



Evaluation of the response of Fractional Carbon Dioxide (CO₂) Laser and Punch Elevation Technique in Treatment of Acne Scars: A split-face comparative clinical, histopathological, and immunohistochemical study

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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LIST of ABBREVIATIONS

AP	Activator Protein
ASR	Ablative Skin Resurfacing
CO₂	Carbon Dioxide
ECCA scale	Evaluation Clinique des Cicatrices d'acne
EGF	Epidermal Growth Factors
Er.-YAG	Erbium Yttrium Aluminum Garnet
FGF	Fibroblast Growth Factor
FP	Fractional Photothermolysis
FT	Fractional Thermolysis
H & E	Hematoxin and Eosin
HSV	Human immuno-Suppressing Virus
IL	Interleukin
MENDs	Microscopic Epidermal necrotic Debris
MMPs	Matrix Metallo-Proteinases
MTZs	Micro-Thermal Zones
NDR	Non-ablative Dermal Remodeling

Nd-YAG Garnet	Neodymium – doped Yttrium Aluminum
NRS	Numerical Rating Scale
O₂	Oxygen
P.acne	Propionibacterium acne
PAMPs	Pathogen-Associated Molecular Patterns
PC	Personal Computer
PPAR Receptors	Peroxisome Proliferator-Activated
PRP	Platelet-Rich Plasma
Punch/Frac CO₂ Fractional CO₂	Punch Elevation technique, combined with laser treatment
“ r ”	correlation coefficient
RF	Radio Frequency
RNase	Ribo Nuclease enzyme
SD	Standard Deviation
SPF	Sun Protection Factor
SPSS	Statistical Package for Social Science

T-cells	Tissue mediated immune cells
TCA	Tri-Chloro-Acetic Acid
TIMPs Proteins	Tissue Inhibitor of Matrix metallo-
TNF	Tumor Necrosis Factor
TH	Tissue Helper
TLRs	Toll-Like Receptors
VEGF	Vascular Endothelium Growth Factor
YSGG	Yttrium - Scandium - Gallium - Garnet

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Abstract

Background : Acne is the most common skin disease affecting adolescents and young adults, with associated scarring and its sequelae. Treatment options are either lifting procedures raising scar base closer to normal skin surface, or resurfacing ones injuring epidermis and superficial dermis with neocollagenesis and epidermal repair. Punch elevation(PE) method is better for improving deep atrophic acne scars ,that can be combined with depth resurfacing. CO₂ laser stimulates new collagen formation , tightens skin and raises scar to surface. **Aim of the work:** to assess efficacy and safety of combination of PE technique and fractional co₂ laser (Fr co₂ L) compared to fr co₂ L alone. **Subjects and Methods :** 20 atrophic post acne scars patients were subjected to history taking, general and dermatological examinations, identifying scars types and grades. Treatment response at start , before each fr. co₂ L session and 4 weeks after last laser session was clinically evaluated by Goodman and Baron scale, and recording patients' photographs, satisfaction, and complications. Histopathological examination of scar skin biopsies before and 4 weeks after the last fr. co₂ L session was done using H&E, Mallory trichome, sliver stain and immunohistochemical VEGF. **Results:** combined treatment with fr co₂ L and PE was more effective in improving post acne scars than fr. co₂ L resurfacing alone. Histopathological examination before combined fr. co₂ L and PE treatment and 1 month after the last fr. co₂ L session showed high significant increase in epidermal thickness (H&E), increase in collagen fiber type III (Mallory trichrome stain), decrease in collagen fiber type I (sliver stain) and increase in fibroblasts' activity (VEGF). **Conclusion:** both PE technique and fr. co₂ L resurfacing show promising efficacy and safety in treating atrophic post acne scars, complementing each other to improve skin texture and appearance, with excellent cosmetic outcomes.

Key words : Acne scar, Punch elevation, Fractional CO₂ Laser, Efficacy, Safety.