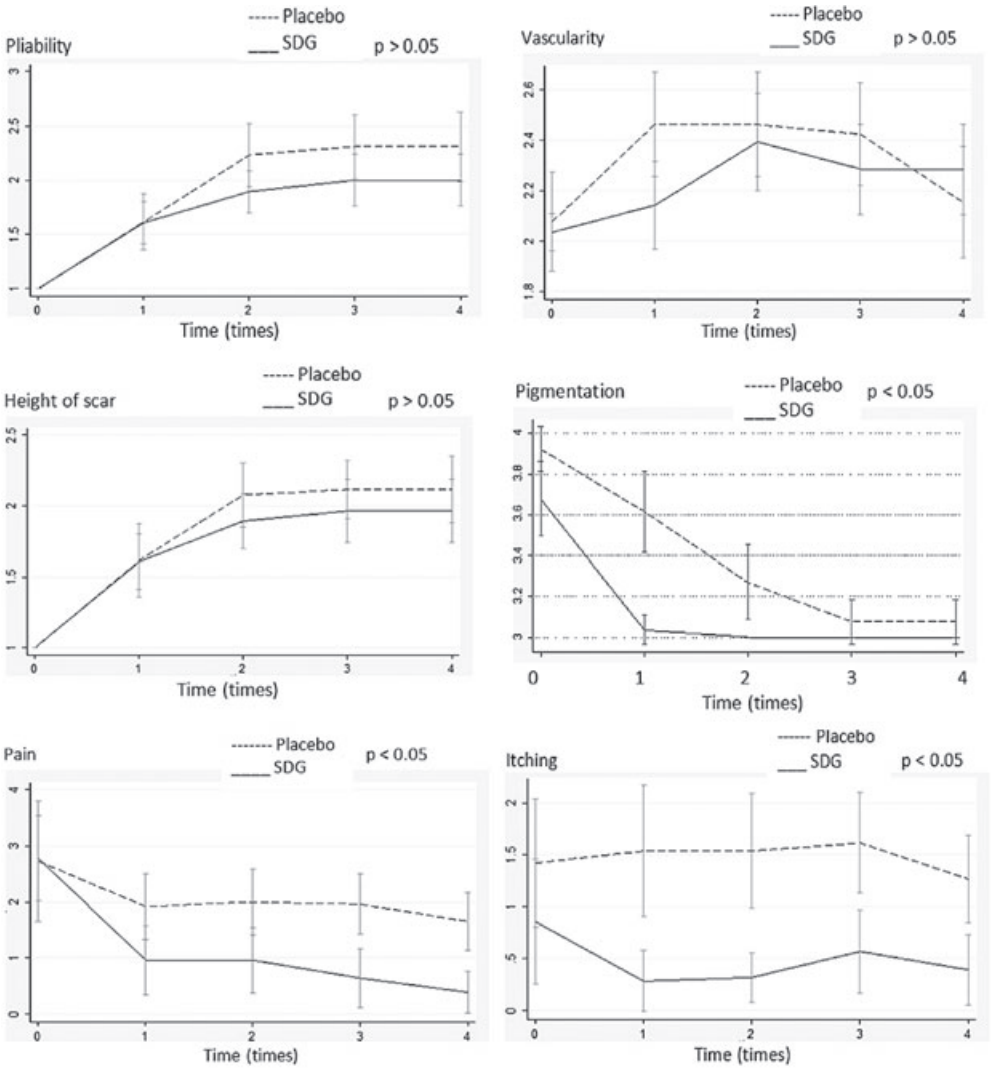

Figure 1. Patient assessment score and Vancouver scar score in the control and treatment group.

Key Points

- Quercetin, a bioflavonoid from *Allium cepa* also exhibited antihistamine release effects and may reduce itching from the scar

release collagen. Excessive collagen production leads to abnormal scarring. Topical silicone derivative plus onion extract gel might restore the barrier function of the stratum corneum, reducing transepidermal water loss and turning off the stimulation of keratinocytes to produce cytokines that activate dermal fibroblasts.

One previous study reported that the increase temperature at the scar area enhance the scar healing process (15). Silicone gel sheeting has good evidence of efficacy, and it has now become part of the standard care practiced by plastic surgeons (4,16–18). However, there are several products containing silicone derivative in semi-liquid gel form that has equivalent efficacy to traditional silicone gel sheeting (19,20). In addition, silicone derivative in this form is easy to use and there are fewer side effects compared to conventional silicone gel sheeting (21,22). Combination of silicone derivative with other active compounds such as onion extract may also have synergistic effects in scar improvement (23–27). Quercetin, a bioflavonoid from *Allium cepa* also exhibited antihistamine release effects. It may reduce itching from the scar. Hosnuter *et al*. (23) reported that the onion extract was more effective in relation to fade scar colour and the most effective therapeutic results were obtained when the silicone gel sheet treatment was combined with onion extract.

At the Srinagarind Hospital, Khon Kaen University, high incidences of hypertrophic scar from median sternotomy wounds are reported especially the thoraco-abdominal skin junction. Silicone derivative plus onion extract

gel application can significantly reduce pain, itch and pigmentation symptoms in treatment groups when compared with control groups according to previous studies (19,28). There is no significant difference between the study and control group on pliability, height and vascularity. It may be because of the subjective method used in this study. Although the application of this method is easy, it has some unclear definition of variables. We cannot have a definite conclusion on the colour change although visually, the scar was observed to have faded. Besides, the calibration of the scale is not standardised so the grading of the scores may not be precise (Figure 2). In the evaluation of height of the scar, we cannot just evaluate the height of the scar as the lesion may vary in volume (Figure 3). This limitation is usually found in subjective assessment. Objective evaluation may be useful in future studies.

Another limitation in this study is distance. Almost all our patients live in the rural area and it was inconvenient for follow-up visits at our unit so this study was conducted over a period of 12 weeks. The duration of therapy should be extended in future studies in order to have a more complete assessment on scar progression.

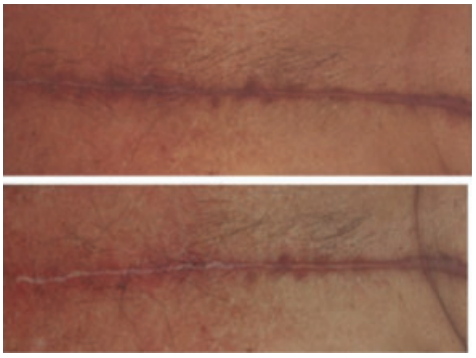

Figure 2. Different of pigmentation but the same score in the same patient in 2 months after apply silicone derivative plus onion extract gel group; silicone derivative plus onion extract gel (SDG) (upper) and 3 months after apply SDG (lower).

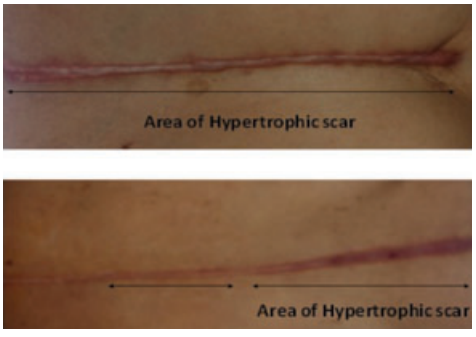

Figure 3. Different of volume of scar but the same score in height in worst result of both group control group (upper) and silicone derivative plus onion extract gel group (lower).

CONCLUSION

Silicone derivative plus onion extract gel has plausible efficacy in the prevention and treatment of scar formation. It could improve subjective symptomatic pain, itching symptoms and hyperpigmentation of scar.

Key Points

- in conclusion,silicone derivative plus onion extract gel has plausible efficacy in the prevention and treatment of scar formation
- it could improve subjective symptomatic pain, itching symptoms and hyperpigmentation of the scar

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