

Keloid Recurrence after Surgical Excision: Current Evidence and Adjuvant Treatment Strategies

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ABSTRACT

Keloid recurrence remains a major challenge after surgical excision, particularly when surgery is performed without a postoperative treatment plan. This narrative review examines clinical evidence for radiotherapy, intralesional corticosteroids and 5-fluorouracil, silicone sheeting, and compression as adjuncts to excision. Selected studies suggest that postoperative radiotherapy and multimodal treatment can achieve favorable local control, although recurrence estimates differ considerably across treatment protocols and anatomical sites. In a retrospective radiation cohort involving 250 lesions, recurrence was 1.6% after 20 Gy in five fractions and 9.6% after lower-dose schedules. A comparative auricular study reported recurrence in 21.7% of patients treated with 5-fluorouracil plus triamcinolone and compression, compared with 38.3% receiving triamcinolone and compression. Interpretation is constrained by differences in recurrence definitions, follow-up, and whether outcomes are reported per patient or per lesion. For clinical practice, the available literature favors planning adjuvant treatment alongside excision, while tailoring the choice of therapy to lesion location, previous treatment, adverse effects, and the feasibility of follow-up.

KEYWORDS: keloid; recurrence; surgical excision; radiotherapy; triamcinolone; 5-fluorouracil; compression.

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I. INTRODUCTION

Keloids present a persistent reconstructive problem: removing the raised scar does not necessarily resolve the process responsible for its formation. A technically satisfactory excision may be followed by renewed growth, discomfort, or cosmetic dissatisfaction. Consequently, the outcome that matters most is sustained control rather than the appearance of the wound immediately after surgery. Contemporary recommendations emphasize clinical assessment, scar location, and multimodal management [5,6].

The literature on postoperative treatment is extensive but difficult to compare. Some studies assess recurrence after excision; others measure flattening or symptom improvement in scars that were never surgically

removed. Moreover, evidence from small auricular keloids is often discussed alongside results from lesions on the chest, shoulders, and other sites. This review evaluates the principal adjunctive approaches used after excision and considers how their reported outcomes can inform surgical decision-making [1–4].

II. REVIEW APPROACH

A targeted narrative search of PubMed-indexed literature, available full-text articles, and publisher records informed this review. Search concepts included keloid, surgical excision, recurrence, postoperative radiotherapy, triamcinolone, 5-fluorouracil, silicone, compression, and imiquimod. Primary studies describing excision followed by

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adjunctive treatment were prioritized; reviews and consensus documents were used to contextualize findings. Publications represented in the selected bibliography span 1996–2026. This narrative review provides a critical synthesis of selected clinical studies, focusing on recurrence outcomes, treatment efficacy, and the clinical applicability of adjuvant strategies following keloid excision. Reports on nonsurgical treatment of established keloids were considered only as indirect evidence for postoperative prevention.

III. SURGICAL EXCISION AND THE MEANING OF RECURRENCE

The operative method and subsequent scar care should be considered together. De Sousa et al. used a keloid rind flap with corticosteroid injections and silicone sheeting, whereas Qi et al. described core excision followed by radiation and pressure [3,4]. Their outcomes reflect treatment packages rather than the isolated effect of a particular excision technique. Similarly, site-specific approaches combining surgical planning, radiation, and ongoing scar care make it difficult to assign benefit to any one component [7].

Recurrence also requires a clear definition. Renz et al. counted clinically apparent redevelopment at the treated site as local failure [1]. Other publications report response rates, scar scores, or patient satisfaction. These measures address related but different clinical questions. Comparisons are most informative when they retain the original endpoint, distinguish patients from lesions, and account for the duration of follow-up.

IV. POSTOPERATIVE RADIOTHERAPY

Radiotherapy is among the better studied postoperative adjuncts. In a retrospective series of 124 patients and 250 lesions, Renz et al. found recurrence in 1.6% of lesions treated with 20 Gy in five fractions, versus 9.6% after 12–16 Gy in three or four fractions, at a median follow-up of 40 months [1]. The difference suggests a dose–response relationship within that cohort. Because treatment assignment was not randomized, however, these findings should guide interpretation rather than be treated as a universal prescription.

Systematic reviews have examined external-beam radiation and brachytherapy, but comparisons across studies are affected by variation in dose, anatomical distribution, and observation periods [8,9]. A more recent meta-analysis encompassing 106 studies reported no statistically significant difference in recurrence or complications by radiation modality or whether treatment began within or after 24 hours [10]. That result does not eliminate the practical importance of coordinating surgery and radiation in advance. Choice of modality, field, dose, and expected late effects requires radiation-oncology input, especially near sensitive structures.

In a randomized study, Sclafani et al. compared postoperative radiotherapy with corticosteroid injections following surgical excision of earlobe keloids. Recurrence

was observed in 2 of 16 lesions treated with radiotherapy and 4 of 12 lesions receiving corticosteroid injections after a minimum follow-up of 12 months [11]. Although recurrence was numerically lower in the radiotherapy group, the difference was not statistically significant.

V. INTRALESIONAL THERAPY

Corticosteroid injections are widely used after keloid surgery, either alone or with other interventions. Khalid et al. compared postoperative 5-fluorouracil plus triamcinolone with radiotherapy for ear keloids and reported treatment efficacy of 73.33% and 43.33%, respectively [2]. Because these figures were reported as efficacy outcomes, they should not be presented as postoperative recurrence rates without verifying the study's specific definition and assessment period.

Injection timing may matter. In a randomized study of 34 patients with auricular keloids, Burusapat et al. found lower recurrence with immediate than with delayed triamcinolone injection at five months [13]. Earlier experience with perioperative steroid injections similarly supports the feasibility of combined treatment, although longer follow-up is needed to evaluate sustained control [14]. Evidence comparing intralesional drugs in unexcised keloids helps explain treatment options but cannot directly establish postoperative prophylactic efficacy [12,16].

In a comparative study of 120 patients with ear keloids, Lamba et al. reported one-year cumulative recurrence of 13/60 (21.7%) after 5-fluorouracil plus triamcinolone and 23/60 (38.3%) after triamcinolone alone; both groups used compression [15]. These are patient-based denominators, despite the presence of bilateral lesions in many participants. The combination arm had more local adverse effects, including ulceration and wound dehiscence. Thus, the potential improvement in control must be considered alongside treatment tolerability and the limitations of the study design.

VI. SILICONE AND COMPRESSION

Physical scar management is appealing because it can be continued beyond the immediate postoperative period, although adherence is a major practical consideration. De Sousa et al. observed two recurrences among 22 auricular lesions treated with excision, corticosteroids, and silicone sheeting after a mean follow-up of 16 months [3]. Datema et al. reported one recurrence among 16 lesions managed with excision, repeated steroid injections, and a custom pressure device; the patient with recurrence had discontinued pressure treatment [17]. Neither series can isolate the contribution of silicone or compression from the accompanying treatments.

A 2024 meta-analysis reported recurrence estimates of 10.66% for excision plus compression earrings and 9.09% when silicone sheeting was also used, without a statistically significant difference between modalities [18]. These results predominantly concern auricular scars. Their applicability to

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anatomical regions where sustained pressure is difficult remains uncertain. Device fit, discomfort, and patient willingness to maintain treatment deserve attention during preoperative counseling.

VII. OTHER POSTOPERATIVE APPROACHES

Recent studies illustrate the diversity of combined protocols rather than a single emerging standard. Qi et al. described 11 patients with 21 auricular lesions treated with core excision, planned electron-beam radiation, and pressure clips; two patients developed mild recurrence, including one who

declined radiation [4]. Because recurrence was reported at the patient level, the number of lesions should not be used as its denominator.

Topical agents have also been studied. In a small paired-lesion randomized trial, Ricciardi et al. observed recurrence in three of eight imiquimod-treated lesions and four of eight lesions treated with topical methylprednisolone aceponate during the first year [19]. The limited sample and follow-up losses preclude a confident preference for either regimen.

SELECTED CLINICAL EVIDENCE

Table 1. Selected clinical reports. Outcomes differ in definition, denominator, and follow-up and are not direct head-to-head comparisons.

Study	Population / intervention	Reported finding
Renz 2018 [1]	250 lesions; retrospective radiation cohort	1.6% vs 9.6% recurrence; median 40 months
Khalid 2018 [2]	Randomized; excision + 5-FU/TCA vs radiation	73.33% vs 43.33% efficacy (not recurrence)
De Sousa 2014 [3]	22 ear lesions; multimodal series	2/22 recurrences; mean 16 months
Sclafani 1996 [11]	Randomized; earlobe lesions	2/16 vs 4/12 recurrences
Burusapat 2021 [13]	34 patients; immediate vs delayed steroid	Lower recurrence with immediate injection at 5 months
Lamba 2025 [15]	120 patients; both groups used compression	13/60 vs 23/60 patients with recurrence
Datema 2023 [17]	16 auricular lesions; triple therapy	1/16 recurrence; mean 28 months
Qi 2025 [4]	11 patients; 21 ear lesions; combined treatment	2 patients with mild recurrence
Ricciardi 2025 [19]	8 completers; paired-lesion randomized study	3/8 vs 4/8 lesions recurred

VIII. DISCUSSION

The most useful conclusion from the available studies is not that one adjunct should follow every keloid excision, but that postoperative treatment needs to be planned as deliberately as the operation itself. Radiation studies provide some of the clearest lesion-level recurrence data, including a signal that dose matters [1]. Intralesional regimens offer an alternative or complement, particularly in auricular disease, but repeated visits and local adverse effects influence whether a patient can complete the proposed course [2,13,15]. Compression and silicone may contribute to multimodal management, although the evidence rarely separates their effects from steroids or the surgical technique [3,17,18].

Anatomical site is central to applying these findings. Much of the prospective and recent comparative evidence concerns the ear, where pressure devices can be fitted and lesions are relatively small. A protocol that is practical for an earlobe cannot automatically be extended to a broad chest or shoulder keloid. For larger or recurrent lesions, the surgeon must also consider closure tension, reconstructive requirements, previous treatment, and whether radiotherapy

can be arranged within the intended postoperative pathway [5,7]. These considerations support individualized planning, not a validated site-based algorithm.

Apparent differences in reported recurrence rates also deserve careful interpretation. A study reporting two recurrent patients among eleven participants cannot be compared directly with one reporting two recurrent lesions among twenty-two scars. A five-month assessment may capture early regrowth but miss later failure. Likewise, efficacy and scar improvement are not equivalent to absence of recurrence [2,4,13]. These distinctions are particularly important when several lesions are treated in one patient or when multiple adjuncts are given together.

Treatment burden and safety should be part of the discussion with patients. Steroid-associated atrophy and pigmentary change, as well as pain, ulceration, or wound complications associated with fluorouracil-containing regimens, may affect adherence [15–17]. Radiation introduces a different set of questions about dose, exposure of adjacent tissues, and potential late effects; small series with limited follow-up cannot adequately quantify rare delayed

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harms [5,10]. Patient preferences and access to repeated appointments therefore have clinical relevance alongside published recurrence percentages.

This review has limitations. The literature search was targeted rather than systematic, and the included studies varied in design, treatment protocols, definitions of recurrence, and follow-up duration, limiting direct comparisons. No formal risk-of-bias assessment or quantitative synthesis was performed. In addition, potential overlap among primary cohorts included in existing systematic reviews should be considered when interpreting their findings [6,8–10,20].

Future studies should use prespecified definitions of recurrence, report outcomes at both the patient and lesion levels, and document adherence to postoperative treatment. Longer follow-up, together with assessment of symptoms and quality of life, would help clarify the durability and clinical relevance of treatment outcomes. These measures would support more reliable comparisons of adjuvant strategies and better-informed reconstructive decisions.

IX. CONCLUSION

Surgical excision should be considered part of a comprehensive strategy to prevent keloid recurrence. Postoperative radiotherapy and multimodal approaches incorporating intralesional therapy, silicone, or compression have shown promising outcomes, although heterogeneity in the available evidence limits direct comparisons and prevents identification of a single optimal regimen across anatomical sites. Adjuvant treatment should be individualized according to lesion characteristics, patient preferences, and treatment feasibility, with postoperative care planned before surgery whenever possible. Treatment success should be assessed through clearly defined recurrence outcomes and sufficiently long follow-up, together with improvements in symptoms and quality of life.

REFERENCES

- I. Renz P, Hasan S, Gresswell S, Hajjar RT, Trombetta M, Fontanesi J. Dose Effect in Adjuvant Radiation Therapy for the Treatment of Resected Keloids. *Int J Radiat Oncol Biol Phys.* 2018;102(1):149-154. doi:10.1016/j.ijrobp.2018.05.027.
- II. Khalid FA, Farooq UK, Saleem M, et al. The efficacy of excision followed by intralesional 5-fluorouracil and triamcinolone acetonide versus excision followed by radiotherapy in the treatment of ear keloids: A randomized control trial. *Burns.* 2018;44(6):1489-1495. doi:10.1016/j.burns.2018.02.017.
- III. De Sousa RF, Chakravarty B, Sharma A, Parwaz MA, Malik A. Efficacy of triple therapy in auricular keloids. *J Cutan Aesthet Surg.* 2014;7(2):98-102. doi:10.4103/0974-2077.138347.
- IV. Qi Y, Xu S, Wang J, Xin C, Li X, Lin B. The clinical application of ear keloid using five-blade core excision combined with pressure and superficial electron beam radiation. *Front Med (Lausanne).* 2025;12:1634961. doi:10.3389/fmed.2025.1634961.
- V. Ogawa R, Akita S, Akaishi S, et al. Diagnosis and Treatment of Keloids and Hypertrophic Scars-Japan Scar Workshop Consensus Document 2018. *Burns Trauma.* 2019;7:39. doi:10.1186/s41038-019-0175-y.
- VI. Walsh LA, Wu E, Pontes D, Kwan KR, Poondru S, Miller CH, Kundu RV. Keloid treatments: an evidence-based systematic review of recent advances. *Syst Rev.* 2023;12(1):42. doi:10.1186/s13643-023-02192-7.
- VII. Ogawa R, Tosa M, Dohi T, Akaishi S, Kuribayashi S. Surgical excision and postoperative radiotherapy for keloids. *Scars Burn Heal.* 2019;5:2059513119891113. doi:10.1177/2059513119891113.
- VIII. Mankowski P, Kanevsky J, Tomlinson J, Dyachenko A, Luc M. Optimizing Radiotherapy for Keloids: A Meta- Analysis Systematic Review Comparing Recurrence Rates Between Different Radiation Modalities. *Ann Plast Surg.* 2017;78(4):403-411. doi:10.1097/SAP.0000000000000989.
9. van Leeuwen MCE, Stokmans SC, Bulstra AEJ, et al. Surgical Excision with Adjuvant Irradiation for Treatment of Keloid Scars: A Systematic Review. *Plast Reconstr Surg Glob Open.* 2015;3(7):e440. doi:10.1097/GOX.0000000000000357.
- IX. Seth I, Gibson D, Marcaccini G, et al. Post-excisional radiotherapy for keloid treatment: A systematic review and meta-analysis. *J Plast Reconstr Aesthet Surg.* 2026;113:459-531. doi:10.1016/j.bjps.2025.11.016.
- X. Sclafani AP, Gordon L, Chadha M, Romo T 3rd. Prevention of earlobe keloid recurrence with postoperative corticosteroid injections versus radiation therapy: a randomized, prospective study and review of the literature. *Dermatol Surg.* 1996;22(6):569-574. doi:10.1111/j.1524-4725.1996.tb00376.x.
- XI. Srivastava S, Patil A, Prakash C, Kumari H. Comparison of Intralesional Triamcinolone Acetonide, 5- Fluorouracil, and Their Combination in Treatment of Keloids. *World J Plast Surg.* 2018;7(2):212-219. PMID:30083505.
- XII. Burusapat C, Wanichjaroen N, Wongprakob N, Sapruangthong R. The Effectiveness of Immediate Triamcinolone Acetonide Injection after Auricular Keloid Surgery: A Prospective Randomized Controlled Trial. *Plast Reconstr Surg Glob Open.*

2021;9(8):e3729.

doi:10.1097/GOX.00000000000003729.

- XIII. Jung JY, Roh MR, Kwon YS, Chung KY. Surgery and Perioperative Intralesional Corticosteroid Injection for Treating Earlobe Keloids: A Korean Experience. *Ann Dermatol.* 2009;21(3):221-225. doi:10.5021/ad.2009.21.3.221.
- XIV. Lamba RS, Pargal P, Salwan A, Junaide PM, Nigam P, Bansal N. Combination Therapy of 5-Fluorouracil and Triamcinolone Acetonide with Compression Therapy after Surgical Excision in the Management of Keloids in Ears. *Indian J Plast Surg.* 2025;58(2):105-109. doi:10.1055/s-0044-1801403.
- XV. Morelli Coppola M, 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;11:387-396. doi:10.2147/CCID.S133672.
- XVI. Datema FR, Saridin J, Timmer FCA, Rothuizen LT, van Zijl FVWJ. Triple Therapy Protocol for Primary and Secondary Auricular Keloids: A Prospective Outcome Evaluation. *Dermatol Surg.* 2023;49(9):838-843. doi:10.1097/DSS.0000000000003867.
- XVII. Tahir SM, Ihebom D, Simman R. Compression Therapy for Keloid Scars: A Systematic Review and Meta- analysis. *Plast Reconstr Surg Glob Open.* 2024;12(6):e5864. doi:10.1097/GOX.0000000000005864.
- XVIII. Ricciardi AS, Chedid MF, Thompson CE, da Silva RK, Azulay DR, Manela-Azulay M. Randomized clinical trial comparing removal followed by topical imiquimod versus removal followed by topical methylprednisolone in the treatment of keloids. *Acta Cir Bras.* 2025;40:e406225. doi:10.1590/acb406225.
- XIX. Wojarska M, Kokot K, Ossowska B, et al. Surgical Excision with Adjuvant Therapies in the Management of Keloids: A Systematic Review. *Medicina (Kaunas).* 2026;62(5):916. doi:10.3390/medicina62050916.