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Patient satisfaction after fractional ablation of burn scar with 2940nm wavelength Erbium-Yag laser

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ABSTRACT

Objective: Fractional laser therapy is a new treatment with potential benefit in the treatment of burn scars. We sought to determine patient satisfaction after burn scar treatment with the Erbium-Yag laser.

Methods: We performed a telephone survey of all patients who underwent fractional resurfacing of burn scars with the Erbium-Yag 2940 wavelength laser at Parkland Hospital from 01/01/2016 to 05/01/2017. Subjects were asked to rate their satisfaction with their scars' after treatment characteristics on a scale from 1 (completely unsatisfied) to 10 (completely satisfied). Subjects were also asked to assess their treatment response using the UNC 4P Scar Scale before and after treatment.

Results: Sixty-four patients underwent 156 treatments. A survey response rate of 77% (49/64) was seen (age: 36.8+21 years; surface area treated=435+326 cm^2; 35% of burn scars were >2 years old; mean scar age of 1.02+0.4 years). Overall, 46/49 (94%) of patients reported some degree of scar improvement after treatment. Patient satisfaction scores were 8.3+2.3. Number of laser treatments included: 1 (31%), 2 (33%), 3 (18%), 4(10%), >5 (8%). Treatment depth, scar age, and number of laser procedures were not significant predictors of satisfaction or UNC 4P Scar scores. The paired t-test showed a significant reduction on each of the UNC 4P Scar scale items (pain, pruritus, pliability, paresthesia). One subject reported that she felt that the laser treatment made her scar worse (2%).

Conclusion: Burn patients treated with the Erbium-Yag laser are highly satisfied with changes in their burn scars.

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1. Introduction

According to the Center for Disease Control, 436,000 patients received medical treatment for their burn injuries in the United States in 2013 [1]. Burn victims today have the potential to live significantly longer compared to those in the past due to advances in technology as well as improved resuscitative measures. While mortality has significantly improved (a recent American Burn Association (ABA) statement estimated the overall survival rate for thermal injury in North America to be 96.8% [2]), symptomatic burn scarring in survivors remains problematic. The medical therapies for burn scar are of limited effectiveness and the surgical options are invasive with associated down time. With varying levels of efficacy, and a limited number of high quality, comparative studies, to date no definitive guidelines exist on appropriate contracture release technique [3].

In recent years, fractional laser resurfacing via the Erbium-Yag laser has been gaining popularity in the treatment of burn scar hypertrophy and contracture. Multiple studies have demonstrated fractionated laser resurfacing to be a safe technique in the treatment of burn scars with significant clinical improvements in scar texture, color, thickness [4–7]. At our institution, we began fractional laser resurfacing of burn scars with the Erbium-Yag 2940 wavelength laser in January 2016. To date, our group has performed 200 treatments in 88 patients.

Our anecdotal experience has been that patients have been extremely satisfied with their post-procedure results with frequent statements that their scars feel softer, more pliable, and have decreased pain and itching. We sought to formally evaluate our burn patients' satisfaction with their perception of the changes induced in their burn scar after undergoing fractional resurfacing with the Erbium-Yag laser at our ABA-verified burn center. Our aims are as follows: 1) to perform a telephone survey of all patients to date who underwent at least one treatment of fractional resurfacing of burn scar with the Erbium-Yag 2940 wavelength laser 2) to evaluate patients' treatment response before and after resurfacing laser therapy using the UNC 4P Scar Scale [8,9]. We hypothesized that patients would be both satisfied with fractional laser resurfacing of their burn scars and see improvements in their UNC 4P Scar Score Assessments.

2. Methods

2.1. Design and procedures

We performed a telephone survey of all 64 patients who underwent at least one treatment of fractional resurfacing of burn scar with the Erbium-Yag 2940 wavelength laser at Parkland Hospital between 01/01/2016 and 05/01/2017. No patients were excluded. Of the 64 patients, 49 were able to be telephonically contacted and all 49 agreed to participate in the study survey. Demographic and patient factors were collected and included: age (years), gender, mechanism of burn injury (flame, scald, contact, electric, chemical, and other), percentage of total body surface areas (TBSA) burned, age of scar prior to first laser treatment (coded in fractions of years, unless greater than 2 years), treatment indication (pliability/movement restriction, cosmetic, pain/pruritis), depth of laser treatment (nm), laser treatment area (cm^2), and total number of laser treatments performed. This study was approved by our Institutional Review Board.

2.1.1. Standard of care for clinical patient selection

Patients are considered to be candidates for fractional resurfacing with the 2940 wavelength Erbium-YAG laser if they have any degree of atrophic, normotrophic, or hypertrophic burn scar with decreased pliability sufficient to restrict range of motion or unacceptable itching, dyschromia, or hyperesthesia at a minimum of six months after scar formation. At approximately 21 days after each laser treatment, the patient is examined and asked for their subjective perception of any changes in their scar. Patients self-reporting an improvement in their scar but with continued room for improvement are offered an additional treatment session. Any additional laser treatment sessions are conducted at a minimum of 30 day intervals. No maximum number of treatment sessions was set, nor were any limitations placed on Fitzpatrick skin type or size TBSA treated in a single session.

2.1.2. Standard of care for laser performance

All procedures were performed by one of three burn surgeons in our group (H.A.P., S.E.W., B.D.A.) using a 2940 nm wavelength Erbium-YAG (Sciton, Pal Alto CA) utilizing the ProFractional-XC handpiece™. Scars were treated with a single pass without overlap between adjacent laser grids at the following settings: 50–200 J/cm^2, coverage density of 11%, utilizing a pulse width of 350 μs/pulse, and a 430-μm spot size. Er:YAG laser wavelength has an ablation threshold of 0.7 J/cm^2. Energies above 0.7 J to ablate tissue at a rate of 4 μm/J. 50 J therefore ablates to a depth of 200 um of tissue. 200 J ablates to a depth of 800 μm. Settings were selected according to thickness of scar tissue. Thicker scars natural received a more aggressive depth to affect the most scar/treatment. On average, most patients were started 400 μm. If the patient responded well to the treatments and noted appreciable result at follow up, we trialed higher depth settings during additional treatments. Occasionally, with significant hypertrophic, thick scaring we started deeper than 400 μm. In pediatric patients, specifically the younger age groups, we started at the 200-300 μm depth setting. Pulses were stacked in a manner proportional to the energy settings to achieve desired depth within tissue. No subablational pulses were delivered so as to avoid any thermal damage to adjacent tissues.

2.2. Measures

Patients were contacted telephonically via information from their electronic medical record (EMR). Up to three attempts were allowed to be made to the contact number given in the EMR. Patients for whom contact was successful were made aware of the study goals via scripted discussion, and verbal consent was collected for participating subjects. For patients below the age of 16 years at the time of phone contact, the parent with whom contact was established was used as the data source.

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