ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 5, Issue, 03, pp. 3775-3777, March, 2015

Full Length Research Article

REDUCTION OF ERYTHEMA AFTER LASER ON ROSACEA BY SUBTHERMAL 448 KHZ MONOPOLAR RADIOFREQUENCY

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ARTICLE INFO

Article History:
Received 02nd December, 2014
Received in revised form
05th January, 2015
Accepted 18th February, 2015
Published online 31st March, 2015

Key words:
Radiofrequency-448kHz,
Erythema,
Biostimulation,
Post-laser,
Proionic effects.

ABSTRACT

Excellent results are usually obtained when facial benign vascular alterations such as erythrosis and couperosis are treated with vascular laser (pulsed dye, KTP, Neodimiun-YAG) or with Intense Pulsed Light (IPL). However, the erythema occurring at hours or days after such treatment may hamper the patients' ability to go back to their daily lives and increase the risk of adverse effects. The 448 kHz capacitive/resistive monopolar radiofrequency system is based on the subthermal electrical stimulation of tissues, enabling the restoration of ionic balance at cell level. For this study, this system was applied on patients with erythematotelangiectatic rosacea before and immediately after treatment with pulsed dye laser. This technology helps restrict the progression of treatment-related erythema, thereby reducing recovery time and the risk of more serious adverse effects.

INTRODUCTION

Although radiofrequency has been and is traditionally used for its thermal effects, other authors have described effects resulting from subjecting various tissues to a 448 kHz electromagnetic field at intensities which are not capable of heating such tissues, showing the occurrence of molecular phenomena other than those caused by the well-known classic thermal effects (Hernández-Bule *et al.*, 2007, 2010, 2012, 2014a, 2014b). Among these, proionic phenomena stand out. The 448 kHz capacitive/resistive monopolar radiofrequency system with proionic effects is based on the subthermal electrical stimulation of tissues, enabling the restoration of membrane potentials. This system is capable of improving membrane permeability for an adequate maintenance of cell functions, as well as improving circulation and modulating inflammatory response. Erythrosis is redness appearing sporadically or permanently on the cheeks and nose, while couperosis (telangiectasia) is dilatation of small blood vessels on the face. Rosacea is a chronic inflammatory dermatosis characterized by erythema, telangiectasia, papules and pustules around the center of the face (Crawford *et al.*, 2004). Although its etiology is unknown, several factors have been implicated, including vascular reactivity disorders and immune response to microorganisms such as Demodex folliculorum and Helicobacter pylori. Treatment is based on skin care, antibiotics, anti-inflammatory drugs, retinoids (topical or systemic) (Del Rosso, 2006), and light therapies -laser and IPL- (Butterwick *et al.*, 2006). Among the side effects caused by these light technologies in the treatment of erythrosis and couperosis associated with rosacea, the most frequent is temporary erythema (Laube *et al.*, 2002), which is functionally and esthetically incompatible with the patient going immediately back to their social and work life. The purpose of this series of cases has been to record the reduction of temporary erythema caused by 595 nm pulsed dye laser (PDL) in patients treated for rosacea with subthermal 448 kHz monopolar radiofrequency.

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MATERIALS AND METHODS

Participants

All patients who started treatment for rosacea with PDL between April 1 and April 30, 2014, at the Clínica Elite Láser

in Madrid were consecutively recruited. The sample included ten volunteers (n=10). The inclusion criteria were: 30 to 50 years old, phototypes I to IV (Fitzpatrick), no systemic pathologies, no topical or systemic treatment within one month of PDL application, and no smoking within one year. The Declaration of Helsinki for ethical principles in medical research with human subjects has been followed.

Apparatus

Radiofrequency was applied with Indiba Deep Care ELITE® (Indiba S.A., Spain). The mexameter included in the Antera® platform, Miravex Ltd, Ireland, was used immediately before and after applying radiofrequency. Variables: a) Haemoglobin Average Level and b) Haemoglobin Variation (mexameter). A subjective assessment of patient satisfaction was also carried out by means of a short questionnaire.

Procedure

PDL treatment was performed in a single session on the areas where patients had erythrosis and/or couperosis: cheeks, chin and nose. Parameters: 10 mm spot, 7J/cm^2 fluence, 6 ms pulse and 20% overlapping (Neuhaus *et al*, 2009). Mean treatment duration was 20 minutes (150 cm^2 +/-30 areas). VBeam II, Candela Laser Corp., USA. No purpuric dosing was applied with PDL in order to minimize patient recovery time. The 448 kHz radiofrequency was applied following the Proionic® protocol both pre-treatment (24 hours before the PDL session) and post-treatment (immediately after the PDL session). Parameters: 15-minute session, 5-8% power (10W to 20W, based on electrical impedance of the skin at the time of treatment) and medium-sized resistive electrode in indirect contact with the areas pre-treated with PDL (the electrode comes in contact with the back of the hand of the specialist and thus his fingers become active electrodes. The treatment is applied on the patient's skin by rubbing specialist fingers on a thin layer of "Proionic Care Cream").

RESULTS

Haemoglobin average level before radiofrequency was 1.907 (SD: 0.188), while after radiofrequency it was 1.682 (SD: 0.223). The difference was statistically significant (p = 0.026). Haemoglobin average variation before radiofrequency was 0.238 (SD: 0.049), while after radiofrequency it was 0.218 (SD: 0.049). The difference was not statistically significant (p = 0.36). *Patients reported a mean satisfaction of 4.00 points (SD: 0.8165).*

DISCUSSION

The erythema caused by the use of PDL for the treatment of facial benign vascular alterations such as erythrosis and couperosis is associated with an inflammatory process which is often excessive (Neuhaus *et al.*, 2009). Controlling intradermal inflammatory response is necessary in order to prevent adverse effects such as post-inflammatory hyperpigmentation. Haemoglobin average level decreased from 1.907 immediately after PDL treatment to 1.682 after treatment with the Proionic protocol (Table 1), which may indicate a lower risk of adverse effects.

Table 1. Haemoglobin Level, Haemoglobin Variation and Patient Satisfaction Score

	Haemoglobin Average Level		Haemoglobin Variation		Satisfaction
	Pre-RF	Post-RF	Pre-RF	Post-RF	Post-RF
P1	1.65	1.27	0.171	0.178	3
P2	2.26	2.12	0.300	0.259	4
P3	1.88	1.59	0.215	0.232	3
P4	1.97	1.67	0.235	0.242	3
P5	2.06	1.84	0.265	0.219	5
P6	1.90	1.70	0.213	0.191	4
P7	1.88	1.77	0.260	0.263	3
P8	2.05	1.79	0.326	0.282	5
P9	1.72	1.56	0.201	0.197	4
P10	1.70	1.51	0.198	0.118	5

"Haemoglobin Average Level" and "Haemoglobin Variation" measured before and after subthermal 448 kHz monopolar radiofrequency application. Arbitrary Units Scale, from 0.00 to 2.99 (Antera® platform). "Patient Satisfaction Score", 1 to 5 points: 1, very unsatisfied; 2, unsatisfied; 3, indifferent; 4, satisfied; 5, very satisfied.

These statistically significant changes have clinical repercussions (Figure 1). Haemoglobin variation establishes the difference between the maximum and the minimum haemoglobin level in the area under review (Clementoni *et al.*, 2011). This parameter decreased from 0.238 immediately after PDL treatment to 0.218 after treatment with the Proionic protocol (Table 1). These results are not statistically significant (probably due to the small sample). It is interesting to note that decreases in haemoglobin average level concomitant with a slight increase in haemoglobin variation have been observed in certain areas. The Proionic® protocol has decreased erythema associated with haemoglobin average level, but such decrease has been greater in areas with erythrosis (lower haemoglobin levels) than in areas with telangiectasia (higher haemoglobin levels), resulting in a greater "step" between areas with higher haemoglobin levels.

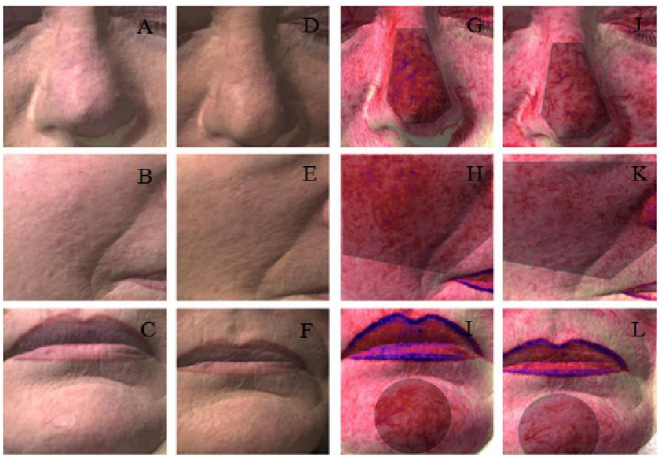

Figure 1. Mexametry. Nose, chin, cheeks

Antera® image processing: standard picture before subthermal 448 kHz monopolar radiofrequency application (A, B, C); standard picture after subthermal 448 kHz monopolar radiofrequency application (D, E, F); mexametry picture before subthermal 448 kHz monopolar radiofrequency application (G, H, I); mexametry picture after subthermal 448 kHz monopolar radiofrequency application (J, K, L)

Analysis of patient satisfaction assessment has shown that patients who have felt satisfied or very satisfied (4 or 5 points

respectively) with the results of the Proionic® protocol are those where both variables, haemoglobin average level and haemoglobin variation, have decreased. On the other hand, patients with a decrease in haemoglobin average level only may have been indifferent because both, areas with excess of vascularization and areas with regular vascularization have decrease in the same percentage. Studies with larger samples should test the correlation between these variables in the future. These results suggest that subthermal 448 kHz radiofrequency treatment significantly reduces post-treatment erythema caused by PDL in the treatment of rosacea. In fact, the Proionic® protocol helps patients go back to their social and work lives more quickly. Again, studies including a greater number of subjects will be necessary in order to confirm or dismiss these results.

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