Open Access

Original Article

Comparing the Efficacy of Intralesional Combination of Verapamil and Triamcinolone Vs Intralesional Triamcinolone for Treatment of Keloid

Muhammad Tayyab Iqbal, Qamar Uddin Khan, Hina Mazhar*, Asma Malik, Madeeha Shaukat***, Muhammad Farhan Shahid****

Departments of Dermatology, Combined Military Hospital Lahore/National University of Medical Sciences (NUMS) Pakistan,*Departments of Dermatology, Combined Military Hospital Quetta/National University of Medical Sciences (NUMS) Pakistan,** Departments of Dermatology, Combined Military Hospital Multan/National University of Medical Sciences (NUMS) Pakistan,***Departments of Dermatology, KRL Hospital Kahuta Pakistan

ABSTRACT

Objective: To compare intralesional combination of verapamil with triamcinolone versus intralesional triamcinolone for resolution of keloid in terms of mean change in Vancouver Scar Scale (VSS).

Study Design: Randomized Controlled Trial (Trial Registration: TCTR20251117012)

Place and Duration of Study: Departments of Dermatology, Pakistan Emirates Military Hospital (PEMH), and Combined Military Hospital (CMH), Rawalpindi, Pakistan, from Feb to Aug 2025.

Methodology: This study included 60 patients, 30 in each group, with diagnosis of keloid and hypertrophic scars where Group-A received combined injection of triamcinolone acetonide (TAC) (20mg/ml) and verapamil (1.25mg/ml), while Group-B received only injection of TAC 20 mg/ml, at three weeks interval for maximum five sessions. After five sessions, keloid scars were assessed by VSS.

Results: The study participants had an mean age of 32.58 ± 8.09 years with an mean duration of symptoms lasting 8.27 ± 2.50 months and mean baseline VSS score of 8.48 ± 2.39. Demographic distribution showed 51.70% male and 48.30% female participation. There were no remarkable differences between the groups regarding age distribution, gender, duration of keloids or baseline VSS score. After treatment, the VSS scores were significantly reduced in Group-A (3.37 ± 1.96) compared to Group-B (5.77 ± 2.40) where $p<0.001$.

Conclusion: Intralesional verapamil combined with TAC is significantly more effective than TAC alone in reducing keloid severity, as demonstrated by a greater reduction in VSS scores.

Keywords: Intralesional, Keloid, Triamcinolone, Verapamil

How to Cite This Article: *Iqbal MT, Khan QU, Mazhar H, Malik A, Shaukat M, Shahid MF. C Comparing the Efficacy of Intralesional Combination of Verapamil and Triamcinolone Vs Intralesional Triamcinolone for Treatment of Keloid. Pak Armed Forces Med J 2026; 76(Suppl-3): S611-S615. DOI: https://doi.org/10.51253/pafmj.v76i2.14065*

INTRODUCTION

Keloids arise from excessive collagen deposition in dermal and subdermal tissue, resulting from disrupted wound healing mechanisms, frequently following surgical intervention, burn injuries, inflammatory and other cutaneous traumas, often extending beyond boundaries of original injury and may result in both aesthetic and functional disabilities.[1] A broad spectrum of therapeutic strategies for keloids is available, ranging from non-invasive to surgical interventions but high recurrence rate remains a problem.[2] Corticosteroids, particularly triamcinolone acetonide (TAC), are typically the first-line treatment for keloids, working by modulating inflammatory pathways but having significantly variable efficacy when given as monotherapy.[1] Verapamil is another potential treatment option, which enhances collagen breakdown through increased collagenase activity while suppressing inflammatory cytokines involved in scar development, aiding in the improvement and remodelling of keloid scars.[3] The efficacy of verapamil and TAC alone has been evaluated in existing literature, and TAC has been found to be more effective[3, 4] notably reported in one study where a significant difference was found among both groups (p-value=0.010)[5] while another study found that VSS among combination groups was 0.19±0.21, whereas the TAC group was 0.86±0.61 with p-value <0.05.[6] Although TAC is widely used and effective, it is often linked with greater frequency of adverse events while verapamil has demonstrated more favourable safety profile.[7] Despite the documented effectiveness of both drugs, limited data exist regarding their combined therapeutic use in Pakistan, therefore, this study was undertaken to evaluate effectiveness of combination of intralesional TAC with verapamil versus TAC monotherapy for the management of keloids in our population.

Correspondence: Dr Muhammad Tayyab Iqbal, Departments of Dermatology, Combined Military Hospital Lahore Pakistan

Received: 25 Nov 2025; revision received: 03 Jun 2026; accepted: 09 Mar 2026

METHODOLOGY

This randomized controlled trial study began from 14th February to 14th August, 2025 at the Departments of Dermatology, Pakistan Emirates Military Hospital (PEMH), and Combined Military Hospital (CMH), Rawalpindi, Pakistan, upon obtaining ethics clearance from the institutional Ethics Review Board (Letter no A/28/ERC/185/24, dated 25th November 2024) prior to the recruitment process. Probability sampling using purposive technique was used. The trial was registered at https://www.thaiclinicaltrials.org with registration no TCTR20251117012.

Inclusion Criteria: Male and female individuals, between 18 to 55 years in age, having post-surgical or post-injury keloids were included.

Exclusion Criteria: Patients who had undergone previous treatment for keloids in head and neck region, keloids aged <3 months or >1 year after surgery/injury, keloids smaller than 0.50 cm or larger than 10.00 cm in largest diameters, pregnant or lactating women, known allergies to verapamil or TAC, and patients with comorbid conditions like ischemic heart disease, diabetes mellitus, chronic hypertension, or immunocompromised status or having active infection in the keloid area were not included in the study.

Enrolled sample comprised of 60 individuals, 30 in each group, which was calculated using estimated VSS values of 1.50 ± 0.60 for verapamil + TAC group and 4.10 ± 1.90 for the TAC group, from a previous study 5. The sample size was calculated using a two-sided hypothesis test for a population mean with a 5% level of significance ($\alpha = 0.05$) and 90% power ($1-\beta = 0.90$). The population standard deviation (σ) was assumed to be 1.90, with the test value of population mean (μ_0) = 4.10 and the anticipated population mean (μ_a) = 1.60. Using the formula:

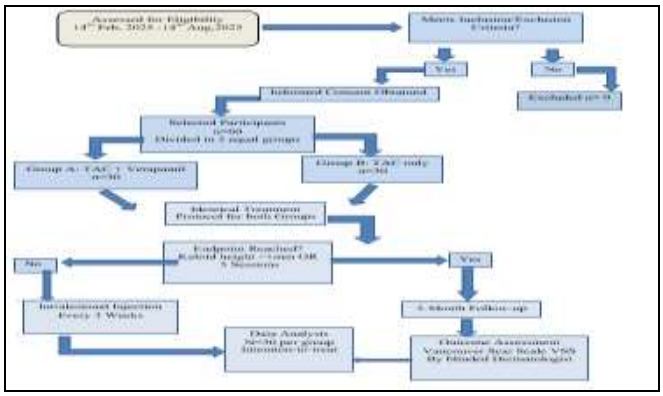
$$n = \frac{\sigma^2 (Z_{1-\alpha/2} + Z_{1-\beta})^2}{(\mu_0 - \mu_a)^2}$$

the minimum required sample size was calculated as 7 participants per group but to increase the reliability of results and account for possible variability, 30 patients were included in each group, making a total sample size of 60 participants. Our study hypothesized that combining verapamil with TAC is more productive than TAC alone for treatment of keloids. After receiving informed consent, study participants were randomly allocated into one of the two treatment arms, Group A or Group B, by lottery method. To maintain allocation concealment, sequentially numbered, sealed, opaque envelopes were prepared by an independent investigator who was not involved in patient enrolment or evaluation of study outcomes. Group-A received a combination of TAC 20mg/ml with verapamil 1.25mg/ml, where 0.50ml of injection TAC containing 40mg/ml was diluted with 0.5ml of injection verapamil containing 5mg/2ml. Group-B received intralesional injections of TAC at a final concentration of 20 mg/ml, prepared by diluting 0.50ml of TAC 40 mg/ml with 0.50 ml of normal saline. A maximum intralesional dose of 2 ml was given per session, for a total of 5 sessions. Multiple intralesional injections were delivered using an insulin syringe in both groups until even blanching of keloid was observed. Treatment sessions were conducted at three-week intervals until the keloid height was reduced to less than 1 mm or until five sessions had been completed. Following treatment completion, patients were monitored for a period of three months. The outcome was assessed using the VSS, and the assessor remained blinded to the assigned treatment group. Scar severity was assessed using the Vancouver Scar Scale (VSS), which evaluates four parameters: vascularity (0–3), pigmentation (0–2), pliability (0–5), and height (0–3). The total score ranges from 0 to 13, with higher scores indicating greater scar severity. Scars were assessed at baseline and after completion of treatment sessions to determine the change in VSS score. Statistical analysis was conducted using IBM Statistical Package for Social Sciences (SPSS) version 25.00. Quantitative variables including age, BMI, size and keloid duration, VSS scores at baseline and after three-months, were expressed as mean ± standard deviation (SD). Qualitative variables, such as gender, were reported as frequencies (n) and percentages (%). A comparison between the two groups was made using an independent sample t-test in terms of post-treatment VSS scores where statistical significance was set at p <0.05.

RESULTS

A total of 60 participants were enrolled in the study and were divided into Group-A (n=30) and Group-B (n=30). All participants completed the study and were included in the final analysis. The primary outcome measured was change in VSS score following allocated treatment regimen. The mean age of participants was 32.58 ± 8.09 years, and the mean duration of symptoms was 8.27 ± 2.50 months while

mean baseline VSS score was 8.48 ± 2.39. Demographic distribution showed that 51.70% of participants were male and 48.30% were female, but gender distribution between groups was not statistically significant (p = 0.438) and no significant differences were observed between the groups regarding age, gender, duration of keloids, and baseline VSS score as shown in Table-I.



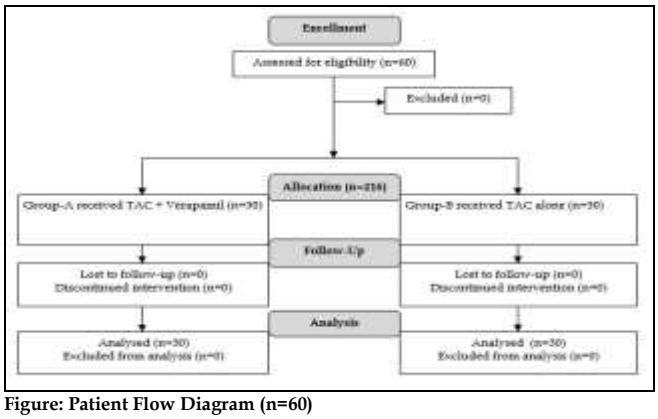


Figure: Patient Flow Diagram (n=60)

Table-I: Distribution of Quantitative Variables Between Groups (n = 60)

Variable (Mean ± SD)	Group-A (n=30)	Group-B (n=30)	*p*-value
Age (years)	32.37±6.80	32.80±9.32	0.84
Duration (months)	8.57±2.39	7.97±2.62	0.36
VSS at start	8.67±2.72	8.30±2.04	0.56

**VSS: Vancouver Scar Scale, SD: Standard Deviation*

Post-treatment VSS scores were significantly lower in Group-A (3.37 ± 1.96) compared to Group-B (5.77 ± 2.40), demonstrating a statistically significant difference between the two groups (t = 4.243, p < 0.001), as shown in Table-II.

Stratification according to age, gender, and duration of keloids revealed that the difference between Groups A and B remained statistically significant in the following subgroups: age <35 years, male gender, and keloid duration >7 months (p < 0.05) as shown in Table-III. Minor adverse effects were observed in some participants, including transient pain and erythema at the injection site. No serious adverse events were reported.

Table-II Post-treatment Vancouver Scar Scale (VSS) Score Between Groups (n = 60)

Outcome (Mean ± SD)	Group-A (n=30)	Group-B (n=30)	*p*-value
VSS score	3.37 ± 1.96	5.77 ± 2.40	<0.0001

**VSS: Vancouver Scar Scale, SD: Standard Deviation*

Table-III Post-stratification Outcomes in Vancouver Scar Scale Score Between Groups (n= 60)

Variable (Mean ± SD)	Subgroup	Group-A (n=30)	Group-B (n=30)	*p*-value
Age (years)	≤35	2.94 ± 1.89	6.10 ± 2.29	<0.001
	>35	4.00 ± 1.95	5.10 ± 2.60	0.27
Gender	Male	2.76 ± 1.95	6.36 ± 2.13	<0.001
	Female	4.15 ± 1.72	5.25 ± 2.57	0.20
Duration (months)	≤7	3.60 ± 2.67	4.92 ± 2.23	0.22
	>7	3.25 ± 1.55	6.33 ± 2.40	0.01

DISCUSSION

Our study evaluated two treatment modalities (TAC and TAC plus verapamil) in reducing scar severity as assessed by the VSS score post-treatment. The results revealed substantial decrease in post-treatment VSS scores in combination group (3.37 ± 1.96) as compared to only the TAC group (5.77 ± 2.40, p < 0.001), suggesting superior efficacy of combination treatment group. Further post-stratification analysis showed that males, younger patients (<35 years), and individuals with longer symptom duration (>7 months) showed more pronounced improvements in the combination group. Our study results align with previous studies demonstrating TAC's efficacy in scar reduction. One study reported a 64.24% reduction in VSS scores with TAC compared to 82.34% with verapamil (p < 0.001), with TAC achieving faster scar reduction[3] while another study found that TAC significantly improved scar pliability and vascularity, with 63.60% of patients achieving excellent results compared to 22.70% with verapamil,8 with another author reinforcing these findings, showing the superiority of TAC in reducing scar height and erythema (p < 0.05).[9] Given these results, TAC or a TAC-based combination shows superior efficacy. Verapamil has emerged as an alternative to TAC, particularly for patients who are prone to corticosteroid-related side effects, as it offers a favorable safety profile at the expense of less potency. One study found verapamil comparable to TAC for

small keloids only, but less effective for larger and symptomatic scars.[4] In another study, an increased recurrence rate with verapamil as compared to TAC (p = 0.01) was reported[10] but fewer side effects (e.g., skin atrophy, hypopigmentation) with verapamil were documented in another study, which makes it more suitable for long-term use.[11] Some research data, reported sustained improvements up to two years with combination therapy, which strongly advocates its long-term benefits.[12] Some studies reported that 5-Flurouracil (5-FU) has also shown significant improvement in scar reduction over time, with one author noting that it is superior to TAC in reducing scar size, vascularity, and height with comparable side effects, while another found that the combining TAC with 5-FU proved more effective.[13, 14] While TAC and Verapamil are considered to have a good safety profile alone or in combination, the risks and benefits should be weighed as TAC is associated with skin atrophy, telangiectasia, and hypopigmentation[15, 16] while verapamil has a lower rate of skin atrophy and better long-term tolerability, which makes it a better choice for long-term usage.[11] The side effects of TAC alone can be reduced by using it in combination with pentoxifylline.[17] Male participants in our study showed greater improvement (VSS 2.76 ± 1.95 vs. 6.36 ± 2.13, p < 0.001), possibly due to hormonal influences on fibroblast activity in the males 13 while females and older patients showed no statistically significant differences, possibly due to age-related fibrosis.[18] Emerging alternative therapies for keloids include fractional CO_2 laser, which shows comparable efficacy to TAC over time.[19, 20]

LIMITATIONS OF STUDY

Our study outcomes lack the reporting of adverse effects and are limited by the lack of extended follow-up to monitor for recurrence. Future research should prioritize the larger-scale RCT comparing combination therapies with long-term recurrence and side effects data. Biomarker studies would also provide more insights.

CONCLUSION

Intralesional combination therapy of TAC and verapamil demonstrated significantly greater improvement in keloid scars compared with TAC alone, as reflected by a larger reduction in VSS scores. The combination treatment produced better scar resolution after 3 months follow up. Both groups showed improvement; however, the reduction in scar severity was significantly higher in the combination group (p<0.001).

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MTI & QUK: Data acquisition, data analysis, critical review, approval of the final version to be published.

HM & AM: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MS & MFS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Klomparens K, Simman R. Treatment of Keloids: A Meta-analysis of Intralesional Triamcinolone, Verapamil, and Their Combination. Plast Reconstr Surg Glob Open 2022; 10(1): e4075. https://doi.org/10.1097/GOX.0000000000004075
2. Bao Y, Xu S, Pan Z, Deng J, Li X, Pan F, et al. Comparative Efficacy and Safety of Common Therapies in Keloids and Hypertrophic Scars: A Systematic Review and Meta-analysis. Aesthetic Plast Surg 2020; 44(1): 207-218. https://doi.org/10.1007/s00266-019-01518-y
3. Adil A, Ilyas S, Kiran R, Saeed W, Aman S, Jamil T. Comparison of efficacy and safety of Intralesional Verapamil hydrochloride & Intralesional triamcinolone acetonide in the treatment of keloids. J Pak Assoc Dermatol 2024; 34(1): 31-39.
4. Belie O, Ugburo AO, Mofikoya BO, OA TO, Belie MF. A comparison of intralesional verapamil and triamcinolone monotherapy in the treatment of keloids in an African population. Niger J Clin Pract 2021; 24(7): 986-992. https://doi.org/10.4103/njcp.njcp_474_20
5. Haghani-Dogahe Z, Hadadi R, Esmailzadeh M, Mobayen M. Comparing intralesional triamcinolone and verapamil-triamcinolone injections in keloids: A single-blinded randomised clinical trial. Int Wound J 2023; 20(10): 4166-4174. https://doi.org/10.1111/iwj.14314
6. Mohanty S, Gupta J, Rohatgi G, Saigal S. Comparative efficacy of intralesional verapamil hydrochloride, triamcinolone acetonide and combination of both drug in hypertrophic scars and keloids at tertiary care center. Int Surg J 2021; 8(10): 2940-2945.
7. Liu R, Yang B, Deng Z, Liu L, Zhao X. Efficacy and safety of verapamil vs triamcinolone acetonide for keloids and hypertrophic scars: A systematic review and meta-analysis. Dermatol Ther 2020; 33(4): e13564. https://doi.org/10.1111/dth.13564
8. Ahuja RB, Chatterjee P. Comparative efficacy of intralesional verapamil hydrochloride and triamcinolone acetonide in hypertrophic scars and keloids. Burns 2014; 40(4): 583-588. https://doi.org/10.1016/j.burns.2013.09.029
9. Kuang J, An P, Li W. Comparative efficacy and safety of verapamil and triamcinolone in keloid and hypertrophic scar treatment: a meta-analysis. J Cosmet Laser Ther 2021; 23(1-2): 26-34. https://doi.org/10.1080/14764172.2021.1950765
10. Danielsen PL, Rea SM, Wood FM, Fear MW, Viola HM, Hool LC, et al. Verapamil is Less Effective than Triamcinolone for Prevention of Keloid Scar Recurrence After Excision in a Randomized Controlled Trial. Acta Derm Venereol 2016; 96(6): 774-778. https://doi.org/10.2340/00015555-2384
11. Jiang ZY, Liao XC, Liu MZ, Fu ZH, Min DH, Guo GH. The Safety and Efficacy of Intralesional Verapamil Versus Intralesional Triamcinolone Acetonide for Keloids and Hypertrophic Scars: A Systematic Review and Meta-analysis. Adv Skin Wound Care 2020; 33(4): 1-7. https://doi.org/10.1097/01.ASW.0000655476.10403.d6
12. Kant SB, van den Kerckhove E, Colla C, Tuinder S, van der Hulst R, Piatkowski de Grzymala AA. A new treatment of hypertrophic and keloid scars with combined triamcinolone and verapamil: a retrospective study. Eur J Plast Surg 2018; 41(1): 69-80. https://doi.org/10.1007/s00238-017-1322-y

13. Kaur A, Garg R, Mittal RK, Shah S, Patial T, Addiwal R. Comparative Efficacy of Intralesional Triamcinolone Acetonide and 5-Fluorouracil for Keloid Scars. Plast Aesthet Nurs (Phila) 2022; 42(4): 184-189. https://doi.org/10.1097/PSN.0000000000000465
14. Sun P, Lu X, Zhang H, Hu Z. The Efficacy of Drug Injection in the Treatment of Pathological Scar: A Network Meta-analysis. Aesthetic Plast Surg 2021; 45(2): 791-805. https://doi.org/10.1007/s00266-019-01570-8
15. Wang P, Gu L, Bi H, Wang Q, Qin Z. Comparing the Efficacy and Safety of Intralesional Verapamil With Intralesional Triamcinolone Acetonide in Treatment of Hypertrophic Scars and Keloids: A Meta-Analysis of Randomized Controlled Trials. Aesthet Surg J 2021; 41(6): NP567-NP575. https://doi.org/10.1093/asj/sjaa357
16. Zhang W, Li X, Li X. Efficacy and Safety of Verapamil Versus Triamcinolone Acetonide in Treating Keloids and Hypertrophic Scars: A Systematic Review and Meta-Analysis. Aesthetic Plast Surg 2023; 47(1): 473-482. https://doi.org/10.1007/s00266-022-03229-3
17. Serag-Eldin YMA, Mahmoud WH, Gamea MM, Hegab DS. Intralesional pentoxifylline, triamcinolone acetonide, and their combination for treatment of keloid scars. J Cosmet Dermatol 2021; 20(10): 3330-3340. https://doi.org/10.1111/jocd.14305
18. Mane BS, Gavali RM. Our Experience at Tertiary Medical College-Intralesional Injection of Triamcinolone Acetonide Versus Injection Verapamil Following Keloidectomy with Fillet Flap in Auricular Keloids. Indian J Otolaryngol Head Neck Surg 2024; 76(1): 237-244. https://doi.org/10.1007/s12070-023-04132-2
19. Leszczynski R, da Silva CA, Pinto A, Kuczynski U, da Silva EM. Laser therapy for treating hypertrophic and keloid scars. Cochrane Database Syst Rev 2022; 9(9): CD011642. https://doi.org/10.1002/14651858.CD011642.pub2
20. Srivastava S, Kumari H, Singh A. Comparison of Fractional CO(2) Laser, Verapamil, and Triamcinolone for the Treatment of Keloid. Adv Wound Care (New Rochelle) 2019; 8(1): 7-13. https://doi.org/10.1089/wound.2018.0798