Case Report

Skin rejuvenation with the Lux 1540® nm laser: a clinical analysis

Análise clínica de 16 pacientes consecutivos tratados com LUX 1540® para rejuvenescimento

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ABSTRACT

Introduction: The treatment of cutaneous aging with fractional non-ablative lasers has been intensely studied in the last few years, yet the number of publications describing specific equipments is limited.

Objective: To describe patient and dermatologist satisfaction after treatment with the Lux 1540® laser.

Methods: Retrospective study of patients (n=16) who have undergone facial rejuvenation therapy with Lux 1540® laser. Photographic assessments were performed by a dermatologist not involved in the treatments. Patient satisfaction was analyzed before treatment and after three sessions. The study variables were spots, sagging, wrinkles, enlarged pores, telangiectasias, and general satisfaction.

Results: In the dermatologist's evaluation, good or excellent improvement was found in the majority of the patients, for all studied variables. Regarding the improvement in the patients' general appearance, 82% were rated good or excellent. Regarding patients' opinions, 63% expressed good to excellent general satisfaction.

Conclusions: Treating cutaneous aging with Lux 1540® laser yields satisfactory results and may be a good option for patients that do not want or cannot undergo more aggressive treatments.

Keywords: lasers; skin aging; laser therapy

RESUMO

Introdução: *O tratamento do envelhecimento cutâneo com Lasers fracionados não ablativos tem sido muito divulgado nos últimos anos, embora o número de publicações, com aparelhos específicos, ainda seja pequeno.*

Objetivo: *Descrever o grau de satisfação do paciente e de um dermatologista avaliador após o tratamento com o aparelho Lux 1540®.*

Métodos: *Estudo retrospectivo com 16 pacientes que realizaram a terapia para rejuvenescimento facial com o Lux 1540®. Foi realizada análise fotográfica por dermatologista, não envolvido nos tratamentos, e os pacientes foram questionados quanto ao grau de satisfação antes e após três sessões. As variáveis avaliadas foram manchas, flacidez, rugas, poros dilatados, telangiectasias e satisfação geral.*

Resultados: *Na avaliação do dermatologista ocorreu melhora considerada boa ou excelente na maioria dos pacientes, em todos os critérios estudados. Em relação à melhora do aspecto geral, 82% dos avaliados apresentaram melhora considerada boa ou excelente. Em relação à observação dos pacientes, 63% deles referiram satisfação geral boa a excelente.* ***Conclusões:*** *A terapia com Lux 1540® para rejuvenescimento da face pode ser alternativa com resultados satisfatórios, tornando-se boa opção para os pacientes que não desejam ou não podem submeter-se a tratamentos mais agressivos.*

Palavras-chave: *lasers; envelhecimento da pele; terapia a laser*

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INTRODUCTION

Fractional therapy was introduced in 2004 by Rox Anderson MD/PhD, in light of the necessity to develop a laser-based rejuvenation treatment that was more effective than non-ablative treatments and devoid of the complications of ablative treatments.[1]

The fractional laser, which emits microbeams of light – the so-called microthermal zones (MTZ) that penetrate deeply in the skin and heat up the dermis, sparing the epidermis – was then conceived. [1] Reepithelialization occurs in about 24 hours, and the necrotic epithelial remains of dermal material and melanin are expelled after 14 days. Among the MTZ there are islands of healthy skin with many melanocytes and dermal papillae stem cells that allow a fast regeneration with reduced risk. The MTZ measure between 70 and 100 µm in diameter and reach on average from 300 to 1,200 Ìm in depth, from the papillary dermis to the middle reticular dermis, depending on the energy employed.[2]

Currently, there are several types of fractional non-ablative lasers available (Table 1). The Lux 1540® (Palomar Medical Technologies, Inc., Burlington, Massachusetts, US), like other equipment belonging in that group, has water as its chromophore, with an affinity of medium intensity, causing coagulation (not vaporization like CO2 lasers, which have a much greater affinity for water).

Non-ablative fractional resurfacing presents results that are considered good, yet inferior to those of ablative lasers in the treatment of cutaneous photoaging. Other uses include treating atrophic scars, acne scars, surgical and burn scars.[4] Currently, fractional non-ablative devices are the only FDA-approved equipment to treat melasma. However, they should be used carefully in treating melasma, and only in cases that are unresponsive to conventional therapy.[5]

The treatment is conducted in three to five sessions with intervals of about 30 days, depending on the energy employed. The session lasts on average 30 minutes for the whole face. The associated pain is considered tolerable, and can be relieved with topical anaesthesia. Edema and minor erythema occur immediately after the procedure, and last for 1 to 4 days. 6 Cool compresses of saline solution or cooling systems (for instance, Zimmer® or Siberian®) are sufficient to relieve the immediate post-operative symptoms. To reduce the chances of postinflammatory hyperchromia, oral or topical corticoids can be used. Photoprotection is necessary, and prophylaxis for herpes simplex can be useful when there is a previous history of this disorder and when the procedure needs to be more aggressive. This study's objective was to evaluate the effects of resurfacing with Lux 1540® in 16 patients.

METHODS

This was a retrospective study conducted at a private clinic in the city of Jundiaí, São Paulo, Brasil. Initially, 26 consecutive patients who underwent facial treatment with and Erbium Glass 1540 nm laser were selected. Of the initial group, 4 could not be located, 3 were less than 30 years old and 3 were undergoing other treatments concomitantly, leaving 16 patients in the study.

Photographic analysis was performed by a dermatologist not involved in the study, before and after three treatments with Lux 1540®. The pictures were standardized regarding illumination and distance using the digital system Visia (Canfield®, Fairfield, Iowa, US). Two men and 14 women, aged between 32 and 60 (average 46), with light to moderate photoaging and with phototypes II to V, took part in the study.

Patients were anesthetized with a 6.5% prilocaine and 6.5%

Table 1- Fractional non-ablative lasers

EQUIPMENT	COMPANY	TYPE	WAVELENGTH	ENERGY	PULSE DURATION	MAXIMUM PENETRATION
Fractional Lux 154®	Palomar	Erbium glass rod	1540 nm	Up to 100 mJ/mB	10 ms and 15 ms	1000 µm³
Fractional Lux 154®	Palomar	Nd:Yag	1440 nm	10 mJ/mB	3ms-5ms-7ms-10 ms	
Fraxel Restore®	Solta	Erbium glass laser	1550 nm	4-70 mJ/MTZ	Not available	1400 µm
Fraxel Refine®	Solta	Fiber laser	1410 nm	1-20 mJ/MTZ	Not available	500 µm
Matrix IR®	Syneron	Diode and radiofrequency	Diodo 915 nm			2.5 mm
Affirm Multiplex®	Cynosure Quantel Medical	Nd: Yag and Xenon pulsed light Erbium glass	1400 nm/ 1320 nm/ 560-950 nm/ 1540 nm	8 J/cm2 / 20 J/cm 8 to 126 J/cm²	3 ms / 5-35ms 3.3ms	400 µm to 2 mm
Aramis®	Palomar	Erbium glass rod	1540 nm	Up to 100 mJ/mB	10ms and 15 ms	1000 µm3

lidocaine cream 1 hour before the procedure (formulation dispensed by the chemist Almaderma, Jundiaí, SP, Brazil). During the session, the asepsis of the skin and one pass of 1540 nm laser, with an approximate overlap of 50%, were performed. The energy employed varied between 50 and 80 mJ/mB, with a 15 ms pulse duration. For comfort, the skin was cooled using the Siberian® device (Industra, São Carlos, SP, Brazil), during and after the procedure, followed by the application of a mask of 10% vitamin C (formula dispensed by the chemist Almaderma). The patients underwent three sessions with 30-day intervals and administered the topical treatment at home (including retinoic or glycolic acid) before and after the sessions.

The patients were contacted 6 to 12 months after the end of treatment and asked about improvement in the following items: spots, sagging, wrinkles, dilated pores, telangiectasias and general satisfaction. The scale employed is presented in Table 2. The variables that were not present in some patients before treatment were considered not applicable and removed from the specific analysis.

RESULTS

The analysis conducted by the evaluator dermatologist is presented in Graph 1. An improvement of good (7 and 8) or excellent (9 and 10) occurred in most patients, for all criteria analyzed. In addition, regarding the improvement of general appearence, 82% of patients presented an improvement considered good or excellent (7 to 10). The criterias wrinkles and telangiectasias, obtained the best results (70% and 86%, respectively, of marks rating the improvement either good of excellent).

General patient satisfaction was good or excellent (63%) (Graph 2). It is important to note that the questionnaire was answered at least six months after the last session and all patients observed at least an improvement from moderate to excellent for the criteria *pores* and wrinkles. For the variable wrinkles, 73% considered the improvement good or excellent, while for *dilated pores* that rating was 78%.

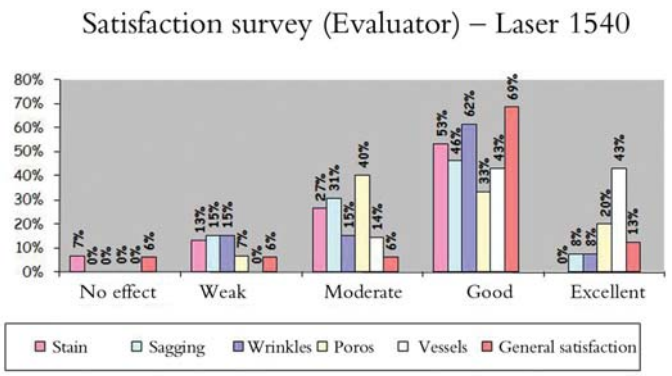
The melasma worsened in one patient, representing the 6% who did not notice improvement in the graph (she also rated her satisfaction as 0). When treated with topical whitening substances, this patient presented a good response.

Table 2: Scale employed to evaluate patients' and evaluator dermatologist satisfaction

MARKING	SATISFACTION DEGREE
0	No effect
1	Weak
2	Weak
3	Weak
4	Moderate
5	Moderate
6	Moderate
7	Good
8	Good
9	Excellent
10	Excellent
99	Absence of opinion

Tabela 3 - Avaliação do grau de dor do paciente com o procedimento

PONTUAÇÃO	GRAU DE DOR
0	Sem dor
1	Leve
2	Leve
3	Leve
4	Moderada
5	Moderada
6	Moderada
7	Forte
8	Forte
9	Muito forte
10	Muito forte



Graph 1 - Evaluator dermatologist's analysis

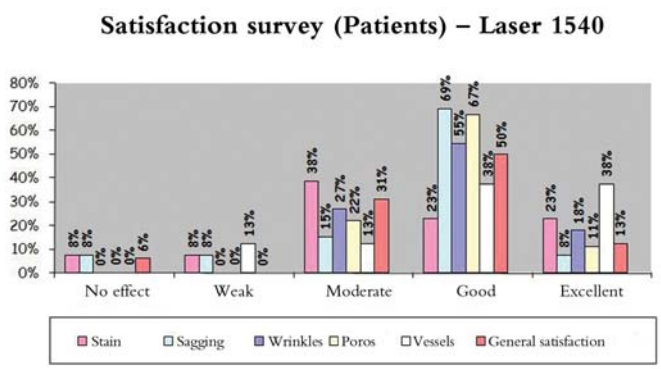
Regarding pain (Graph 3), 56% of patients considered the pain light, 31% moderate, and 13% strong. No patient rated the pain as very strong.

DISCUSSION

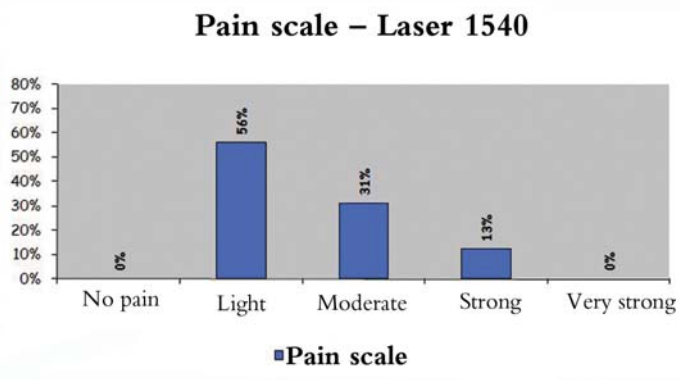
According to the authors' experience, the fractional Erbium 1540 seems to be a less efficient therapy than ablative resurfacing, yet is nevertheless effective for wrinkles, pores, spots and vessels. Overall it is an effective treatment, with neither the risks nor the very long recovery period typical of ablative lasers.

Although there is plenty of documentation describing the decrease in adverse effects that resulted from the fractioning of ablative lasers [1], it is considered an aggressive therapy. Cases of scars caused by fractional CO2 laser were published recently, highlighting that ablative procedures, even when fractional, carry risks.[7]

There are few studies evaluating the rejuvenation obtained with the equipment in the focus of this article. In the Pubmed database, there are 15 articles related to the keyword "Erbium," only 4 of which were dermatology related. From these 4 articles, one is forthcoming, two employed the Aramis® laser (Quantel) – one written by Jason R. Lupton et al [8] in 2002 and the other by Fournier and Mordon in 2005. [9] The fourth published study used the Lux 1540®, written by Farkas JP et al in June 2009, even including a histopathological analysis. However the skin sample was collected



Graph 2 - Patients' evaluations



Graph 3 - Evaluation of the degree of pain during the procedure

from the abdominal region, known to have characteristics different from those presented by facial skin. In addition, the variable evaluated was the depth that the procedure could reach with that equipment and not the clinical improvement of the skin.[3] When searching for the term "Starlux," a pilot study of acne scars in the skin of East Asian patients was found; a search for "Lux" returned no articles.

Unlike in ablative resurfacing procedures – where pain is a great problem, demanding in some cases injectable anaesthesias – this is not an important issue with fractional lasers. More than half of the patients in our study considered the pain as light and none considered it very strong.

Regarding side effects, only one patient (6% of the cases) experienced a worsening of melasma after treatment. This finding corroborates the authors' experience, which shows that melasma can worsen in up to 20% of cases after treatment with fractional non-ablative lasers. Regardless, it is worth noting that the non-ablative laser is one of the few such devices approved by the FDA (2008) for treating melasma, which is considered a disorder that is resistant to conventional therapies due to its recurrent character and difficult treatment. Therefore non-ablative lasers are a good alternative.[5]

Two patients reported improvement in acne scars (good and excellent) in spite of the fact that evaluating scars was not a study objective. It is known that the Erbium glass 1540 nm does not have the same degree of affinity for water as ablative lasers (Erbium 2940 nm and CO2), which are able to penetrate more deeply in the dermis with a smaller dispersion of energy, and are thus more useful in treating condition that require greater remodelling of the collagen, such as striae and scars.

The present study presents some limitations. In spite of the small sample, the study patients were selected consecutively as they underwent treatment, meaning the sample was chosen randomly. Performing tests of association among variables was not possible, since a larger sample is necessary to obtain significant and statistically meaningful results. Therefore, this analysis is classified as a descriptive study; further studies are required to confirm the discoveries more precisely.

CONCLUSION

Fractional non-ablative therapy with Lux 1540® seems to be a good option for rejuvenation treatments, especially for those patients who require an effective treatment with reduced recovery time, few reactions and fewer risks than ablative lasers. Further studies are needed to evaluate the improvement percentage accurately, but this study suggests a good general satisfaction with the results achieved using this equipment. ●

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