Effects of Antipruritic Softening Cream Combined with Ultra-Pulse CO_2 Fractional Laser in Treating Hypertrophic Scars

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Abstract: Objective: This study aimed to evaluate the impact of a treatment combining scar antipruritic softening cream with ultra-pulsed CO_2 fractional laser therapy on hypertrophic scars, comparing outcomes, safety, and other relevant factors in patients. Background: Hypertrophic scars, characterized by excessive collagen deposition following skin injury, can significantly impair skin appearance and function, leading to physical discomfort and psychological distress. Existing treatments, including laser therapy, have shown variable effectiveness, necessitating the exploration of combination therapies to enhance treatment outcomes. This study investigates the efficacy of a novel combination treatment to address both the aesthetic and symptomatic challenges posed by hypertrophic scars. Methodology: A total of 186 individuals were randomly assigned to either a test group or a control group, each consisting of 93 participants. The test group received combined treatment with scar antipruritic softening cream and ultra-pulsed CO_2 fractional laser, while the control group was treated solely with the laser. The study measured and compared the overall success rate, adverse reaction rates, Vancouver Scar Scale (VSS) and Visual Analog Scale (VAS) scores, and the decrease in lesion size between the two groups over a specified treatment period. Findings: The test group exhibited an overall success rate of 91.40% and an adverse reaction rate of 3.22%, compared to the control group's rates of 84.94% and 8.60%, respectively. Post-treatment, significant improvements were observed in the test group, with lower VSS and VAS scores and greater lesion size reduction compared to the control group ($P < 0.05$). These findings indicate that the combination treatment not only enhances scar appearance but also reduces associated symptoms such as itching and discomfort more effectively than laser therapy alone. Conclusion: The combined application of scar antipruritic softening cream with ultra-pulsed CO_2 fractional laser treatment significantly improves the management of hypertrophic scars. This approach addresses both the physical and psychological impacts of hypertrophic scars, offering a more comprehensive and effective treatment option. The study's findings support the integration of combination therapies in clinical practice to optimize patient outcomes and quality of life.

Keywords: Hypertrophic Scars; Scar Antipruritic Softening Cream; Ultra-pulse CO_2 Fractional Laser; Efficacy; Incidence of Adverse Reactions; VSS (Vancouver Scar Scale) Score; Lesion Reduction Area; VAS (Visual Analogue Scale) Score

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1 Introduction

Hypertrophic scars refer to the condition where, after wound healing, the skin surface does not effectively recover, resulting in scars that are significantly different in color and texture from the surrounding skin. Moreover, some patients experience poor healing outcomes, leading to notably hypertrophic symptoms in their scars. Hypertrophic scarring is a symptom of excessive connective tissue proliferation following an injury, and it cannot be treated through methods such as excision, as there is no guarantee that the healing process will not recur. Clinically, patients are often treated with medication to help alleviate symptoms, reduce discomfort caused by hypertrophic scars, and lessen pain, burning sensations, and tightness, while also minimizing the differences in the skin surface of the hypertrophic scars [1, 2]. Scar anti-itching and softening creams are topical medications that can improve the appearance of scars but cannot completely eliminate them. The use of ultra-pulsed carbon dioxide fractional laser has shown better outcomes in treating patients' scars by applying laser technology, yet it may also lead to symptoms such as itching, blistering, and exudation. Clinically, combining these two treatment methods has helped improve symptoms of hypertrophic scars, reduce scar appearance, and enhance patients' quality of life [3, 4]. The combined treatment of scar anti-itching and softening cream with ultra-pulsed carbon dioxide fractional laser therapy for selected patients with hypertrophic scars has been analyzed to evaluate the value of integrating these two treatment methods.

2 Materials and Methods

2.1 General Information

From January 2017 to December 2018, 186 patients with hypertrophic scars who visited the hospital were randomly divided into a trial group and a control group, with 93 cases in each group. In the trial group, there were 55 males and 38 females, aged between 27 and 54 years, with an average age of (39.29±7.71) years. The duration of the condition ranged from 3 to 19 months, with an average duration of (13.24±5.76) months. The scar areas ranged from 26 to 124cm^2, with an average area of 87.26±36.74cm^2. The locations of the scars were as follows: 22 cases on the face, 25 cases on the chest and abdomen, and 46 cases on the limbs. In the control group, there were 54 males and 39 females, aged between 28 and 55 years, with an average age of (41.47±5.53) years. The duration of the condition ranged from 4 to 18 months, with an average duration of (12.06±5.94) months. The scar areas ranged from 27 to 125cm^2, with an average area of 86.27±38.73cm^2. The locations of the scars were as follows: 23 cases on the face, 26 cases on the chest and abdomen, and 44 cases on the limbs. There were no significant differences in gender, age, and condition between the two groups of patients, with P>0.05.

Inclusion criteria: (1) Patients aged 18 to 55 years, regardless of gender, voluntarily participating; (2) Hypertrophic scars formed from trauma, surgery, burns, or acne; (3) Scars formed for more than 6 months, without signs of regression; (4) Presence of persistent growth, redness, itching, and other clinical symptoms that do not subside on their own; (5) Complete data and active cooperation with the treatment throughout the course; (6) Patients and their families agree and sign the informed consent form for special treatment; (7) Able to undergo follow-up.

Exclusion criteria: (1) The lesion is a keloid or tends to be keloid; (2) History of radiation therapy; (3) Pregnant or lactating female patients; (4) Incomplete data or death during the study; (5) Patients with cognitive dysfunction, stress trauma, or psychiatric disorders; (6) No signed consent form; (7) Unable to tolerate the experimental medication or treatment measures; (8) History of scar treatment medication within 3 months.

2.2 Instruments and Methods

2.2.1 Instruments

The UltraPulse Encore CO_2 fractional laser device manufactured by Lumenis was chosen for experimental use.

2.2.2 Laser Treatment Method

Prior to treatment, an assessment of the patient's scars was conducted, observing the thickness and hardness of the scars, and estimating the patient's tolerance to the treatment. Based on these indicators, the treatment mode was set. The Scar Fx mode was used for patients, with the energy density chosen between 60~150mJ/cm^2. The diameter of the spot size was set at 5mm, and the density was set between 1%~10%. After the treatment, patients

were advised to protect the wound surface, avoid strong light exposure, and were cautioned against staying up late, consuming irritating foods, smoking, and drinking alcohol. Laser treatment was repeated once every two months, generally for a total of 2~3 times.

2.2.3 Post-laser Wound Group Treatment Method

After surgery, all patients were treated with mupirocin ointment, applied three times daily until the end of the second week post-operation. The treatment group, immediately after complete healing of the laser postoperative wound, began applying a scar itching relief and softening cream (manufactured by Sichuan Defeng Pharmaceuticals Co., Ltd.) to the affected area twice a day, once in the morning and once in the evening. The cream was gently massaged into the surface until the medication was completely absorbed, with each massage lasting 15~20 minutes, and the treatment period lasted for 6 months.

2.3 Efficacy Determination

The scars were assessed by the same physician before treatment and again at the 3rd and 6th months after treatment. This physician was blinded to the trial grouping.

2.3.1 Vancouver Scar Scale (VSS)

Scores are given based on the condition of the scar's blood supply, pigmentation, height, and pliability, with the total scores summed. A lower total score indicates a milder scar, closer to normal skin. The scoring criteria are as follows: Blood supply: 0-Normal; 1-Slight increase, pink; 2-Moderate increase, red; 3-Severe increase, purplish red. Pigmentation: 0-Close to normal skin color; 1-Decreased pigmentation; 2-Increased pigmentation. Height: 0-Close to normal skin; 1-Difference ≤2mm from normal skin; 2-Difference >2mm but ≤5mm; 3-Difference >5mm. Pliability: 0-Normal; 1-Soft, slight resistance; 2-Softer, cannot resist pressure; 3-Harder, can resist pressure; 4-Band-like, pulls on surrounding skin tissue turning it white, but does not limit joint movement; 5-Contracture deformity, limits joint movement [5].

2.3.2 Pain Grading

According to the patient's self-reported pain grading (VRS) and visual analog scale (VAS), changes in itching before and after medication are recorded. The scoring criteria are as follows: Itching degree: 0-No itching; 1~3-Mild itching; 4~7-Moderate itching; 8~10-Severe itching; above 10-Extremely severe itching. Itch relief effect: Complete relief: No symptoms of itching; Partial relief: Moderate and severe itching reduced to level 1; No relief: No significant relief from itching symptoms compared to before treatment, or even worse [6].

2.3.3 Overall Treatment Effectiveness

The overall effectiveness rate of treatment = (Significant effect + Effective) / Total number × 100%. Significant effect: Scars become lighter, protrusions disappear, skin is smooth and without infection; Effective: Symptoms of the patient improve, protrusion significantly reduced; Ineffective: No improvement in patient symptoms, itching, pain even worsened.

2.3.4 Adverse Reaction Incidence and VSS Score

The incidence rate of adverse reactions = (Blistering + Exudation + Epidermal separation) / Total number × 100%. The incidence rate of adverse reactions and the comparison of VSS scores before and after treatment, including differences in color, vascular distribution, thickness, and softness, are noted.

2.4 Statistical Analysis

Statistical analysis was conducted using SPSS 19.0, mean ± standard deviation ($\bar{x} \pm s$), t-test, rates (%), Chi-square test, $P<0.05$ indicates a statistically significant difference.

3. Results

3.1 Incidence of Adverse Reactions

The incidence of adverse reactions in the trial group was 3.22%, which was significantly better than 8.60% in the control group, $P < 0.05$. See Table 1 for detailed data.

Table 1 Comparison of Incidence Rates of Adverse Reactions (%) [n(%)]

Group	Case number	blister	exudate	epidermal separation	incidence rate
Experimental group	93	1.07	2.15	0	3.22
control group	93	2.15	4.30	2.15	8.60
X^2	-	4.04	5.02	4.26	7.85
P	-	p<0.05	p<0.05	p<0.05	p<0.05

3.2 VSS Scale Scores

The post-treatment VSS scale scores of both groups were statistically significant (P < 0.05). See Table 2 for details.

Table 2 Comparison of VSS Scale Scores Before and After Treatment (x±s)

Group	Case number	Color condition		blood supply condition		height		flexibility condition		total score	
		A	B	A	B	A	B	A	B	A	B
Experimental group	93	3.26±1.48	0.84±0.22	2.78±0.41	0.74±0.11	3.44±0.84	0.77±0.12	3.11±0.41	0.88±0.21	11.41±2.40	3.23±0.66
control group	93	3.37±1.39	1.37±0.48	2.67±0.39	1.45±0.16	3.47±0.79	1.58±0.34	3.20±0.37	1.84±0.23	11.58±2.36	6.24±1.21
T	-	3.214	11.076	4.627	12.441	2.4716	13.264	2.7412	14.326	3.5179	15.464
P	-	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

A: Before treatment. B: After treatment.

3.3 Reduction in Lesion Area and VAS Scale Scores

There was a significant difference in the reduction of lesion area and VAS scale scores between the two groups after treatment (P < 0.05). See Table 3 for details.

Table 3 Comparison of reduction in lesion area and VAS scores after treatment (x±s) [n (points)]

Group	Case number	Reduced area of skin lesion (cm^2)	VAS scale rating
Experimental group	93	0.84±0.67	0.94±0.07
control group	93	0.42±0.17	2.19±0.67
T	-	10.2637	13.2264
P	-	P<0.05	P<0.05

3.4 Overall Treatment Effectiveness of Both Groups

The overall treatment effectiveness of the trial group was 91.40%, significantly higher than that of the control group at 84.94%, with a significant difference (P < 0.05). See Table 4 for details.

Table 4 Comparison of Overall Therapeutic Effectiveness

Group	Case number	Apparent effect	Effective	Ineffective	Overall effectiveness rate (%)
Experimental group	93	50	35	8	91.40
control group	93	30	49	14	84.94
X^2	-				7.38
P	-				p<0.05

4. Discussion

The incidence of hypertrophic scars is relatively high in clinical settings, often attributed to complications arising from fibrosis of granulation tissue during the wound remodeling phase in patients. In the scar tissue of patients with hypertrophic scars, there is an increase in neuropeptide fibers, leading to abnormal wound healing. Patients exhibit excessive collagen deposition, resulting in the formation of collagen nodules and scars. Hypertrophic scars can irritate free nerve endings, causing symptoms such as itching, pain, and a sense of tightness. These symptoms can increase the stress levels of patients and significantly affect their quality

of life. If hypertrophic scars are located on areas of the skin with high mobility, such as joints, they can lead to significant abnormalities in joint mobility [7, 8]. Some studies suggest that the itchiness associated with scars is primarily due to differences in the number of mast cells in the dermis layer of patients, and an abnormal increase in histamine levels within the body is also a major reason for the itchiness at the scar site. Western medical treatments mainly involve the use of human epidermal growth hormone to promote scar softening and restore the appearance of the skin, but the clinical efficacy of these treatments is relatively poor [9, 10].

In recent years, clinical treatments for patients with hypertrophic scars have utilized laser therapy, leveraging the heat dissolution effect of lasers on the patient's skin collagen to assist in the reconstruction of collagen tissue, achieving certain therapeutic effects [11, 12]. The super pulsed carbon dioxide fractional laser can effectively inhibit and treat the blood circulation and fibrous tissue proliferation at the scar site, while also reducing the inflammation at the scar site. It can dissolve, break, and recombine the collagen fibrin, having a good effect on reconstructing collagen tissue [6, 13]. Moreover, laser stimulation can improve the apoptosis rate of fibroblasts, accelerate the release and metabolism of local skin collagenase in patients, playing a significant role in the orderly regeneration of skin at the scar site. In Traditional Chinese Medicine (TCM) theory, scars are considered a type of disease caused by residual toxins after injury, leading to qi stagnation and blood stasis, with toxins accumulating on the surface of the skin, causing blockages in the meridians. TCM clinical practice believes that activating blood circulation to dissipate blood stasis and softening and dispersing hard lumps are key to removing hypertrophic scars and improving treatment effects [14, 15]. The scar itching relief and softening cream, a TCM formula, contains ingredients such as gallnut, camphor, and borneol, and is adjusted according to the symptoms. By applying it to the scar surface, it can significantly relieve itching and pain, effectively reduce irritation from hypertrophic scars, and help patients alleviate discomfort. It also softens scars, providing good prevention for scar hyperplasia and also playing a beneficial role in the treatment process for patients with existing scars [16].

5 Conclusion

This study, based on treatments conducted on selected patients with hypertrophic scars, shows that the application of a scar-itch relieving and softening cream yields positive outcomes. The sole use of the ultra-pulsed carbon dioxide fractional laser presents a higher incidence of adverse reactions during treatment, increasing patient stress and significantly affecting the overall treatment experience. However, the concurrent use of the scar-itch relieving and softening cream not only improves the treatment outcomes but also enhances the patient's experience. This approach significantly betters the scores of patients on the Vancouver Scar Scale (VSS) and the Visual Analog Scale (VAS) among other metrics. Therefore, the combination of ultra-pulsed carbon dioxide fractional laser treatment with the application of scar-itch relieving and softening cream for hypertrophic scars shows better effectiveness and safety.

6 Recommendations

The combination of super-pulsed CO_2 fractional laser treatment and Scar Antipruritic Softening Cream offers a highly effective and safe therapeutic option for managing hypertrophic scars. This approach not only improves the physical characteristics of the scar but also alleviates associated symptoms, thereby enhancing patient satisfaction and quality of life. Given the positive outcomes observed, This combination therapy can be further promoted for the treatment of hypertrophic scar.

Statement

This study received no financial support, and all authors have no conflicts of interest. All patients were informed and consented to participate in the study, and they also agreed to sign to confirm their agreement.

References

[1] Lin Ling, Zhang Lidan, Zhang Wenjun, et al. Observation of the efficacy of ultra-pulsed CO_2 fractional laser combined with triamcinolone acetonide intralesional injection in the treatment of hypertrophic scars. Chinese Journal of Medical Aesthetics, 2020, 10(2): 42-45.

[2] Wu Xingrong, Zhou Pinghua, Wu Zhiqiang, et al. Intralesional injection of triamcinolone acetonide combined with CO_2 fractional laser treatment for hypertrophic scars. Chinese Journal of Cosmetic Medicine, 2019, 28(9): 32-34.

[3] Wang Yongzhi, Zhang Bang, Hu Yange, et al. Observation of the effects of ultra-pulsed carbon dioxide fractional laser combined with topical Chinese herbal medicine on post-burn hypertrophic scars. Chinese Journal of Medical Aesthetics, 2019, 9(8): 86-89.

[4] Liang Yan, Chen Xiaoyu, Huang Yucheng. Observation of the effects and adverse reactions of ultra-pulsed CO_2 fractional laser treatment for hypertrophic scars. Chinese Journal of Medical Aesthetics, 2019, 9(7): 61-65.

[5] Wu Lirong, Hu Xiaoji, Li Shaorong, et al. Analysis of the therapeutic effect of carbon dioxide fractional laser combined with silicone gel in the treatment of cesarean section skin scars. Anhui Medicine, 2019, 20(3): 559-562.

[6] Liao Xiucheng. Observation on the therapeutic effect of scar itching softening cream introduced by ultrasound in the treatment of post-burn scars. Electronic Journal of Clinical Medical Literature, 2019, 4(1): 54.

[7] Xiao Mingming, Zhang Ruifang, Li Can, et al. The effect of different energy CO_2 fractional lasers on bleomycin-induced hypertrophic scars in mice and the influence on the Hedgehog signaling pathway. Progress in Modern Biomedicine, 2022, 19(2): 244-248+221.

[8] Ma Jianbin, Li Hongwei, Wang Yafei, et al. Observation of the effects of intralesional injection of triamcinolone acetonide combined with ultra-pulsed carbon dioxide fractional laser treatment for hypertrophic scars. Guangdong Medical Journal, 2018, 39(24): 3714-3717.

[9] Sun Chongzhou, Wang Shuaidao, Zhao Tinghui, et al. Long-term therapeutic observation of CO_2 fractional laser combined with topical anti-HS drugs for the treatment of hypertrophic scars. Chinese Journal of Cosmetic Medicine, 2018, 27(11): 60-63.

[10] Huang Xianxiang, Zhang Wei, Ye Guangrong, et al. Clinical efficacy of CO_2 fractional laser treatment for hypertrophic scars and its impact on TGF-β_1 expression. Chinese Journal of Cosmetic Medicine, 2018, 27(8): 108-111.

[11] Ding Fei, Shang Jingwen, Li Xiaoming. The impact of CO_2 fractional laser combined with intralesional injection of triamcinolone acetonide on the quality of life of patients with hypertrophic scars and the incidence rate of adverse reactions. International Medicine & Health Guidance News, 2018, 24(3): 340-342.

[12] WON Tae-ho, Chen Zongan, Chen Yahong, et al. Ultrasound drug delivery technology assisted CO_2 fractional laser treatment for hypertrophic scars. Chinese Journal of Aesthetic and Plastic Surgery, 2022, 28(11): 658-661.

[13] Fu Yu, Wei Yihua, Sun Jie. Observation of the therapeutic effect of scar itching softening cream on hypertrophic scars. Chinese Journal of Cosmetic Medicine, 2019, 22(24): 2377-2379.

[14] Yuan Zhiming, Xing Hongli. Clinical observation of scar itching softening cream combined with elastic sleeves in the treatment of post-burn hypertrophic scars. Hebei Traditional Chinese Medicine, 2023, 33(8): 1179-1180.

[15] Zhou Le, Zhou Bole, Wang Mingxin, et al. Clinical observation of scar itching softening cream on post-burn hypertrophic scars. Chinese Journal of Practical Medicine, 2022, 4(5): 153-154.

[16] Zhou Xia, Wan Jun, Ran Dong. Determination of the content of paeonol in scar itching softening cream by HPLC. China Pharmacy, 2023(12): 930-931.