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Successful Treatment of Keloid with Weekly Intralesional Triamcinolone Acetonide (40%) And 5-Fluorouracil Combination: A Case Report

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ABSTRACT

Keloids often cause significant physical discomfort and psychological distress, profoundly impacting patients' quality of life. Intralesional therapy combining triamcinolone acetonide (TA) and 5-fluorouracil (5-FU) has emerged as a promising treatment option, with demonstrated efficacy in clinical studies. Although most protocols advocate injection intervals of 2–3 weeks, weekly administration has been explored in some studies. However, data on the efficacy and safety of this combination therapy particularly in Asian populations remain limited. This case report describes the successful use of intralesional 5-FU combined with 40% TA for keloid treatment, demonstrating efficacy with minimal adverse effects. A 42-year-old woman with a history of surgical excision presented with a solitary, irregularly shaped, well-defined, hyperpigmented, and pruritic tumor in the pubic region. Following an initial cryotherapy session, the patient underwent weekly intralesional injections of 40% TA and 5-FU in a 1:9 ratio for six weeks. The patient experienced mild to moderate procedural pain, with a Visual Analog Scale (VAS) score of 3–5, and developed ulceration at the injection site after the sixth session. Despite the absence of a standardized protocol for this combination therapy, significant clinical improvement was observed, with the keloid size reducing from 6 × 3.5 × 0.8 cm to 4.9 × 2.4 × 0.1 cm . This case highlights the weekly intralesional combination of 40% TA and 5-FU as an effective treatment for keloid reduction, offering tolerable side effects and favorable patient outcomes

Keywords: *Combined Modality Therapy, fluorouracil, keloid scar, triamcinolone acetonide*.

1. INTRODUCTION

Keloid is a fibroproliferative skin disorder resulting from abnormal wound healing, characterized by the overgrowth of fibrotic tissue and excessive collagen deposition.1–3 This condition typically arises from deep skin injuries caused by physical trauma, surgical incisions, burns, or skin piercings.4,5 Keloids can lead to both cosmetic and functional impairments, including contractures and subjective symptoms such as pain and pruritus. Epidemiologically, individuals of Black and Asian descent demonstrate a higher predisposition to keloid formation compared to those of Caucasian descent, with prevalence ratios ranging from 14:1 to 2:1 in Black versus Caucasian populations. In Asian populations, the incidence is approximately 0.1%, which is comparable to the 0.09% incidence observed in Caucasian populations. Keloids may develop spontaneously or following trauma, with race and genetic predisposition identified as key risk factors.6

Keloids can profoundly impact a patient's physical health and quality of life.4,7 Current treatment strategies primarily aim to alleviate symptoms and improve the aesthetic appearance of scar tissue, as even minor improvements can significantly enhance a patient's psychological well-being.8 Various therapeutic modalities have been employed, including silicone-based products, cryotherapy, intralesional corticosteroids, and 5-fluorouracil (5-FU).2 However, keloid management remains challenging due to frequent recurrences and limited therapeutic efficacy. Additionally, the potential side effects of treatments must be carefully evaluated.

Triamcinolone acetonide, a glucocorticoid, is widely recognized as a first-line therapy for keloid lesions.9 This medication

exerts anti-inflammatory effects, inhibits the proliferation of keratinocytes and fibroblasts, and induces vasoconstriction, collectively contributing to keloid regression.10,11 Several studies have demonstrated that combining TA with other agents, such as bleomycin, botulinum toxin, and 5-FU, enhances the therapeutic efficacy in keloid repair. 5-FU, a pyrimidine analog, effectively inhibits fibroblast proliferation and has been extensively used in keloid treatment.8,12 The combination of TA and 5-FU has shown superior outcomes compared to monotherapy with either agent, providing an accelerated therapeutic response and a reduced incidence of adverse effects.9,13,14 For instance, Salem et al. in Pakistan reported that the combination of 5-FU and TA yielded better results than TA alone.14 However, the potential side effects of these treatments require careful consideration. Intralesional injections of TA are associated with adverse effects such as pain, skin atrophy, hypopigmentation, hyperpigmentation, and telangiectasia. In contrast, 5-FU injections may cause pain, purpura, transient hyperpigmentation, burning sensations, and skin erythema.9 Notably, the combination of 5-FU and TA has been shown to reduce the incidence of side effects, particularly pain.15 This case report highlights the use of 5-FU in combination with 40% TA as an intralesional therapy for keloids, demonstrating effective outcomes with minimal side effects

2. CASE REPORT

A 42-year-old woman presented to the Tumor and Dermatosurgery Outpatient Clinic at Dr. Hasan Sadikin General Hospital in Bandung, Indonesia, with complaints of skin-colored, pruritic tumors in the pubic region. The symptoms initially developed two years following lipoma excision surgery. Three months post-surgery, scars formed at the surgical site; however, the patient did not seek medical attention at that time. Three months prior to the consultation, she noticed enlargement of the lesion accompanied by pruritus, which prompted her to visit our clinic for evaluation.

On physical examination, a solitary mass was identified in the pubic region, characterized by a finger-like projection and a hyperpigmented surface. The lesion measured 6 × 3.5 × 0.8 cm and was clinically diagnosed as a keloid, with a Vancouver Scar Scale (VSS) score of 10 (**Fig. 1A**). The patient underwent cryotherapy using liquid nitrogen, with each cycle consisting of a 15-second freezing period followed by a 30-second thawing period. One-week post-procedure, the patient reported the development of ulcerations and significant discomfort, including severe pain, which they described as highly distressing. Due to these adverse effects, the patient expressed a preference for alternative treatment options (**Fig. 1B**).

The treatment plan was revised to incorporate weekly intralesional injections of a combination of 40% TA and 5-FU in a 1:9 ratio. A 1 cc syringe was used to administer 4 mg (0.1 mL of 40 mg/mL) of TA (Trilac®) and 45 mg (0.9 mL of 50 mg/mL) of 5-FU (Curacil®) (**Fig. 2A**). The keloid was marked using a skin marker with 1 cm intervals between injection points (**Fig. 2B**). Clinical improvements were observed within the first week, including reduced pain and pruritus, as well as softening and shrinkage of the keloid to 5.8 × 3.1 × 0.7 cm, with a VSS score of 9 (**Fig. 1C**). The primary adverse effect was injection site pain, with a Visual Analog Scale (VAS) score of 3–5, which was tolerable and resolved within 24 hours. Following the sixth injection, the lesion exhibited further reduction in size, measuring 5.5 × 2.7 × 0.6 cm. The patient reported complete resolution of pain and pruritus; however, ulceration developed at the lesion site without pain (**Fig. 1H**). By the eighth injection, the lesion measured 5 × 2.5 × 0.4 cm, with a VSS score of 7. Although the patient reported no pain or pruritus, the ulceration had expanded, prompting an adjustment in the combination ratio of 5-FU and TA to 1:1 (**Fig. 1J**). After 11 injection sessions, the lesion showed significant reduction in size and flattening, measuring 4.9 × 2.4 × 0.3 cm, with a VSS score of 5 (**Fig. 1K**). Due to the marked improvement, the injection therapy was discontinued, and the patient was scheduled for a follow-up assessment the following week. At week 12, the lesion had further decreased to 4.9 × 2.4 × 0.1 cm, with a VSS score of 4 (**Fig. 3**). The patient reported no pain or pruritus associated with the lesion

3. DISCUSSION

Keloids result from a hyperproliferative response of connective tissue to trauma, typically occurring in areas of high skin tension.[16] They are characterized by the extension of scar tissue beyond the boundaries of the original wound, distinguishing them from hypertrophic scars, which remain confined to the injury site.[17] Although epidemiologic data on keloid prevalence are limited, existing studies suggest a higher prevalence among females and individuals with darker skin tones, particularly those of African or Asian descent.[18] According to Oei et al., 44 cases of keloids were reported in 2021, with the majority of patients being women (58.8%). Notably, 63.6% of these patients had no family history of keloids. Patients with Fitzpatrick skin types III and IV are more susceptible to keloid development.[17] This observation is consistent with the current case, involving a woman with Fitzpatrick type III skin and no family history of keloids. It is also possible that female patients may seek medical care more frequently due to greater concerns about aesthetic outcomes.

Keloids can develop following various disruptions of skin integrity. Traumatic factors associated with keloid formation include friction, scratching, surgical procedures, burns, vaccinations, piercings, tattoos, shaving, and skin infections or inflammations such as chickenpox, herpes zoster, acne vulgaris, and folliculitis.[18,19] he precise pathogenesis of excessive scarring remains incompletely understood; however, it is thought to involve numerous transcription factors, growth factors, cytokines, and extracellular matrix (ECM) proteins during the tissue repair process.[18,20] Wound healing is a complex, multi-phase process comprising hemostasis, inflammation, proliferation, and remodeling..[18] During the inflammatory phase, the

innate immune system is activated in response to damage-associated molecular patterns (DAMPs) and danger signals. The proliferation phase is characterized by granulation tissue formation, angiogenesis, and keratinocyte migration. In the remodeling phase, blood vessels regress, and collagen type III is gradually replaced by collagen type I.[18,21] Keloid formation is associated with the overactivation of fibroblasts, driven by the overexpression of transforming growth factor-beta (TGF-β), leading to excessive synthesis of ECM collagen.[20,22] Specifically, TGF-β1 isoforms have been implicated in the overproduction of collagen by fibroblasts in pathological lesions.[20,23]

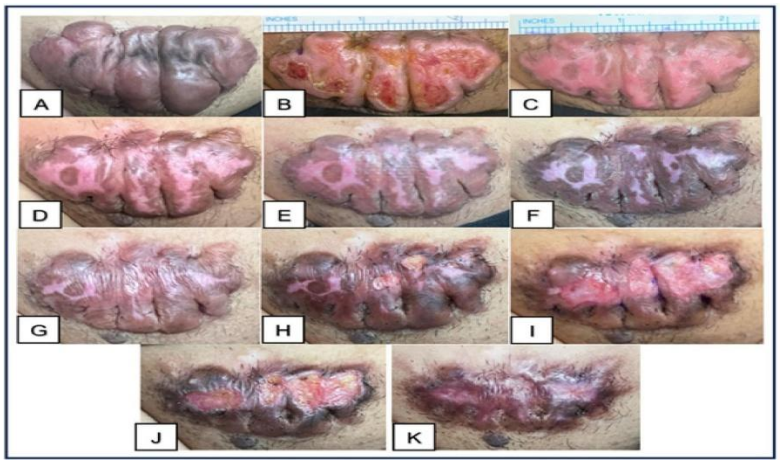

Figure 1. Keloid scar from the beginning of therapy until the last therapy (A) before therapy (B) 1 week after cryotherapy. Using a combination of 40% TA with intralesional 5-FU (C) after 1 week

(D) after 2 weeks (E) after 3 weeks (F) after 4 weeks (G) after 5 weeks (H) after 6 weeks (I) after 7 weeks (J) after 8 weeks (K) after 9 weeks

The primary goal of keloid therapy is to minimize the risk of functional and cosmetic impairment.[9,24] However, there is no single standardized or universally effective treatment for keloids.[17] Current therapeutic options include intralesional corticosteroid injections, 5-FU injections, cryotherapy, and surgical excision.[2] Since the mid-1960s, intralesional corticosteroid injections, particularly TA, have been widely used for keloid management.[25] Corticosteroids exert their effects by reducing fibroblast proliferation, inhibiting collagen and glycosaminoglycan synthesis, and suppressing inflammatory mediators. They also promote collagen degradation by inhibiting α2-macroglobulin, which normally blocks collagenase activity, thereby enabling collagenase to break down collagen. Furthermore, corticosteroids inhibit vascular endothelial growth factor (VEGF) and TGF-β1, contributing to scar regression.[25,26] TA is the most commonly used corticosteroid, typically administered at a concentration of 10 mg/mL, though higher concentrations (e.g., 40 mg/mL) may be employed.[17] However, corticosteroid use is associated with potential side effects, including skin atrophy, telangiectasia, hypopigmentation, ulceration, and, in rare cases, systemic complications such as Cushing's syndrome.[26] Alongside TA, 5-FU is commonly used in keloid treatment. 5-FU inhibits thymidylate synthase, an enzyme essential for DNA synthesis, and is incorporated into both DNA and RNA, disrupting their functions and affecting cellular protein production, including TGF-β. TGF-β is a key signaling protein involved in collagen production and fibroblast activity. Intralesional injection of 5-FU is thought to reduce fibroblast proliferation, thereby decreasing scar tissue formation and maintenance.[27] Adverse effects associated with 5-FU include pain, ulceration, burning sensations, and hyperpigmentation at the injection site.[28]

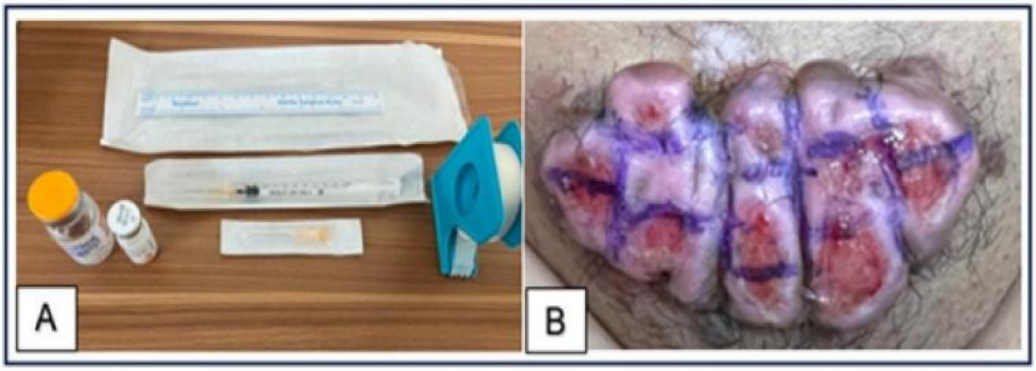

Figure 2. Equipment and patient preparation (A) Drugs and tools used (B) Injection site

Several studies have demonstrated that combination therapy is more effective than monotherapy for keloid management.[8] For instance, Khan et al.[29] compared TA monotherapy with the combination of TA and 5-FU in 150 keloid patients. The combination therapy resulted in an 84% reduction in lesion height, whereas only 68% of patients receiving TA monotherapy achieved similar outcomes.[29] While the therapeutic benefits of 5-fluorouracil (5-FU) and triamcinolone acetonide (TA) combination therapy are well-established, evidence regarding its efficacy and safety in Asian populations, especially Indonesian patients, remains scarce. Additionally, the optimal drug ratio and administration protocol for this combination lack standardized guidelines.[29,30] However, studies have supported the use of intralesional 5-FU and TA at ratios of 9:1 or 3:1.[8] Intralesional injections are typically administered at 2-3 week intervals, with variable treatment outcomes reported across studies. However, some researchers have investigated weekly administration protocols. Khalid et al. demonstrated that weekly combined 5-FU and triamcinolone acetonide (TAC) injections were more effective and safer than TAC monotherapy, showing significant scar tissue reduction, lower recurrence rates, and minimal side effects. This approach appears biologically plausible since fibroblast growth regression is dose- and time-dependent.[15]

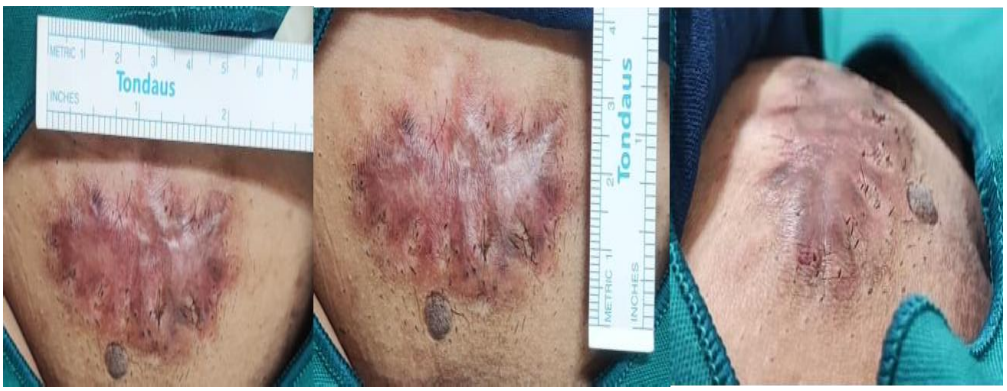

Figure 3. Keloid lesion size at week 12 following combination therapy with 5-FU and 40% TA injections

Based on these considerations, a therapeutic approach prioritizing patient comfort and lesion size reduction was selected. Cryotherapy, while effective, can cause significant discomfort due to pain and ulceration, potentially interfering with daily activities and making it less favorable for some patients. Therefore, intralesional injection therapy was chosen. Given the lesion size, a combination of TA and 5-FU was selected to minimize steroid-related side effects while maintaining therapeutic efficacy. The combination of TA and 5-FU has been shown to be effective in reducing keloid size and lowering recurrence rates. In this case, the patient was treated with weekly combination of 40% TA and 5-FU in a 1:9 ratio, administered at a dose of 0.1 mL per cm of lesion length. Weekly follow-up assessments were conducted to monitor therapeutic progress. By the first week post-injection, the keloid exhibited a reduction in size, indicating a positive response to therapy. After 11 injection sessions, the lesion size decreased to 4.9 × 2.4 × 0.1 cm. The reported adverse effects included ulceration and injection site pain, with a VAS score of 3–5, which resolved within 24 hours.

Keloids are benign neoplasms that do not pose a direct threat to life.[31] However, keloids do not regress to normal skin and can lead to significant cosmetic and functional impairments.[32] Given their high recurrence rates, careful selection of appropriate therapeutic interventions and comprehensive patient education regarding keloid management are essential.[33]

4. CONCLUSION

Keloids are benign fibroproliferative lesions that can significantly impair both the cosmetic appearance and functional integrity of the affected area. When managing keloids, it is essential to balance therapeutic efficacy with potential adverse effects to ensure patient comfort and satisfaction. The weekly combination of 5-FU and 40% TA in a 1:9 ratio has been shown to be an effective treatment option. After 12 weeks of therapy, this combination demonstrated a significant reduction in lesion size while maintaining a favorable safety profile. The observed adverse effects were generally well-tolerated and deemed acceptable by patients. In this case, ulceration developed after the sixth injection. If therapy had been continued, the ulceration would likely have expanded, despite being non-painful. Therefore, adjusting the ratio of 5-FU and TA should be considered in such scenarios. However, these findings are based on a single patient over a 12-week period, highlighting the need for further research with larger sample sizes and longer follow-up durations to validate these observations.

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REFERENCES

[1] Ogawa R. Keloid and hypertrophic scars are the result of chronic inflammation in the reticular dermis. Int J Mol Sci. 2017;18(3).

[2] Ogawa R. The most current algorithms for the treatment and prevention of hypertrophic scars and keloids: a 2020 update of the algorithms published 10 years ago. Plast Reconstr Surg. 2022;149(1):79E-94E.

[3] Hao Y-H, Xing X-J, Zhao Z-G, Xie F, Hao T, Yang Y, et al. A multimodal therapeutic approach improves the clinical outcome of auricular keloid patients. Int J Dermatol. 2019;58(6):745–9.

[4] Zhuang ZH, Li YT, Wei XJ. The safety and efficacy of intralesional triamcinolone acetonide for keloids and hypertrophic scars: a systematic review and meta-analysis. Burns. 2021;47(5):987–98.

[5] Lee HJ, Jang YJ. Recent understandings of biology, prophylaxis and treatment strategies for hypertrophic scars and keloids. Int J Mol Sci. 2018;19(3).

[6] Huang C, Wu Z, Du Y, Ogawa R. The epidemiology of keloids. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management. Switzerland: Springer; 2020. p. 29–35.

[7] Chiang RS, Borovikova AA, King K, Banyard DA, Lalezari S, Toranto JD, et al. Current concepts related to hypertrophic scarring in burn injuries. Wound Repair Regen. 2016;24(3):466–77.

[8] Reinholz M, Guertler A, Schwaiger H, Poetschke J, Gauglitz GG. Treatment of keloids using 5-fluorouracil in combination with crystalline triamcinolone acetonide suspension: evaluating therapeutic effects by using non-invasive objective measures. J Eur Acad Dermatology Venereol. 2020;34(10):2436–44.

[9] Elsaie ML. Update on management of keloid and hypertrophic scars: a systemic review. J Cosmet Dermatol. 2021;20(9):2729–38.

[10] Sharma S, Bassi R, Gupta A. Treatment of small keloids with intralesional 5-fluorouracil alone vs. intralesional triamcinolone acetonide with 5-fluorouracil. J Pakistan Assoc Dermatologists. 2012;22(1):35–40.

[11] Wolfram D, Tzankov A, Pülzl P, Piza-Katzer H. Hypertrophic scars and keloids - a review of their pathophysiology, risk factors, and therapeutic management. Dermatologic Surg. 2009;35(2):171–81.

[12] Nanda S, Reddy BSN, Fitzpatrick RE. Intralesional 5-fluorouracil as a treatment modality of keloids. Dermatologic Surg. 2004;30(1):54–7.

[13] Walsh LA, Wu E, Pontes D, Kwan KR, Poondru S, Miller CH, et al. Keloid treatments: an evidence-based systematic review of recent advances. Syst Rev. 2023;12(1).

[14] Saleem F, Rani Z, Bashir B, Alta F, Khurshid K, Pal SS. Comparison of efficacy of intralesional 5-fluorouracil plus triamcinolone versus triamcinolone alone in the treatment of keloids. Med Forum Mon. 2022;33(5):62–6.

[15] Khalid FA, Mehrose MY, Saleem M, Yousaf MA, Mujahid AM, Rehman SU, et al. Comparison of efficacy and safety of intralesional triamcinolone and combination of triamcinolone with 5-fluorouracil in the treatment of keloids and hypertrophic scars: randomised control trial. Burns. 2019;45(1):69–75.

[16] Berman B, Sadegh Amini, Hilary Baldwin. Keloid management. In: June K Robinson, C William Hanke, Daniel M Siegel, Alina Fratila, editors. Surgery of the skin. third. Elsevier Inc; 2015. p. 674–87.

[17] Smith N, Kelly B. Cha, Christopher Bichakjian. Perioperative considerations in dermatologic surgery. In: Kang S, Amagai M, Bruckner AL, Enk AH, Margolis DJ, McMichael AJ, et al., editors. Fitzpatrick's Dermatology. Edisi ke-9th New York: Mc Graw-Hill; 2019. p. 3706–24.

[18] Lee CC, Tsai CH, Chen CH, Yeh YC, Chung WH, Chen CB. An updated review of the immunological mechanisms of keloid scars. Front Immunol. 2023;14(March):1–15.

[19] Manoharan A, Rao SM. Analysis of risk factors behind keloid. 2020;6(2):138–41.

[20] Udayan Betarbet, Travis W. Blalock. Keloids: a review of etiology, prevention, and treatment. J Clin Aesthet

Dermatol. 2020;13(2):33–43.

[21] Magda M.W.Ulrich. Fetal wound healing. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management. Switzerland: Springer; 2020. p. 4–9.

[22] Wang PH, Huang BS, Horng HC, Yeh CC, Chen YJ. Wound healing. J Chinese Med Assoc. 2018;81(2):94–101.

[23] Elazhary E, Abd Al-Salam F, Abd El-Hafiz H, Maghraby H. Updates on keloid scar pathogenesis, assessment and treatment modalities. J Recent Adv Med. 2022;3(1):75–86.

[24] Vivas AC, Tang JC, Maderal AD, Viera MH. Hypertrophic scars and keloids, part 1: conventional treatments. Cosmet Dermatology. 2012;25(7):309–16.

[25] Coppola MM, Salzillo R, Segreto F, Persichetti P. Triamcinolone acetonide intralesional injection for the treatment of keloid scars : patient selection and perspectives. Clin Cosmet Investig Dermatol. 2018;24(11):387–96.

[26] Lee J, Kim J. Minimal-invasive technologies for treatment of hts and keloids: corticosteroids. In: Téot L, Mustoe TA, Middelkoop E, Gauglitz GG, editors. Textbook on Scar Management. Switzerland: Springer; 2020. p. 244–9.

[27] Rabey NG, Goldie SJ, Price RD. 5-fluorouracil for keloid scars (protocol). Cochrane Database Syst Rev. 2017;(9).

[28] Agusni JH, Sutedja EK, Chandra F. Triamcinolone acetonide and 5-fluorouracil intralesional combination injection in keloid treatment. Int J Integr Heal Sci. 2017;5(1):36–41.

[29] Khan MA, Bashir MM, Khan FA. Intralesional triamcinolone alone and in combination with 5-fluorouracil for the treatment of keloid and hypertrophic scars. J Pak Med Assoc. 2014;64(9):1003–7.

[30] Gauglitz GG, Korting HC, Pavicic T, Ruzicka T, Jeschke MG. Hypertrophic scarring and keloids: pathomechanisms and current and emerging treatment strategies. Mol Med. 2011;17(1–2):113–25.

[31] Limandjaja GC, Niessen FB, Scheper RJ, Gibbs S. The keloid disorder: heterogeneity, histopathology, mechanisms and models. Front Cell Dev Biol. 2020;8(5).

[32] Ekstein SF, Wyles SP, Moran SL, Meves A. Keloids: a review of therapeutic management. Int J Dermatol. 2021;60(6):661–71.

[33] Limmer EE, Glass DA. A review of current keloid management: mainstay monotherapies and emerging approaches. Dermatol Ther (Heidelb). 2020;10(5):931–48.