Original Article

Outcome of Piercing Auricular Keloid After Surgical Excision by Through-and-Through Technique and Adjuvant Triamcinolone Acetonide Injection

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Abstract

Introduction: Keloids are benign fibrous proliferative tissues resulting from pathological wound healing process. Auricular keloids are the challenging problem to cope with due to their resistance to various modalities of treatment and having a high recurrence rate. There are no standard protocols for the treatment of ear keloids in the present practice. The purpose of this study is to introduce and evaluate the effectiveness of the practical treatment protocol for treating auricular keloids by using the modified surgical technique called "Through-and-Through excision technique" and postoperative intralesional Triamcinolone Acetonide (TA) injection as an adjuvant therapy.

Methods: We retrospectively analyzed all patients who present with piercing auricular keloids at Plastic Surgery Outpatient Clinic, Thammasat University Hospital between June 2017 and March 2019. Forty one patients representing with forty nine keloids were treated by a single Plastic Surgeon. Every patient received surgery and intralesional TA injection at 2-week postoperative time period. TA injection was considered every 1 month for the individual patient. Results were evaluated at one year after the operation.

Results: The patients' ages ranged from 16 to 58 years old (mean age: 24 years old). The mean size of keloid is 1.6 cm which ranged from 0.5 to 5 cm. The treatment protocol achieved a 94% success rate in 1-year of follow-up with only three keloids (6%) which developed recurrence.

Conclusions: Surgical excision by Through-and-Through technique with postoperative intralesional TA injection is one of the alternatives and beneficial modalities which can be used effectively for patients with piercing auricular keloids due to its excellent results and cost-effectiveness.

Keywords: Auricular keloid, Ear keloid, Piercing, Corticosteroid injection, Recurrence

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Introduction

Keloids are abnormal tissue scars that grow beyond the initial border of the wound. After the breakdown of the skin integrity, the wound healing process comprising of hemostasis, inflammation, proliferation, and remodeling phase has proceeded. Keloids result from pathological and imbalance of wound repairing process which cause excessive accumulation of the connective tissue. The unique characteristic of keloids is continuous proliferation and expansion with rare spontaneous regression.[1] Therefore, we can describe keloids as benign fibrous proliferative tumors.[2] The etiology of the keloid formation is multifactorial including genetic predisposition, prolonged inflammation, infection, and other factors that impair the wound healing process.[3] Risk factors for keloid formation are younger age especially between 10 to 30 years old, pregnancy, pigmented-skin population, and skin at the mobile and high tension sites.[4]

Most of auricular keloids are preceded by ear piercing which is commonly located at the ear lobule and helix of the auricle. The patients with ear keloids frequently tolerated with itching, painful, burning sensation, ulceration, secondary infection, and aesthetic deformities.[5] Auricular keloids are a challenging problem to deal with due to their resistance to various modalities of treatment and has a high recurrence rate. Surgical excision alone provides a varying range of therapeutic success, therefore, the perioperative adjuvant therapy should be combined to control and limit the recurrence. Nowadays, there are numerous choices of adjuvant treatment for example intralesional corticosteroid injection, pressure therapy, silicone gel, silicone sheeting, radiotherapy, laser, and cryotherapy.[6] However, there is no standard treatment or protocol that can be used effectively in all groups of patients.

The purpose of our study is to introduce the practical treatment protocol of auricular keloids comprising of modified surgical technique called "Through-and-Through excision technique" and postexcisional intralesional Triamcinolone Acetonide (TA) injection from our experiences.

Methods

Patient

We reviewed all patients who came to our clinic with auricular keloids from June 2017 to March 2019 in this retrospective case series. All patients had auricular keloids which occurred after ear piercing for more than 6 months to reassure that the keloid mass did not regress. The characteristic of ear keloids included in our study are ones occurring on both sides of the ear surface with a connecting tract called the dumbbell-shaped keloid. The small ear keloid (less than 0.5 cm), large keloid (more than 5 cm), and pediatric patients (age less than 15 years) were excluded from our study. Forty one patients with forty nine auricular keloids were excised by Through-and-Through technique with postoperative intralesional TA injection as an adjuvant therapy by one board-certified Plastic surgeon. The protocol was approved by The Human Research Ethics Committee of Thammasat University (MTU-EC-SU-0-101/63). The patients' age ranged from 16 to 58 years old (mean age: 24 years old). The onset of keloid formation after ear piercing ranged from 7 months to 10 years. We measured the maximum size of the keloid mass by using the longest diameter of anterior or posterior keloid in any of its axis without considering the length of the sinus tract. The maximum size of keloid ranged from 0.5 to 5 cm (mean size: 1.6 cm). The most common presentation of patients is an aesthetic concern. Other presentations are itching, painful, and burning sensation. Among forty one patients, eight patients had received prior treatment. Four patients received excision alone and four patients received excision with postoperative intralesional TA injection (Table 1).

Table 1 Patient data

Case	Age/Sex	Site and location	Maximum Size (cm)	Previous treatment	No. of Postoperative TA ILI (time)	Recurrence
1	21/F	Right helix	1.0	-	2	No
		Left helix	1.5	-	2	No
2	27/F	Left earlobe	4.0	Excision	5	No
3	24/F	Right earlobe	1.0	-	1	No
		Left earlobe	0.8	-	1	No
4	20/F	Left earlobe	0.9	-	1	No
5	26/F	Left earlobe	1.2	-	1	No
6	30/F	Right helix	3.0	Excision	1	No
7	22/M	Left earlobe	2.0	Excision with TA ILI	1	No
8	22/F	Left earlobe	0.8	-	1	No
9	20/M	Left earlobe	1.0	-	5	Yes at 5th month PO
10	23/F	Left earlobe	2.7	Excision with TA ILI	2	No
11	26/M	Left helix	0.8	-	1	No
12	19/F	Left earlobe	1.0	-	1	No
13	19/F	Right earlobe	0.5	-	1	No
14	27/F	Left earlobe	5.0	-	4	No
15	44/F	Right earlobe	2.5	Excision with TA ILI	2	No
		Left earlobe	3.0	Excision with TA ILI	2	No
16	22/F	Right earlobe	3.0	-	1	No
17	18/F	Right helix	2.3	-	1	No
		Left helix	1.5	-	1	No
18	29/F	Right earlobe	2.5	Excision	5	Yes at 1st year PO
19	23/M	Left helix	1.0	-	1	No
20	16/F	Left earlobe	1.0	Excision with TA ILI	8	No
21	26/M	Left earlobe	2.0	-	1	No
22	23/F	Right earlobe	2.5	Excision	1	No
23	18/F	Left earlobe	1.0	-	1	No
24	35/F	Left helix	0.8	-	1	No
25	16/F	Left earlobe	0.5	-	1	No
26	21/F	Right earlobe	0.6	-	1	No
27	18/F	Left earlobe	2.0	-	2	No
28	22/F	Right earlobe	1.1	-	6	No
		Left earlobe	1.0	-	6	Yes at 6th month PO
29	23/F	Right earlobe	3.0	-	4	No
30	36/M	Left earlobe	2.0	-	1	No
31	23/F	Left helix	1.2	-	1	No
32	58/F	Right helix	2.0	-	6	No
33	25/F	Right earlobe	0.7	-	1	No
		Left earlobe	1.5	-	1	No
34	19/F	Right helix	1.2	-	1	No

TA ILI: intralesional Triamcinolone Acetonide injection, PO: postoperative time point

Table 1 Patient data (Cont.)

Case	Age/Sex	Site and location	Maximum Size (cm)	Previous treatment	No. of Postoperative TA ILI (time)	Recurrence
35	22/F	Right earlobe	1.0	-	1	No
36	20/F	Left earlobe	0.6	-	1	No
37	23/F	Left earlobe	1.0	-	1	No
38	22/F	Right earlobe	3.0	-	1	No
		Left earlobe	2.5	-	1	No
39	20/F	Right earlobe	0.9	-	2	No
40	34/F	Left earlobe	1.5	-	3	No
41	20/F	Right earlobe	0.8	-	3	No
		Left earlobe	1.0	-	3	No

TA ILI: intralesional Triamcinolone Acetonide injection, PO: postoperative time point

Methods and Surgical procedures

The patient was placed in a supine position and the neck was rotated to the opposite side of the operated ear. The ear was scrubbed and painted with 4% Chlorhexidine solution in a sterile fashion. Incisions were planned and designed on healthy skin precisely adjacent to the keloid mass in both surfaces of the ear. The procedure was performed under local anesthesia by using 1% Lidocaine with 1:100,000 Epinephrine. The Through-and-Through excision procedure was started. Incisions were made along the planned line on both sides. Anterior and posterior keloid masses were dissected kindly along the plane by Metzenbaum. The marginal skin which comprises of epidermis and dermis around the keloid mass was separated from keloid tissues gently (Figure 1). The sinus tract that connects the anterior and posterior keloid mass was identified. The anterior part, posterior part, and connecting tract were removed from the ear simultaneously in the same piece of the specimen. The Specimen was subjected to histopathological examination to confirm the nature of the mass and specify its margin. Bleeding was checked and stopped. Suturing was meticulously done by the cutting needle with 6 - 0 non-absorbable monofilament materials in interrupted technique. Each interrupted suture was tension-free and skin margins were minimally everted for the good result of the healing process (Figure 2). Topical antibiotic ointment and pressure dressing was applied respectively for three days. Patients were discharged with antibiotic and analgesic drugs Patients were scheduled to return one week after surgery for wound evaluation and suture removal. Every patient received postexcisional intralesional TA injection at incision site with concentration 40 mg/ml at 2-week postoperative time point. TA injection was considered every 1 month to the individual patient depending upon the patients'clinical manifestation and complaint. Therefore, there are some patients that received TA injection more than one time. The amount of 40 mg/ml TA totally used in each time ranged from 0.1 to 1 ml depending on the size of the scar and the patients' symptom. During the course of treatment, if the scars were growing and expanding after ceasing TA injection, they were considered as recurrence. Patients were followed up completely at one year after surgery and after this was advised to come back to the clinic immediately if abnormal sensation and keloid lesion are reappeared. All patients were strongly advised to avoid not only ear piercing but also body piercing again in the future (Figure 3).

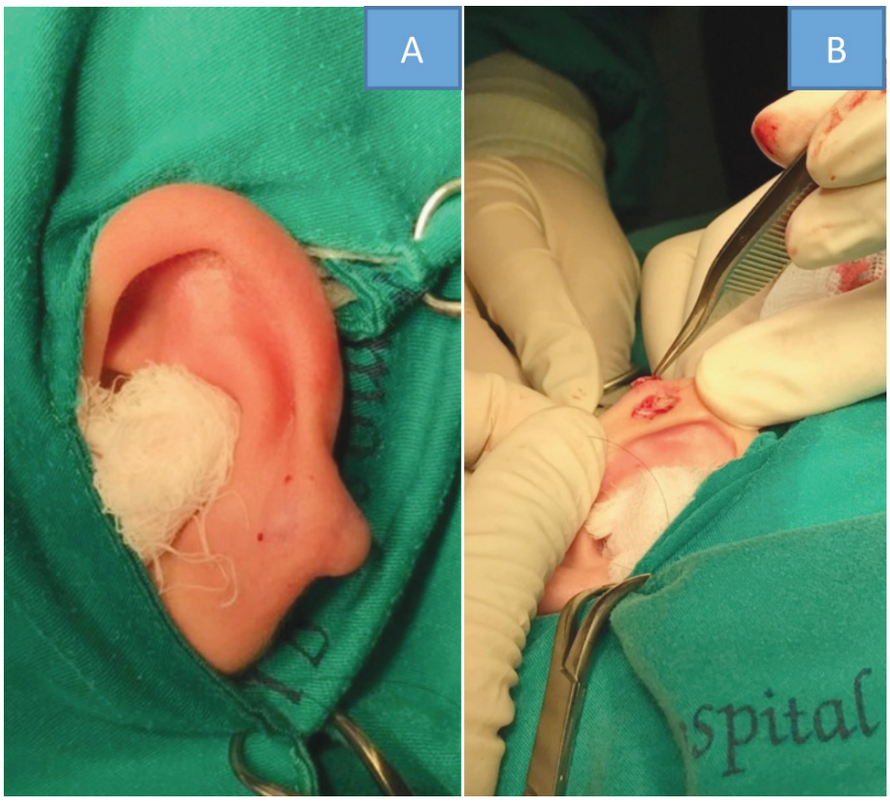

Figure 1 (A) Dumbell-shaped keloid at auricular helix. (B) Anterior and posterior keloid masses were dissected gently.

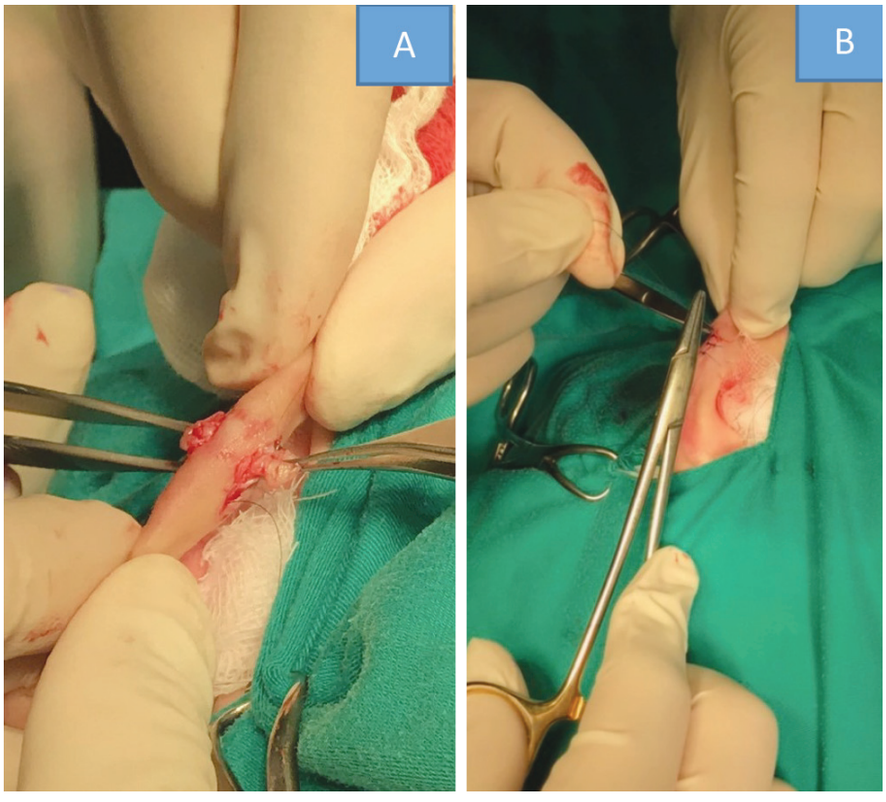

Figure 2 (A) The anterior part, posterior part, and connecting tract were removed simultaneously. (B) The defect was closed by suturing with interrupted technique meticulously.

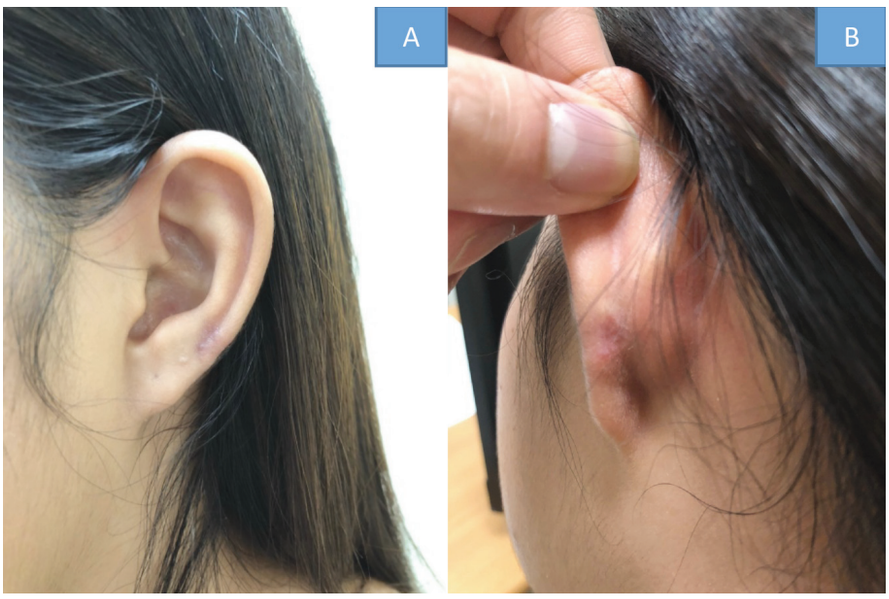

Figure 3 After Through-and-Through excision technique for 1 year (A) Anterior side. (B) Posterior side of the ear.

Results

We analyzed 41 patients with 49 auricular keloids. 33 patients presented with a single ear keloid, while 8 patients had bilateral ear keloids. 19 patients had right ear keloids and thirty patients had left ear keloids. Keloid was located on ear lobule in 38 cases (78%) and on helix in 11 cases (22%). A number of total primary ear keloids is 40 (82%) and secondary ear keloids is 9 (18%). Prior to excision with Through-and-Through technique, four auricular keloids were excised alone and five auricular keloids were excised and injected with TA postoperatively. All operated specimens were sent for histopathological examination and reported the result of the specimen as the keloid. No malignant transformations were found. Only one case had a positive margin of keloid tissue in the specimen. The number of postexcisional intralesional TA injection ranged from 1 to 8 times (mean: 2.2 times). Forty six auricular keloids (94%) responded to the treatment and did not develop recurrence in 1-year of follow-up. Only three keloids (6%) proliferated and developed recurrence during 1-year follow-up. Each case showed a recurrence at 5 month, 6 month, and 1 year after surgery respectively. All of the recurring keloids were located in the earlobe and received postoperative intralesional TA injection more than four times. From forty nine specimens that were sent for histopathological examination, the only one specimen was reported a positive margin of keloid tissues which belonged to a patient who developed recurrence at 5th month after excision. Keloid remnants remained around 0.1 cm after the operation in this patient. All patients with regrowth keloids were treated with multimodal therapies simultaneously such as intralesional corticosteroid injection, silicone gel, and compression therapy. In the end, three recurred keloids regressed within 6 months after receiving non-operative multimodal therapies (Table 2).

Table 2 Auricular keloid data

Quantity	
- Unilateral	33
- Bilateral	8
Side	
- Right	19
- Left	30
Location	
- Earlobe	38
- Helix	11
Previous treatment	
- No	40
- Excision alone	4
- Excision with TA ILI	5
Treatment response	
- Responded	46
- Recurrence	3

TA ILI: intralesional Triamcinolone Acetonide injection

Discussion

Skin is the largest organ of the body which covers all of the underlying organs.[7] There are numerous functions of the skin for example regulating the body temperature, excreting waste as sweat, and producing vitamin D. One of the essential and indispensable roles of the skin is acting as a biological barrier to prevent penetration from the external environment.

After the breakdown of the skin continuity, the wound healing process occurs to restore the biological barrier. The reparative process results in a wide spectrum which ranges from absence of vestige to overgrowth scar called keloids.[8] Keloids are originated in the dermis layer which results from an abnormal inflammatory phase in the restorative process. Due to the prolonged inflammatory process, dermal connective tissues such as collagen fibers are excessively produced but minimally decomposed, therefore, the accumulated number of collagen fibers is greater than in the normal healing process.[9]

Nowadays, ear piercing is popular and fashionable worldwide. However, there are many complications after ear piercing such as infection, allergy, bleeding, and scarring. The severity depends on location, materials used, the practitioner's skill, and sanitary of the recipient.[10] The auricular keloid is a major problem after piercing injury because it causes pain, itching, and cosmetic concerns to patients.[11]

The piercing auricular keloid has a special identity when compared with other causes such as burns or accidents. In our country, ear piercing is usually done at the earlobe and helix with a sharp instrument. After ear piercing was done, an injury arises at both sides of the auricular skin, subdermal tissue and possibly at the auricular cartilage. Next, fibrous tissues are formed at the layer between the anterior opening and posterior opening of a piercing process which cause keloid tissues on the anterior, posterior, of both surfaces with a conjoining sinus tract.[12] Therefore, the typical characteristic of auricular keloid after piercing injury is the dumb-bell-shaped keloid which is described as the keloid mass with a connecting tract between anterior and posterior surfaces.[12] In some cases, we can see only anterior or posterior keloid mass but all of them have a tract penetrating inside the soft tissue.

The major goal of surgery in the keloid lesion is complete excision of the keloid mass and the connecting tract with minimal removal of the healthy surrounding tissue. In 2017, Chong et al.'s study reported that all cases with positive resection margins result in recurrence of the lesion at the end of treatment and none of the cases with negative resection margins had a recurrence.[13] The connecting tract between the anterior and posterior keloid

mass should be completely removed because it causes persistent inflammation which stimulates the proliferation of fibroblasts and delays the remodeling of the scar. The histopathology of the sinus tract shows granuloma in 8 of 19 cases in Ramesh et al.'s study thus, totally getting rid of the sinus tract has a great benefit in reducing a recurrence rate in the auricular keloid.[12] The purpose of minimal removal of surrounding tissue is to avoid excessive tension when suturing and avoid notching of the pinna because auricular skin does not have much laxity. Through, some studies showed that adequate extralesional excision should be performed to remove active perilesional fibroblasts for the prevention of the recurrence.[14] Thereby, we should get rid of keloid tissue sufficiently and minimally injure the healthy tissue for the best therapeutic and cosmetic outcomes. Treating keloid by only surgical removal without adjuvant therapy results in recurrence about 45% to 100%.[15, 16] Combined surgical and adjuvant therapies to treat auricular keloid for the excellent and prospective result should be conducted.

As of now, there are no standard protocols for the treatment of ear keloids. The adjuvant therapy plays a supporting role in controlling recurrence after surgery. The various way adjuvant therapy is used in the present practice includes corticosteroid injection, cryotherapy, radiation, laser, compression therapy, and gel sheeting.[17]

One of the effective and popular combinations of treatment is surgical excision with postsurgical intralesional corticosteroid injection.[18] Not only do they suppress the inflammatory process, corticosteroids also impair fibroblast proliferation. Moreover, Corticosteroids inhibit alpha 2-macroglobulin which blocks collagenase activity thus, the process results in stimulating collagen degradation. Other crucial actions of corticosteroids are impairing vascular endothelial growth factor (VEGF) and transforming growth factor B1 (TGF-B1) while promoting scar regression.[19, 20] Besides lowering recurrence events, corticosteroids have benefits in relieving itching and painful sensation. Comparing to other modalities, advantages of the corticosteroid injection including cost-effectiveness and requiring general instruments which are widely available and accessible in every medical center. The frequent complaint about intralesional corticosteroid injection from our study is pain during injection. We alleviate it by compressing the lesion with a cold pack before injection, which ultimately provides patients with satisfaction. Common adverse effects of corticosteroid injection are telangiectasia, hypopigmentation, necrosis of local skin, and atrophy of skin and subcutaneous tissue but we can prevent them by using the appropriate amount of steroids and injecting solution accurately in the layer of the lesion.[9]

Many prior studies have shown that the recurrence rate of postexcisional corticosteroid injection is around 3% to 25%.[21] In 2020, Ramesh et al.'s study reported a recurrence rate of 10% when using Loupe magnification in keloid excision and using topical liquid silicone as an adjuvant.[12] In Aradi et al.'s study, they perform keloidectomy with core fillet flap and use postoperative corticosteroid injection at 2-week as adjuvant and reported a recurrence rate of their procedure about 9.5%.[22] The recurrence rate of our study was 6%. There are many advantages to our treatment regimen and surgical technique. Firstly, we can completely excise keloid tissue with its tract under bare vision except in only one case that had a positive margin of keloid tissue from histopathological examination, consequently, this technique can be easily used in all medical institutes. Secondly, our protocol can be used effectively in both primary and secondary keloid lesions. Lastly, our surgical techniques require only a few courses of adjuvant intralesional TA injection to control the recurrence compared with many previous studies. The mean number of injections is 2.2 times. Many patients needed only one injection to control recurrence in 1 year follow-up time. Additionally, if you use intralesional TA injection more than five times after conducting our excision technique, you should aware to prepare other additional modalities to combine with this protocol for complete regression of the keloid mass.

However, there are some limitations to our study. The follow-up time is only 1 year which provides only the short-term results thus, further studies are needed to evaluate the long-term outcomes and complications. Moreover, to fulfill our technique, a magnification instrument for example surgical loupes should be used to make sure that all keloid tissues were removed which resulted in a negative margin of keloid tissue in all cases from

histopathological reports.

We have learned that the key success factors in auricular keloid treatment comprised of complete removal of the anterior and posterior keloid tissue with connecting core, tension-free closure of auricular skin, avoidance of infection, patients' adherence to follow-up, and their awareness to the recognize signs and symptoms of the recurrence. In our opinion, Through-and-Through excision technique with adjuvant intralesional TA injection is an effective modality to deal with auricular keloids by not only minimizing the recurrence rate but also providing excellent outcomes to the patient's satisfaction.

In summary, piercing auricular keloids have a unique characteristic which differ from other keloids. This characteristic is called the dumbbell-shaped keloid which is comprised of anterior mass, posterior mass, and connecting tract between them. The principle of treatment in this type of keloid is complete excision keloid mass with its sinus tract and using adjuvant therapy postoperatively. This study shows a low recurrence rate and the good result after excision by Through-and-Through technique with postoperative intralesional TA injection. Therefore, our treatment protocol is one of the practical and beneficial models which can be used effectively for patients with piercing auricular keloids.

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