

# Scar wars

E Möller,<sup>1</sup> R Martinez,<sup>2</sup> H Rode,<sup>2</sup> S Adams<sup>1</sup>

<sup>1</sup> Division of Plastic and Reconstructive Surgery, Red Cross War Memorial Children's Hospital, University of Cape Town, South Africa

<sup>2</sup> Division of Paediatric and Burn Surgery, Red Cross War Memorial Children's Hospital, University of Cape Town, South Africa

**Corresponding author:** Dr Ernst Möller (ernstmoller\_10@hotmail.com)

**Background:** Burn scars are common in the paediatric population. When involving the face, it diminishes quality of life. Ablative fractional laser (AFL) therapy is becoming the preferred choice for established scars due to its greater potential depth for thermal injury (4 mm), which leads to photothermolysis with subsequent neocollagenesis and collagen fibre realignment and remodelling. Combined with small z-plasties and topical steroids, it has been proven to: flatten and decrease the volume of scars, increase pliability and decrease pruritus and erythema. The purpose of the case series was to determine the clinical significance of a single session of AFL therapy, combined with small z-plasties and topical steroids on facial scars post burn injury.

**Methods:** Four cases of paediatric facial scarring post burns were selected to undergo a single treatment of AFL therapy, accompanied by small z-plasties and topical steroids. Modified Vancouver Scar Scores (MVSS) pre- and postoperatively at 3 and 6 months were evaluated.

**Results:** Improvement of all components of the MVSS was achieved after 6 months, with major improvement in scar pliability and symptomatology. The mean MVSS improved from 14 (range 12–16) preoperatively to 5 and 5.5 respectively at 3 and 6 months postoperatively. Non-parametric analysis with Friedman Two-Way ANOVA by Rank showed a statistical significance between the pre- and postoperative MVSS ( $p = 0.024$ ).

**Conclusion:** AFL should form an integral part of the burn scar armamentarium.

**Keywords:** burn scars, paediatric population, ablative fractional laser

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## Introduction

Paediatric facial burns are common in South Africa. In the Western Cape, facial burns account for 20% of the overall body surface affected.<sup>1</sup> Even more alarming is that 40% of burns treated at our institution, Red Cross War Memorial Children's Hospital (RCWMCH), involved the head and neck region as single or multiple site burns.<sup>2</sup>

Major advances in acute burn care resuscitation and treatment has led to an increased survival rate. This has led to an increased population of patients with bad scarring. When confined to the face, scars produce significant morbidity and impair quality of life in several ways. They have a raised and vascular appearance, reduced pliability and can lead to possible debilitating contractures, intense pruritus and refractory pain.<sup>3</sup>

Treatment of scars, can be surgical or conservative, depending on the severity of patient signs and symptoms.<sup>4-7</sup> Although surgical release remains the mainstay of treatment for contractures,<sup>8</sup> laser therapy is becoming more popular.<sup>9,10</sup>

Ablative fractional laser (AFL) therapy is becoming the preferred choice for established scars, due to its greater

potential depth for thermal injury (4 mm), which leads to photothermolysis with subsequent neocollagenesis and collagen fibre realignment and remodelling.<sup>11-13</sup> Combining laser therapy with small z-plasties has proven to thin and soften scars, improve texture, flatten and decrease volume of scars, increase pliability and decrease pruritus and erythema and is a suitable alternative to scar excision.<sup>14</sup>

Due to lack of laser therapy outcomes for scars on the African continent, we decided to select suitable cases for a single session of ablative fractional laser therapy combined with small z-plasties and topical steroids, to assess its feasibility in the South African context.

## Methods

Four cases of facial scarring post burns were selected to undergo a single session of ablative fractional carbon dioxide laser therapy with small tension relieving z-plasties and topical steroids at RCWMCH. All 4 cases sustained flame burns to the face and scalp. Three cases required early excision and split-thickness skin grafting (SSG) as definitive

treatment. One case was treated with wound dressings only and healing by secondary intention.

The procedure was performed under general anaesthesia and consisted of the following four components:

1. Small tension relieving z-plasties for thick bands or contractures.
2. Ablative fractional carbon dioxide laser therapy utilising the Fractional, 10.600-nm wavelength CO<sub>2</sub> laser (*Lumenis UltraPulse, CPG and DeepFX hand pieces, Santa Clara, CA*) to burr columns of 600–1000 microns in size through the scars connecting with the underlying subcutaneous tissue, followed by a superficial therapy which creates 10–70 micron columns on the surface of the scars to flatten out irregularities.
3. Topical application of dexamethazone (8 mg diluted to 10 millilitres with normal saline).
4. Petroleum jelly (emolient) coverage of the face post treatment.

The patients were followed up at 2 weeks for routine wound check and again at 3 and 6 months, to assess the MVSS (Table 1) by a qualified plastic surgeon and occupational therapist. The higher the MVSS, the greater the morbidity associated with the scar.

## Results

The age of the children was four, eight, ten and eleven years respectively. The mean time period from injury till intervention was 6 years (range 3–10 years). All 4 patients underwent treatment and followed up as planned. There was no intraoperative or postoperative complications. Preoperative and postoperative MVSSs are depicted in Figure 1. The mean preoperative scar score was 14, while the mean postoperative scar scores were 5 and 5.5 at 3 and 6 months respectively.

Improvements in all components of the MVSS were seen, with major improvement (> 50% reduction) especially in scar pliability and symptom relief (Figure 2). Non-parametric analysis with the Friedman Two-Way ANOVA by Rank was used to assess for clinical significance between the three timeframes. There was a statistically significant difference in the MVSS between the pre- and postoperative timeframes,  $\chi^2(2) = 7.429$ ,  $p = 0.024$ .

All cases were asymptomatic in terms of pain and pruritus at 3 months, although 1 case had refractory pruritus at 6 months, but required less frequent medication as prior to the treatment.

## Discussion

Laser therapy combined with small surgical releases as alternative to extensive scar excision, is not uncommon. Donelan et al. evaluated 57 patients with facial burn scars undergoing pulsed dye laser and small z-plasties and concluded that it provides a safe and effective way for

**Table 1. Modified Vancouver Scar Score<sup>15</sup>**

<b>Pigmentation (M)</b>	0 – Normal
	1 – Hypopigmented
	2 – Mixed
	3 – Hyperpigmented
<b>Pliability (P)</b>	0 – Normal
	1 – Supple: Flexible with minimal resistance
	2 – Yielding: Giving way to pressure
	3 – Firm: inflexible, not easily moved, resistant to manual pressure
	4 – Banding: rope-like tissue that blanches with extension of scar
<b>Height (H)</b>	0 – Flat
	1 – < 2mm
	2 – 2–5 mm
	3 – > 5 mm
	<b>Vascularity (V)</b>
1 – Pink	
2 – Red	
<b>Pain</b>	0 – Non
	1 – Occasional
	2 – Requiring medication
<b>Pruritus</b>	0 – Non
	1 – Occasional
	2 – Requiring medication

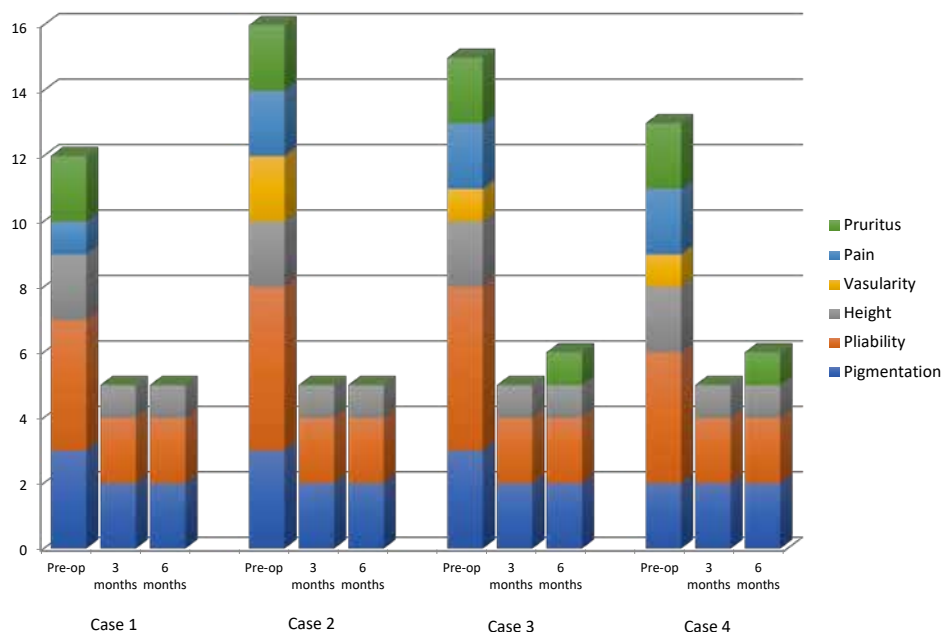


Figure 1



Figure 2

reversal of hypertrophic scarring and management of longstanding erythema and pruritus.<sup>14</sup> With the advent of ablative fractional laser therapy, leading to greater efficacy and less downtime for scar treatments,<sup>16</sup> multiple studies evaluated burn scars. Żądkowski et al. evaluated 47 children with hypertrophic burn scars and mean time from injury of 7.5 years, treated with ablative fractional CO<sub>2</sub> laser therapy.<sup>17</sup> As with our findings, they had improvement of all aspects of the VSS, especially scar pliability. Even though we combined z-plasties and topical steroid therapy with the AFL therapy, Hultman et al. have found similar results with AFL therapy alone.<sup>18</sup> A major advancement in our case series was achieving significant VSS improvement and symptom relief after only one session, as all 4 of our cases had refractory pain and pruritus despite conventional scar management, i.e. physical therapy, compression dressings and silicon sheeting. This coincides with the findings of Issler-Fisher et al. which showed significant improvement in VSS and pain and pruritus scores after a single AFL treatment.<sup>19</sup> Our case series also had patients of higher Fitzpatrick skin types. Three of our patients had scores of 5 and one of 4, compared to means of 2 - 4 as reported in other studies.<sup>18,20-22</sup> Although the MVSS proved to be a valuable assessment tool of post burn scars, it fails to incorporate patient input and an additional tool will need to be utilised in future studies. Despite having

combination procedures, none of our patients presented with any perioperative complications. A systematic review by Willows et al. of 51 observational studies, clinical trials and systematic reviews, highlighted the fact that laser therapies should be implemented in current burn scar protocols due to its significant benefits and minimal risk.<sup>23</sup> Also worth mentioning is the gaining popularity of safe and successful early laser treatment of burn scars.<sup>24</sup>

## Conclusion

This case series provides clinical evidence that a single ablative fractional laser treatment in combination with small z-plasties and topical steroids is effective and safe to significantly improve established scars multiple years post burn injury. Ablative fractional laser therapy has proven to be most effective due to its potential thermal injury depth, which leads to more effective collagen remodelling and realignment. Increased pliability of the scars and symptom relief after just one treatment, confirms the integral part laser therapy should play as part in the burn reconstruction armamentarium. This will alter current treatment protocols as careful consideration of rehabilitating scars instead of removing them with complex procedures will take priority.

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## Conflicts of interest

None

## Ethics approval

Ethical approval was obtained from the University of Cape Town HREC 863/2017.

## Orcid

Ernst Möller  <https://orcid.org/0000-0002-3100-3314>

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