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Comparison of Intralesional Triamcinolone and Intralesional Verapamil in the Treatment of Keloids

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ABSTRACT

An imbalance between synthesis and degradation of collagen and the extracellular matrix leads to keloid formation. Inadequately treated keloids lead to significant physical and emotional distress. **Objectives:** To compare the mean reduction of the Vancouver Scar score in patients with keloids after 3 months of treatment with intralesional triamcinolone versus intralesional verapamil. **Methods:** This parallel group, single blind randomized controlled trial was performed at the dermatology department, Nishtar Hospital, Multan, from April 2025 to September 2025. Sixty patients aged 10–50 years with keloids (1–5 cm, duration <5 years, baseline Vancouver score ≥5) were enrolled. Exclusion criteria were pregnant and lactating women, positive family history of keloids, conditions of acromegaly, and congestive heart illnesses. Group A (n=30) received intralesional verapamil monthly, and Group B (n=30) received intralesional triamcinolone acetonide (40 mg) monthly until keloid flattening or for three months. Vancouver scores were assessed at 16 weeks (four weeks post-treatment), and data were analyzed using SPSS version 23.0. Mean ± SD was recorded for quantitative and frequencies and percentages for categorical data. An independent sample t-test was used for numerical comparison at 5% significance level. **Results:** The mean age was 28.6±7.9 years with 58.3% males. The baseline Vancouver score was 8.7 ± 1.7, improving to 4.9 ± 1.5 after treatment. The triamcinolone group had a lower score (4.0 ± 0.7) and greater reduction (4.6±1.2) than the verapamil group (5.9 ± 1.5; reduction 2.9 ± 0.8; p<0.001). **Conclusions:** Overall, intralesional triamcinolone acetonide is clearly more effective than verapamil in reducing keloid severity.

INTRODUCTION

A keloid is an aberrant growth of scar tissue that extends beyond the initial scar boundaries, usually at the place of skin distortion. After excision, it has a high chance of recurring and rarely regresses on its own [1]. Although keloids can develop anywhere on the body, they most frequently appear on the cheeks, shoulders, earlobes, and sternum. Minor skin injuries like ear piercing, abrasions, tattoo making, burns, and injection injury can cause keloids [2, 3]. Acne formation or chickenpox infection can also be the reasons, and sometimes keloids spontaneously appear in the sternal area in individuals who are prone to develop this condition [4]. Because of their high likelihood of recurrence, keloids are difficult to treat. Keloids can be prevented and treated with compression bandages, silicone gel, intralesional corticosteroids, cryotherapy, radiation, intralesional interferon injection, bleomycin, and laser therapy [5, 6]. The most widely used corticosteroid for treating keloids is intralesional triamcinolone acetonide, which promotes collagen and fibroblast degeneration while inhibiting fibroblast growth factors and the inflammatory process in the wound [7]. Another anti-hypertensive medication used to treat keloids is verapamil. When applied intralesionally, it promotes the breakdown of collagen by decreasing the production of extracellular collagen and increasing the synthesis of collagenases [8]. The rationale of current research is to compare the effect of intralesional triamcinolone and verapamil in patients presenting with keloid in our local setting. The local results

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will direct us towards the most appropriate treatment of keloids by selecting the suitable drug. Adequate treatment will reduce significant emotional and physical distress in patients. We hypothesized that the mean reduction in Vancouver Scar Score will be higher in the triamcinolone acetonide group compared to verapamil after three months of treatment. This study aimed to compare the mean reduction of the Vancouver Scar score in patients with keloids after 3 months of treatment with intralesional triamcinolone versus intralesional verapamil.

METHODS

This parallel group, single blind (outcome assessor) randomized controlled trial (Registry No. NCT06897969) was conducted at the dermatology department, Nishtar Hospital, Multan, after approval from the institutional ethical review board of Nishtar Medical University, Multan (Ref. No. 21467/NMU) over a period of six months from April 2025 to September 2025. Patients of either sex, 10 - 50 years of age, keloid size of 1-5 cm on any site of the body, duration < 5 years, and a Vancouver scar score of ≥5 at enrolment were consecutively included in the study after informed consent. Pregnant or lactating mothers, with a family history of keloids, acromegaly, and congestive cardiac diseases, were excluded from the study. Patient characteristics like age, gender, obesity, diabetes mellitus, and duration of keloid (months) were recorded. The baseline Vancouver Scar Score was recorded for all the participants before starting treatment. The Vancouver Scar scale assesses four parameters of vascularity, pigmentation, pliability, and height (mm). The total score ranges from 0–13. The patients were randomly divided into group A and group B. The random sequences were generated manually using the lottery method, and allocation concealment was ensured through the use of sequentially numbered, sealed, opaque envelopes prepared by a person not involved in recruitment or data collection. Patients in group A were administered intralesional verapamil. One ml (2.5 mg) of intralesional verapamil injection was administered once a month. Patients in group B were given Intralesional Triamcinolone acetonide (40mg) monthly. The injections were administered with an insulin syringe with a 27-gauge needle. Patients and doctors administering the injections were not blinded due to the different colors of the injections. Treatment continued till the keloids were flattened or total duration of three months. Vancouver scare score was assessed at 16 weeks after randomization (4 weeks after completion of treatment) by the consultant dermatologist who was not aware of the assigned treatment. A minimum sample size of 60 participants was calculated using online OpenEpi software, taking a mean Vancouver scar score reduction of 2.50±0.72 in verapamil and 4.35±0.70 in triamcinolone treatment groups [9] at 80% power, 5% significance level and 1.85 mean difference of Vancouver scar score between the treatments. SPSS version 23.0 was utilized for data analysis. Descriptive statistics in the form of mean ± SD for numerical data and frequency and percentages for categorical data were measured. Independent sample t-test and chi-square test were used for numerical and categorical comparisons between the groups, respectively. P-value < 0.05 was taken as significant.

RESULTS

In the overall group of 60 participants treated for keloids, the mean age was 28.6 ± 7.9 years, with a slight male predominance (58.3% male and 41.7% female). Approximately 31.7% (n=19) of the patients were classified as obese, and 25% (n=15) had diabetes mellitus. The keloids had been present for an average of 14.6 ± 5.9 months before treatment, and the baseline severity as measured by the Vancouver Score was 8.7 ± 1.7. Following a three-month treatment period, the overall Vancouver Score improved significantly, decreasing to 4.9 ± 1.5. The mean reduction in Vancouver scar score was 3.7 ± 1.3. The demographic characteristics and baseline Vancouver score were comparable between the Verapamil and Triamcinolone treatment groups. After three months, the mean Vancouver score was significantly lower in Triamcinolone compared to the Verapamil treatment group (4.0 ± 0.7 vs. 5.9 ± 1.5, p<0.001). The mean reduction in Vancouver scar score was remarkably high in the Triamcinolone compared to Verapamil treatment group (4.6 ± 1.2 vs. 2.9 ± 0.8, p<0.001)(Table 1).

Table 1: Characteristics of patients undergoing treatment for Keloid(N=60)

Characteristics	Overall (N=60)	Verapamil Group (N=30)	Triamcinolone Group (N=30)	p-Value*
Age (years)	28.6 ± 7.9	28.8 ± 7.3	28.3 ± 8.5	0.808
Gender, N (%)				
Male	35 (58.3)	19 (63.3)	16 (53.3)	0.432
Female	25 (41.7)	11 (36.7)	14 (46.7)	
Obesity, N (%)				
Yes	19 (31.7)	10 (33.3)	9 (30.0)	0.781
No	41 (68.3)	20 (66.7)	21 (70.0)	
Diabetes Mellitus, N (%)				
Yes	15 (25.0)	9 (30.0)	6 (20.0)	0.371
No	45 (75.0)	21 (70.0)	24 (80.0)	
Duration of Keloid (months)	14.6 ± 5.9	15.3 ± 5.8	14.0 ± 6.0	0.402
Baseline Vancouver Scar Score	8.7 ± 1.7	8.8 ± 1.8	8.6 ± 1.6	0.707
Vancouver Scar Score after 3 months	4.9 ± 1.5	5.9 ± 1.5	4.0 ± 0.7	<0.001
Reduction in Vancouver Scar Score	3.7 ± 1.3	2.9 ± 0.8	4.6 ± 1.2	<0.001

*Independent sample t-test for numerical comparison and chi-

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square test for categorical comparison

After stratification on demographic characteristics, the reduction in Vancouver scar score after three months of treatment remained significantly higher in triamcinolone compared to verapamil ($p<0.005$) (Table 2).

Table 2: Effect of demographic characteristics on reduction of Vancouver scar score between the treatment groups (N=60)

Demographic Characteristics	Verapamil	Triamcinolone	Cohen's d (95% CI)	p-Value*
Age (years)	< 30-years	2.9 ± 0.8	-1.7 (-2.5 -0.89)	<0.001
	≥ 30-years	2.8 ± 0.8	-1.7 (-2.6 - -0.85)	<0.001
Gender	Male	2.9 ± 0.7	-1.6 (-2.3 -0.81)	<0.001
	Female	2.8 ± 0.9	-1.8 (-2.8 - -0.87)	<0.001
Duration of Keloids	≤ 12-month	2.9 ± 0.7	-1.5 (-2.4 - -0.66)	<0.001
	> 12-month	2.8 ± 0.8	-1.8 (-2.6 - -0.98)	<0.001
Obesity	Yes	3.0 ± 0.6	-1.7 (-2.8 - -0.65)	0.002
	No	2.8 ± 0.8	-1.7 (-2.5 - -1.00)	<0.001
Diabetes mellitus	Yes	3.1 ± 0.9	-1.6 (-2.8 - -0.38)	0.009
	No	2.7 ± 0.7	-1.7 (-2.5 - -1.1)	<0.001

*Independent sample t-test

DISCUSSIONS

Keloids most frequently affect those under 30 years of age, peaking between 10 and 20. Raised body hormone levels, particularly during puberty and pregnancy, also contribute to its incidence. The distribution of sexes is nearly equal. The higher rate of earlobe piercing may be associated with a slight female predominance. Keloid management is both demanding and difficult. Although many therapies have been promoted and asserted to be successful, cures are rarely seen. Keloids have been treated and prevented using a variety of methods. In our study, the mean age of patients was 28.6 ± 7.9 years, with a slight male predominance (58.3% male and 41.7% female). Similar to our results, previous studies showed that 47% of patients were female and 52% of patients were male. In contrast to our data, the occurrence of keloids is distributed approximately equally by sex on a global scale [9, 10]. The socioeconomic structure of our country, where fewer women with keloids visit hospitals, could be the cause of this. The dearth of epidemiologic research on keloids in Pakistan could be another factor; there might be variations in the sex distribution of keloids in this region of the world. According previous study, the majority of the patients were under 30, with a peak age of 20 to 30 years. This is consistent with our findings and research conducted globally. More than 57% of the patients were under 30 years old. Earlier researchers discovered that the age range of 18 to 25 accounted for 40.9% of cases. In the present study, we observed that after three months, the mean Vancouver score was markedly lower in the Triamcinolone group in contrast to the Verapamil treatment group, and the mean reduction in Vancouver scar score was predominantly high in the Triamcinolone group, in contrast to the Verapamil treatment group. Similar to our results, triamcinolone was reported to be more successful, since it totally eliminated pain and itching in six and twelve weeks, respectively, whereas Verapamil-treated patients did not experience a complete resolution [10, 11]. Previous studies enrolled 80 patients, divided equally into two groups (Group A - Intralesional Verapamil injection and Group B - Intralesional Triamcinolone acetonide). After the completion of the study (3 months), a 58% decrease in the initial score was observed in the steroid group, in contrast to 36.7% in group A. The mean reduction in score was 2.5±0.72 in Group A and 4.35±0.70 in Group B [9]. Earlier studies enrolled 15 patients (30 scars) to compare the intralesional triamcinolone effect with that of verapamil. Better improvement in height (0.2±0.5 vs. 3.1±1.8) and pliability (0.20±0.41 vs. 2.07±0.26) was observed with steroids in contrast to verapamil at the 24th week of follow-up. In previous findings, 160 patients were divided into four groups, with 40 cases in each category. Group B received intralesional verapamil, Group C received intralesional 5-fluorouracil, Group D received intralesional platelet-rich plasma, and Group A (control) received intralesional triamcinolone. The most successful treatment was found to be intralesional verapamil, whereas intralesional triamcinolone acetonide was found to be as effective as platelet-rich plasma [12]. Similar comparative research was done by Saki *et al.* who found that both study groups showed a decrease in height and pliability at the conclusion of the investigation. Compared to verapamil, triamcinolone showed a greater improvement in height and pliability [13]. In a prospective study, Shanthi et al randomly assigned 54 patients to groups receiving verapamil and triamcinolone. They discovered that the length had not changed significantly [14]. Current findings were different from theirs. Their study's smaller sample size may have been the likely cause. Group A received intralesional 5-fluorouracil (5 FU), Group B received intralesional triamcinolone acetonide (TAC), and Group C received intralesional triamcinolone acetonide 40 mg/dl (0.1 ml) along with 5-fluorouracil 50 mg/ml (0.9 ml) every month for six months. There was a statistically significant difference between the 5 FU Vs 5 FU+TAC group ($p=0.04$) and the TAC Vs 5 FU+TAC group ($p=0.02$). TAC and 5FU together were more effective at treating keloids [15]. Verapamil hydrochloride may be less effective than corticosteroids because corticosteroids limit the production of collagen and glycosaminoglycans, degenerate fibroblasts and collagen, and have an extra anti-inflammatory impact on scar tissue [16]. Earlier studies investigated how calcium antagonists affected the synthesis of extracellular matrix. They proposed that calcium channel blockers change the

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morphology of fibroblast cells from bipolar to spherical and depolymerise actin filaments, which could lead to an increase in the production of procollagenase [17]. Verapamil's reduced anti-inflammatory effect is most likely caused by its capacity to suppress the synthesis of proinflammatory mediators as well as the activity of enzymes phospholipase A2 and phospholipase C [18]. Eicosanoids and leukotrienes are produced, the mast cell membrane is stabilized by preventing calcium ions from entering, platelet aggregation is inhibited, granules are released, and neutrophil activity is reduced, all of which lessen pain and pruritus symptoms [19]. When verapamil is given, calcium channel blocking in excitable tissues, such as nerve fibers, decreases excitability by delaying the action potential, which alleviates pain and itch symptoms [20, 21]. Current results provide a well-researched comparison between intralesional triamcinolone acetonide and verapamil for keloid treatment. The findings strongly support the superior efficacy of triamcinolone acetonide in reducing keloid severity. The study's findings are backed by clear clinical evidence, making it a valuable reference for dermatologists. The strength of this study was its randomized controlled study design. The limitations of our study were that firstly, it had small sample size. Secondly, we could not measure the side effects of the drugs. The follow-up duration was short (three months post-treatment), so long-term recurrence rates and sustained scar improvement could not be assessed. The study did not assess patient-reported outcomes such as pain, pruritus, or satisfaction, which are important measures of therapeutic success.

CONCLUSIONS

Treatment of keloids is very challenging, and management options are still evolving. Intralesional verapamil is a better option to treat keloids, but intralesional administration of triamcinolone acetonide is more efficacious. More randomized controlled studies on a larger scale are required to prove the efficacy of intralesional verapamil and steroids in managing keloids.

Authors Contribution

Conceptualization: AB[1]
Methodology: AB[1], ST, ZA, AB[2], SI
Formal analysis: ST
Writing review and editing: AB[1], AA, ST, ZA, AB[2], SI

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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