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ORIGINAL ARTICLE

Comparative Efficacy & Safety of Intralesional Verapamil versus Intralesional Triamcinolone Acetonide as First-Line Therapy for Treating Hypertrophic Scars & Keloids

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ABSTRACT

Background: Hypertrophic scars and keloids are challenging fibroproliferative disorders with high recurrence rates. Intralesional therapies like verapamil and triamcinolone acetonide are widely used, yet their comparative efficacy and safety as first-line treatments remain underexplored.

Objective: To compare the efficacy & safety of Intra lesional Verapamil versus Intra lesional Triamcinolone Acetonide as first-line therapy in treatment of Hypertrophic scars and Keloids.

Study Design & Setting: Randomized clinical trial conducted on patients attending OPD of Plastic and reconstructive department of Sheikh Zayed Medical College, Rahim Yar Khan August 2022 to July 2023.

Methodology: Patients fulfilling inclusion criteria were selected through non probability purposive sampling. After randomization, the study participants were divided into 2 groups, A and B. Group A given Intra lesional Injection of Verapamil, 2.5 mg/ml every 4 weeks and in Group B, Intralesional Injection of Trimcinolone Acetonide at a dose of 40 mg/ml was given at 4 weeks interval. A total of 6 sessions were done or till the flattening of the scar. Follow up was done after 5 months or till the scar was flattened by calculating Vancouver scar scale. VSS of < 3 was taken as success of treatment. After data collection and analysis, frequencies & percentages were calculated. The success rate of treatment with Intra lesional Injection of verapamil was compared to Intra lesional Injection of Triamcinolone Acetonide, Chi square test and t-tests were used as test of significance for qualitative and quantitative variables respectively.

Results: This study conducted on 60 patients showed that most patients having hypertrophic scars and keloids were between ages 12-55 years. 60% affected were males, 45% dark skinned, 55% gave history of burn as most prevalent because whereas most common site of scars was presternal in both the groups (40 and 36.6%). The success of treatment in Group A treated with Intra lesional Injection of Verapamil was 28% versus 72% in patient in Group B this difference was statistically significant.

Clinical Implication: Identifying a more effective and safer first-line intralesional agent can significantly improve scar outcomes, reduce recurrence, and guide evidence-based clinical management of keloids and hypertrophic scars**.**

Conclusion: Intra lesional Injection of Triamcinolone Acetonide has better efficacy and safety than Intra lesional Verapamil as 1st line therapy in treating hypertrophic scars and keloids.

Keywords: Hypertrophic Scar, Keloid, Intra lesional, First-line therapy, Verapamil,

INTRODUCTION

Keloids & hypertrophic scars are dermal fibro-proliferative disorders, in predisposed individuals, are a result of aberrant wound healing following trauma, burns, surgery or inflammation. While keloids extend beyond original wound margins, hypertrophic scars donot. The pathology appears to be associated with a robust inflammatory response, excessive collagen production & increased fibroblast activation.[1] Incidence of hypertrophic scars ranges from 0.09-16% in patients. It occurs in 40%-70% following surgery & up to 77% following burn injuries[2,3] depending upon depth. Average keloid incidence is reported more in dark skinned patients as compared to people having light colored skin. It is reported that hypertrophic scars occur in 32-35.3% patients after 1 year of surgery.[4,5]

While hypertrophic scars remain confined within the original wound margins, keloids typically extend beyond them. Their pathogenesis involves an exaggerated inflammatory response, increased fibroblast activity, and excessive collagen deposition. The incidence of hypertrophic scars varies widely, ranging from 0.09% to 16%, and is particularly high—up to 77%—following burn injuries, depending on the wound depth. Keloids are more prevalent in individuals with darker skin tones.[6] Although intralesional corticosteroids, such as triamcinolone acetonide, are commonly used as first-line treatments, calcium channel blockers like verapamil have also demonstrated promising results. While both treatments have been studied independently, there is limited comparative data, especially in our local population.[7] First-line treatment for hypertrophic scars & keloids may be the intra lesional corticosteroids but calcium channel blockers like verapamil have also shown effectiveness in their treatment.[8] Many studies have assessed the role of intra lesional Verapamil and intra lesional Triamcinolone Acetonide individually as first-line therapy in treatment of the scars and keloids.[9-11]

Hypertrophic scars and keloids significantly affect patients' quality of life due to cosmetic concerns and discomfort. Intralesional triamcinolone acetonide is widely used but may cause side effects like skin atrophy and telangiectasia. Verapamil, a calcium channel blocker, has emerged as a safer alternative with promising results in scar modulation. However, limited comparative studies exist evaluating their efficacy and safety as first-line therapies. This study aims to bridge that gap and determine the more effective and safer option for clinical use in our population.

MATERIALS & METHODS

This study was a randomized controlled trial conducted at the Outpatient Department of Plastic and Reconstructive Surgery, Sheikh Zayed Hospital, Rahim Yar Khan. The duration of the study was from August 2022 to July 2023. A total of 60 patients were enrolled, with 30 patients in Group A who received intralesional injection of verapamil and 30 patients in Group B who received intralesional injection of triamcinolone acetonide. The sampling technique used was non-probability purposive sampling.

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Patients included were male and female individuals between 12 to 60 years of age, presenting with hypertrophic scars or keloids ≤10 cm in size and a Vancouver Scar Scale (VSS) score of >10, with a scar history of more than six months Patients were excluded if they were below 12 or above 60 years of age, had previously received any treatment for scars including injections of verapamil or triamcinolone acetonide, had keloids with local infection or ulceration, were pregnant or lactating, or had underlying renal or liver dysfunction.

All patients full filling the inclusion criteria after taking informed consent were included in the stusy. Data was collected through a pre-designed and pre-tested questionnaire. The questionnaire consisted of two parts. The first part consisted of socio demographic details like age, gender, educational qualifications, marital status and place of work. The second part consisted of location and number of scars/ keloid, duration in months, history of surgery, history of burn or trauma and any recent skin manifestations as itching. The treatment given as first-line therapy, history of burn, surgery or trauma with dose given, follow up and efficacy assessed by outcome measured by VSS (Vancouver scar scale) consisting of Pigmentation, vascularity, Pliability and height. The safety was assessed by non-occurrence of side effects like Injection site pain, skin atrophy and telengactasias. Confidentiality of the participants was maintained. Patients full filling the inclusion criteria were after randomization divided into two groups A and B. After blinding Group A were given Injection Verapamil 40 mg/ml intra lesionally at an interval of 4 weeks and in group B, Injection Triamcinolone Acetonide at a dose of 2.5 mg/ml at an interval of 4 weeks was given for a period of 5 months (Each session 4 weeks apart making a total of 6 sessions). They were followed every month for 5 months or till the complete flattening of the scar to assess the efficacy through clinical outcome and safety. The clinical outcome was assessed by Senior Plastic Surgeon of the ward who is directly not related to the research. Four measures of Vancouver scar scale (VSS) which are Pigmentation, Vascularity, pliability and height. The percentage of patients showing reduction in VSS score from baseline was calculated and efficacy was assessed. The patients having VSS of < 3 were labelled as successful treatment. Non-occurrence of side effects like Injection site pain, skin atrophy and telengactasias was labelled as safe. Data collected was entered and analyzed using SPSS version 25. Dependent variables were efficacy through clinical outcome and safety whereas independent were age, gender, duration in months, marital, socioeconomic and educational status. Frequencies percentages were calculate. The success rate of treatment was compared in Group A given intra lesional Verapamil versus the group B given Intra lesional Triamcinolone Acetonide. Chi-square and t-test were used as test of significance. P value equal to or less than 0.05 was considered significant.

RESULTS

This study conducted on 60 patients showed that among the patients participating in the study, ages ranged from 12 to 55 years, the most common age group was between 23-33 years. Group (A) included 21 males (70%) & 9 females (30%) and Group (B) included 19 males (63.3%) & 11 females (36.6%). Among 60 patients, 45% were dark skinned people. Regarding the cause of scar, most 55% of patients gave history of burn, 35 % gave history of trauma, 8% postoperatively and 2% after having acne. Regarding the location of scar, Group A including 30 patients with different scar locations where 12 (40%) of them where presternal, 8 (26.6%) on extremities, 7(23.3%) face & 3(10%) torso-back whereas scar locations were 11(36.6%) presternal, 10 (33.3%) on extremities, 4 (13.3%) face and 5 (16.6%) torso- back in Group B with no significant differences in both groups. (Figure 1) The height score in Group A ranged from 1-3 mm (2.40 ± 0.58) & from 2-3mm (2.65 ± 0.52) in Group B. While comparing the improvement in height score between both groups Triamcinolone had better effect than verapamil (P value = 0.033) which was statistically significant thus although both the drugs improved the height of keloid or hypertrophic scar but triamcinolone is better than the other modality . The vascularity score in Group A ranged from 0-3 (1.15 ± 0.69) & from 0-3 (1.30 ± 0.82) in group B with no statistical significance difference between both drugs P value being 0.446. In group A the pliability score ranged from 1-3 (Mean ± SD =3.01± 0.69) whereas ranged from 2-3 (Mean ± SD = 2.98 ± 0.67) in the other group. Comparing the improvement in pliability score between groups A & B we found no significant difference between the two, P value =0.864. So, both drugs equally improved pliability of keloid or hypertrophic scar. The total VSS score in verapamil group ranged from 7-11 (7.35± 1.36) and from 5-11 (8.05 ± 1.15) in triamcinolone group. And the difference between the two modalities was statistically significant (P value= 0.035). (Table 1) Thus the success of treatment in Group A treated with Intra lesional Injection of Verapamil was lower than Group B treated with Intra lesional Injection of Triamcinolone Acetone and this difference was found to be statistically significant.(Figure no 2) 40% of patients treated with Intra lesional Triamcinolone Acetonide showed no side effects while 76% of patients treated with intra lesional Verapamil showed no side effects.

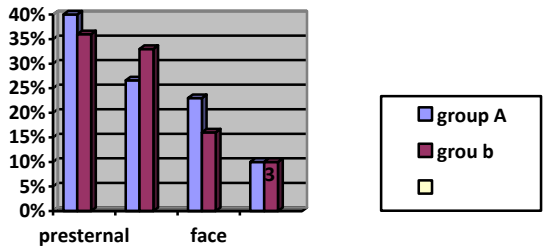

Figure 1: location of scars in Group A & B

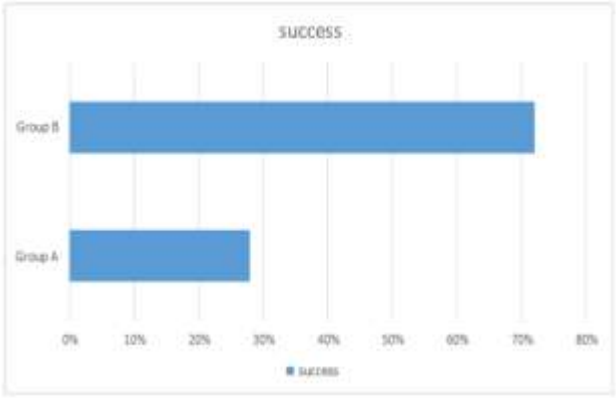

Figure 2: treatment success

Table 1: Comparison of Group A and B by VSS score

Parameter	Group A (Triamcinolone)	Group B (Verapamil)	P Value
Height Score	1-3 mm (2.40 ± 0.58)	2-3 mm (2.65 ± 0.52)	0.033
Vascularity Score	0-3 (1.15 ± 0.69)	0-3 (1.30 ± 0.82)	0.446
Pliability Score	1-3 (3.01 ± 0.69)	2-3 (2.98 ± 0.67)	0.864
Total VSS Score	7-11 (7.35 ± 1.36)	5-11 (8.05 ± 1.15)	0.035

DISCUSSION

This study conducted on 60 patients having hypertrophic scars/ keloids showed that patients were in age range 12-55 years which

was nearly similar to study conducted in Surabay where patients having hypertrophic scars were in ages 18-70 years. Our study participants were mostly in age group 23-33 years which was consistent to findings of age group where 40% were in age group 17-25 years. 60% of patients having hypertrophic scars were males which were quite similar to > 50% in study conducted in Surabay.[4] and 56.8% males in another study conducted in Mayo hospital Lahore.[6] 55% patients gave history of burn in my study which was also similar to study of Surabay where 54% gave history of burn.[4] This study proved that efficacy of intra lesional Triamcinolone was 72% compared to Intra lesional Verapamil which had success of treatment in 28% cases and this difference was statistically significant. These results were similar to results of a study conducted in mayo Hospital. Lahore.[5] Both the drugs improved pliability & vascularity score of keloid & hypertrophic scar almost equally with no statistical significant difference. Both of the drugs under study improved height significantly, but triamcinolone showed better improvement, this finding was similar to a study conducted in Egypy.[6] Our study showed side effects in 60% treated with Intra lesional Triamcinolone group versus side effects in 24% patients treated with Verapamil. It was contrasting to study of Mayo hospital Lahore where No side effects were observed with Verapamil given intra lesionally compared to no side effects in 60.5% observed in group treated with intra lesional Triamcinolone.[7]

Our study, which compared intralesional triamcinolone acetonide and verapamil in the treatment of hypertrophic scars and keloids in 60 patients aged 12–55 years, aligns with and adds to a growing body of literature demonstrating the efficacy of both agents in scar management. While both treatment modalities improved key parameters—height, pliability, and vascularity—triamcinolone showed statistically superior outcomes in scar height reduction and overall VSS (Vancouver Scar Scale) scores, albeit with a higher side effect profile. Our findings are consistent with those of Adil et al. (2023), where both verapamil and triamcinolone led to reductions in VSS scores, but the triamcinolone group showed a significantly greater improvement.[15] In Adil's study, the VSS score at the end of 18 weeks was 4.91 ± 0.83 in the triamcinolone group compared to 5.68 ± 1.58 in the verapamil group ($p = 0.006$), and after four weeks of cessation, the VSS further declined to 1.73 ± 1.04 in the triamcinolone group versus 3.7 ± 1.60 in the verapamil group ($p < 0.001$).[15] In our study, although the VSS scores were slightly higher overall, the final mean VSS was 8.05 ± 1.15 in the triamcinolone group compared to 7.35 ± 1.36 in the verapamil group ($p = 0.035$), again confirming triamcinolone's superior performance. Additionally, Adil et al. reported higher efficacy rates (63.6% vs. 22.7%, $p < 0.001$) and a greater mean percentage reduction in VSS (82.34% vs. 64.24%) with triamcinolone, echoing our statistically significant improvement in height scores with triamcinolone ($p = 0.033$).[15]

Further support comes from Wang et al. (2021), who conducted a meta-analysis of seven randomized controlled trials involving 461 patients. Their findings revealed that triamcinolone produced a more rapid initial reduction in scar height (MD = 0.07; $p < 0.05$) and pliability (MD = 0.23; $p < 0.05$) compared to verapamil. However, no significant differences were noted in later sessions, and both treatments had similar overall efficacy. This resonates with our results where height score improved more in the triamcinolone group (mean 2.65 ± 0.52) than the verapamil group (mean 2.40 ± 0.58), while pliability improvements were statistically non-significant ($p = 0.864$), showing similar effects by both drugs on pliability over time.[16]

The findings of Ahuja et al. (2014) also mirror our observations. Their study noted faster reductions in scar height and vascularity with triamcinolone (zero VSS scores achieved in 12 and 15 weeks respectively) compared to verapamil (21 and 18 weeks respectively).[17] Although both drugs showed similar effects on pigmentation, they highlighted verapamil's ability to flatten raised scars with fewer side effects and lower cost. This directly relates to our study, where 76% of verapamil-treated patients had no side effects compared to only 40% in the triamcinolone group, suggesting verapamil's better tolerability profile despite being slightly less effective.

Similarly, Shanthi et al. (2008) observed a reduction in vascularity, pliability, and height with both drugs, with faster changes noted in the triamcinolone group. However, they reported that pigmentation and scar length were largely unaffected, findings that are in line with the limitations noted in our own patient outcomes.[18] Importantly, their conclusion that adverse reactions were more frequent with triamcinolone matches our experience, reaffirming verapamil as a safer alternative, especially in patients where steroid-induced side effects such as atrophy or telangiectasia are a concern.

This comparative advantage positions verapamil as a viable alternative or adjunct in long-term scar management protocols, especially for patients prone to corticosteroid-related complications. Individualized treatment planning based on efficacy, safety, scar characteristics, and patient tolerance remains paramount. Future studies with larger sample sizes and longer follow-up periods are warranted to further validate and refine these therapeutic strategies.

CONCLUSION

This study concluded that patients having hypertrophic scars/ keloids were in age range of 23 -33 years. Most of these patients were male, dark skinned and presternal reported as most common site of the scar. More than half of the patients reported cause of the scar as burn. Intra lesional Injection of Triamcinolone Acetone had better efficacy than Intra lesional Injection Verapamil as first line therapy in treatment of hypertrophic scars and keloids and this difference was statistically significant. Whereas safety wise intralesional Verapamil was better.

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