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

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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.ERYTHEMATOTELANGIECTATIC 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.

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 1 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/cm² fluence, 6 ms pulse and 20% overlapping (Neuhaus et al, 2009). Mean treatment duration was 20 minutes (150 cm² +/-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 Level               | Haemoglobin Variation          | Satisfaction   |
|                                | Pre-RF  | Post-RF | Pre-RF  | Post-RF | Pre-RF  | Post-RF | Pre-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       |         |

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.

REFERENCES

Del Rosso, JQ. 2006. Update on rosacea pathogenesis and correlation with medical therapeutic agents. Cutis.; 78:97-100

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