

S-shaped Wound Closure Technique for Dumbbell-shaped Keloids

Seiji Komatsu, MD, PhD*
 Shougo Azumi, MD*
 Yuko Hayashi, MD*
 Tsuneharu Morito, MD†
 Yoshihiro Kimata, MD, PhD‡

Summary: Dog-ear collection, Z-plasty, and W-plasty are often performed for excision of dumbbell-shaped keloids; however, these procedures require additional incisions or excision of normal skin. Thus, an S-shaped wound closure technique was performed. The keloid lesions were extraleisionally excised above the deep fascia, and the wound edges were shifted in opposite directions along the major axis to form an S-shape. The incision was closed by applying deep fascial sutures, subcutaneous sutures, and superficial sutures. Postoperative external beam radiation therapy was started within 6 hours after surgery at a dose of 20 Gy applied in 4 fractions. All wounds were covered with silicone-gel sheeting and fixed with tape after suture removal. No intralesional corticosteroid injection or oral tranilast was administered. Corticosteroid tape was applied in cases with suspected postoperative recurrence. Scoring was performed using the Manchester Scar Scale. A total of 8 lesions were treated. Temporary erythema and scar elevation were observed in 2 chest lesions; however, both were flattened and turned white using corticosteroid tape. Other than these 2 lesions, there was no recurrence or complication. The mean score improved from 15.8 to 7.2. The S-shaped wound closure technique has 3 advantages. First, no additional incision or excision is required, and additional scarring and keloid recurrence can be avoided. Second, aesthetic results are good, and noticeably long and zigzag-shaped scars can be avoided. Third, dispersion of tension on the scar can be expected. Although the S-shaped wound closure technique has limited application, it is a useful option for keloid treatment. (*Plast Reconstr Surg Glob Open* 2017;5:e1278; doi: 10.1097/GOX.0000000000001278; Published online 30 March 2017.)

INTRODUCTION

Although many treatments are available, keloid management remains difficult and relatively high recurrence rates have been reported. However, surgical excision with postoperative radiation therapy is considered one of the most efficacious treatments.¹⁻⁵ Keloids spread as a “crab’s claw” and often take on a dumbbell form. Dumbbell-shaped keloids can usually be directly closed after exci-

sion; however, dispersion of mechanical force cannot be expected on the straight scar; therefore, there is a risk of keloid recurrence. Besides, dog-ear deformity frequently appears. Dog-ear correction requires additional excision of normal skin, thereby resulting in a long scar. Various surgical procedures, such as Z-plasty and W-plasty, are established, and excellent procedures to form a nonstraight scar, disperse mechanical force on the scar, and prevent keloid recurrence, but additional incision or excision of normal skin, are required. Z-plasty and W-plasty also result in noticeably long zigzag-shaped scars, and there is also a risk of additional scarring and keloid recurrence.^{1,6} This dilemma motivated us to invent a new surgical procedure by including the best of everything.

To avoid these problems, we perform an S-shaped wound closure technique inspired by the small-wave incision method, planimetric Z-plasty, and S-plasty.⁶⁻⁸ This procedure made it possible to avoid additional incision or excision of normal skin and form nonstraight scars. Here, the application of an S-shaped wound closure technique is reported.

From the *Department of Plastic and Reconstructive Surgery, Okayama Saiseikai General Hospital, Okayama, Japan; †Department of Radiology, Okayama Saiseikai General Hospital, Okayama, Japan; and ‡Department of Plastic and Reconstructive Surgery, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan.

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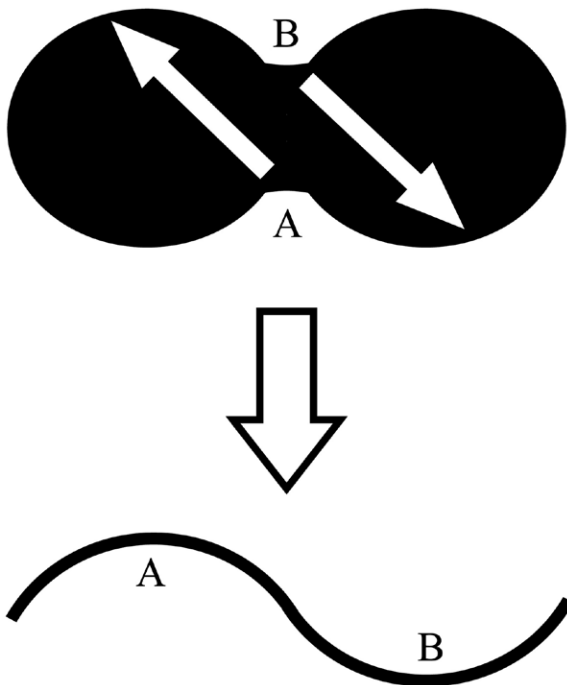


Fig. 1. Design of the “S-shaped wound closure technique.” The wound edges were shifted in opposite directions along the major axis to form an S-shape. Dog-ear collection is not required.

PATIENTS AND METHODS

All keloids were extralesionally excised above the deeper fascia under local anesthesia. Subcutaneous undermining was widely performed to reduce mechanical force on the dermis of the wound edge. Wound edges were shifted in opposite directions along the major axis to form an S-shape (Fig. 1). Dog-ear collection was not required. The incision was closed by applying deep fascial sutures using 3-0 PDS II (Ethicon, Inc., Somerville, N.J.), subcutaneous sutures using 3-0 or 4-0 PDS II (Ethicon, Inc.), and superficial sutures using 6-0 nylon.

Postoperative external beam radiation therapy was started within 6 hours after surgery at a dose of 20 Gy applied in 4 fractions.^{4,5} After the sutures were removed, all wounds were covered with silicone-gel sheeting fixed with tape. Postoperative follow-up was performed approximately every 1–2 months. No intralesional cortico-

steroid injection or oral administration of tranilast was performed. Corticosteroid tape (Eclar Plaster, Hisamitsu, Tokyo, Japan) was applied in cases of postoperative recurrence. Scoring was performed using the Manchester Scar Scale before surgery and at the final examination.⁹ All procedures were performed in Okayama Saiseikai General Hospital between December 2014 and January 2016.

RESULTS

A total of 5 patients (3 men and 2 women; mean age, 30.6 years; age range, 22–50 years) with 8 lesions underwent this procedure (Table 1). Two patients had keloids on 1 shoulder, 1 patient had keloids involving both shoulders, 1 patient had keloids involving both shoulders and the chest, and 1 patient had a keloid involving the chest. The mean postoperative follow-up duration was 14.6 months (range, 9–21 months).

Temporary erythema and mild elevation of the scar tissue were observed in the 2 chest lesions without growth beyond borders at 7 and 10 months, respectively, after surgery. After application of corticosteroid tape, these scars quickly flattened and turned white. Other than these 2 lesions, there was no case of recurrence or complication. The mean preoperative score was 15.8 (range, 14–17), and the mean final score improved to 7.2 (range, 6–9). Pruritus and pain existed preoperatively in all cases, and these symptoms improved markedly after surgery in all cases. The pre- and postoperative appearances of a typical case are shown in Figure 2.

DISCUSSION

In case of direct closure of irregular-shaped keloids, wounds often unexpectedly or unintentionally become S-shaped. However, as far as we are aware, there is no report on the intentional use of S-shaped wound closure for keloids. The S-shaped wound closure technique has 3 advantages. First, no additional incision or excision of normal skin is required, thereby avoiding additional scarring and keloid recurrence.⁶ Second, aesthetic results are good, and noticeable long and zigzag-shaped scars can be avoided.⁶ In future studies, we plan to evaluate patient satisfaction using the visual analog scale and so on. Third, dispersion of mechanical force on the scar can be expected because the postoperative scar will not be straight.^{2,6,10}

Table 1. Patient Characteristics

No.	Patient Age (y)	Sex	Postoperative Follow-up (mo)	Lesion Location	Recurrence	Preoperative Score	Final Score	Complications
1	22	M	21	Left shoulder	No	17	7	No
2	22	M	8	Left shoulder	No	16	8	No
3	50	F	18	Bilateral shoulder	No	14	6	No
4	32	F	9	Bilateral shoulder Chest	No	17 15	6 9	No Erythema and mild elevation (temporary, 7 months after surgery)
5	25	M	17	Chest	Erythema and mild elevation (temporary, 10 months after surgery)	16	7	No

F, female; M, male.

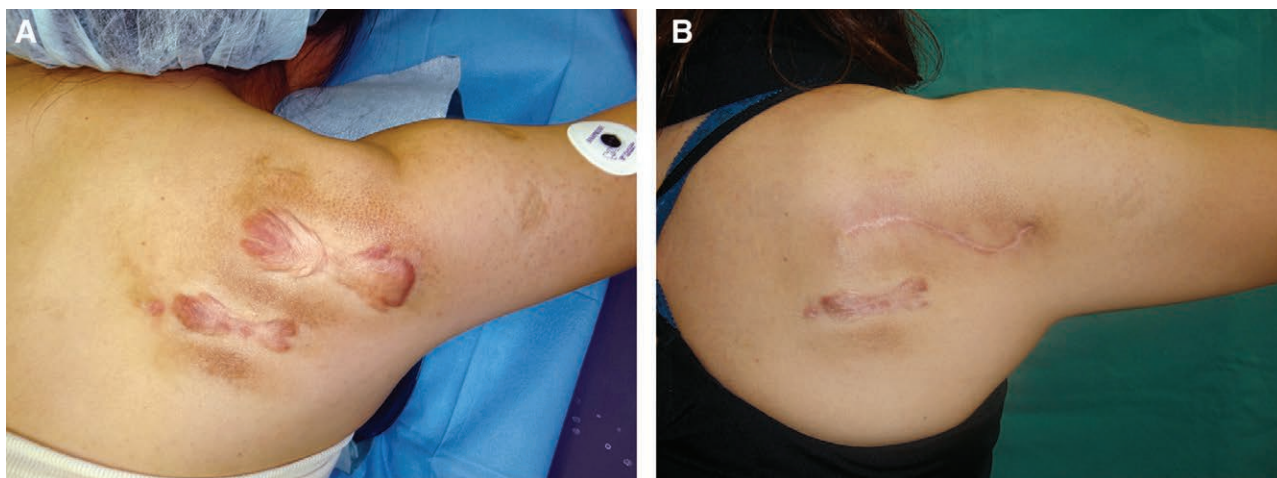


Fig. 2. Treatment of a typical dumbbell-shaped keloid using S-shaped wound closure technique (case no. 4, right shoulder). A, Preoperative view. There were 2 keloids, but only upper keloid was excised. The preoperative score of upper keloid was 17. B, Postoperative view after 18 months. The final score of the upper keloid improved to 7.

However, because it is unclear whether this procedure inhibits recurrence, it is necessary to investigate whether the recurrence rate is lower than with simple direct closure. In addition, this study included a small sample size; thus, further follow-up and assessment are required. In future studies, we plan to analyze the difference of mechanical force between the S-shaped wound closure technique, simple direct closure, Z-plasty, and W-plasty using a visualized finite element study.

Keloid excision alone results in a high recurrence rate of 45–100%; thus, surgical excision should be combined with adjuvant therapy to reduce the rate of recurrence. Although the treatment protocols and results varied among the referenced articles, surgical excision with postoperative radiation therapy was considered one of the most efficacious treatments and the recurrence rate was approximately 10–30%.^{1–5} Postoperative external beam radiation therapy was performed, but corticosteroid use was minimized to avoid complications, such as local tissue atrophy, hypopigmentation, and capillary dilation.^{1–3} In cases in which postoperative recurrence was suspected, corticosteroid tape was used. All scars were flattened and quickly turned white. However, the extent of the contributions of postoperative radiation therapy, silicone-gel sheeting, and corticosteroid tape to the results is unclear. Patients should be strictly followed up for long periods to determine the start of additional therapies.

This S-shaped wound closure technique cannot be applied to all keloids, but it is useful for dumbbell-shaped keloids. However, different procedures, such as skin graft, local flap, and intralesional excision, must be applied to large or multiple keloids.^{1–3}

CONCLUSIONS

We reported an S-shaped wound closure technique for dumbbell-shaped keloids. This procedure made it possible to avoid additional incision or excision of normal skin and form nonstraight scars. Although this procedure has limited application, it is a simple and useful option for keloid treatment.

Seiji Komatsu, MD, PhD

Department of Plastic and Reconstructive Surgery
Okayama Saiseikai General Hospital
2–25 Kokutai-cho Kita-ku
Okayama 700–8511, Japan
E-mail: komats-s@cc.okayama-u.ac.jp

STATEMENT OF CONFORMITY

All procedures were conducted in compliance with the Declaration of Helsinki. Written informed consent was obtained from all patients.

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