



Management of Complex Facial Keloid -- A Review of the Literature

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Abstract: *Purpose:* Keloids are noncontagious, pathologic, irregular deposits of collagen within an injured area and its boundaries. Only a few publications have described treatment of facial keloids, and there is obvious inconsistency regarding the treatment of facial keloids, specifically due to the high rate of recurrence and patient's expectation of the results. *Materials and Methods:* We performed a literature review for more than 35 articles to draw attention to the management and treatment of facial keloids. *Results:* There are several surgical techniques for managing facial keloids. First involves simple surgical excision. Second strategy involves surgical excision of the keloid within the margin of the lesion, leaving keloid at the periphery to avoid violating the healthy tissue thus minimizing the recurrence. The third strategy involves simple surgical excision of the keloid followed by radiotherapy which appears to be the most effective treatment of the keloids. A fourth technique involves simple surgical excision of the keloid followed by steroid injection. A fifth technique involves excision of the keloid and using the keloid skin for resurfacing or as a skin flap to cover the surgical defect followed by HBO treatment. A sixth technique involves excision of the keloid followed by using Cryopreserved Placental Membrane. There are also non-surgical strategies to manage keloids. The first involves Intralesional injection with a mixture of 5-fluorouracil and Betamethasone and the second involves hydration and compression therapy. *Conclusions:* Facial keloids are very difficult to manage. In addition, they may develop complications including infections. It is imperative to make all attempts to prevent keloid formation, as the management regardless of modality, often leads to recurrence.

Keywords: Keloids, Keloid Treatment, Keloid Radiotherapy, Facial Scars

1. Introduction

Keloids are noncontagious, pathologic, irregular deposits of collagen within an injured area and its boundaries. The mechanism of keloid formation remains uncertain. Populations with dark skin/pigmentation are at higher risk of keloid formation including African, Hispanic, and Asian populations, however they may still occur in all types of skin colors. When a keloid arises, it is more common in middle age than children and elderly. Multiple conditions may occur during keloid formation with the most common being infection within and outside its borders.

The definitive treatment of Keloids is a challenge for all treating providers. Up to the current time, there is no satisfactory

or consistent treatment of keloids. Surgical, medical, and physical therapies, or combinations of all modalities, have been used with limited results. Multiple publications have reported satisfactory results by using combination therapies, while others have shown significant recurrence. By reviewing more than 35 articles, there is obvious inconsistency regarding the treatment of facial keloids, specifically due to the high rate of recurrence and patient's expectation of the results.

2. Etiology

Most studies report that facial keloids result from facial acne which is common in the young population [22]. However, previous surgery, trauma, piercings, and insect bites may also lead to the formation of keloids. This occurs

secondary to the thickening of injured connective and subsequent keloid formation [15]. Skin injury may develop into either hypertrophic scars or keloids, but it is difficult to predict the outcome [15]. The NEDD4 gene, when present, is considered a risk factor of keloid formation as well. However, at the current time, it is impossible to predict which factor may be most influential in the development of keloids.

3. Management and Prognosis

Generally, the treatment of keloids remains a challenge. The ideal treatment of keloids remains elusive for most, if not all surgeons. By reviewing more than 35 articles, it becomes apparent that keloid treatment remains controversial. We will discuss most of the surgical, medical and/or combined approaches for the management of keloids. There are several techniques for managing facial keloids. The first involves simple surgical excision. This technique has the highest incidence of recurrence. [15] The second strategy involves surgical excision of the keloid within the margin of the lesion, leaving keloid at the periphery to avoid violating the healthy tissue thus minimizing the recurrence [4, 5]. The third strategy involves simple surgical excision of the keloid followed by radiotherapy which appears to be the most effective treatment of the keloids from several author's viewpoint. [18, 20, 28, 30, 36]. A fourth technique involves simple surgical excision of the keloid followed by steroid injection. [17, 21]. A fifth technique involves excision of the keloid and using the keloid skin for resurfacing or as a skin flap to cover the surgical defect followed by HBO treatment. [22] A sixth technique involves excision of the keloid followed by using Cryopreserved Placental Membrane. [13] In addition, another strategy involves the use of laser and cryotherapy treatment. [19, 23, 25, 33]

There are also non-surgical strategies to manage keloids. The first involves Intralesional injection without surgical excision with a mixture of 5-fluorouracil and Betamethasone and the second involves Hydration and compression therapy. [4, 5, 11, 27, 29]

There are also some surgeons who defer any elective surgical excision and treat only the complications that occur with keloids including pruritis and infection. This is a controversial option and depends on the patient goals and understanding regarding the non-treatment of keloids. Multiple factors affect this non-treatment decision including patient gender and age, keloid location, and keloid size and duration of existence.

For any patients that undergo management of facial keloids, at least 12 months of postoperative follow up is recommended. However, since there are no definitive guidelines regarding management, and as the behavior and success of keloid management varies, the post treatment monitoring also remains somewhat variable.

4. Discussion

Keloid treatment is one of the most challenging entities

due to their tendency to recur, their resistance to resolve, the potential worsening of the condition after treatment, and the unsatisfactory result. There is no universally accepted method to treat keloids; however, multiple different individualized algorithms have been used by different surgeons to treat keloids. Success had been reported in the literature, however, recurrence, resistance to treatment, and patient and surgeon frustration had been reported as well.

Simple surgical excision without any additional therapy showed high recurrence 50-80% of the treated cases [4, 5, 15]. Keloidectomy with adjunctive therapy is highly recommended by most of the authors and superior to surgical excision alone to minimize the incidence of recurrence. Skin tension plays an important role of keloid treatment and recurrence. [15] A partial keloidectomy leaving 1-2mm of keloid in the periphery has been proposed to avoid violation of the surrounding healthy tissue. Unfortunately, high rates of recurrence and keloid spread has been reported with incomplete peripheral excision. Therefore, it is not a curative method, and the use of this technique should be limited. [35]

Keloid treatment with laser and cryotherapy remains with limited success and high recurrence rates. [8, 19, 25, 33] Most keloid cases that were treated by laser revealed softening of the lesion and disruption of the keloid blood circulation [25, 33, 19]. There is more than a 50% recurrence rate reported after 6 months for lesions treated with a laser. [19] However, Laser treatment may be more effective if it is combined with other treatment modalities. [8, 19, 33] In the other hand, regarding cryotherapy, no significant results have been reported using cryotherapy alone in keloid treatment. 50-70% of recurrence rate had been reported by several authors [15]. Cryotherapy used as an adjunctive therapy after surgical excision presents with good results with minimal recurrence and decreased scarring. [10]

Surgical excision followed by radiotherapy has been one of the most used and successful methods to treat keloids with minimal recurrence [18, 30]. There was excellent response to various doses and fractionations of radiotherapy after complete resection of the keloid. However, recurrence has been reported 12-15 months after excision was completed (20, 32, 36, Paul). When reviewing the literature, 16-18 Gy in 2-3 fractions showed a recurrence rate of 9.56% while 16-20 Gy in 5 fractions over 1 week showed recurrence of 10-30%. [31] A retrospective cross-sectional study by performed by Abdus-Salam reviewed 172 keloid patients. [1] 171 patients underwent complete resection of the keloid followed by radiation therapy. 12gy in 2 fractions over 14 days showed 14.53% recurrence. Another retrospective study in 2018 by Renz Paul studied 2 groups treated with complete surgical excision of keloids in different parts of the body followed by radiation therapy. 125 keloids treated by 12-16 Gy in 3-4 fractions showed a recurrence rate of 9.6% and another 125 keloids treated by 20 Gy in 5 fractions showed a recurrence rate of 1.6% with median follow up of 40 months for both groups. Hyperpigmentation and telangiectasis are the most common postoperative complication. [28] Overall, surgical excision followed by radiotherapy appears to be an effective

treatment modality for keloids and the recurrence rate is less as the radiation dose increases. However, radiation hyperpigmentation, wound dehiscence, acute and chronic toxicity should always be taken into consideration.

Studies involving the excision of the keloid followed by intralesional steroid injection or intralesional steroid injection alone have been published. [2, 16, 24, 27] In 1991, A randomized, prospective study was performed by Lawrence WT on 27 keloids in 16 patients. [21] The treatment involved 2 preoperative triamcinolone intralesional injections, followed by the excision of the keloid, followed by 3 postoperative triamcinolone intralesional injections. In this study, only 30% of the cases were cured while 60% of the keloids recurred. In addition, a high recurrence rate was reported by Kiil J in treating keloids with surgical excision followed by Triamcinolone Acetonide (Kenalog) injections. [17] There was a 50% recurrence rate reported after 1-5 years from the treatment. Thus, there is minimal control of keloid recurrence with this method. [17]

In 2018, Shu Liu reported a new method of excising the keloid and using the keloid skin to cover the surgical defect. [22] This method was performed on 45 patients with facial keloids. The keloids were completely excised while the skin of the keloid was dissected and lifted off the specimen with minimal trauma. All the skin was preserved and applied to the residual defect as a skin graft. 900 cGy of radiation was then administered on day 1 and day 7, which was then followed by HBO treatment completed every day until all sutures were removed. Pressure bandages were used for 6-12 months after complete healing of the skin. 89.9% of these patients were cured without complications while there was a documented recurrence rate of 11.1%. [22] Gupta R. J reported in 2018 reported the use of Cryopreserved Placental Membrane after excising a keloid in the per-auricular area status post TJR. [13] No keloid reformation was seen after 4-9 months follow up. [13]

Intralesional injection without surgical excision is one of the non-invasive treatments for keloids. A mixture of 5-fluorouracil and Betamethasone is a relatively safe but painful injection for keloids. Apikian, M. in 2004 reported 2 keloid cases that were treated by a combination of 5-fluorouracil (either 0.8 or 1.6 mL at a concentration of 500 mg/mL) and betamethasone (either 0.2 or 0.4 mL at a concentration of 5.7 mg/mL). [3] This treatment with 4 different injection combinations was found to be effective in decreasing the volume of the keloids by 90%. 1 year follow up after the treatment did not reveal any recurrence or regrowth of the keloids. The combination of Triamcinolone or 5-FU was more effective in regression of keloids compared to using each one alone [24]. Granstein R. D. reported intralesional interferon injection/Interferon-gamma helped in diminishing the keloids size on 8 keloid cases. [3, 12] Biopsy of the treated keloids showed reduction of the fibroblast synthesis of collagen, collagenase activity, and flattening of the keloids' texture by the end of the treatment course. However, limited success with such method has also been reported. [3, 12]

Intraoral surgical approaches for the excision of benign

lesions of the facial skin to avoid scarring has also been used as a preventative measure. Arpan Tahim reported 47 benign facial lesions that were excised with intraoral approaches. [34] The aim of this study was to prevent or minimize damage to the facial skin. There was a 6.4% recurrence rate of the excised pathology, and a 2.1% facial nerve palsy and hematoma formation complication rate. Intraoral access is a complicated procedure when used for large lesions. It may be useful for small lesions including lipomas, dermoid and epidermoid cysts, along with deep scars resulting from previous surgeries. Extraoral approaches are recommended for large lesions and keloids to avoid facial nerve trauma as well as preservation of other vital structures. The intraoral approach is a preventive method to minimize keloid formation more than a definitive approach of keloid treatment. [34]

Hydration and occlusion with compression therapy was reported by Sawada and Sone in 1990 using a Silicone oil-based cream [29]. This study showed significant regression of the hypertrophic keloids with minimal complications, including pain, redness, stiffness of the treated area and pruritis. In 1992, the same authors reported 31 keloid cases using the same concept but another silicone-based cream. This study revealed very similar results with similar low complication rates. The authors theorize that mechanical compression causes pressure, thus creating a hypoxic environment, which in turn leads to a decrease of the metabolic activity and reduction of fibroblast proliferation to the area of concern. It is effective mainly with earlobe keloids after excision with almost no recurrence. [4, 5, 27]

The keloids result mainly due to insult to the soft tissues which cause irregular deposition of type II and type IV collagens to the injured area and its boundaries. Once formed, keloids are extremely difficult to manage. Generally, prevention is always better than management, however, even with a thorough evaluation of a patient's history, there is no effective screening method to determine who is more susceptible to develop keloids. However, once keloids are formed, regardless of the treatment modality, successful resolution will always be a challenge with high recurrence rates. Depending on the size and location, facial keloids may be disfiguring, and as documented in this case report, keloids can develop infections which add additional morbidity to an already difficult situation for both the patient and surgeon.

For any patient undergoing excisional procedures on the face, for traumatic wounds of the face, and for piercings, a thorough history involving any history of keloids should be documented. For those patients with a history of keloid formation, avoidance of piercings and possible intraoral approaches to lesions should be used whenever possible. If facial excision is unavoidable or if the patient sustains facial lacerations, aggressive management of surgical sites and wounds including pressure dressing and injection of steroids may assist in the prevention.

5. Conclusion

Facial keloids are very difficult to manage. In addition,

they may develop complications including infections. It is imperative to make all attempts to prevent keloid formation, as the management regardless of modality, often leads to recurrence.

Declarations

Financial Interests

The authors have no financial interest to declare in relation to the content of this article.

Ethical Approval

IRB approval was not necessary because only a literature search was performed, and the research did not involve human subjects.

Patient Consent

Patient consent was not required.

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All authors have read and approved this article.

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