

CLINICAL CHARACTERISTICS OF AURICULAR KELOIDS TREATED SURGICALLY AT 108 MILITARY CENTRAL HOSPITAL

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ABSTRACT

Purpose: to describe the clinical characteristics of surgically treated auricular keloids. **Subjects and methods:** Cross-sectional descriptive study on 45 patients with auricular keloid surgery at 108 Military Central Hospital during the period from June 2020 to June 2023. Study subjects had their past medical history taken, clinical examination, and lesion size measured to record research indicators. **Results:** The study subjects had an average age of 20.7 ± 4.4 years old, all patients were female, accounting for 100%. The main cause of keloids is ear piercing, accounting for 97.7%. Surgical auricular keloids have an average size of 4 ± 3.5 cm², the main location of keloids is in the helix accounting 44.1% and the earlobe accounting for 41.93%, the number of keloids is from 1 to 5. **Conclusion:** auricular keloids are mainly found in teenagers with an average age of 20.7 years old, 100% are female patients, 97.7% are caused by piercing. The location of keloids treated by surgery is in the earlobe and helix areas account for 44.1% and 41.93%, respectively; On average, there are 1.76 keloids/person, the average auricular keloid size is 4.07 ± 3.58 cm, mainly in groups 3 and 4 according to Michael Tirgan's classification (1).

Keywords: keloid, auricular keloid, keloid surgery.

I. INTRODUCTION

Auricular keloid is a recurrent condition, often requiring multiple combined treatments

(13). The current trend is to combine multidisciplinary treatment of auricular keloids with surgery that plays a fundamental role. Among the many treatment options, a combination of surgical intervention with radiation, therapeutic pressure, cryotherapy, silicone-gel, laser therapy, anti-tumor or immunosuppressive agents and intradermal injectable corticosteroids were applied and showed variable efficacy depending on each study (4). However, applying multiple treatments also means that it is expensive as well as prolonged in terms of treatment time, along with the side effects of radiation chemicals. Therefore, treating auricular keloids thoroughly and completely with only one surgery is always the first choice of both patients and surgeons. Properly selecting patients and prescribing surgery for effective result is a challenge for surgeons.

At 108 Military Central Hospital, many patients had multidisciplinary treatment of auricular keloids, however, there were some cases treated thoroughly with 1 surgery and no recurrence of scarring, producing satisfactory surgical results. Therefore, we conduct research with the objective: to contribute to show clinical characteristics of auricular keloids that can be treated surgically and solutions for auricular keloids that were surgically operated in a central hospital of highest line as a reference source for our colleagues.

II. SUBJECTS AND METHODOLOGY

2.1. Subjects: 45 patients with auricular keloids who underwent surgery at 108

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Military Central Hospital from June 2020 – June 2023.

2.2. Methodology: cross-sectional clinical descriptive study without a control group, the study sample consists of 2 groups:

Retrospective group: consisting of 32 patients, collecting data based on medical records stored at the record storage room, selecting records according to patient selection standards from June 2020 to January 2023

Prospective group: consisting of 13 patients, who received a clinical examination, preoperative and postoperative assessment, and following up medical record study forms from January 2023 to June 2023.

2.3. Steps of performance

Retrospective group: collecting data through medical records, taking study variables according to medical records.

Prospective group: patients are examined to collect information on age, gender, history of present illness, past medical history to find the cause of keloids, diagnosis, classification, assessment of lesions, taking basic tests.

We counted the number of keloids each patient had and the location of the keloids, measured the size of the keloids, and categorized the size of the keloids according to Michael Tirgan. Author Michael Tirgan classified the size of auricular keloids when compared to the anatomical structures of the same ear (1). This classification is very easy to practice clinically, does not require accurate measurement. This classification consists of 4 levels.

III. RESULTS

3.1. General characteristics

Our study looked at 45 patients with 79 auricular keloids. The follow-up period ranged from 6 -19 months, averaging 13.95 months, over 85% of patients followed for 12 months or more.

- Distribution by age: 11 - 31, average age: 20.7 ± 4.4
- Distribution by gender: 100% female
- Cause: mainly due to piercing, accounting for 97.7%

Table 1: Percentage of cause groups leading to auricular keloids (n=45)

Causes	Number of patients	Percentage
Piercing	44	97.7%
Injury	1	2.3%

3.2. Clinical features of auricular keloids:

- **Quantity:** each patient has more than 1 keloid so 45 patients have 79 keloids

Table 2: Number of auricular keloids (n=79)

Number of auricular keloids per patient	Number of patients	Percentage
1	23	51.11%
2	15	33.33%
3	3	6.67%
4	3	6.67%
5	1	2.22%
79	45	100%

- **Size:**

Table 3: Keloid size (n=79)

Number of keloids	Size (cm ²)	Number of keloids	Size (cm ²)
14	0.15 – 0.8	1	6.75
16	1	2	7
4	1.5	1	7.5
4	2	1	8
3	2.5	1	9
7	3	1	9.8
4	4	3	10.5
3	4.5	1	11.25
4	5	2	12
3	5.25	1	12.25
2	6	1	13.5

- The average size of the keloid group in the study is 4.07±3.58 cm², the largest is 13.5 cm², the smallest is 0.15 cm². Over 75% of the keloids in the study ranged in size of 5.25 cm² or less.

Table 3: Level of keloid size (Michael Tirgan’s classification) of the two surgical groups

Surgical method	Keloid size level (Michael Tirgan’s classification) ²²	Quantity of keloids	Percentage
Direct closure (n=44)	4	38	86.36%
	3	6	13.64%
Skin flaps-grafts (n=35)	4	12	34.3%
	3	23	65.7%

- Group of keloids with direct closure of the defect after scar removal: average size of 2.31±2.34 cm², wide distribution size range, most of which are keloids with a size of 1 cm².

- Scar group treated with skin flaps-grafts of the defect after scar removal: average size of 6.43±3.68 cm², wide distribution size range of 0.8 cm²-13.5 cm², no concentration in certain size groups.

+ Scar location:

Table 4: Percentage of auricular keloid locations (n=79)

Location		Quantity	Percentage	
Cartilage-free area	Earlobe	33	41.93%	41.93%
	Helix	35	44.10%	58.07%
Cartilage area	Triangular fossa	1	1.27%	
	Scarpa	1	1.27%	
	Postauricular area	9	11.43%	

IV. DISCUSSION

4.1. General characteristics

4.1.1. Age and gender

In our study, the average age of 45 patients is 20.68±4.36. The youngest patient is 11 years old, the oldest is 31 years old. The

average age of onset of auricular keloids is 18.9±4.35 years old, of which the youngest is 10 years old, the oldest is 29 years old. Through the investigation of patients based on a questionnaire, the study noted that all

patients at the onset of auricular keloid were at or had passed puberty.

The age in our study is also similar to that of the majority of other authors. Tae Hwan Park studied 1436 keloids in 883 patients with an average age of 24 and majority of patients are between the ages of 21-30 (2). In another study in Japan on 1290 patients with keloids from 0 to 78 years old, the average age of onset patients was reported as 16 years for men and 20 years for women (3). Similarly, in 715 patients with keloids in China, the average age at onset patients was 21 years in women and 22.6 years in men (4). Most of the above studies are carried out on Asian people, which are very similar to our study. Although there are other single studies showing that the average age of patients is higher, it should be noted that the majority of those patients had keloid onset at a young age, but had no need for treatment. During the examination of the patients in the study, we also found that the patients visiting often have deep concern for their appearance, which is the main reason for their examination, followed by concern about symptoms such as itching and pain.

Giving reasons for the young age in the keloid studies in general, and auricular keloid studies in particular, in addition to the social reasons mentioned above, there are also other hypotheses and scientific evidence. A prominent reason among them is that endocrine problems, keloids in general, and auricular keloids in particular tend to develop more easily during and after puberty. This is associated with endocrine factors and increased pituitary activity during puberty which result in hyperpigmentation due to the release of melanocyte-stimulating hormone (MSH), keloid formation mainly occurs in parts of the body with high melanocytes

levels, and it is rare in the soles of the feet and palms. During puberty, there is a sharp increase in secretion of growth hormones which is also one of the mechanisms that easily promote keloid formation (5). Another theory is that these age effects are due to greater skin tightening in young people compared to older skin and that younger people have a higher frequency of injuries than older people (6). More in-depth studies and larger sample sizes are needed to confirm the role of these hypotheses in explaining why keloids often appear at a young age.

Along with age, gender is also one of the factors researchers are interested in when evaluating patients with keloids. Our study, which looked at 100% female, shows a preponderance of women in keloid studies in general as well as auricular keloids. Studies only on auricular keloids also recorded the superiority of female patients: Muhammad Mustehsan Bashir studied 50 patients with auricular cartilage keloids and all of them are female; Rei Ogawa also studied 57 patients with auricular cartilage keloids to assess the effectiveness of keloid core removal and up to 91.2% of them are female; Korean author Tae Hwan Park studied 1436 keloids in 883 patients and up to 93.7% of them are female (7).

Many studies suggest that there is no difference between keloid development in men and women. However, patients with keloids who go to the hospital for treatment are more likely to be female simply because of social factors, namely that female individuals are more concerned about their appearance, and have a greater need for ear piercings than men. (8)

At least in patients with onset in childhood, female gender is a strong

promoter of the onset or progression of keloids. It can be seen that before the age of 15, the patient's family has started to see a doctor, without showing gender preference. Therefore, our data suggest that by at least 15 years of age, female gender may be a risk factor for keloids (3). Another piece of evidence supporting the notion that female gender promotes keloid formation is that in childhood, both boys and girls are vaccinated on the arm, but studies showed a significantly higher rate of keloids in girls than that in boys (3).

4.1.2. Causes

Auricle piercing

In our study, most patients developed keloids after auricle piercing; only one patient developed keloids due to an auricular wound. We would like to focus on problems from piercing because it is more common and concerned in the community.

As we already know, keloids are an unusual form of healing. In normal healing, the inflammatory phase ends when the dermis closes and epithelialization ends. However, there are unusual cell-to-cell signals leading to prolonged excessive collagen deposition. This process usually happens in skin burns due to specific causes such as trauma, infection, pimples and can also be spontaneous.

A very specific type of trauma to auricular keloids is piercing. Ear piercing is found to be very popular among adolescents, as in the world there are communities that carry out ear piercing as an act of traditional culture from childhood or right from birth. Most of the piercing is done outside health facilities, so hygiene is not ensured, increasing the risk of infection, especially articular cartilage infection. Besides, during ear piercing, the articular tissues also subject to a rather

severe injury under great pressure of the piercing tool.

The initial features of chondritis include increased temperature at the site of inflammation, redness and pain, followed by swelling of the infected ear and the formation of an abscess. *Staphylococcus aureus* or *Pseudomonas aeruginosa* is primarily cultured from an inflammatory cartilage zone abscess, *Streptococcus* infection or *Proteus* species have also been reported (9). Ear piercing results in complications seemingly unrelated to how the piercing is performed. Complications encountered are usually mild, long-term sequelae are very rare. Cartilage piercing does not appear to increase overall complication rates when compared to soft tissue piercing. This study indicates that cartilage piercing causes a small increase in the risk of minor local infections, but this increase does not give rise to the same increase in more significant long-term problems (9).

In our study, nearly all cases of keloids formed after piercing, accounting for 97.3%. This result is also similar to many studies of authors around the world: All patients in the study of Shiv Shankar Saha in New Delhi, India or the study of Erika Nicole Music et al., or the study of Rei Ogawa in Japan on 63 auricular keloids lesions were 95.2% due to piercing. A keloid study on a pediatric population conducted by Faraz A Khan also recorded all cases of keloids formed after piercing (7). Although not all studies have documented piercings as the primary cause of keloid formation, some of the evidence above suggests that the preponderance of piercings may stem from the fact that piercings are believed to be more aesthetically concerned than others. Therefore, the appearance of auricular

keloids greatly affects their psychology and aesthetics, so the treatment needs of the patient group are significantly higher.

4.2. Clinical characteristics of lesions

4.2.1. Quantity of scars: on average, there are 1.76 scars/person; each person has at most 5 scars and at least 1 scar, most patients have 1 scar each, accounting for 51.11%, patients with 2 scars account for 33.33%. The number of patients with more than 2 scars is very small, totaling 6 patients and only accounting for 15.56%.

4.2.2. Defect size

Our study noted the measurement of keloids in 2 dimensions: length and width, along with a comparison between the sizes of keloids and the earlobe of the same ear which is presented by author Michael Tirgan with 4 levels (10). In other studies around the world, the authors can take the largest size of the scar to represent, some also measure the 3-dimensional size of auricular keloids.

We recorded the size: average 4.07 ± 3.58 cm², maximum 13.5 cm², minimum 0.15 cm². The average size of the recurrent scar group is 6.49 ± 3.99 cm², the average size of the non-recurrent scar group is 3.28 ± 3.09 cm², the average size of the direct closure group is 2.31 ± 2.34 cm², the average size of the skin flaps-grafts group is 6.43 ± 3.68 cm². The sizes of the two pairs of recurrent and non-recurrent groups, as well as the sizes of the two pairs of direct closure and skin flaps-grafts groups all had statistically significant differences, the size of the recurrent group is greater than that of the non-recurrent group, the size of the flaps-grafts group is larger than the direct closure group. Comparison with the earlobes which are mainly classified at level 4 (smaller than the size of the earlobe of the same ear) and 3 (larger or equal to the earlobe of the same ear, but smaller than $\frac{1}{2}$

of the area of the same ear) according to the classification by author Michael Tirgan, shows no difference between the two groups of recurrence and non-recurrence.

4.2.3. Location

As mentioned above, the piercing site is also almost identical to the site of keloids in our study. In addition, there is a case of patient showing keloids after ear trauma and a case of keloids appearing on the background of the old incision of the previous surgery.

The most common location of keloids is the helix 35/79 (44.30%) and the earlobe 33/79 (41.93%), followed by the postauricular area 9/79 (11.43%) and then the triangular fossa and Scarpha both appeared in 1 patient (1.27%). If divided into two groups of locations containing cartilage and not containing cartilage, the rates are 58.07% and 41.93%, respectively.

This rates are also quite variable in the studies of other authors in the world: Tae Hwan Park studied 842 keloids with 77.08% cartilage-free keloids, Bernardo Hochman also recorded the same results with Park with 82% of keloids at the cartilage-free position; in the study in Thailand with 43 auricular keloids, the position containing cartilage also accounted for 67.4% (11). Because the formation of keloids is affected by various factors, there seems to be no rule as to which location the keloid is more dominant.

In contrast to our results, in Thiti Tantitham's study, the relationship between piercing site and keloid formation was demonstrated, piercing in the auricular cartilage area was shown to be more prone to keloids than lobular piercing. This may be due to a local infection e.g. chondritis which prolongs the healing process. In this study, all patients who developed keloids in the

auricular cartilage had piercing site infections. Therefore, infection appears to be an important risk factor for the development of these keloids. Due to the sparse blood supply of cartilage, it is susceptible to infection and more importantly, the cartilage piercing site infection is difficult to fight by the host defense system and antibiotics again due to lack of supply blood. This prolongs the healing time by secondary intention resulting in the formation of these mild keloids. Furthermore, we have reason to believe that as a consequence of the sparse blood supply of cartilage, the hypoxic environment directly increases collagen production and reduces collagen degradation resulting in increased collagen deposition in the cartilage-containing area of the ear and formation of these various keloids (12). On the other hand, 3 of the 11 lobular piercing sites had keloids. These observations suggest that infection may be better fought due to better blood supply. Therefore, the lobular piercing sites may develop keloids with the slightest irritation when a person has a genetic predisposition to this process and this is a severe, difficult-to-treat keloid with a very high rate of recurrence. While cartilage piercing sites develop mild keloids as part of the hypertrophic response whenever the healing process is prolonged mainly due to infection and little blood supply, even if one does not have a genetic predisposition to keloids. Thus, these mild postchondral keloids will have a better response to treatment and in fact these keloids, as opposed to resection in the lesion, are treated with further resection of the lesion with a very low rate of recurrence (8).

V. CONCLUSION

After researching 45 patients with 79

keloids at 108 Military Central Hospital, we found that:

The median age of patients in the auricular keloid study group is mainly teenagers with an average age of 20.7 years old, 100% are female.

The cause of keloids is mainly caused by piercing, accounting for 97.7%, only 2.3% due to injury. The average number of keloids is 1.76 scars/person, each person has at most 5 scars, at least 1 scar, most patients have 1 scar, accounting for 51.11%, patients with 2 scars account for 33.33%. The number of patients with more than 2 scars is very small, totaling 6 patients and only accounting for 15.56%.

The average auricular keloid size is $4.07 \pm 3.58 \text{ cm}^2$, the largest is 13.5 cm^2 , the smallest 0.15 cm^2 , and their sizes mainly belong to groups 3 and 4 according to Michael Tirgan's classification.

The surgical keloids located in the earlobe area account for 44.1%, while those in the helix account for 41.93%.

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