

A Review of Treatments of Keloids with Intramarginal Surgical Excision and Postoperative Irradiation to Prevent Recurrences

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Background : Keloids are abnormal healing responses to injury and are likely to recur after treatment. Although many modalities have been used to treat keloids, there are no definitive treatment guidelines.

Objective : The purpose of this review was to propose surgical treatment guidelines for the prevention of recurrence.

Methods : This clinical investigation was made of 13 patients with keloids who had undergone the surgery at the Department of Dermatology, Ewha Womans University Tongdaemun Hospital from September 1997 to September 2002.

Results :

1. A total of 15 keloids from 13 patients were surgically removed; Of the 15 keloids, 14 keloids were excised with intramarginal excision and the defects developed after keloidal excision were mostly repaired with split-thickness saved flap.
2. As the adjuvant therapy, postoperative irradiations were performed to prevent the recurrences for 14 of the 15 keloids.
3. Of the 10 keloids which had been followed up for over 1 year, 4 keloids (40%) recurred partially.

Conclusions : Intramarginal excision and split-thickness saved flap repair was a remarkable surgical method in the keloid, especially in the bulky keloid and the keloid of the earlobe. Postoperative irradiation as an adjuvant treatment was also recommended to prevent recurrence. (*Ann Dermatol* 16(4) 145 ~ 152, 2004)

Key Words: Intramarginal excision, Keloid, Postoperative irradiation, Split-thickness saved flap repair

INTRODUCTION

A keloid is developed by the proliferation and sclerosis of dermal collagen fiber after skin injury, it is expressed as a solid nodular or protuberant mass projecting beyond the original wound margins, and mainly occurs on the anterior chest, shoulders, arms,

and ears¹.

Although various methods have been tried to treat keloids, no method has been considered as a reliable therapy yet. Intralesional interferon, cryosurgery, radiation, intralesional corticosteroids, surgical excision, ultraviolet radiation, 5-fluorouracil, bleomycin, silicone gel, and laser surgery are used for treating keloids, as monotherapy or combination therapy².

Because simple excision as a surgical method has a high recurrence rate when performed solely, clinicians apply a surgical way that can prevent recurrence^{3,4}, or combine the excision with adjuvant therapy such as postoperative external compression, radiotherapy, intralesional corticosteroid injection, and cryosurgery. Many researchers report that the combination of surgery with radiotherapy shows a

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high success rate⁵⁻⁸.

In this study, the authors performed a clinical review of patients with keloids, who were treated by surgical excision in our hospital to evaluate the results of intramarginal excision with postoperative radiation and propose the surgical treatment guidelines for the prevention of recurrence.

MATERIALS AND METHODS

1. Subjects

The 15 keloid lesions of 13 patients who were treated by surgical approach for keloids between September 1997 and September 2002 (for five years) at the department of dermatology in the Ewha Womans University Tongdaemun Hospital were included in this study (Table 1).

Out of the patients, 1 was male and 12 were female, and the mean age was 22.5 years (14 - 31 years). According to the locations of the lesions, 8 keloidal lesions were on the earlobes, 5 lesions were on the shoulders, 1 lesion was on the back, and the

remaining 1 lesion was on the ankle. The mean size of the lesions was 2.83 cm (0.8 - 7.8 cm) in diameter. According to the form of the lesions, all the lesions were protuberant nodules. According to the precipitating factors, 8 lesions occurred on the earlobes after the patients had their ears pierced, 5 lesions occurred on the shoulders after the BCG inoculation, and 1 lesion exceptionally occurred on the ankle after a burn. The precipitating factor of the lesion which occurred on the back wasn't recorded.

2. Methods

1) Methods for analysis

The medical records and operation records of the patients were retrospectively analyzed for preparing investigation charts that included sex, the age at surgery, the location and size of the lesion, precipitating cause, surgical method, the performance and kind of adjuvant therapy, and the occurrence and time of recurrence. When postoperative radiotherapy was accompanied, the exposure dose and the irradiation fraction were recorded.

When patients were not continuously followed up

Table 1. Summary of Cases in Our Hospital

No.	Sex/Age	Site	Size (cm)	Surgical excision	Postoperative irradiation	Other therapy	Follow up	Recurrence
1	F/22	shoulder	4.0×3.5	intramarginal	○	steroid IL	1 m	
2	F/14	shoulder	2.0×1.5	intramarginal	○	X	74 m	○
3	F/31	back	4.2×2.8	intramarginal	○	steroid IL	56 m	○
4	F/23	earlobe	0.8×0.8	intramarginal	○	X	72 m	X
5	F/28	shoulder	5.3×3.4	intramarginal	○	X	3 m	
		shoulder	5.1×2.7	intramarginal	○	X	2 m	
6	M/18	earlobe	1.5×1.0	intramarginal	○	X	1 w	
7	F/20	earlobe	0.8×0.6	simple	○	steroid IL*	46 m	X
8	F/21	earlobe	1.7×1.5	intramarginal	○	steroid IL	1 m	
9	F/26	shoulder	7.8×3.5	intramarginal	○	cryosurgery steroid IL	22 m	X
10	F/18	ankle	5.0×3.0	intramarginal	X	X	20 m	○
11	F/22	earlobe	1.0×0.8	intramarginal	○	X	19 m	X
12	F/18	earlobe	1.6×1.0	intramarginal	○	X	19 m	X
		earlobe	0.5×0.5	intramarginal	○	X	19 m	X
13	F/31	earlobe	1.2×1.0	intramarginal	○	X	17 m	○

steroid IL*: immediate postoperative steroid injection.

after surgery, the authors investigated how the keloid had recurred, either by direct observation or by telephone questionnaire.

2) Methods for treatment (Fig. 1)

The authors treated under the following principle; if possible, they performed intramarginal excision in which the marginal area of keloid remained and postoperative radiotherapy in order to prevent recurrence, and applied other methods except excision to the remaining tissue after treatment. After simple or intramarginal excision was performed according to the forms of lesions, primary closure or split-thickness saved flap, in which the superior skin of the keloid was used, was applied as reconstruction. In general, split-thickness saved flap was performed after intramarginal excision, but simple excision and primary closure were done when the lesion was small and on the earlobe. The radiotherapy was started within 48 hours after the surgery, and total 1200 cGy was irradiated over three times. Intralesional steroid injection and cryosurgery were also used as

adjuvant therapy.

RESULTS

Based on the therapeutic principle, all the 14 lesions were performed of intramarginal excision, except the one in which the small keloid occurred on the earlobe, and the method of reconstruction was selected according to the location or size of lesion (Table 2). In the No. 1 patient whose keloid occurred on the shoulder after a BCG inoculation, the authors performed intramarginal excision by applying an incision 2-3 mm from the interior to the upper boundary of the keloid. The lesion was repaired by using split-thickness saved flap (Fig. 2). In the No. 10 patient whose keloid occurred on the ankle after a burn, the authors performed intramarginal excision by applying two incisions to the upper and lower parts and repaired the lesion by using split-thickness saved flap (Fig. 3). In the No. 11 and No. 13 patients whose keloids occurred on

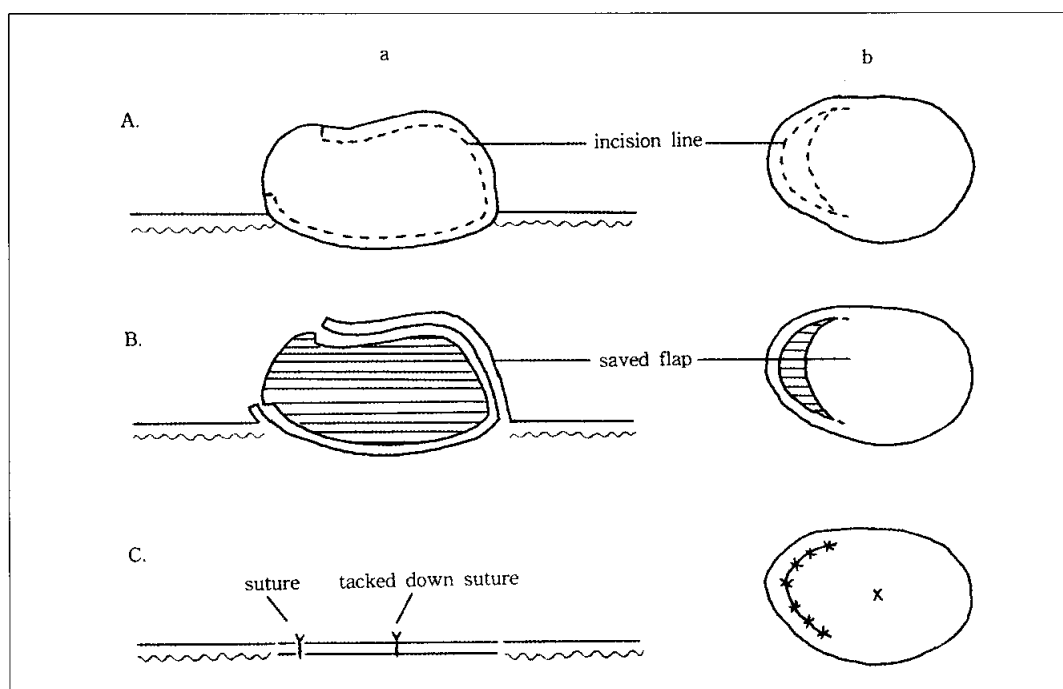
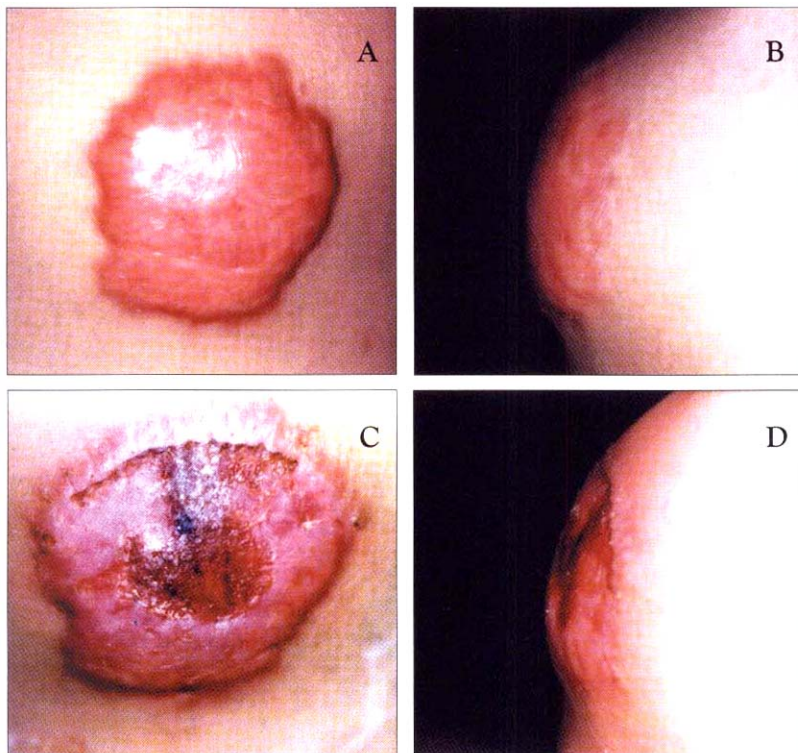


Fig. 1. The method of intramarginal excision and split-thickness saved flap repair. A, A half-moon or tongue-like incision of the approximate size of the base of the lesion to be excised is made 2-3 mm within the keloid edge. B, The overlying flap, which consists of epidermis and thin dermis covering the keloid, is carefully separated from the keloid core with the scalpel. The keloid core is extirpated across its base, leaving a thin margin of scar tissue in the normal tissue. C, The wound is closed with the saved flap that tacked down with a central suture. a, Side view. b, Top view. (modified from June KR, et al. Atlas of cutaneous surgery. 1st ed. Philadelphia)

Table 2. Methods of Surgical Excision and Repair

Methods	Patient No.	Total
intramarginal excision & split-thickness saved flap	1, 2, 3, 5, 6, 8, 9, 10, 12-1, 13	11
intramarginal excision & primary closure	4, 11, 12-2	3
simple excision & primary closure	7	1

**Fig. 2.** Deltoid keloid treated by intramarginal excision with single side incision and split-thickness saved flap repair. A&B, Pre-operative view. C&D, 1 week after operation.

the earlobes after they had their ears pierced, the authors applied different methods based on the size of the lesions: the intramarginal excision by applying a narrow incision to the center was performed for the No. 11 patient and the defect was repaired by primary closure (Fig. 4); for the No. 13 patient, the defect was repaired by split-thickness saved flap (Fig. 5).

As the postoperative adjuvant therapy, radiotherapy was performed in 14 of the 15 lesions, while radiotherapy was not applied to the lesion on the ankle because the possibility of disability in the joint movement was expected after the treatment. The lesions remaining after surgical excision and postoperative radiotherapy were treated by intralesional steroid injection (No. 1, No. 3, and No. 8), and for the No. 7 patient, immediate postoperative steroid

injection was performed before postoperative radiotherapy. The lesion of the No. 9 patient, a dumbbell-shaped keloid occurring after BCG inoculation on the shoulder, was treated by surgical excision for the upper thick part and by cryosurgery for the lower part, and the remaining lesion was managed by intralesional steroid injection.

The duration of follow-up for all the 15 lesions was between a week and 74 months (mean; 24.8 months). Among 10 lesions that were possible of follow-up for at least a year, 4 (40%) recurred partially. The recurring time was at the 1st, 5th, 6th, and 11th month after the surgery, respectively (mean; the 5.7th month after the surgery). In the lesions to which postoperative radiotherapy was applied as adjuvant therapy, 3 (33%) out of 9 lesions showed recurrence and the mean recurring time was

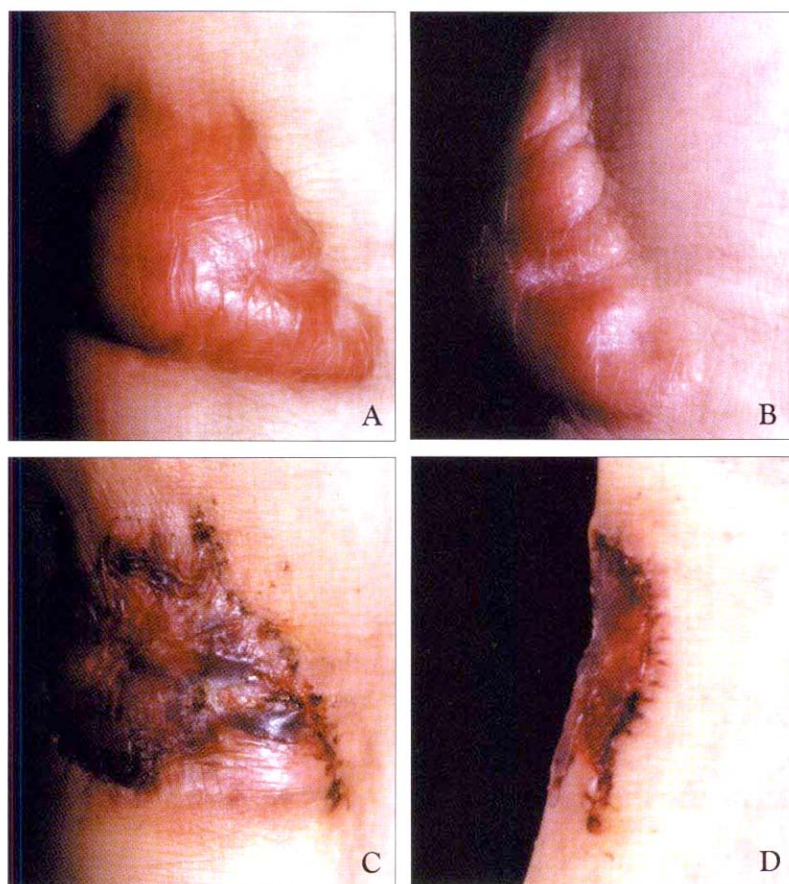


Fig. 3. Ankle keloid treated by intramarginal excision with double side incision and split-thickness saved flap repair. A&B, Pre-operative view. C&D, 1 week after operation.

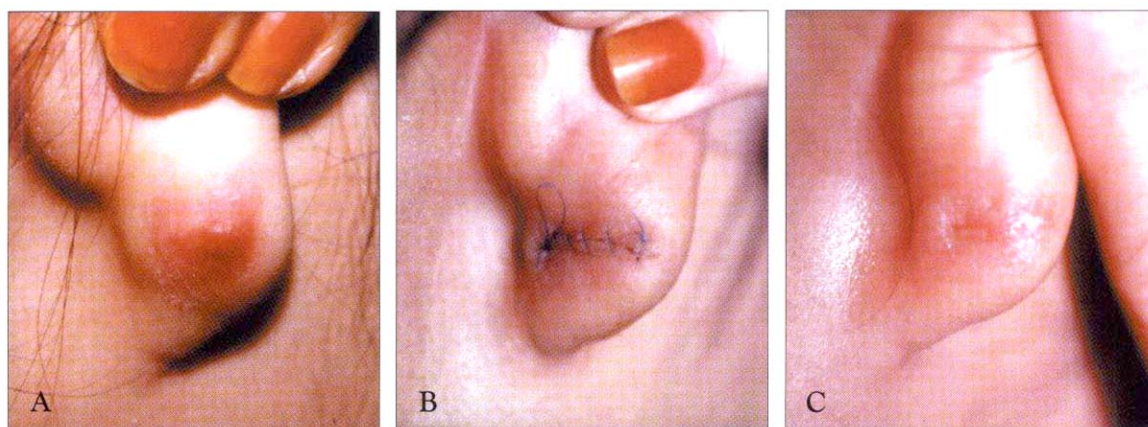


Fig. 4. Earlobe keloid treated by intramarginal excision and primary closure. A, Pre-operative view. B, 1 week after operation. C, 1 month after operation.

8 months. Meanwhile, the only lesion to which postoperative radiotherapy was not applied recurred during the 1st month following surgery. Only one

lesion (13%) recurred among the 8 lesions which occurred on the earlobes.

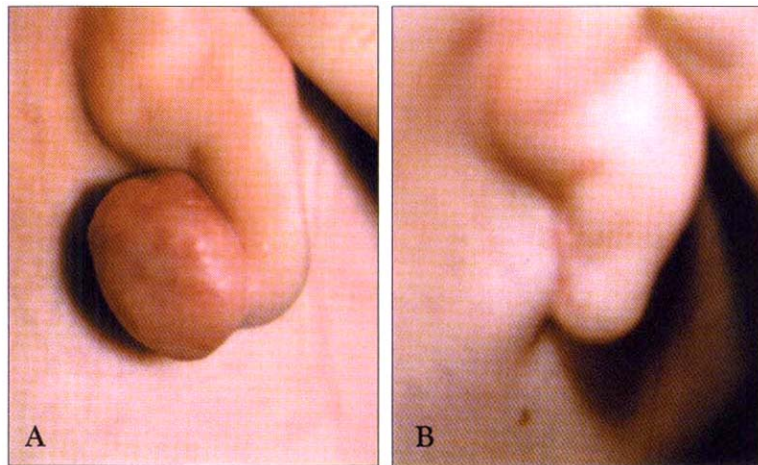


Fig. 5. Earlobe keloid treated by intramarginal excision and split-thickness saved flap repair. A, Pre-operative view. B, 5 months after operation.

DISCUSSION

A keloid is the abnormal healing response to skin injury, and is shown clinically as a firm, frequently pruritic or painful nodular or protuberant scar, and projects beyond the site of the original injury⁹. It doesn't respond to treatment quite often, and there are no definitive treatment guidelines as yet, although various methods have been attempted to treat keloids.

Keloids can be treated by medical or surgical modalities such as external compression, intralesional corticosteroids, systemic immunosuppressive drugs such as methotrexate, silicone gel dressings, intralesional interferon, cryosurgery, surgical excision, radiotherapy, laser surgery, and electrosurgery⁹. In general, the most effective approach to the management of keloids are the combination of medical and surgical modalities⁹.

There are several kinds in surgical excisions. Simple excision and primary closure should be performed when the lesion is small and is located in regions where the skin tension is low, and intramarginal excision should be performed when the lesion is large. Unlike simple excision in which the whole keloid is removed, intramarginal excision is a method in which the inside of keloid boundary is incised and only its center is extracted, and allows thin scar tissue within the normal tissue to prevent the distensibility produced during the healing phase from transmitting to peripheral normal tissue^{3,4}. In

this study, intramarginal excision was performed on all lesions except the one in which the small keloid occurred on the earlobe.

In the reconstruction of the skin defect that occurs after surgical excision, a skin graft or flap is commonly used due to the size and tension of the defect. Split-thickness saved flap is a reasonable method, because keloid occurs at the donor site in 50% of such cases. Split-thickness saved flap means a method in which the split-skin including the epidermis and part of upper dermis covering the keloid is detached and used to cover the skin defect occurring after the keloid is removed. The term 'split-thickness saved flap' is suggested by the author in this study to replace the existing terms such as split-thickness saved autograft³ or keloid rind flap⁴. Flap rather than graft is considered to be appropriate because the remaining skin is connected with peripheral skin. The size of the lesion serves as an important criterion in the selection of the kinds of repair. While second intention or primary closure can be applied when the diameter of the base is below 1cm, split-thickness saved flap is appropriate when the diameter is over 1 cm³. In this study, the lesions were repaired by split-thickness saved flap, except for 4 lesions in which keloids smaller than 1 cm occurred on the earlobe. Because skin tension determines the postoperative result, it is important to minimize the tension around the suture by appropriate undermining between skin and subcutaneous tissue.

Various adjuvant therapies have been suggested in order to prevent postoperative recurrence. Among them, postoperative irradiation is reported to have a high success rate and to reduce postoperative recurrence by 50%, and total 900 to 1500 cGy of superficial X-ray was irradiated over three times within the 10 days after surgery commonly². In respect of the appropriate time of radiotherapy, Tepmongkol et al.¹⁰ reported that preoperative radiotherapy showed no effect and suggested that postoperative radiotherapy should be applied within the 1st day after surgery because the sooner radiation is given after surgery, the more effective it is. However, Kovalic et al.⁵ reported that there was no advantage to starting radiation within 1 day after surgery than starting later. In respect of the effect of postoperative radiotherapy, Kovalic et al.⁵ reported that the size over 2 cm and the history of previous therapy served as unfavorable prognostic factors and suggested that the patients needed at least a two-year follow-up, because the mean recurring time was 12.8 months after surgery. Wagner et al.⁸ reported that no association was observed between the success of treatment and the total amount of irradiation and suggested the etiology and localization of the lesion as new prognostic factors. According to their study, the lesions by surgical or mechanical traumas showed more favorable prognosis than those by burn, and the lesions on the face or neck showed more favorable prognosis than those on the chest.

In this study, a recurrence rate after surgical excision and postoperative irradiation is about 33%. This is higher than the data from the other literature, although it is difficult to compare exactly because there are many factors to affect the outcome as already stated. The reasons for the recurrence of the No. 10 patient without postoperative radiotherapy might be that postoperative radiotherapy was not applied and the lesion was the scar caused by a burn.

In general, a keloid on the earlobe is reported to improve more significantly and recur less frequently by surgical treatments, when compared to that on the other regions. In this study, only one case on the earlobe recurred in follow-up regardless of the kind of surgical method. This corresponds to the data from the other literature¹¹. Although keloids on the earlobes can be treated by simple excision, the authors in this study attempted to treat the keloid

by intramarginal excision which is not only to conserve the anatomic form of the ear¹ but also to leave thin scar tissue within the lesion and lower postoperative recurrence. Effects to lower the recurrences can be identified in other literatures in which keloids on the earlobes were treated by intramarginal excision. Salasche et al.¹² reported that 6 cases were treated by the excision accompanied with steroid intralesional injection without recurrence. Lee et al.⁴ reported that 5 cases were treated by the excision solely without recurrence.

Although the authors didn't study the effect of intramarginal excision and split-thickness saved flap repair statistically, they believe that these surgical methods are efficacious to prevent local recurrences. Further randomized study with additional patients is needed to compare the effectiveness of various surgical methods and adjuvant therapies.

CONCLUSION

In this study, the authors performed a clinical review on 15 lesions of 13 patients with keloids who were treated by surgical excision, and concluded that intramarginal excision and split-thickness saved flap repair were particularly appropriate for large, protuberant keloids or keloids on the earlobes and that postoperative radiotherapy was encouraged to prevent recurrence.

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