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## Laser Photobiomodulation of the Induratio Penis Plastica or La Peyronie's Syndrome

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### Abstract

**Background:** Since 1980, laser therapy has been proposed with success in the treatment of the Induratio Penis Plastica (IPP), also called La Peyronie's Syndrome, but still few physicians use it.

**Objective:** We would like to investigate the clinical effects of using more laser sequentially in each session, in the treatment of chronic IPP. We used high levels of energy, watts rather than milliwatts, reducing the duration of each application, and the number of the cycles in total.

**Materials and methods:** Laser wavelengths used for photobiomodulation (PBM) were 808, 1064, and 10,600 nm. Taking into account the clinical aspect of the lesion being treated, the specific dosage for each patient was determined. Penis echography established the exact localization and extension of the pathologic fibrous tissue as plaque, nodules, and ring. From 2012 to 2019, we treated 41 patients, 35–65 years old, who were selected using the same criteria: inflammatory signs present since  $\geq 12$  months, negative results with two other types of physical therapy, and exclusion of surgical cases.

**Results:** Echographic test was repeated 1 month after the end of the treatment, for the evaluation of the results. Further parameters of results evaluation were presence/absence of pain, inflammation, recurvation, and functional limitation. The control was done comparing similar cases not treated with laser, selected with random criteria.

**Discussion and conclusions:** Results were positive in a high percentage of patients, the majority after one cycle of treatment, and follow-up was positive after 2 years. The sequential use of more laser with wavelengths listed above gave better results than the wavelengths used up until the year 2000, in our previous experience. We need fewer cycles to obtain positive results, and follow-up improved significantly.

**Keywords:** induration penis plastic, nonsurgical laser therapy, PBM, recurvatio, plaque, fibrosis, diode, echographic findings

### Introduction

**I**NDURATIO PENIS PLASTICA (IPP) or Syndrome of La Peyronie is one of most frequent collagenopathias.<sup>1–4</sup> According to the causes, we can distinguish degenerative and secondary to trauma and/or primary idiopathic to recurrent diseases or drug side effects. According to the date of occurrence, we can identify different levels of induratio: acute, subacute, and chronic. Morphologically, nodes, patches,

and filaments can be distinguished that are linear and circular, made evident by echography. This is checked both in spontaneous or caused erection, or in a restful position. "Primus movens" appears as a microvasculitis of the albuginea, followed by apposition of fibrin, which is not reabsorbed spontaneously. This, with a new apposition of collagen, stimulates a chronic irritation. What follows is fibrosis, which is, clinically, responsible for the recurvatio. An apposition of calcium sometimes occurs.

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One of the first clinical symptoms is reduced erection or difficult erection because of pain (not always present) due to the mechanical compression of patches and nodes on the nerves and on the vessels. Recurvatio is the principal symptom, followed by “impotence coeundi” due to mechanical as well as psychological reasons. It is recurvatio that patients complain about most often. Recurvatio is the principle symptom and this leads to both the mechanical and psychological causes of “impotence coeundi.” Diagnosis requires observation of the penis’ clinical features, and echography in restful position and in erection. In the case of calcific induration, a radiography should be required.

**Materials and Methods**

Lasers have been used both for therapeutic nonsurgical and for surgical aims.<sup>5</sup> We enrolled 41 patients, 35–65 years old, nonsmokers, with chronic nontraumatic IPP that occurred a minimum of 1 year ago, already treated with other therapies without results. We also had a small group of 30 similar patients who were not treated, we used as control. Informed consent was obtained from all individual participants included in the study.

We performed cycles of 20 sessions of irradiation with a diode laser 810 nm, average 12 J/cm<sup>2</sup>; an Nd-YAG laser 1064 nm, PW, spot/size 6 mm<sup>2</sup>, average 35 J for spot; CO<sub>2</sub> laser 10,600 nm, average 36 J/spot. The lasers were applied sequentially in each session. Total energy was variable with the localization and the kind of the injury (Fig. 1). Penis echography established the exact localization and extension of the pathologic fibrous tissue as plaque, nodules, or ring.

Using a low-power diode laser, we observed we had reached a maximum dosage when there was a mild change of color of the area. The patient himself suggested when the hold was finished using a high-level diode laser, with laser CO<sub>2</sub> and Nd-YAG, when the patient felt a sensation of local heat. This at first could be relieving but then became uncomfortable, at which point the action stopped. After each session, the average dosage used for spot irradiated for each patient was calculated.<sup>6</sup>

The power of the lasers and the length of each application change to obtain wound healing. With stronger lasers, there is a shortening of the application times that are required to obtain the therapeutic dosage. Laser photobiomodulation studies of the wound healing confirm results using energy density around 4 joule/cm<sup>2</sup> with visible red wavelength and

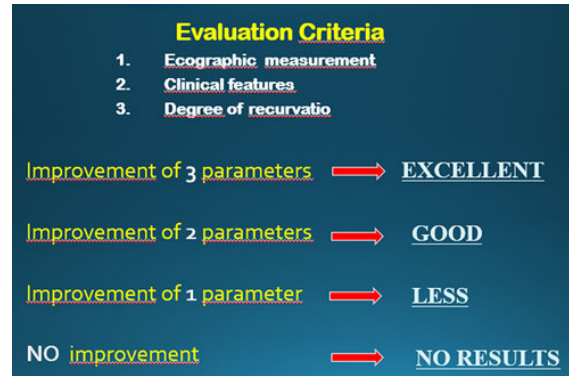


FIG. 2. Results.

3 joule/cm<sup>2</sup> ca with near infrared. The infrared can stimulate the textural repair and increase the proliferation of the fibroblasts and the new apposition of collagen.<sup>6</sup>

Our aim with the case of induratio fibrosa is exactly the opposite. When we use the same laser type we can reach it by increasing the dosage of irradiation from 8 to 20 Joules.<sup>1</sup> Using dosages over this range may cause micro-burn conditions to appear. The clinical effects of more laser were investigated.<sup>6</sup>

Following the results obtained, patients were divided into four groups (Fig. 2): (1) No-Group: who had no-results; (2) Less-group: with improvement of inflammation, recurvatio, echographic features; (3) Good group: with improvements of two parameters; and (4) Excellent Group: had improvements of all three parameters. Patients were followed for 2 years after the cycle of applications. Echography was performed the first time after 1 month, then after 6 months, and then once per year.

**Results**

We must remember that, when we evaluate results, there is a spontaneous remission of 12–13% of IPP.<sup>3</sup> The control was done when we compared others with random treatments and those with similar cases. There seems to be a range of wavelengths from infrared to visible that are able to block fibroblast production and flatten the scars with effects that are strictly dose-dependent and procedure-dependent. It was confirmed in the laboratory that some substances used in the wound healing modelling process, such as metal-proteinase, show an increase of >80% on hypertrophic scars after every laser application.<sup>6</sup> This also may happen with nodes on the induration, and with fibrous patches, even if no biopsies confirm this. With acute inflammation, after a few laser applications, the inflammation itself tends to disappear.

There were positive results and a total high percentage using multi-wavelength laser therapy at 808, 1064, and 10,600 nm for La Peyronie’s Syndrome (Fig. 3). When we had a reduction of <50% with the first cycle, we used the same procedure with repeated additional cycles. We used an average of 3 cycles per year for each patient and that resulted in positive follow-up within that time period (Fig. 4). This result made it possible to reduce the time of irradiation during each session, as well as reduce the number of cycles needed

DOSES		CO <sub>2</sub>	Diode	Nd-YAG
• Wavelength	nm	10600	808	1064
• Emission		PW	PW	PW
• Spot size	cm	3-10	3-6	0,5-3
• Fluence	Joule /cm <sup>2</sup>	4-36	8-12	35
• Repet. Pulse Frequency	Hertz	100	1000	1
• Irradiated points (zones)		Lesion & adjacent tissue		
• Procedure of irradiation		Scanner (1 cm/sec)		
• Nr. & rythm of sessions		20 - 1 a day (minimum 1 a hour)		

FIG. 1. Induratio Penis Plastica. Laser used and dose (average).

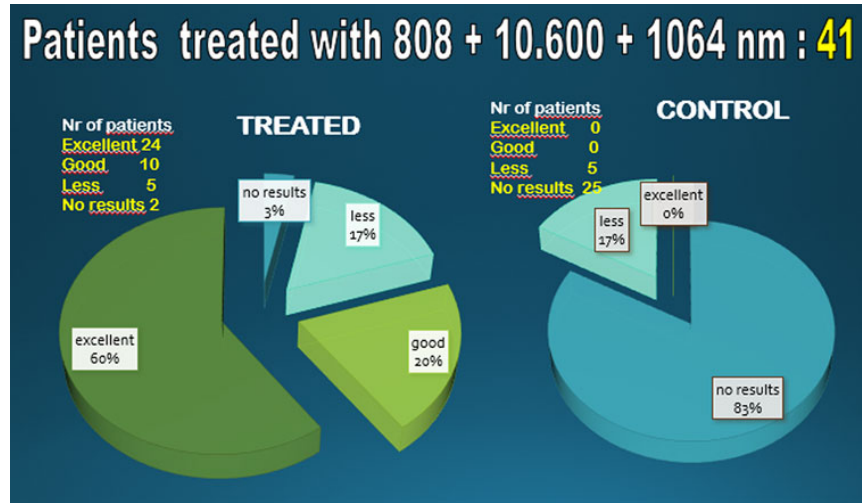


FIG. 3. Year 2012/2019—Chronic Induratio Penis Plastica.

to obtain improvement in clinical signs. Follow-up was positive after 1 year, and stable after 2 years in the majority of the patients (Fig. 5). The patients without results, however, had to stop because of little effect on the lesions (Fig. 6). Any negative impacts from the laser beam used at a high dosage of energy are not apparent.

**Discussion**

As therapy, many drugs have been suggested, such as POTABA, DMSO, PTH, procarbazine, cortisone, vitamin E, colchicine, Orgotein, Graphites, Verapamil, vessel dilators, and prostaglandins, but with partial or poor results, while the side effects of the substances in therapeutic dosage are often important.<sup>7,8</sup>

Today many urologists use specific enzymes, such as the collagenase clostridium histolyticum, injected directly on the lesions.<sup>9</sup> The effect is often immediately positive, but two

aspects need to be improved: risk of skin ulcers for diffusion of the enzyme, and the follow-up negative after some months.

Laser photobiomodulation (PBM) treatment above doesn't have these side effects and limits. Some physiotherapies, such as ultrasonics, ionophoresis, micro-iontophoresis, electroporation, Vacuum device, penile extender, low-frequency electrostimulation, and shockwaves, have been suggested. However, none of these are recognized as efficacious in most cases, and often follow-up was positive for only a short time.<sup>7,8</sup> For different types of intervention, surgery has been suggested with results that have been more or less harsh. Some cases ended with worse results, and others ended with no results.<sup>9,10</sup> In extreme cases, penis prosthesis is requested when the lesion is extended on the full penis. We excluded these patients from laser PBM treatment.

Using laser PBM at the dosage and with the procedure proposed above, the skin and tissues do not show burns when the thermal relaxation time is used on tissue that is irradiated.

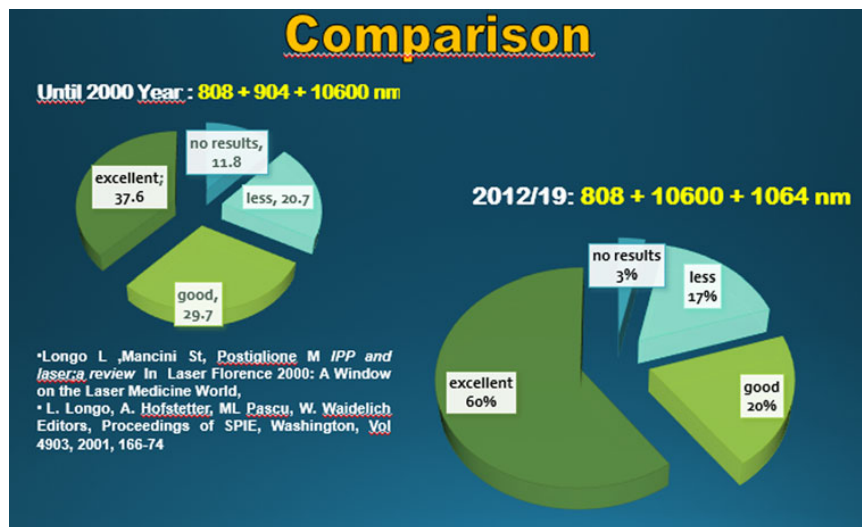


FIG. 4. Results on chronic Induratio Penis Plastica.

\*Longo L, Mancini St, Postiglione M IPP and laser: a review In Laser Florence 2000: A Window on the Laser Medicine World,  
 \* L. Longo, A. Hofstetter, ML Pascu, W. Waidelich Editors, Proceedings of SPIE, Washington, Vol 4903, 2001, 166-74

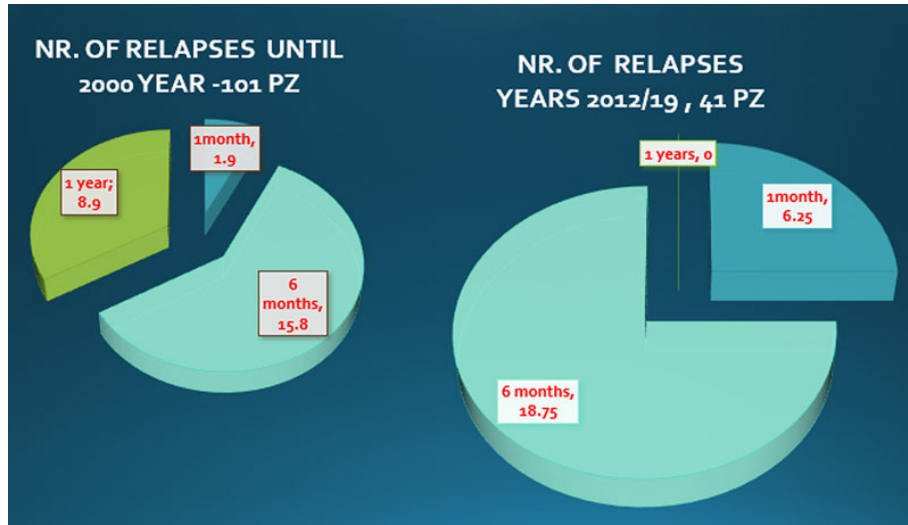


FIG. 5. Chronic Induratio Penis Plastica. Follow-up after 1, 6, and 12-months.

Neither are there substantial differences between groups treated using different lasers. But there are positive results in the percentages that occurred within each group. What is less treatable is induration that has circular patches or that has major horizontal axis. From previous experience, the prognosis for post-traumatic IPP is much better than for cases that are degenerative.<sup>1,2,5</sup> In this experience, we treated only non-post-traumatic IPP. The period of the manifestation and the age of the patient with the patch do not observably impact the significance of the results achieved. There are great anti-inflammatory effects in selectively following the different color tissues, to block vasculitis of the Albuginea layer, first mechanism of the lesion.<sup>5</sup>

Today we know the dosage range that is required to inhibit fibrous tissue metabolism, as well as how to increase hyperemia of the microcirculation and the venous-lymphatic drainage, and to activate the macrophage activity.<sup>6</sup> For these reasons, the nodule and/or the fibrous plaque typical of the

syndrome at first look is hard, then elasticity increases and the volume is reduced, until it totally disappears. We did not obtain poor effects in any patients. Effects that were negative were limited to the persistence of ethnographic and clinical findings. A block of the negative evolution of the pathology was presented in all patients. To confirm this data, and to codify this method of treatment for IPP and other collagenopathies, further studies with a larger number of patients would be useful.

**Conclusions**

Multi-wavelength laser PBM of chronic IPP had a high percentage of positive results, in total, and excellent follow-up after 2 years. If there was a reduction of <50% after the first cycle, we repeated further cycles, using the same procedure. On average, we performed 3 cycles per year for each patient, and that resulted in positive follow-ups within that

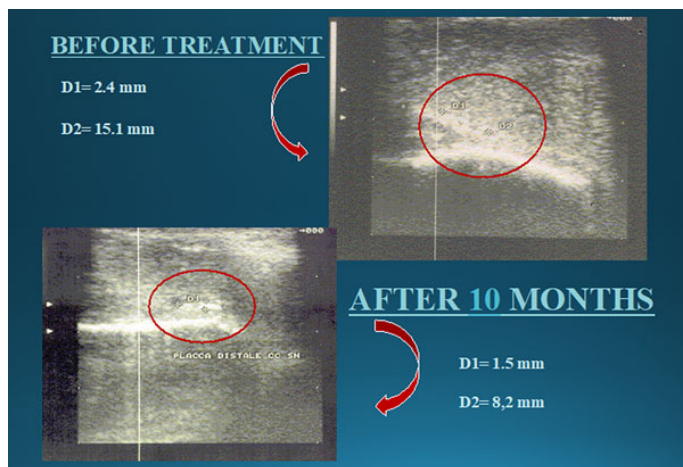


FIG. 6. Induratio Penis Plastica before treatment and after 10 months

period of time. This made it possible to reduce irradiation time for each session, and to reduce the number of cycles necessary to obtain improvement in clinical signs, which is very important. Possible negative effects of laser beam used at a high dosage of energy did not appear, as the skin and the other tissue do not present burns if we respect the thermal relaxation time of the tissue irradiated.

#### Author Disclosure Statement

No competing financial interests exist.

#### Funding Information

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