Problems associated with the use of silicone gel sheeting for hypertrophic scars in the hot climate of Saudi Arabia

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Abstract

Twenty five consecutive Saudi patients who underwent treatment of hypertrophic scars using Cica-care silicone gel sheets were included. The scars were secondary to burns or traumatic friction injuries. There were 15 females and 10 males with a mean age of nine years. Patients were given detailed instructions in applying and washing the gel and attended a review clinic regularly. At each visit, problems and scar assessment using the Vancouver scale were documented by an experienced occupational therapist. Problems associated with gel sheeting were common and included persistant pruritis (80%), skin breakdown (8%), skin rash (28%), skin maceration (16%), foul smell from the gel (4%), poor durability of the sheet (8%), failure of the sheet to improve hydration of dry scars (52%), poor patient compliance (12%) and poor response of the scar to treatment (24%). Most of these problems were eliminated by temporary interruption of treatment, more frequent washings of the gel sheet, better skin hygiene and occasionally by changing the brand of gel sheets. Permanent discontinuation of treatment occurred in only one patient and was because of lack of response to treatment. The modes of action of silicone gel in the treatment of hypertrophic scars are discussed. © 2001 Elsevier Science Ltd and ISBI. All rights reserved.

Keywords: Hypertrophic scars; Silicone sheets

1. Introduction

The commonest problem following thermal and traumatic friction injuries is the development of hypertrophic scarring. The conventional method employed to reduce these thick, red, itchy scars is the continuous application of pressure garments. However, this treatment regimen can take up to one year before the scar has a satisfactory appearance [1]. Perkins and coworkers [2,3] from Australia were concerned that effective pressure is difficult to apply to scars in difficult anatomical areas. In an effort to apply effective pressure to all scars they used a silicone gel under pressure garments. Later, they discovered that silicone gel alone reduced hypertrophic scarring but the mode of action was not fully understood. Since then, effectiveness of topical silicone gel sheets alone for the treatment of hypertrophic scars have been confirmed by different authors from different parts of the world [4–20]. The following clinical study is the first investigation from Saudi Arabia, specifically, looking at the problems associated with the use of silicone gel sheeting for hypertrophic scars in our hot climate and Saudi population.

2. Patients and methods

The study included 25 consecutive Saudi patients who underwent treatment of hypertrophic scars using cica-care silicone gel sheets (Smith and Nephew, U.K.). The patients were recruited at the Rehabilitation Services Department, King Fahad National Guard Hospital in Riyadh (Saudi Arabia). The scars were secondary to burns in 21 patients and secondary to traumatic friction injuries in the remaining four patients. There were 15 females and 10 males. The mean age was nine years (range 2–36 yr). The treated scars were located on the face (n = 3), upper limbs (n = 10), lower limbs (n = 4), chest (n = 6) and back (n = 2). The size of
treated scars varied from 2 to 500 cm² (mean = 81 cm²). Treatment with silicone sheets was begun 2–6 months (mean 3 months) after injury and patients were followed up for a minimum of two years.

Patients were given detailed instructions in applying and washing the gel. For better skin acclimatisation, they were advised to begin by applying the silicone sheet for 4 h per day the first two days, 8 h per day the next two days, and increase usage time gradually until the optimal 24 h per day treatment is obtained. Hours of wear were recorded daily by the patient or parent. Although cica-care silicone sheets are self adhesive, it was frequently necessary to hold the sheet in place by a light elastic bandage (tubigrip, Seton Health Care Group, UK) or tape (hypafix, Smith and Nephew, UK). The silicone sheet was washed in warm soapy water once daily and dried gently on paper before reapplication. When the weather was very hot and excessive sweating was noted, patients were advised to wash the sheet more often. A new silicone sheet was used when the piece in use became fragmented. If irritation occurred, sheet use was discontinued until the problem resolved. Patients attended a review clinic at regular monthly intervals. However, patients were advised to attend the clinic earlier if any problems arise.

Although documentation of patient compliance is mostly subjective, an attempt was made to assess compliance as follows:

Excellent – adherent to instructions all the time, washes the sheet at least once daily, more than 20 h of use daily.

Good – adherent to instructions most of the time, washes the sheet daily or every other day, uses the sheet 15–20 h daily.

Poor – adherent to instructions only occasionally, washes the sheet irregularly, uses the sheet less than 15 h daily.

It is important to note that not all conditions need to be fulfilled in order to grade patient’s compliance. For example, the compliance of a patient who washes the sheet daily but uses it less than 15 h daily is considered poor.

In each visit, problems and scar assessment were documented by an experienced occupational therapist (M. Nikkonen). Scar assessment was done using the Vancouver scar scale [21] by assessing scar pigmentation, vascularity, pliability, and height according to the grading system shown in Table 1. The total scar score was calculated for every patient before and after treatment.

3. Results

Problems associated with the use of silicone gel sheeting are summarized in Table 2. Although scar pruritis was the most common reported problem, it is important to note that pruritis is a feature of hypertrophic scars and hence it should not be considered as a true complication of the gel. All our patients who complained of scar pruritis reported it before gel treatment was commenced and most patients were not sure if pruritis got worse or not. However, it was clear that gel treatment does not usually result in immediate or early improvement of pre-existing scar pruritis.

Two patients developed a minor skin breakdown under the gel sheet. Gel treatment was interrupted for 1–2 weeks, until the skin healed. The re-use of cica-care sheets in these two patients did not result in any further problems.

Skin rash were noted in seven patients. In two patients the rash developed under the cica-care sheet and this complication resolved with switching treatment to spenco gel sheets. The rash in the remaining five patients was related to the tape used to fix the sheet. Fixation was switched to tubigrip in these five patients with no further problems.

Excessive sweating led to skin maceration under the sheet in four patients and this problem was solved by

<table>
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<tr>
<th>Problem</th>
<th>Number of patients (%)</th>
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<tr>
<td>1. Persistant prutitis of the scar</td>
<td>20 (80%)</td>
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<tr>
<td>2. Skin breakdown under the sheet</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>3. Skin rash under the sheet</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>4. Skin rash related to the tape used to fix the sheet</td>
<td>5 (20%)</td>
</tr>
<tr>
<td>5. Excessive sweating leading to skin maceration under the sheet</td>
<td>4 (16%)</td>
</tr>
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<td>6. Foul smell from the gel sheet</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>7. Poor durability of the gel sheet (A new sheet is required within two weeks of use)</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>8. Failure of the sheet to improve hydration of dry scars</td>
<td>13 (52%)</td>
</tr>
<tr>
<td>9. Poor patient compliance in using the sheet</td>
<td>3 (12%)</td>
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<tr>
<td>10. Poor response of the scar to treatment</td>
<td>6 (24%)</td>
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more frequent washing of the gel. Another patient complained of foul smell from the gel sheet, which resolved with better skin hygiene.

According to the manufacturer, cica-care sheets should last 2–4 weeks. In two of our patients, a new sheet was required every 10 days of use. Both these patients had excessive sweating requiring more frequent washing of the sheet. The durability of gel sheets in the remaining 23 patients was good and ranged between two and four weeks.

Another frequent problem was failure of the sheet to improve hydration of dry scars, noted in 52% of cases. Dryness was effectively treated with a topical moisturizing lotion. Patients were instructed to let the lotion dry before applying the silicone sheet, which was effective in maintaining scar hydration obtained by the lotion.

Compliance was considered excellent in fifteen, good in seven and poor in the remaining three patients. Response of the scar to treatment was done by comparing the Vancouver scar scale before and after treatment. The initial scar scale ranged between 6 and 13 (mean 9.36) and the post-treatment final scar scale ranged between 1 and 10 (mean 4.36). Table 3 shows the response of treatment in the form of “change of scar scale” which was defined as the difference between the pre-treatment and after treatment scales. One patient showed no response and treatment was permanently discontinued. Another three patients had minimal response making the total percentage of poor response 24%. It was interesting to note that poor patient compliance was not always associated with a poor response. The response to treatment in the three patients with poor compliance was poor in one and excellent in the remaining two patients.

4. Discussion

The current study details the problems noted with the use of cica-care silicone gel sheets in a Saudi population living in the hot climate of Riyadh. Although problems were frequent, they were mostly minor complications that could be eliminated by temporary interruption of treatment, more frequent washings of the gel sheet, better skin hygiene and occasionally by changing the brand of gel sheets. In our study, permanent discontinuation of treatment occurred in only one patient and was because of lack of response to treatment. Another interesting observation was the fact that poor patient compliance was not always associated with lack of response to treatment indicating that hypertrophic scar response to gel sheets is multifactorial. The number of patients with poor compliance in our study was small (12% only) and it might be worth investigating this observation in a large number of patients with various routines and hours of application. Another explanation of this finding is the fact that the minimum number of hours for silicone sheets to produce a significant response is not known. Both patients with poor compliance in whom an excellent response was observed used the sheet 12–14 h daily.

Assessment of hypertrophic scars undergoing silicone gel treatment in various studies included measurement of extensibility and texture (using an extensometer), assessment of blanching and softening of the scars, and the Vancouver scar grading system [4–20]. We chose the Vancouver scale because it has been shown to be reliable and a viable measure for research [21,22].

The mode of action of silicone gel is not known and various theories were investigated in details by Quinn [1]. Quinn classified possible mechanisms of action of silicone gel into either physical (pressure, temperature, oxygen tension and hydration) or chemical parameters and then studied each in details. It was shown that pressure obtained under the gel is low and inconsistent and hence pressure was not required for the therapeutic action of silicone gel. Immediately after application of gel sheets, the temperature of scar dropped. However, this cooling effect was lost within 10 min. It was also found that although silicone gel acted as a barrier, sufficient oxygen reaches the skin for respiration. In fact, Quinn found that oxygen tension in silicone gel-treated and untreated scars did not differ significantly [1]. Silicone gel sheets release silicone and this may contribute to the mode of action by a chemical mechanism.

Perhaps, the most controversial mode of action of silicone gel sheets is hydration. Using an evaporimeter, which measures the rate of water vapour transmission from a surface, Quinn [1] determined the effect of silicone gel on the hydration properties of the skin. The results showed that when in situ, the gel has a water vapour transmission rate almost half that of skin and, when removed, the water loss from the scar increases dramatically. This build up of fluid below the gel was not apparent, i.e. the scar did not look or feel wet. Quinn concluded that there must be a water reservoir

<table>
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<tr>
<th>Change of scar scale *</th>
<th>Description</th>
<th>Number of patients (%)</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>No response</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>1–3</td>
<td>Minimal response</td>
<td>5 (20%)</td>
</tr>
<tr>
<td>4–6</td>
<td>Good response</td>
<td>11 (44%)</td>
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<tr>
<td>7 or more</td>
<td>Excellent response</td>
<td>8 (32%)</td>
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* Change of scar scale – Vancouver scar scale before treatment – Vancouver scar scale after treatment.

Table 3
within the skin, and it was likely to be in the stratum corneum. However, more recent studies by Suetake and coworkers from Japan [23] did not support the hypotheses that the efficacy of silicone gel is mainly produced by the hydrating effect. Silicone gel initially induced a mild state of hydration of the stratum corneum. However, the water-holding capacity of the stratum corneum normalized after seven days of silicone gel treatment. The clinical findings of our study confirm these research observations. In 52% of our patients, cica-care sheets failed to improve the hydration of dry hypertrophic scars requiring the use of topical moisturizing lotions. However, we noted that the gel was effective in maintaining scar hydration obtained by the lotion.

References