

Toe Keloids Treated with Core Excision, Postoperative Radiotherapy, and Steroid Plaster

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Summary: Although keloids are common on the joints, precordial areas, and abdomen, toe keloids are rare. The limited literature to date also suggests that they can be difficult to treat. We experienced the case of a 21-year-old woman with toe keloids on the first, second, and third toes that arose after ingrown-nail operations at another hospital. The second toe keloid was resected but recurred. Since subsequent conservative treatments were ineffective, the patient was referred to our hospital. The first visit revealed three large keloids: in particular, the keloid on the second toe had engulfed the entire circumference of the toe. Surgery with the core-excision method and postoperative radiotherapy were performed. After the sutures were removed, the scars were treated for 24 hours/day with steroid plaster until the induration disappeared. One and a half years after the operation, recurrence was not observed and the appearance of the toes had improved greatly. Thus, combination therapy composed of core excision, radiotherapy, and steroid plaster therapy is highly effective for toe keloids. (*Plast Reconstr Surg Glob Open* 2020;8:e3085; doi: 10.1097/GOX.0000000000003085; Published online 23 September 2020.)

Although keloids are common on the joints, precordial areas, and abdomen, toe keloids are rarely encountered. The limited literature available to date also suggests that keloids can be difficult to treat. We experienced the case of a 21-year-old woman with toe keloids on the first, second, and third toes that arose after ingrown-nail operations done at another hospital. The second toe keloid had been resected at the other hospital but recurred. Because subsequent conservative treatments were ineffective, the patient was referred to our hospital. The first visit revealed 3 large keloids: in particular, the keloid on the second toe had engulfed the entire circumference of the toe. Thereafter, surgery with the core-excision method was performed on all toes. The first and third toes were subjected to postoperative radiation. This was not performed on the second toe to avoid possible blood-flow problems. After the sutures of the toes were removed, the scars were treated for 24 hours/day with steroid plaster until the induration disappeared. One and a half years after the operation, recurrence was not observed and

the appearance of the toes had improved greatly. Thus, a combination therapy composed of core excision, radiotherapy, and steroid plaster therapy is recommended for treating toe keloids.

There are few reported cases of toe keloids.¹⁻⁹ Nearly all were reported to occur after a surgery for treating syndactyly, macrodactyly, or ingrown nail.^{1-3,5-9} Some were difficult to treat.³ A few could be treated conservatively, for example by steroid injection.^{1,5} Others required surgery, which often consisted of total excision and full-thickness skin grafting.^{1,2,4-9} A good surgical alternative may be the core-excision method, where the fibrous mass of the keloid is removed and the tissue retained over the keloid serves as a flap. This method is highly effective with auricular keloids.¹⁰

We describe a case of a recurrent toe keloid that was successfully treated with the core-excision surgery¹⁰ followed by a postoperative radiotherapy and long-term steroid-plaster therapy.¹¹ We also discuss the effectiveness and limitations of our combinatorial therapy approach.

CASE REPORT

A Japanese woman underwent an ingrown-nail surgery on the first, second, and third toes of the left foot at the age of 13 in another hospital. After the operation, a keloid suddenly formed on the second toe, which was excised surgically in that hospital. At the age of 14, keloids re-formed on the second toe, and the first and third toes showed newly developed keloids. The previous hospital

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Fig. 1. View of a 21-year-old female patient's left foot during presentation, with keloids on the first to third toes. The keloid on the second toe had grown around the circumference of the toe and down past the distal interphalangeal joint.

treated the keloids with a weak steroid tape (fludrocortide tape)¹¹ but it was ineffective.

During the first medical examination in our hospital, the patient was 21 years old. We found keloids on the first to third toes of her left foot. The patient complained of mild itching and pain and an unappealing appearance due to bumps, induration, and redness (Fig. 1). The patient did not have any other keloids. We speculated that the keloids were induced by chronic inflammation that arose after the ingrown-nail surgery. We proposed a surgery combined with postoperative radiotherapy and continuous steroid-plaster therapy for all three toes. After discussing the risks and benefits of this treatment strategy with the patient, she consented to undergo our newly proposed combinatorial therapy.

Core excision was performed to remove the keloid fibrous masses only. Flaps were designed on each keloid. Care was taken to ensure that the width and length of each flap were commensurate with its blood flow, thereby preventing an ischemia occurrence later (Fig. 2). The flaps were created, after which they were trimmed and then sutured with 5-0, 6-0 polypropylene sutures (Fig. 3). Starting on postoperative day 2, the flaps of the first and third toes were subjected to a postoperative radiotherapy



Fig. 2. View of the patient's left foot before surgical treatment of the three toe keloids. The surfaces of the keloids were first marked on the basis of the local blood flow to indicate the flaps that would be used to cover the defects caused after excision. Surgery with the core-excision method was then performed to remove the fibrous mass and some of the skin.

with a 4-MeV electron beam (16 Gy/4 fractions/4 days); in both cases, the normal skin was shielded with lead plates. The decision to subject the second toe to postoperative radiotherapy was rescinded after surgery because of the fear of blood-flow problems and the subsequent possibility of a nail deformation. The histopathological examination of the resected tissues indicated that the lesion was keloid.

After the operation, the patient was asked to rest and told not to place any load on her left foot. After the sutures were removed, the patient was asked to apply a strong steroid tape (deprodone propionate plaster, ie, Eclar plaster) on all three toes for 24 hours/day until further notice to prevent recurrence.¹¹

The patient visited our hospital every 3 months. One year after surgery, the redness, thickening, and induration of the keloids had improved and mature scarring was observed. At that point, the steroid-plaster treatment was terminated. The patient was highly satisfied with the outcome. Six months later (ie, 1.5 years after surgery), recurrence was still not observed (Fig. 4) and follow-up was completed. All treatments were covered by the national health insurance in Japan.



Fig. 3. Photograph of the patient's foot after surgery, with the flaps trimmed and sutured.

DISCUSSION

There are relatively few reports on toe keloids.¹⁻⁹ Nearly all keloids occurred after a surgery for syndactyly (particularly syndactyly of infant toes), macrodactyly, or ingrown nail. The cause of toe keloids is unknown but probably reflects chronic inflammation and the consequent fibroproliferation, both of which drive other keloids. It is possible that formation of toe keloids can be triggered by infections after toe surgery, friction from shoes, or via other stimuli that accompany walking.

The surgery often involved total excision followed by skin grafting.^{1,2,9} None employed core excision. In core excision, only the fibrous mass of the keloid is removed; the tissues on top are partly spared and serve as flaps to close the defect after excision. This method does not require a donor and provides good color matching. It is commonly used (and is very effective) for auricular keloids.¹⁰

However, there are some concerns about the core-excision method, namely that it may leave residual keloid tissue that could spark recurrence. Moreover, if the blood flow of the flap is impaired, flap necrosis could arise. To limit these problems, we ensure that the fibrous mass is removed as much as possible and that the length, width, and thickness of the flap are commensurate with its blood



Fig. 4. Postoperative photograph of the patient's foot 1.5 years after the operation. Recurrence was not observed, and the toes had a good appearance.

flow. The core-excision method requires some experience but takes a shorter operation time than the time taken for skin grafting.

In most of the previous case reports on toe keloids, surgery was combined with postoperative compression therapy,⁴ steroid injections,^{2,5,7} or methotrexate treatment.⁹ However, in a recent case, Liu et al.⁸ reported removing two big-toe keloids from a patient via total excision followed by skin-flap transplantation, after which the toes were irradiated to prevent recurrence and subjected to hyperbaric-oxygen therapy to prevent any blood flow disorders in the flaps. No recurrence was observed.⁸

In our case, we treated all three toes with the core-excision surgery and then subjected the surgical sites of the first and third toes to postsurgical radiotherapy while shielding the normal skin with lead plates. Such postoperative irradiation is well known to suppress new angiogenesis and inflammation, both of which play key roles in keloid (re) growth.^{12,13} With regard to the second toe (which had proved to be the most troublesome of all the three toe keloids), we speculated that the planned postoperative irradiation could hamper the peripheral circulation. Therefore, we did not subject the second toe to irradiation. All three toes were then subjected to continuous steroid-plaster application.

These postoperative measures and precautions were clearly effective because we did not observe any recurrence in any of the toes after 1.5 years and the only side effect of the radiotherapy was temporary redness.

One study limitation is that, with the case report of Liu et al⁸ being the first of its kind, this is only the second case in which toe-keloid surgical excision was followed by postoperative radiotherapy. Further studies on the effectiveness of this procedure, especially for recurrent toe keloids, are warranted. Notably, we caution that radiotherapy should be avoided in children. The first-line treatment for pediatric toe keloids is therefore application of steroid tape, which should be continued until keloid resolution or adulthood, as needed.¹³

CONCLUSIONS

We experienced a case of toe keloids after ingrown toenail surgery that was effectively and aesthetically treated with the core excision followed by postoperative radiotherapy and continuous steroid-plaster application. The core-excision method is a particularly effective surgical approach because it does not require a donor site and provides good color matching.

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