RESEARCH PAPER

A Study of the Efficacy and Safety of 1% Phenytoin Cream with Dermaroller vs 0.5% Copper Peptide Serum with Dermaroller in Acne Scars: A Randomised Controlled Trial

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ABSTRACT

Introduction: Atrophic acne scars present a therapeutic challenge due to collagen loss and connective tissue damage. Phenytoin cream and copper peptide serum, both known to promote collagen synthesis, are commonly used with dermaroller microneedling for scar treatment. However, direct comparative evidence of their efficacy and safety is limited.

Methods: This randomized controlled trial enrolled 76 patients with atrophic acne scars, randomized into two groups: Group A received 1% phenytoin cream with dermaroller, and Group B received 0.5% copper peptide serum with dermaroller. Five treatment sessions were administered at three-week intervals, with follow-up at week 15. Scar severity was assessed using Goodman and Baron's quantitative and qualitative scoring systems, and patient satisfaction was measured via a Likert scale. Adverse effects were documented using the Global Aesthetic Improvement Scale (GAIS). Statistical analysis involved chi-square and independent t-tests with significance set at $p<0.05$.

Results: Both groups showed significant improvement in scar severity scores from baseline to final follow-up, with no statistically significant difference between groups in quantitative score improvement (8.6 ± 3.1 vs 8.4 ± 3.3; $p=0.78$) or qualitative grading ($p=0.60$). Patient satisfaction and global photographic assessment scores were comparable ($p=0.34$ and $p=0.47$, respectively). Adverse effects were mild and similar across groups, with no serious complications reported.

Conclusion: Dermaroller-assisted delivery of 1% phenytoin cream or 0.5% copper peptide serum provides safe and effective treatment for atrophic acne scars, with similar clinical outcomes and patient satisfaction. Further studies with larger samples and longer follow-up are recommended to confirm long-term effects.

Keywords: Atrophic acne scars, Phenytoin cream, Copper peptide serum, Dermaroller microneedling, Randomized controlled trial

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INTRODUCTION

Atrophic acne scars, a common sequela of severe acne vulgaris, affect a significant proportion of individuals worldwide, often resulting in psychological distress due to their visible and persistent nature.(1) These scars are characterized by depressions on the skin surface caused by the loss of collagen and connective tissue during the healing process, posing a considerable therapeutic challenge in dermatology.(2) Various treatment modalities have been explored to improve skin texture and promote collagen synthesis, aiming to restore a more aesthetically pleasing and functional skin appearance.(3–5) Phenytoin cream, originally developed as an antiepileptic agent, has demonstrated potential in enhancing wound healing through its ability to stimulate collagen production, modulate inflammatory responses, and

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promote fibroblast proliferation.(6) Similarly, copper peptides, particularly glycyl-L-histidyl-L-lysine (GHK)-Cu complexes, are endogenous molecules known to facilitate extracellular matrix remodeling, stimulate collagen and glycosaminoglycan synthesis, and aid in skin repair mechanisms.(7) Dermaroller therapy, a microneedling technique, further complements these treatments by creating controlled micro-injuries that initiate neocollagenesis and neovascularization, thereby improving scar appearance.(8) Despite the widespread use of phenytoin cream and copper peptide serum individually, there is a paucity of clinical evidence directly comparing their efficacy when combined with dermaroller therapy in the management of atrophic acne scars. This randomized controlled trial aims to fill this knowledge gap by evaluating and comparing the safety and effectiveness of 1% phenytoin cream versus 0.5% copper peptide serum, each used adjunctively with dermaroller, in improving acne scar outcomes. The study also seeks to document the post-procedural adverse effects associated with these treatment modalities, thereby providing a novel and evidence-based therapeutic approach for atrophic acne scars.

METHODOLOGY

The study was conducted as a Randomized Controlled Trial (RCT) at the outpatient clinic of Dermatology, Venereology, and Leprosy, R L Jalappa Hospital and Research Centre, Sri Devaraj Urs Medical College, Tamaka, Kolar, from September 2025 to February 2026. Patients with acne scars attending the dermatology outpatient department were enrolled after obtaining informed consent. Inclusion criteria comprised patients above 18 years of age, both male and female, diagnosed with acne scars without active acne lesions, and who had discontinued isotretinoin therapy at least three months prior to treatment. Exclusion criteria included patients with active acne, keloidal tendency, known collagen vascular disease, active bleeding disorders, chronic corticosteroid or anticoagulant therapy, active facial infections, pregnancy, recent invasive acne scar treatment within three months, or inflammation at the treatment site. A total of 76 participants were randomized into two groups using computer-generated block randomization with a block size of 2. Group A received dermaroller treatment combined with 1% Phenytoin cream, while Group B received dermaroller treatment combined with 0.5% Copper peptide serum. The copper peptide serum was prepared through a multi-phase process involving hydration and thickening of the aqueous phase, emulsification with an oil phase, cooling with active ingredients added, pH adjustment, and de-airing before filling into opaque, airless containers. For the intervention, a topical anesthetic cream containing 2.5% w/w lidocaine and 2.5% w/w prilocaine was applied under occlusion for one hour on the treatment area. After achieving adequate anesthesia, dermarolling was performed with 16–20 passes in horizontal, vertical, and oblique directions until uniform pinpoint bleeding was observed. Immediately following dermarolling, Group A participants received topical application of 1% Phenytoin cream, and Group B participants received 0.5% Copper peptide serum. Patients were instructed to retain the applied cream or serum for at least six hours before washing off. Physical sunscreen with SPF 50 was advised for post-procedure care. Each participant underwent five treatment sessions at three-week intervals (baseline, week 3, week 6, week 9, and week 12), with a final follow-up visit at week 16. Baseline clinical history and examination were recorded using a structured proforma. Acne scar severity was assessed using Goodman and Baron's Quantitative and Qualitative scoring systems, and clinical photographs were taken at baseline and each follow-up under standardized conditions using an iPhone 14 Pro.(9) Patient satisfaction was evaluated using a Likert scale at baseline and after each treatment session. Scar severity grading and global photographic assessments were performed by a blinded third observer. Adverse effects such as erythema, edema, itching, pain, burning sensation, and pigmentary changes were documented using the Global Aesthetic Improvement Scale (GAIS).(10) Data were entered into Microsoft Excel and analyzed using SPSS version 22. Categorical variables were expressed as frequencies and proportions, and continuous variables as means and standard deviations. Chi-square tests assessed significance for categorical data, and independent t-tests compared mean differences between groups, with a p-value of <0.05 considered statistically significant.

RESULTS

There were no statistically significant differences between Group A and Group B with respect to age (24.5 ± 4.3 vs 25.1 ± 4.7 years; p = 0.52), gender distribution (male: 52.6% vs 50.0%; p = 0.78), duration of acne scars (14.2 ± 6.5 vs 13.8 ± 7.1 months; p = 0.76), or history of isotretinoin use (39.5% vs 44.7%; p = 0.65), indicating that the two groups were comparable in baseline demographic and clinical characteristics (Table 1).

Table 1: Sociodemographic Characteristics of Participants (N=76)

Variable	Group A (n=38)	Group B (n=38)	Total (N=76)	p-value
Age (Mean ± SD)	24.5 ± 4.3 years	25.1 ± 4.7 years	24.8 ± 4.5 years	0.52
Gender (n, %)				
- Male	20 (52.6%)	19 (50.0%)	39 (51.3%)	0.78
- Female	18 (47.4%)	19 (50.0%)	37 (48.7%)	
Duration of Acne Scars (Mean ± SD)	14.2 ± 6.5 months	13.8 ± 7.1 months	14.0 ± 6.8 months	0.76

History of Isotretinoin Use (n, %)	15 (39.5%)	17 (44.7%)	32 (42.1%)	0.65

Both groups showed substantial improvement in acne scar severity following treatment. Baseline Goodman and Baron quantitative scores were comparable between Group A and Group B (21.3 ± 6.2 vs 22.5 ± 5.8; p = 0.38), as were final scores after treatment (12.7 ± 4.9 vs 14.1 ± 5.2; p = 0.21). The mean improvement in quantitative score was similar in both groups (8.6 ± 3.1 vs 8.4 ± 3.3; p = 0.78), indicating no statistically significant difference in treatment efficacy. Baseline qualitative grade distribution was also comparable (p = 0.85), and both groups demonstrated a shift toward milder grades at the end of the study, with no significant difference in final qualitative grades between groups (p = 0.60). Overall, both treatment modalities produced comparable improvements in acne scar severity (Table 2).

Table 2: Baseline and Post-Treatment Acne Scar Severity Scores

Parameter	Group A (1% Phenytoin + Dermaroller)	Group B (0.5% Copper Peptide + Dermaroller)	p-value
Baseline Goodman & Baron Quantitative Score (Mean ± SD)	21.3 ± 6.2	22.5 ± 5.8	0.38
Final Goodman & Baron Quantitative Score (Mean ± SD)	12.7 ± 4.9	14.1 ± 5.2	0.21
Improvement in Quantitative Score (Mean ± SD)	8.6 ± 3.1	8.4 ± 3.3	0.78
Baseline Goodman & Baron Qualitative Grade (n, %)	Grade 1: 5 (13.2%)	Grade 1: 4 (10.5%)	0.85
	Grade 2: 12 (31.6%)	Grade 2: 13 (34.2%)	
	Grade 3: 16 (42.1%)	Grade 3: 17 (44.7%)	
	Grade 4: 5 (13.2%)	Grade 4: 4 (10.5%)	
Final Goodman & Baron Qualitative Grade (n, %)	Grade 1: 18 (47.4%)	Grade 1: 15 (39.5%)	0.60
	Grade 2: 12 (31.6%)	Grade 2: 14 (36.8%)	
	Grade 3: 6 (15.8%)	Grade 3: 7 (18.4%)	
	Grade 4: 2 (5.3%)	Grade 4: 2 (5.3%)	

Patient satisfaction scores were comparable between Group A and Group B (4.1 ± 0.7 vs 3.9 ± 0.8; p = 0.34). The Global Photographic Assessment (GPA) score distribution also did not differ significantly between groups (p = 0.47), with the majority of patients in both groups demonstrating 25–75% improvement, and similar proportions achieving >75% improvement. Overall, both treatments resulted in comparable patient satisfaction and clinical improvement as assessed by GPA (Table 3).

Table 3: Patient Satisfaction (Likert Scale) and Global Photographic Assessment (GPA)

Parameter	Group A (n=38)	Group B (n=38)	p-value
Patient Satisfaction (Mean ± SD)	4.1 ± 0.7	3.9 ± 0.8	0.34
GPA Score Distribution (n, %)			
- Grade 0 (<25% improvement)	4 (10.5%)	5 (13.2%)	0.47
- Grade 1 (25-50% improvement)	15 (39.5%)	16 (42.1%)	
- Grade 2 (51-75% improvement)	14 (36.8%)	12 (31.6%)	

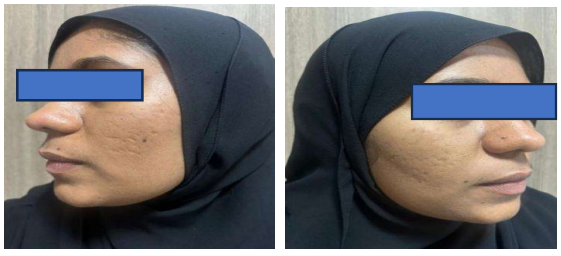
- Grade 3 (>75% improvement)	5 (13.2%)	5 (13.2%)	

The incidence of adverse effects was comparable between Group A and Group B, with no statistically significant differences for erythema (31.6% vs 26.3%; p = 0.61), edema (21.1% vs 18.4%; p = 0.77), itching (15.8% vs 13.2%; p = 0.74), pain (26.3% vs 23.7%; p = 0.79), burning sensation (13.2% vs 15.8%; p = 0.74), or pigmentary changes (7.9% vs 10.5%; p = 0.69). Overall, both treatments demonstrated similar safety profiles with predominantly mild and comparable adverse effects (Table 4).

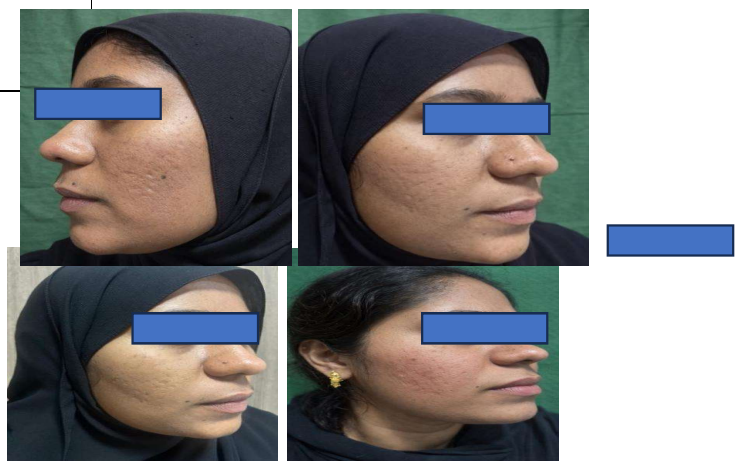
Table 4: Adverse Effects Documented Using GAIS

Adverse Effect	Group A (n=38)	Group B (n=38)	p-value
Erythema (n, %)	12 (31.6%)	10 (26.3%)	0.61
Edema (n, %)	8 (21.1%)	7 (18.4%)	0.77
Itching (n, %)	6 (15.8%)	5 (13.2%)	0.74
Pain (n, %)	10 (26.3%)	9 (23.7%)	0.79
Burning Sensation (n, %)	5 (13.2%)	6 (15.8%)	0.74
Pigmentary Changes (n, %)	3 (7.9%)	4 (10.5%)	0.69

GROUP A: DERMAROLLER WITH 1% PHENYTOIN



AT BASELINE



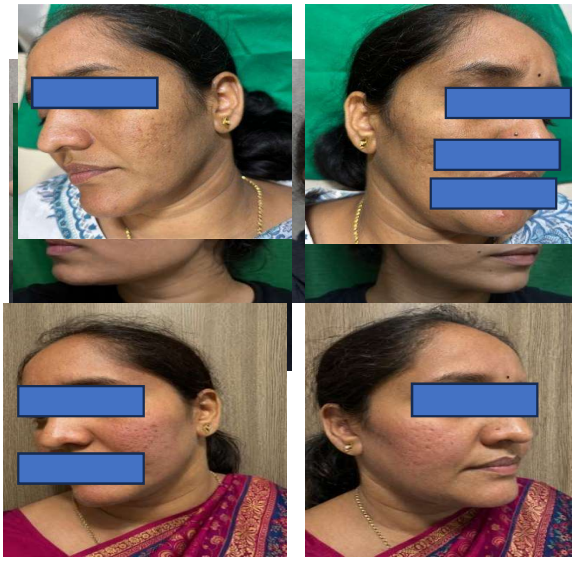
AT 3 WEEKS

AT 6 WEEKS

AT 9 WEEKS

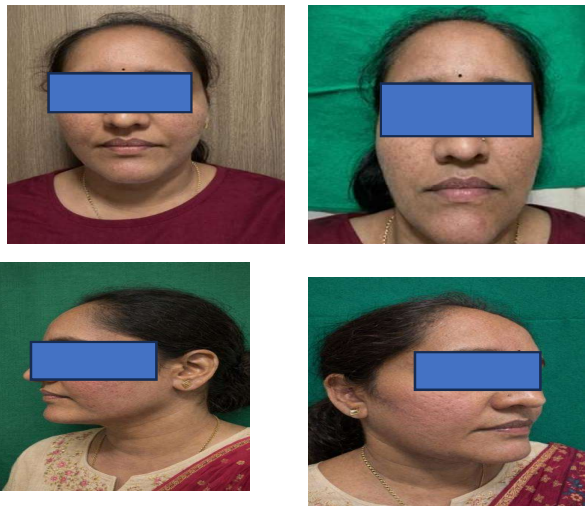
AT 12 WEEKS

GROUP B: DERMAROLLER WITH 0.5% COPPER PEPTIDE SERUM



AT BASELINE

AT 3 WEEKS



AT 6 WEEKS

AT 9 WEEKS

AT 12 WEEKS

DISCUSSION

The results of this randomized controlled trial demonstrated that both 1% Phenytoin cream combined with dermaroller and 0.5% Copper peptide serum combined with dermaroller were effective in improving the severity of atrophic acne scars. Quantitative assessment using Goodman and Baron's scoring system showed a significant reduction in scar scores in both groups from baseline to the final follow-up, indicating a substantial improvement in scar severity. The mean improvement in quantitative scores was comparable between the two groups, with no statistically significant difference, suggesting similar efficacy of the two treatment modalities.Qualitative grading also reflected this trend, with a notable shift from higher severity grades at baseline to lower grades post-treatment in both groups. This qualitative improvement was corroborated by the Global Photographic Assessment (GPA) scores evaluated by a blinded observer, which showed that most patients in both groups achieved at least 25–50% improvement, with a subset experiencing greater than 75% improvement. Patient satisfaction scores were high in both groups, with mean Likert scale ratings indicating good to excellent satisfaction levels. This aligns with the objective clinical improvements observed and underscores the acceptability and tolerability of both treatments from the patients' perspective.(11) Regarding safety, adverse effects were mild and comparable between groups. Common side effects such as erythema, edema, itching, pain, burning sensation, and pigmentary changes were reported with similar frequencies and resolved without significant intervention, as documented by the Global Aesthetic Improvement Scale (GAIS). No severe or permanent adverse events were noted, indicating a favorable safety profile for both treatment regimens. These findings support the hypothesis that dermaroller-assisted transdermal delivery of both phenytoin cream and copper peptide serum promotes collagen synthesis and tissue remodeling, leading to clinical improvement in acne scars.(12) The comparable efficacy between the two groups suggests that both agents, when combined with microneedling, can be considered viable therapeutic options. Limitations of the study include the relatively short follow-up period and the sample size, which, while adequate for detecting significant differences, may limit the generalizability of findings. Future studies with larger cohorts and longer follow-up could provide more insight into the durability of treatment effects and comparative long-term safety.

CONCLUSION

The study concluded that both 1% Phenytoin cream combined with dermaroller and 0.5% Copper peptide serum combined with dermaroller are effective and safe treatment options for atrophic acne scars. Significant improvements were observed in scar severity scores, both quantitatively and qualitatively, with comparable efficacy between the two groups. Patient satisfaction was high, and adverse effects were mild and similar across treatments, resolving without serious complications. These findings suggest that dermaroller-assisted transdermal delivery of either phenytoin cream or copper peptide serum promotes collagen synthesis and tissue remodeling, providing viable therapeutic alternatives for acne scar management. Further research with larger sample sizes and longer follow-up is recommended to confirm the durability and long-term safety of these treatments.

REFERENCES

1. Zhou c, vempati a, tam c, khong j, vasilev r, tam k, et al. Beyond the surface: a deeper look at the psychosocial impacts of acne scarring. Ccid. 2023;16(3):731–738. Doi: 10.2147/ccid.s406235
2. Lin X, Lai Y. Scarring Skin: Mechanisms and Therapies. IJMS. 2024;25(3):1458. doi: 10.3390/ijms25031458

3. Magnani LR, Schweiger ES. Fractional CO2 lasers for the treatment of atrophic acne scars: A review of the literature. Journal of Cosmetic and Laser Therapy. 2013;16(2):48–56. doi: 10.3109/14764172.2013.854639

4. Ahmed R, Mohammed G, Ismail N, Elakhras A. Randomized clinical trial of CO2 LASER pinpoint irradiation technique versus chemical reconstruction of skin scars (CROSS) in treating ice pick acne scars. Journal of Cosmetic and Laser Therapy. 2013;16(1):8–13. doi: 10.3109/14764172.2013.854633

5. Rongsaard N, Rummaneethorn P. Comparison of a Fractional Bipolar Radiofrequency Device and a Fractional Erbium-Doped Glass 1,550-nm Device for the Treatment of Atrophic Acne Scars: A Randomized Split-Face Clinical Study. Dermatologic Surgery. 2013;40(1):14–21. doi:

10.1111/dsu.12372

6.Kumar CS, Vasudeva N, Rao DV, Naidu CRSA. Outcomes of topical phenytoin in the management of traumatic wounds. Journal of Clinical Orthopaedics and Trauma. 2020;13:116–121. doi: 10.1016/j.jcot.2020.11.019

7. Pickart L, Vasquez-Soltero JM, Margolina A. GHK Peptide as a Natural Modulator of Multiple Cellular Pathways in Skin Regeneration. BioMed Research International. 2015;2015(5792):1–7. doi: 10.1155/2015/648108

8. Doddaballapur S. Microneedling with Dermaroller. J Cutan Aesthet Surg. 2009;2(2):110. doi: 10.4103/0974-2077.58529

9. Goodman GJ, Baron JA. Postacne scarring – a quantitative global scarring grading system. J of Cosmetic Dermatology. 2006;5(1):48–52. doi: 10.1111/j.1473-2165.2006.00222.x

10. Saonanon P, Rattanakit K, Vejanurug P, Thanyavuthi A. Skin tightening by an insulated microneedle radiofrequency device combined with lower blepharoplasty: a randomized fellow eye comparison study. J Cosmet Med. 2021;5(1):30–35. doi: 10.25056/jcm.2021.5.1.30

11. Bandral MR, Padgavankar PH, Japatti SR, Gir PJ, Siddegowda CY, Gir RJ. Clinical Evaluation of Microneedling Therapy in the Management of Facial Scar: A Prospective Randomized Study. J Maxillofac Oral Surg. 2018;18(4):572–578. doi: 10.1007/s12663-018-1155-7

12. Vignesh NR, Balakumaran C, Kumar N NA, Sukanya G, Megalai AS, Sowbaghya PT. A study comparing the effect of dermaroller versus dermaroller with copper peptide in the management of acne scars. JCAS. 2025;0:1–9. doi: 10.25259/jcas_56_2025