

Efficacy and Safety of Scar Modulating Combined Laser Interventions for the Treatment of Hypertrophic Scars in Children

Neuhaus K¹, Elrod J¹, Schiestl C¹, Jandali, A²

1) Division of Plastic and Reconstructive Surgery, Department of Surgery, University Children's Hospital Zurich, Zurich, Switzerland

2) Department of Plastic, Hand and Reconstructive Surgery, Cantonal Hospital of Winterthur, Winterthur, Switzerland

Introduction

Hypertrophic scars are particularly common in children despite all surgical progress. Management is challenging as they are frequently associated with significant morbidity: pain, functional impairment, aesthetic disfigurement and, potentially, a decreased quality of life. Ablative fractional CO₂ (AF-CO₂) and pulse dye laser (PDL) therapy have become more and more popular to improve scar quality and thus patients' subjective burden. As those interventions are painful, they usually require general anesthesia (GA) or procedural sedation (PS) in the pediatric population. We aimed to investigate safety and outcome of repeated laser interventions for hypertrophic scars originating from burns and other conditions by means of patient and physician reported outcome measures.

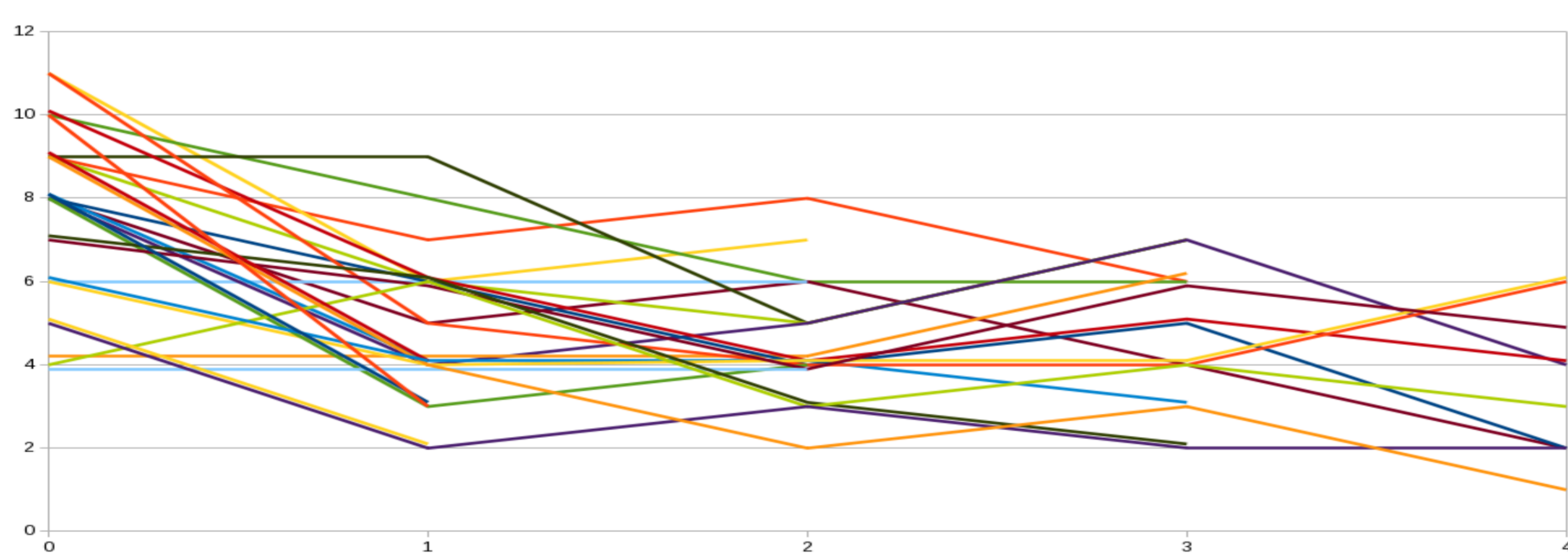
Patients and Methods

Retrospective before-after analysis of laser interventions in patients with hypertrophic scars treated at the University Children's Hospital Zurich between 2017 (start of laser program) and 2019. Demographic data was collected. Outcome was measured using Patient and Observer Scar Assessment Scale (POSAS), Vancouver Scar Scale (VSS) and Itch-Man-Scale (IMS), a 5-point Likert scale. Safety with respect to either laser-related or anesthesia-related complications was assessed. For statistical analysis paired T-Tests were used when appropriate. P-values of less or equal to 0.05 were considered statistically significant. Two-way ANOVA was performed for determination of predictors of treatment success.

Laser protocol: Combined AF-CO₂ and PDL therapy is routinely offered to patients with severe or worsening hypertrophic scars despite comprehensive conservative treatment and/or severe pain or pruritus. A vascular specific 595nm wavelength PDL and a 10.600 nm wavelength AF-CO₂ laser are used. PDL is indicated to reduce pruritus, erythema and edema and AF-CO₂ laser for abnormal texture, thickness, and scar stiffness. Laser treatments are performed under GA or PS provided by a staff pediatric anesthesiologist. No antibiotic prophylaxis is given.

Results

17 patients, aged 11.37 ± 4.82 years with 27 scars underwent 102 distinct laser treatments, mainly combined CO₂ and PDL (94%), few AF-CO₂ only (6%). VSS total score before the first and after the last session decreased significantly from 7.65 ± 2.12 to 4.88 ± 1.73 , POSAS observer overall opinion also dropped from 5.88 ± 1.57 to 4.25 ± 1.70 . Pruritus improved significantly. Patient age and timing of laser intervention did not have any impact on treatment response. Complication rate was low with 2% (wound infection, n=2) for laser-related and 4% for anesthesia-related (insignificant n=2, minor n=1) complications.



Graph 1: Decrease of Vancouver Scar Scale over the sequence of laser sessions per patient.

POSAS-P	Before 1st	After last	P
Pain	2.58 ± 2.61	1.42 ± 0.90	= 0.09
Itch	3.00 ± 2.59	1.50 ± 1.00	< 0.05
Pigmentation	7.08 ± 2.15	4.83 ± 2.21	< 0.05
Pliability	7.58 ± 1.78	4.92 ± 2.19	< 0.01
Thickness	7.17 ± 5.58	4.92 ± 2.23	< 0.01
Relief	6.83 ± 1.90	4.50 ± 2.15	< 0.001
Overall Opinion	7.42 ± 1.78	4.67 ± 2.06	< 0.001

Table 1: Results of POSAS patient scale after the first and the last session. P-Values indicate whether the respective before-after difference is statistically significant.

Pruritus	Before 1st	After last	P
IMS self (n = 21)	1.10 ± 1.14	0.38 ± 0.5	<0.001
IMS parent (n = 21)	1.33 ± 1.39	0.33 ± 0.58	<0.001

Table 2: Effect of laser treatment on pruritus: The Itch-Man-Scale was used to quantify pruritus before the first and after the last laser session. P-Values indicate whether the respective before-after difference is statistically significant.



Picture 1: 13 year old female following a full thickness oil burn of the anterior shoulder area: Hypertrophic scarring before laser treatment at 9 months following split thickness skin grafting (1). Clinical situation 3 months later after only 2 sessions of combined PDL and AF-CO₂ therapy with significant improvement (2).

Conclusion:

Combined laser therapy significantly improves quality, pain, and pruritus of hypertrophic scars in children. Therefore, it significantly reduces subjective burden of patients and families and may positively impact patients' body image. If provided by experienced laser and pediatric anesthesia teams, such laser interventions are safe with a low rate of complications. Prospective randomized trials on ideal timing, number of interventions and ideal technical settings are necessary.