EFFICACY OF MINIMALLY INVASIVE METHODS FOR THE TREATMENT OF POST-TRAUMATIC SCARS USING MODERN LASER TECHNOLOGIES

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Objective of the Study: To evaluate the efficacy and safety of minimally invasive methods for the treatment of post-traumatic scars using modern laser technologies, as well as to determine their impact on the clinical and morphological characteristics of scar tissue and the quality of reparative processes

Materials and Methods: This study included patients referred from other clinics who sought treatment at the **Bukhara Branch of the Republican Scientific Center of Emergency Medical Care** between January 2023 and January 2024. A total of 36 patients aged 16–65 years with previously untreated hypertrophic scars (HTS) resulting from burn injuries were enrolled.Prior to the procedure, all participants received a topical anesthetic cream containing lidocaine and prilocaine, applied one hour before laser treatment. All scars were treated using a fractional ablative CO_2 laser (SmartXide DOT, DEKA, Italy).Laser parameters were stratified into two categories based on scar height. Scars with a height of <5 mm were treated using lower parameters: power 15 W (stack 3), dwell time 700 microseconds, inter-microchannel spacing 500

micrometers, density 13.56%, and an estimated ablation depth ranging from 200 to 400 micrometers. Scars with a height of >5 mm were treated using higher parameters: power 20 W (stack 4), dwell time 1000 microseconds, inter-microchannel spacing 700 micrometers, density 9.24%, and an estimated ablation depth ranging from 400 to 600 micrometersImmediately after laser therapy, participants received one of the following interventions: distilled water (Group A); a 50 mg/mL solution of 5-fluorouracil at a dose of 5 mg/cm², with a total volume of 1–2 mL depending on the treated surface area (Group B); or a 40 mg/mL solution of triamcinolone acetonide at a dose of 4 mg/cm², with a total volume of 0.5–2 mL depending on the surface area, administered via point application (Group C).Of the 36 patients initially assessed, all were considered eligible for risk-group evaluation; however, two patients did not meet the inclusion criteria, and six patients were found to have an allergy to lidocaine and were therefore retained in the control group. The remaining 30 patients were randomly allocated into three equal groups (10 patients per group).In Group A, no significant improvement in Vancouver Scar Scale (VSS) parameters was observed after treatment. In Group B, significant improvements were noted in scar height, pliability, and vascularity, with statistically significant differences before and after treatment ($P < 0.05$). In Group C, significant improvements in scar height, pliability, and pigmentation were identified following treatment ($P < 0.05$).

Results: The study results demonstrate that both triamcinolone acetonide (TAC) and 5-fluorouracil (5-FU) are effective in the treatment of hypertrophic scars. The combination of fractional ablative CO_2 laser therapy with topical application of either 5-FU solution or triamcinolone acetonide was more effective than fractional ablative CO_2 laser treatment alone.

Conclusion: This study specifically focused on post-burn hypertrophic scars and employed the Vancouver Scar Scale (VSS) for detailed assessment and intergroup comparison in order to isolate the effects of individual treatment

modalities. The results demonstrated overall improvement, supporting the effectiveness of laser-assisted drug delivery in the management of hypertrophic scars.