

# **The Efficacy of Combining Fractional Carbon Dioxide Laser With Verapamil Hydrochloride or 5-Fluorouracil in the Treatment of Hypertrophic Scars and Keloids: A Clinical and Immunohistochemical Study**

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## **Abstract**

**BACKGROUND:** Ablative fractional laser-assisted therapy is increasingly used to facilitate drug delivery and intensify clinical efficacy of topically applied drugs.

**OBJECTIVE:** To evaluate the effectiveness of combined ablative fractional CO<sub>2</sub> laser and topically applied 5-fluorouracil (5-FU) or verapamil hydrochloride in the treatment of hypertrophic scars (HTSs) and keloids and to examine their possible effects on TGF- $\beta$ 1 expression.

**PATIENTS AND METHODS:** Thirty patients with HTSs and keloids were randomly treated with combined CO<sub>2</sub> laser followed by topical verapamil or 5-FU application or CO<sub>2</sub> laser monotherapy. All patients received 4 treatments at 1-month intervals. Subjective and objective assessment was obtained using the Vancouver Scar Scale (VSS). Histological changes and immunohistochemical staining for TGF- $\beta$ 1 were performed.

**RESULTS:** Compared with baseline, there was a significant reduction in the VSS 1 month after the last treatment session in all groups ( $p < .05$ ). Laser-assisted 5-FU delivery tended to show a higher extent of improvement in scar characteristics than laser-assisted verapamil hydrochloride delivery, without significance. No significant side effects were reported in all patient groups. TGF- $\beta$ 1 expression was significantly decreased after laser sessions.

**CONCLUSION:** Combined fractional CO<sub>2</sub> laser and topical 5-FU or verapamil hydrochloride offer a safe therapy for HTSs and keloids.