Does taping torso scars following dermatologic surgery improve scar appearance?

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As principal author, Helena Rosengren can confirm that all authors have made substantive intellectual contribution to the study.

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ABSTRACT

Background: Studies show that patients are significantly less satisfied with torso scars than scars elsewhere. Though not an uncommon practice, it is unknown if application of adhesive tapes following dermatological surgery help improve cosmesis.

Objective: To determine the effect of taping sutured torso wounds on overall scar appearance, scar width and patient satisfaction with the scar.

Patients/Methods: Participants having elliptical torso skin excisions in a primary care setting in regional Australia were randomized in a single-blinded, controlled trial to 12 weeks taping (intervention) or usual care (control) following deep and subcuticular suturing. A blinded assessor reviewed scars at three and six months.

Results: Of 195 participants recruited, 136 (63 taped, 73 controls) completed six months of follow-up. Independent blinded assessment of overall scar appearance was significantly better in taped participants (p= 0.004). Taping reduced median scar width by 1 mm (p=0.02) and when stratified by gender, by 3.0 mm in males (p=0.04) and 1.0 mm in females (p=0.2). High participant scar satisfaction was not further improved by taping.

Conclusion: Taping elliptical torso wounds for 12 weeks after dermatologic surgery improved scar appearance at six months.
Introduction

Dermal postoperative repair produces scar tissue that can cause significant psychological and physical consequences [1,2]. With an estimated 55 million elective operations occurring each year in the developed world alone [3] and confirmation that most patients (irrespective of age, gender and ethnicity) believe that even a small improvement in scarring is worthwhile [4], any research that may help improve scar outcome is meaningful.

Research has confirmed a positive correlation between tension and increased scar tissue formation [5,6]. The great range of movement afforded by the spine renders scars on the trunk particularly vulnerable to tension and subsequent disfiguration. It may therefore not be surprising that patients are significantly more dissatisfied with torso scars than other scars [7-9]. Dermatologic surgery on the trunk is common worldwide, and in Australia 27% of all basal cell carcinomas (BCCs), 8% of all squamous cell carcinomas (SCCs), 25% of all invasive melanoma in men and 11% of all invasive melanoma in women are excised from the torso [10,11].

Evidence shows that prolonged use of adhesive tapes applied along a scar following surgery may reduce scar volume and improve cosmetic outcome [12,13]. Though short-term taping following dermatological surgery may be standard protocol for many practices, the optimal duration and mechanism of action of this intervention remains unclear [12,14].

The aim of this study was to determine the impact of 12 weeks of tape application perpendicular to sutured torso wounds on overall aesthetic appearance and width of the scars, as well as patient scar satisfaction at six months following surgery.

Materials and methods

This was a randomized controlled assessor blinded trial involving patients having elliptical skin excisions on the torso in a primary health care setting. The study was approved by the University of Queensland ethics committee (approval number #2008000535 April 2008). All patients gave written informed consent.

Setting & participants

Consecutive eligible patients were recruited by two general practitioners (including the principal researcher, HR), at a primary health skin cancer clinic in Townsville, North Queensland, Australia from June 2008 to January 2010.

Baseline demographic data, relevant medical history, degree of torso movement anticipated during the study period and lesion histology were documented (Table 1). Excision sites were recorded on body maps. The principal researcher trained staff to ensure consistency of data collection and standardization of management.

The study nurse phoned participants within five days of surgery and then fortnightly for 12 weeks to ascertain analgesia requirements, wound complications and intervention compliance. Wound assessment was encouraged at three and six months even if participants had not been fully compliant with the intervention protocol.

Every participant gave signed informed consent and received written postoperative wound care information.

Eligibility criteria

Patients aged 18 to 80 years requiring elliptical skin excisions on the torso were eligible for the study provided they could easily reach the wound or had someone available to help with taping. Exclusion criteria included known tendency to keloid scarring; allergy to the sutures or skin tapes; flap surgery; and prescribed immunosuppressive drugs. Participants requiring a second wider excision for residual tumor or melanoma were subsequently excluded from the study.

Surgical wound management protocol

We used a standardized surgical procedure (Figure 1). In addition to deep and subcuticular sutures, an occasional superficial interrupted 3/0 nylon suture was used where necessary to improve wound edge apposition.

Melolin dressings (Smith and Nephew Medical Ltd, Hull, UK), applied immediately after surgery, were changed after seven days (or sooner if soiled) and removed along with sutures 14 days postoperatively. A splash-proof dressing cover (Opsite Flexifix, Smith and Nephew Medical Ltd, Hull, UK) was used, making showering easier for participants. In the hotter more humid months (November to February inclusive), however, we used non-waterproof dressing covers (Fixomul Stretch, BSN Medical, Hamburg, Germany), allowing wounds to breathe better.

Intervention

Adhesive tapes 100 mm long and 10 mm wide (Leukostrips, Smith and Nephew Medical Ltd, Hull, UK) were applied perpendicularly to the sutured wound, in parallel without overlapping, prior to the dressing (Figure 2). It has been shown that tapes adhere to skin for longer with this technique [15]. Participants and carers were shown how to apply and remove tapes as well as receiving written instructions and a descriptive photo of the taping technique (Figure 3).

Instructions were given to change tapes on the same day each week for 12 consecutive weeks and to trim tape ends if they lifted. If no more than 4 cm extending either side of the scar, instructions were given to replace this tape and still change all tapes on the scheduled weekday.
TABLE 1. Baseline characteristics of participants by treatment group

| Characteristic                                      | Control Group n=103 | Intervention group n=92 | P   |
|----------------------------------------------------|---------------------|-------------------------|-----|
| Age in years—mean (SD)                             | 52.6 (15.4%)        | 51.4 (15.1%)            | 0.59|
| Women                                              | 50 (48.5%)          | 56 (60.9%)              | 0.10|
| Body mass index (kg/m2) – mean (SD)                | 27.0 (4.1%)         | 26.7 (4.5%)             | 0.61|
| Diagnoses of diabetes                             | 8 (7.8%)            | 7 (7.6%)                | 0.97|
| Prescribed aspirin, clopidogrel and/or inhaled steroids | 16 (15.5%)        | 9 (9.8%)                | 0.23|
| Smoking status                                     |                     |                         | 0.28|
| Ex-smoker                                          | 33 (32.0%)          | 27 (29.3%)              |     |
| Current smoker                                     | 9 (8.7%)            | 15 (16.3%)              |     |
| Level of activity at work                          |                     |                         | 0.28|
| Not working                                        | 43 (41.7%)          | 32 (34.8%)              |     |
| Sedentary occupation                               | 39 (37.9%)          | 30 (32.6%)              |     |
| Moderate bending/ lifting                          | 12 (11.7%)          | 16 (17.4%)              |     |
| Strenuous bending/ lifting                         | 9 (8.7%)            | 14 (15.2%)              |     |
| Histology of skin lesion                           |                     |                         | 0.12|
| Basal cell carcinoma                               | 42 (40.8%)          | 44 (47.8%)              |     |
| Sqamous cell carcinoma                             | 5 (4.9%)            | 9 (9.8%)                |     |
| Cutaneous melanoma                                 | 11 (11.3%)          | 6 (6.5%)                |     |
| Dysplastic naevus                                  | 34 (32.0%)          | 27 (29.3%)              |     |
| Other naevus                                       | 3 (3.0%)            | 5 (5.4%)                |     |
| Other lesion                                       | 8 (7.8%)            | 1 (1.1%)                |     |
| Torso site                                         |                     |                         | 0.27|
| Upper back (above waist)                           | 67 (65.0%)          | 59 (64.2%)              |     |
| Lower back/buttock                                 | 10 (9.7%)           | 11 (11.9%)              |     |
| Chest                                              | 22 (21.4%)          | 21 (22.8%)              |     |
| Abdomen                                            | 4 (3.9%)            | 1 (1.1%)                |     |
| Median post-excision length of scar before suturing [mm] (IQR) | 33 (25, 37)       | 33 (28, 37.5)           | 0.41|
| Median post-excision width of scar before suturing [mm] (IQR) | 19 (15, 22)       | 19 (15, 22.5)           | 0.72|

IQR= inter-quartile range; SD = standard deviation
Moderate bending/ lifting<15kg (e.g. bowls/ gardening);
Strenuous bending/ lifting >15kg (e.g. rowing/ weight training)
Randomization and blinding
The allocation sequence was generated using a computerized randomization schedule at the Discipline of General Practice at The University of Queensland. Randomization was done in blocks of six to ensure roughly equal numbers in each study group. Sequentially numbered opaque sealed envelopes containing details of group allocation were only opened following wound closure to ensure blinding to randomization during the surgical procedure. Participants were asked not to reveal their group allocation to the blinded outcome assessor. Scars were assessed 10 to 14 days after completion of the 12-week intervention so that there was no residual tape adhesive that might inadvertently reveal group allocation. Outcome data entry was done at the University of Queensland by a research assistant not directly involved in the trial.

Clinical outcomes
Maximal scar width was recorded to the nearest millimeter. Overall scar appearance and participant satisfaction with their scar were both appraised using five-point categorical scales.

Outcome assessment was undertaken by an independent blinded research nurse three and six months postoperatively. Overall scar appearance was evaluated and documented along with presence of scar elevation, depression and dyschromia. Reference photographs taken and categorized by the principal investigator (HR) before commencement of the trial helped ensure consistency of this assessment.

Participants completed adapted questionnaires [16] at the assessment visits. Participant satisfaction with the scar was ascertained as well as how perceived cosmetic results compared to their expectation and whether they would use tapes for future torso scars if our study results proved favorable.

Sample size
It was hypothesized that a minimum mean difference of 2 mm in wound width between taped participants and controls would be clinically significant. To show this with statistical confidence (power in excess of 80%; significance level 0.05), 29 participants were required in each study group.

For overall scar appearance and patient scar satisfaction (both measured on categorical scales), it was hypothesized that a difference of at least one category between the two

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**Figure 1.** Standardized surgical procedure. [Copyright: ©2013 Rosengren et al.]

**Figure 2.** Randomization protocol. [Copyright: ©2013 Rosengren et al.]

**Figure 3.** Taped torso wound—a descriptive photo. [Copyright: ©2013 Rosengren et al.]
study groups would be clinically significant. To show this with statistical confidence (power in excess of 80%; significance level 0.05), 78 participants were required in each study group.

For all outcomes to be assessed and allowing for a 25% drop out rate, we planned to enroll 204 patients.

**Statistical analysis**

Participant data were analyzed according to allocated study group, irrespective of protocol violation or non-compliance. Success of randomization was ascertained by comparing baseline information between groups. This included age, gender, diabetes, smoking history, degree of torso movement at work and in leisure time, body mass index, histology of lesion, torso site and wound dimensions.

Numerical data were described using mean values and standard deviations when approximately normally distributed or median values and inter-quartile ranges when skewed. Chi-square tests, t-tests and non-parametric Wilcoxon tests were used for baseline comparisons between participants and non-participants and between the study groups. Wound assessments and patient satisfaction scores were compared using non-parametric Wilcoxon tests.

Statistical analysis was conducted using SPSS version 18 (PASW; SPSS Inc., Chicago, Illinois). P-values of less than 0.05 were considered statistically significant.

**Results**

**Baseline description of patients and skin lesions**

Of 240 eligible patients, 195 opted to participate. Excisions were for skin cancer (44.1% BCCs, 7.2% SCCs) or suspicious pigmented lesions (48.7%) (Table 1).

Those with lesions requiring a second wider excision (16 melanoma; two incompletely excised BCCs) were excluded from the study, leaving 177 participants (86 intervention; 91 control). One in-situ melanoma with adequate margins on primary excision remained in the study. Forty-one participants withdrew or were lost to follow-up, leaving 63 (73.3% of 86) in the intervention and 73 (80.2% of 91) in the control group at six months (Figure 4).

At baseline there were no significant differences between study groups (Table 1) with the mean age being 52 years (SD 15.2, range 18 to 80 years) and 53.3% (104) being female. Other than gender there were no differences between the study groups at six months, with 38.4% (28) of controls and 58.7% (37) of intervention participants being female (p=0.013).

**Treatment and complications**

There was no difference between study groups in the number of deep sutures used (p=0.93; median number three; range from two to ten) or postoperative pain relief requirements (p=0.343). Analgesics used were paracetamol (38), paracetamol with 30 mg codeine phosphate (4) and ibuprofen (2), but 77.4% (151) patients required no pain relief.

One participant developed allergy to the adhesive tapes and subsequently stopped taping. Surgical complications (1 hematoma, 2 infection, 1 dehiscence, 2 stitch abscesses) were as infrequent in both study groups (p=0.804).

**Characteristics of non-participants**

Forty-five patients declined participation, mainly due to a lack of interest (73.3%). Participants were more likely to be female (p=0.005), less likely to take anticoagulants or inhaled steroids (p=0.049) and reported more exercise in their leisure time (p=0.042) than non-participants. Those who enrolled in but did not complete the study (41) were more likely to be younger (p<0.001), female (p=0.01) and more physically active at work (p=0.036).

**Main outcome measures**

The overall scar rating given by the blinded assessor at six months was significantly better in the intervention group (p=0.004) (Table 2) both for males (p=0.045) and females (p=0.045). Wounds were rated as good or very good in 64.4% of taped participants and 38.4% controls, whereas they were rated as poor or very poor in 14.6% taped participants and 39.8% controls. Median scar width at six months was 1 mm less in taped participants than controls (p=0.015).

When stratified by gender, there was no significant difference in scar width for females (p=0.155), but for men there was a
Twelve weeks of taping torso scars postoperatively significantly improved independent assessment of overall scar appearance at six months. There was no significant difference in the number of participants with at least some scar depression, elevation or dyschromia. Since degree of these three variables was not evaluated, however, these observations may have little clinical relevance.

Taping reduced median scar width by a modest 1 mm, which, though statistically significant, was thought not to be clinically relevant. When stratified by gender, however, the observed 3 mm reduction in scar width in taped males may be of clinical as well as statistical significance. In non-taped controls, scars were significantly wider in males than females, possibly because men subject the torso to more tension and stretch. This could explain why taping, which may help support the healing wound, had a greater impact on scar width in males.

Participant satisfaction was high in our study and not further improved by taping. A major limitation of this study, however, is that we did not have adequate power to show with statistical confidence whether taping affected patient satisfaction levels. Due to time restrictions and a higher than predicted dropout rate, only 136, rather than the required 156 participants, attended for six-month assessment. Furthermore there may have been under-reporting of dissatisfaction.

### TABLE 2. Independent blinded scar assessment at six months

|                           | Control N=73 | Taped N=63 | p-value |
|---------------------------|--------------|------------|---------|
| Overall rating of scar appearance |              |            | 0.004   |
| Very good                 | 11 (15.1%)   | 10 (16.1%) |         |
| Good                      | 17 (23.3%)   | 29 (46.8%) |         |
| Okay                      | 16 (21.9%)   | 13 (21.0%) |         |
| Poor                      | 25 (34.2%)   | 10 (16.1%) |         |
| Very poor                 | 4 (5.5%)     | 0          |         |
| Median width of scar (IQR) [mm] | 4.0 (2.0, 7.5) | 3.0 (2.0, 5.0) | 0.015 |
| Median length of scar (IQR) [mm] | 36.0 (29.0,42.5) | 35.0 (28.0,41.0) | 0.39  |
| Scar elevation            | 8 (11.0%)    | 4 (6.5%)   | 0.55    |
| Scar depression           | 26 (35.6%)   | 22 (35.5%) | 0.99    |
| Discolouring              | 69 (94.5%)   | 57 (91.9%) | 0.73    |

IQR- interquartile range

#### Discussion

Twelve weeks of taping torso scars postoperatively significantly improved independent assessment of overall scar appearance at six months. There was no significant difference in the number of participants with at least some scar depression, elevation or dyschromia in the two study groups. Since degree of these three variables was not evaluated, however, these observations may have little clinical relevance.

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Participants themselves. Participant satisfaction with torso scars was much higher in our study than in other studies, however [7-9]. Reasons for this may include altered participant expectation and employment of a different suture technique in our study. On recruitment we informed participants that the study was being conducted because torso scars tend to look worse than scars elsewhere. Preoperative expectations are known to be an important determinant of patient satisfaction [8]. Only one participant reported a worse than expected outcome at six months.

Though there has not been sufficient research on the use of absorbable sutures [19], there is evidence that their use in high tension areas results in better scar cosmesis [20]. Furthermore, the use of subcuticular surface sutures avoids additional scars associated with stretched interrupted epithelial suture marks. The two-layered (deep absorbable and

| TABLE 3. Participant questionnaire outcome measures at 6 month follow-up |
|---------------------------------|-----------------|-----------------|------------------|
| How satisfied are you with how your scar looks? | Control (n=73) | Taped (n=63) | p-value |
| Very satisfied | Not answered by 1 | 33 (45.8%) | 25 (43.1%) | 0.65 |
| Satisfied | 26 (36.1%) | 21 (36.2%) | |
| Neutral | 13 (18.1%) | 11 (19%) | |
| Dissatisfied | 0 | 1 (1.7%) | |
| Very dissatisfied | 0 | 0 | |
| How does the scar compare with what you expected? | Not answered by 1 | Not answered by 8 | 0.52 |
| My scar is invisible to me | 23 (31.9%) | 18 (31.6%) | |
| My scar is better than I expected | 28 (38.9%) | 16 (28.1%) | |
| My scar is about what I expected | 20 (27.8%) | 23 (40.4%) | |
| My scar is worse than I expected | 1 (1.4%) | 0 | |
| Given the scarring result would you make the same decision to have surgery? | Not answered by 1 | Not answered by 4 | 0.17 |
| Yes | 71 (98.6%) | 55 (93.2%) | |
| If we find that taping does make a difference to the scar would you tape a future torso scar after surgery? | Not answered by 2 | Not answered by 2 | 0.15 |
| Yes | 51 (71.8%) | 52 (85.2%) | |
| No | 4 (5.6%) | 3 (4.9%) | |
| Don’t know | 16 (22.5%) | 6 (9.8%) | |
subcuticular non-absorbable suture) closure we used may simply have given superior scar aesthetics (increasing participant scar satisfaction) compared to the simple interrupted suture closure used in other studies.

Few studies were found that assessed the cosmetic effect of taping scars. In a randomized prospective study of 39 caesarean section cases, Atkinson et al were able to demonstrate a significant reduction of scar volume where paper tape was applied for 12 weeks along the scar postoperatively [12]. The odds of developing hypertrophic scars were 13.6 times greater in non-taped wounds. In a descriptive paper, Reifelf presented two cases with photographic evidence showing significant improvement in scar formation following surgical scar revision and use of paper tapes along the scar for at least two months [13].

It has been postulated that the following three interventions help prevent excessive scar formation: supporting the healing wound to reduce tension (which results in increased collagen synthesis); covering the wound to improve hydration and hasten scar maturation (by down regulating collagen and fibroblast production); and applying pressure to the wound (causing local hypoxia and subsequent fibroblast and collagen degradation) [12,14,19]. In our study long tapes applied close together perpendicular to the wound edges is likely to have reduced wound tension and provided at least intermittent wound pressure (with torso movement). Though the tapes we employed were only partially occlusive, this may also have played a role in improving scar hydration.

Though the trend in our study suggested that taping torso wounds was beneficial at three months, statistical significance was only seen at six months. Any intervention for torso scars might therefore be best followed up for at least six months before discounting its effectiveness. A longer term observational study mapping the natural progress of torso scars might therefore be best followed up for at least two months [13].

The 12-week period of taping in our study was an arbitrary decision. Perhaps a shorter period of taping is equally effective, or conversely, more prolonged taping gives a superior result. We have outlined several potential reasons why patient satisfaction being high and in particular being equally high in both study groups. Despite this, 82.4% taped participants specified they would tape a future scar if our results proved favorable, indicating that many patients are motivated to improve scar appearance and that 12 weeks of taping is not too onerous.

**Conclusion**

This study has shown that 12 weeks taping of sutured torso scars is a safe, effective and well-tolerated intervention that may significantly improve scar appearance at six months.

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**Ethical approval:** The study was approved by the University of Queensland ethics committee (approval number #2008000535 April 2008). All patients gave written informed consent.

**Trial registration:** Australian New Zealand Clinical Trials Registry (ACTRN12608004963 May 2008)

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