

Complications of 595 and 755 nm Lasers in Therapy of Small Hemangiomas

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Abstract

This study was conducted to examine and compare the clinical response of patients with small hemangiomas treated with two non-ablative lasers with wavelength radiation 755 nm and 595 nm. The treatment efficacy – curative effect and loss of pigment and appearance of scars were compared using Pearson's chi-square test. The therapeutic effect of 595 nm laser radiation was very high – almost 100%. In the contrary, the exposure of 755 nm laser radiation caused loss of pigment and scar formation in some cases.

Keywords: Hemangiomas; Lasers; Radiation

Introduction

Two different non-ablative lasers with wavelength radiation 755 nm and 595 nm were used for treatment of small hemangiomas up to 3 mm in diameter. Hemangioma is a mesenchymal benign tumor formed by blood vessels. Anomalies effect up to 10% of children and they are more common in females than in males.

Non-ablative lasers act on the principle of selective photothermolysis. Laser with the wavelength 755 nm is well-absorbed in deoxygenated carboxyhemoglobin, blue blood color and melanin. It was long time known for its hair-removal capabilities and because of its melanin absorption coefficient levels. This laser is also excellent in treating a variety of pigmented lesions, including those resulting from excessive sun exposure [1,2]. Laser with the wavelength 595 nm is selectively well-absorbed by red oxyhemoglobin, it can be very effectively used for treatment of small types of hemangiomas with minimum adverse effects [3-5]. This 595 nm radiation can be also used for scar reduction after burns, especially in children [6]; it provides vessel reduction in scars, resulting in smooth and rejuvenated colloid and hypertrophic effects. It can be used to treat other conditions such as: port-wine stain, face and leg telangiectasis, acne, rosacea and warts.

Materials and Methods

The main goal of the study was to evaluate the efficacy of hemangioma treatment using two different types of lasers generating radiation with different wavelengths – 595 nm and 755 nm, respectively. The curative effect and adverse events – loss of pigment and appearance of scars were compared. The group of 957 patients with hemangioma was retrospectively reviewed. Patients included in our study were divided into two groups according to the type of laser used: 755 nm (N=125; Male/Female=35/90) and 595 nm (N=832; Male/Female=181/651). All patients were treated in one session without anesthesia application. The non-ablative systems used one shot which destroyed the hemangioma blood vessels.

For the assessment of the treatment efficacy, the following variables were observed: therapeutic effect (yes vs. no), loss of pigment (yes vs. no), and appearance of scar (yes vs. no). To determine whether there is a statistically significant difference in treatment efficacy between two observed types of laser radiation – 755 nm and 595 nm – Pearson's chi-square test was calculated. In the case of small sample size the Fisher's exact test was conducted, and in cases where number of patients is equal to 0 the Haldane's correction was used.

Results

The main patients' characteristics (numbers and percentages of observed variables) together with p-values of Pearson's chi-square test (or Fisher exact test) were shown in Table 1. A graphical presentation of percentages of observed variables (therapeutic effect, loss of pigment and appearance of scar) were presented in Figures 1 and 2.

Pearson's chi-square test was used to determine whether there is a statistically significant difference in the response to laser treatment (therapeutic effect, loss of pigment, and appearance of scars) between two laser radiation wavelength 755 nm and 595 nm, regardless of age and sex of patients. Results presented the statistically significant differences between these two types of laser wavelengths, both in the therapeutic effect, as well as in the adverse effects (loss of pigment and appearance of scars). We have demonstrated the statistically significant differences for the next observed variables (755 nm vs. 595 nm): *Curative effect* – both in men ($p=0.0256$), in women $p<0.00001$; *Loss of pigment* – in men ($p=0.0256$), in women $p<0.00001$; *Appearance of scar* – in men $p=0.0001$ and in women again $p<0.00001$.

Conclusion

Based on the results it was evident that the therapeutic effect of 595 nm laser radiation was very high - almost 100%. The exposure of 755 nm laser radiation caused loss of pigment and scar formation in some cases.

The best therapeutic effect, with only minor side effects has been reached by the laser with radiation wavelength 595 nm (1.5 ms, 7 mm, 9 - 11 J/cm²).



Figure 1: Therapeutic effect and adverse side effects (loss of pigment and appearance of scars) in women – comparison between 755 nm and 595 nm laser radiation



Figure 2: Therapeutic effect and adverse side effects (loss of pigment and appearance of scars) in men – comparison between 755 nm and 595 nm laser radiation

	Women			†p-value	Men		
	755 nm	595 nm	N (%)		755 nm	595 nm	N (%)
Therapeutic Effect							
Yes	11 (12.22%)	651 (100%)		< 0.00001	0 (0%)	181 (100%)	< 0.00001
No	79 (87.78%)	0 (0%)			35 (100%)	0 (0%)	
Loss of Pigment							
Yes	39 (43.33%)	1 (0.15%)		< 0.00001	2 (5.71%)	0 (0%)	=0.0256*
No	51 (56.67%)	650 (99.85%)			33 (94.29%)	181 (100%)	
Appearance of Scars							
Yes	7 (7.78%)	6 (0.92%)		< 0.00001	5 (14.29%)	0 (0%)	=0.0001*
No	83 (92.22%)	645 (99.08%)			30 (85.71%)	181 (100%)	

Table 1: Numbers and percentages of patients treated with 755 nm and 595 laser radiation together with p-values of Pearson's chi-squared test (or Fisher's exact test in case of small sample size)

In the contrary, the wavelength 755 nm (alexandrite) laser was found to be very effective in removal of professional and amateur black tattoo pigment, moderately effective in removal of blue and green pigment, and minimally effective in removal of red pigment. It is supposed to be very effective also in treatment of pigmented lesions resulting from excessive sun exposure. No scarring was seen clinically or histologically.

Literature

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