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Review Article

Efficacy of Lasers on Vascular Lesions and Rejuvenation

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Abstract

Our purpose is to study the efficacy of the NdYAG Laser (1064 nm) when treating telangiectasias and hemangiomas, and the efficacy of the NdYAG Laser and fractional laser on rejuvenation. We used data from our private office from the past five years (2011-2015). We also studied the side effects of the therapies. We treated 500 patients with telangiectasias and 300 patients with hemangiomas with NdYAG Laser. As far as telangiectasias were concerned, the results were much better when the face was treated. In contrast, the recurrence rates were much higher when the legs were treated. The results were impressive in almost all cases of cherry hemangiomas. The combination of NdYAG Lasers and fractional lasers on a monthly basis had satisfactory results in rejuvenation.

Introduction

Our purpose is to study the efficacy of the NdYAG Laser (1064 nm) when treating telangiectasias and hemangiomas and the efficacy of the NdYAG Laser and fractional laser on rejuvenation. We used data from our private office from the past five years (2011-2015). We also studied the side effects of the therapies. We treated 500 patients with telangiectasias and 300 patients with hemangiomas with NdYAG Laser. We also studied the efficacy of the combination of NdYAG Lasers and fractional lasers on a monthly basis in rejuvenation in 300 patients.

Materials and Methods

Telangiectasias

Use of NdYAG Laser (1064 nm): We used energies ranging from 100-130 Joules based on the skin phototype. Higher energies were used in phototypes I and II and lower energies in phototypes III and IV. The duration of the pulse ranged from 5-20 msec depending again on the phototype. The pulse duration used was longer in phototypes III and IV and shorter in phototypes I and II. We used a 5 mm probe for the telangiectasias of the legs and a 3mm probe for the telangiectasias of the face and trunk. We used cold air supplied with a special machine only when we treated the legs.

We completed 4 monthly sessions. All the sessions were held in the fall and winter when sun exposure is limited. The patients were advised to avoid sun exposure and high temperatures for 10 days. Elastic stockings were not required. Additional sessions, if needed, would be resumed the following year.

Cherry hemangiomas

Use of NdYAG Laser (1064 nm): We used energies ranging from 100-130 Joules based on the skin phototype. Higher energies were used in phototypes I and II and lower energies in phototypes III and IV. The duration of the pulse was 5-20 msec depending again on the phototype. The duration used was longer in phototypes III and IV and shorter in phototypes I and II. We used a 3mm probe. We performed 1-2 monthly sessions. All the sessions were held in the fall and winter when sun exposure is limited. The patients were advised to avoid sun exposure and high temperatures for 10 days.

Congenital hemangiomas

Use of NdYAG Laser (1064 nm): We used energies ranging from 100-130 Joules depending on the skin phototype. Higher energies were used in phototypes I and II and lower energies in phototypes III and IV. The duration of the pulse was 5-20 msec depending again on the phototype. The pulse duration used was longer in phototypes III and IV and shorter in phototypes I and II. We used a 5 mm probe. We used cold air supplied with a special machine.

We completed 4-5 monthly sessions. All the sessions were held in the fall and winter when sun exposure is limited. The patients were advised to avoid sun exposure and high temperatures for 10 days. Additional sessions, if needed, would be resumed the following year.

Figures 1 and 2: Before and after photos on leg telangiectasias after 3 sessions treated with NdYAG laser using a 5mm probe, 120 joules and 10 msec.

Rejuvenation

We used the combination of NdYAG Laser and fractional laser alternatively every 15 days for 4 sessions for each laser therapy, which resulted in a total of 8 sessions.

As far as the NdYAG Laser was concerned, we initially used a 5mm probe, an energy of 15 Joules, a pulse duration of 0,5 msec and a repetition rate of 5 Hz without the use of cold air and shortly afterwards we used the following values respectively: 40 Joules, 50 msec and 1,5Hz with the use of cold air.

As far as the fractional laser was concerned, we used the ultra – pulse laser mode, with a frequency of 500 Hz, pulse duration of 200 – 300 μ sec and density of microspots 9X9 or 11X11.

All the sessions were held in the fall and winter when sun exposure is limited. Sessions would resume the following year.

Results

Telangiectasias

Treatment of the legs resulted in 60-80% clearance of the telangiectasias in 50% of the patients, while 30% experienced only 20-40% clearance. The remaining 20% of the patients unfortunately showed no improvement (Figures 1 and 2).

The results on the face and trunk were significantly superior. 80% of the patients had 90% clearance and the remaining 20% had 60-70% clearance.

Cherry hemangiomas

The results were really impressive. Almost all patients had 100% clearance in 1-2 monthly sessions, (Figures 3 and 4).

Figures 3 and 4: Before and after photos of cherry hemangiomas after one session treated with NdYAG laser using a 3mm probe, 120 joules and 10 msec.

Figure 5: Swelling shortly after treatment of telangiectasias on the legs with NdYAG laser.

Congenital hemangiomas

The results were generally poor. Only a small improvement (20 - 30%) of the color was observed in 80% of the patients.

Rejuvenation

The results were not as impressive or immediate as the injectable therapies (BOTOX, hyaluronic acid fillers and PDO threads), but were equivalent to mesotherapy and superior to peelings. All the patients were satisfied and willing to continue therapies the following year. A tightening of the skin as well as smoothing of its surface was obvious.

Side Effects

Telangiectasias

Discomfort during therapy and swelling shortly after therapy was noted in 80% of patients (Figure 5). Bruises occurred in up to 4% of patients but did not result in permanent hyperpigmentation. Blistering developed in 3 patients, which resulted in a slight hyperpigmentation in 2 of them.

Cherry hemangiomas

Discomfort during therapy was observed.

Congenital hemangiomas

Pain during therapy and swelling shortly after therapy was observed in 70% of patients. Bruises occurred in up to 8% of patients but did not result in permanent hyperpigmentation.

Rejuvenation

Absolutely no side effects were observed.

Discussion

Lasers (Light Amplification by Stimulated Emission of Radiation) are sources of high-intensity monochromatic coherent light that can be used for the treatment of various dermatologic conditions depending on the wavelength, pulse, and fluence of the laser being used and the nature of the condition being treated.

Nd:YAG (Neodymium-Doped Yttrium Aluminum Garnet) is a crystal that is used as a laser medium for solid-state lasers.

The triply ionized neodymium [Nd (III)] dopant (i.e. a substance added in minute amounts to another pure substance to alter its conductivity), typically replaces a small fraction of the yttrium ions in the host crystal structure, since the two ions are of similar size.

The neodymium ion provides the laser activity in the crystal.

The Nd:YAG laser has a wave length of 1064 nm and has the capability to reach deeper layers of skin tissue than other types of lasers.

Lasers work by emitting a wavelength of high energy light, which when focused on a certain skin condition will create heat and destroy diseased cells.

The laser light pulses target red pigment (hemoglobin). In addition, lasers have theoretical advantages compared with sclerotherapy for treating leg telangiectasias. Sclerotherapy-induced pigmentation is caused by hemosiderin deposition through extravasated Red Blood Cells (RBCs). Laser coagulation of vessels does not have this effect. Furthermore, Telangiectatic Matting (TM), which occurs in a significant percentage of sclerotherapy-treated patients, has also not been noted after laser treatment of vascular lesions. Finally, specific allergenic effects of sclerosing solutions are not a concern when treating telangiectasias with a laser.

Both lasers and Intense Pulsed Light (IPL) have been used to treat leg telangiectasias. Each acts in a different manner to induce vessel destruction. Effective lasers and IPL are pulsed so that their effects act within the thermal relaxation times of blood vessels to produce specific destruction of vessels of various diameters based on the pulse duration. Lasers of various wavelengths and the broad-spectrum IPL are used to selectively treat blood vessels by taking advantage of the difference between the absorption of the components in a blood vessel (oxygenated and deoxygenated hemoglobin) and the overlying epidermis and surrounding dermis (as described below) to selectively thermocoagulate blood vessels. Each wavelength requires a specific fluence to cause vessel destruction. In addition, leg veins are not composed mostly of oxygenated hemoglobin, unlike Port-Wine Stains (PWSs) and hemangiomas, but are filled with predominantly deoxygenated hemoglobin; hence their blue color. Selective wavelengths for deoxyhemoglobin, as opposed to oxyhemoglobin, include approximately 545 nm, 580 nm, and a broad peak between 650 and 800 nm.

Optical properties of blood are mainly determined by the absorption and scattering coefficients of its various oxyhemoglobin components. Oxyhemoglobin has three major absorption peaks at 418, 542, and 577 nm. A less selective and broader absorption peak spans from approximately 750 to 1100 nm [1].

We used NdYAG Laser for the treatment of vascular lesions in order to avoid the side effects of sclerotherapy and because it is superior to the IPL therapy [2].

Side effects from Nd:YAG laser treatments are usually minor and may include:

- Pain during treatment (reduced by contact cooling and if necessary, topical anesthetic.)

- Redness, swelling and itching immediately after the procedure that may last for a few days after the treatment.
- Rarely, skin pigment may absorb too much light energy and blistering can occur (this settles by itself.)
- Changes in skin pigmentation. Sometimes the pigment cells (melanocytes) can be damaged, leaving darker (hyperpigmentation) or paler (hypopigmentation) patches of skin. Generally, cosmetic lasers will work better on people with lighter, rather than darker skin tones.
- Bruising affects up to 10% of patients. It usually fades on its own.
- Bacterial infection. Antibiotics may be prescribed to treat or to prevent wound infection [1,3].

In the cases we treated, the reactions were only minor and temporary and included redness, topical edema and bruising for a few days.

Fractional laser treatment works by targeting both the epidermis and the dermis. It does this by delivering a laser beam that is divided into thousands of tiny but deep columns of treatment into the skin. These are called Microthermal Treatment Zones (MTZs). Within each MTZ, old epidermal pigmented cells are expelled and penetration of collagen in the dermis causes a reaction that leads to collagen remodeling and new collagen formation. By using MTZs, the laser targets and treats intensively within the zone whilst surrounding healthy tissue remains intact and unaffected and helps heal the wound. This fractional treatment results in a faster healing process than if all the tissue in the treatment area was exposed to the laser [4].

Fractional photothermolysis involves emission of light into microscopic treatment zones, hence creating small columns of injury to the skin and sparing the surrounding untreated skin. The side effects are fewer with these fractional lasers [5].

We used the combination of NdYAG Laser and fractional laser instead of mesotherapy and as an additional therapy to the injectable treatments used for rejuvenation.

In all cases we shared our experience with other colleagues in my country and abroad who used the same combinations of therapies. All the patients were advised to use sunscreen and to avoid sun exposure.

Conclusion

NdYAG Laser is a well - documented treatment for vascular lesions in the literature [6].

The treatment of small telangiectasias on the face has much better results than those of the legs.

Excellent and quick results are obtained in cherry hemangiomas. On the other side, the results are poor in congenital hemangiomas.

The combination of NdYAG Laser and fractional laser is considered to be an additional and satisfactory therapy to the injectable treatments of rejuvenation.

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