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**SmartXide<sup>2</sup>V<sup>2</sup>LR**

**Menopausal Vaginal Atrophy Treatment with  
Microablative Fractional CO<sub>2</sub> Laser. A New Approach.**

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# Menopausal Vaginal Atrophy Treatment with Microablative Fractional CO<sub>2</sub> Laser. A New Approach.

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English translation of:

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## Abstract

Vulvo-vaginal atrophy is a public health problem<sup>1</sup> involving 50% of women in menopause who may have a variety of related symptoms. These are due to the natural physiological ageing process<sup>2</sup> that also involves the vaginal mucosa. The loss of reticular configuration by the extracellular matrix of the connective tissue causes incorrect hydration of mucosa and problems with the vaginal trophism. Until now available treatments have shown partial effectiveness<sup>3,4,5,6</sup>. By applying the principles of regenerative and anti-aging medicine the use of a CO<sub>2</sub> laser system, with pulsed emission specifically created for vaginal mucosa treatment, induces important molecular events<sup>7,8,9</sup> in the connective tissue matrix restoring the correct vaginal trophism. Treated patients referred significant clinical benefits also associated with an improvement in the sexual function<sup>10</sup> and the quality of life. *The Vaginal Health Index* of Gloria Bachman (table 1) was applied to 55 voluntary patients ranging from 37 to 63 years old (average age: 52). Patients began a treatment protocol using the **SmartXide<sup>2</sup> V<sup>2</sup>LR - MonaLisa Touch<sup>®</sup>** fractional microablative CO<sub>2</sub> laser system showed a significant score change in comparison to the baseline conditions. Moreover, all patients indicated subjective improvement in all the symptoms of vaginal atrophy.

## Introduction

The ovaries' failure to produce estrogen is directly related to vaginal atrophy onset, due to the particular sensitivity of the genital tract to the decreased levels of estrogen<sup>1,12</sup>.

Vaginal atrophy symptoms usually appear 4-5 years after menopause and can affect up to 50% of women 1 at this stage of their lives. In contrast to menopausal symptoms, which are usually transient, vaginal atrophy can worsen over the years with negative consequences on sexuality<sup>13</sup> and quality of life; however, despite this, only 25% of patients decide to seek medical attention, which often leads to an underestimation of the disorder.

Patient perception of vaginal atrophy varies in different countries and is often effected by socio-cultural barriers and the lack of health care. In South America, for example, the problems related to vaginal atrophy are usually associated with the idea of loss of femininity<sup>14,15</sup>. In the sub-Saharan countries of Africa, the problem is not a

priority: life expectancy for women does not exceed 55, due to diseases such as HIV - AIDS which receive priority in medical care for this patient group<sup>1</sup>.

The main changes associated with decreased estrogen levels in menopausal women are due to morphological changes of the vaginal mucosa, such as epithelium thinning and loss of vaginal folds; in addition, there is a reduction of blood flow<sup>10</sup> and vaginal secretions, which causes changes in the alterations of the vaginal bacterial flora (lactobacillus). This induces a reduced concentration of lactic acid, changes in pH and makes the vagina more infection-prone as a result of the vaginal non pathognomonic flora. In terms of sexuality, all these changes have a major impact on the quality of sexual intercourse, resulting in, among other things, dyspareunia, sinusorrhagia and alterations in the female sexual response<sup>3,10</sup>.

The primary goal of vaginal atrophy treatment is to restore the normal physiological conditions of the vagina, thus reducing the symptoms<sup>1</sup>.

Various therapies are available for the treatment of

vaginal atrophy, some dating back to the Middle Ages, from natural herbs for the stimulation of menstrual flow (Emmenagogo), to fruits applied to the vaginal lips. At the start of the twentieth century, Fritch and Pals used electroshock and radiotherapy treatment respectively, while Graft proposed the development of ovarian grafting and transplantation<sup>10</sup>.

Non-hormonal treatments, such as lubricants and / or moisturisers, do not provide a long-term solution, and research studies have not proven them to be more effective<sup>6</sup>.

Systemic hormone replacement therapy (HRT) should be administered in the lowest possible dose and to an appropriate selection of patients<sup>3</sup>. As for local estrogen therapy, its beneficial effects to the vaginal mucosa are well known, but its major drawback is the recurrence of symptoms once treatment is suspended, and also that it is only effective in the surface layers of the vagina<sup>10</sup>.

For this reason, in recent years, there has been a greater necessity to identify treatments which are effective beyond the epithelium of the vaginal mucosa, intervening at a molecular level in desmosomes and in the connective tissue, where most damage is caused as a result of vaginal atrophy symptoms.

Carboxytherapy, well known in cosmetic medicine for its effects in micro-circulation, showed good results at a vaginal mucosa level, with an improvement in trophism. These effects, however, are not permanent. Dr. Gaspar and his colleagues showed resulting positive changes in biopsy specimens which were treated with fractional microablative CO<sub>2</sub> laser in combination with platelet-rich plasma<sup>16</sup>. Subsequently, Prof. Calligaro and Dr. Salvatore, at the University of Pavia and the San Raffaele Hospital in Milan in Italy, have verified the induction of molecular changes, demonstrating the stimulation of new collagen synthesis and the activation of fibroblasts in the surgical specimens of patients who had to undergo surgery for pelvic floor dystopia, and who underwent a particular fractional CO<sub>2</sub> laser treatment before the biopsy<sup>10</sup>. The following clinical study carried out on 50 patients showed significant histological changes after fractional microablative CO<sub>2</sub> laser treatment, with a significant positive impact on the symptoms of vaginal atrophy<sup>11</sup>. All patients were assessed using internationally validated questionnaires such as the *Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire - (PISQ-12)* or the *Vaginal Health Index (VHI)* of G. Bachmann. The main advantage of this type of technology is the fractional emission

with a special pulse (D-Pulse), expressly made for vaginal treatment. Its mechanism has a fundamental characteristic for its application to the genital mucosa, namely the emission of a particular type of laser energy that can adapt to the tissue characteristics, thus stimulating it effectively, avoiding thermal damage and side effects.

Similar experiences have been reported following the use of different Er:YAG laser technologies by Dr Zdenko, Dr Vizintin et al.<sup>17,18</sup> in a study of 21 patients [*not peer reviewed*]. The results indicate an improvement in menopausal vaginal atrophy and even in the initial stages of stress urinary incontinence. The main limitation of this type of technology lies in the lack of effectiveness on tissues with a high water component. The high water absorption of Er:YAG wavelength limits the diffusion of energy deep into the tissues, resulting in only temporary effects

## Objectives

- To demonstrate the effectiveness of the fractional microablative CO<sub>2</sub> laser used in this study, for the treatment of menopausal vaginal atrophy.
- To demonstrate the objective changes in the characteristics of the vaginal mucosa with this fractional microablative CO<sub>2</sub> laser treatment.
- To demonstrate significant improvements in the VHI of G. Bachmann as a result of the application of the protocol with the fractional microablative CO<sub>2</sub> laser used in this study.

## Analysis

**T**raditional treatments for menopausal vaginal atrophy are limited only to the vaginal mucosa and their effects are temporary and reversible. The fractional microablative CO<sub>2</sub> laser treatment not only induces molecular changes where the damage originates, but its effects are also permanent. This is to date the only study of its kind in our country and therefore seeks to stimulate the interest of our scientific community.

## Materials and Methods

**T**he VHI of Gloria Bachman (table 1) was applied to 55 voluntary patients ranging from 37 to 63 years old (average age: 52), who presented symptoms of

Score	1	2	3	4	5
<b>Elasticity</b>	none	poor	fair	good	excellent
<b>Fluid Volume (Pooling of Secretion)</b>	none	Scant amount, vault not entirely covered	superficial amount, vault entirely covered	moderate amount of dryness (small areas of dryness on cotton tip applicator)	normal amount (fully saturates on cotton tip applicator)
<b>pH</b>	≥ 6.1	5.6 - 6.0	5.1 - 5.5	4.7 - 5.0	≤ 4.6
<b>Epithelial Integrity</b>	petechiae noted before contact	bleeds with light contact	bleeds with scraping	not friable - thin epithelium	Normal
<b>Moisture (Coating)</b>	none, surface inflamed	none, surface not inflamed	minimal	moderate	Normal

**Table 1:** Definitions for the VHI of Gloria Bachman<sup>2,7</sup>

menopausal vaginal atrophy in baseline conditions. After gaining informed consent from, the patients began a treatment protocol using the **SmartXide<sup>2</sup> V<sup>2</sup>LR - MonaLisa Touch<sup>®</sup>** fractional microablative CO<sub>2</sub> laser system (DEKA, Florence, Italy) (figure 1). Three sessions were conducted at three-week intervals,



**Fig. 1:** Vaginal scanner system Hi-Scan V<sup>2</sup>LR.

and the questionnaire validated by the VHI was again applied at the end of the treatment. The patients were monitored over a 17-month period. Inclusion criteria were: perimenopausal and menopausal patients who have not undergone hormone replacement therapy in the previous six months; patients with reduced lubrication; patients with vaginal itching and atrophic vaginitis; patients with superficial and deep dyspareunia. Exclusion criteria were: patients with recurring urinary tract infections; patients with a current infection of genital herpes or candida; patients with a serious systemic disease; patients who have previously undergone pelvic floor surgery.

## Ethical Considerations

The patients recruited for this study were volunteers from a private practice. They offered to participate prior the issue of a declaration of informed consent and a written authorization to be included in their medical records.

## Informed Consent

The type of informed consent used was specifically designed for the treatment of menopausal vaginal atrophy with fractional microablative CO<sub>2</sub> laser.

## Results

At the end of the patients' follow-up period, attempts were made to determine whether there was a change in the average pre- and post-operative scores of VHI (table 2).

The average measure used was the mean value as a measure of the central tendency, because the values were normally distributed according to the Shapiro-Wilk test.

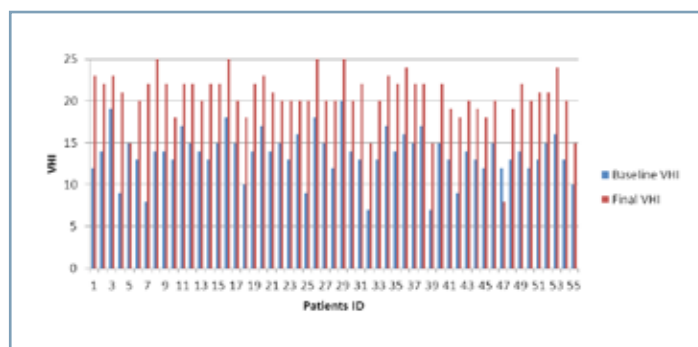
The average age was 52 years, with ages ranging from 37 to 63. The mean pre-operative score was 13.7, with a score range from 7 to 20, and the mean post-operative score was 20.6, with a score range from 8 to 25.

Analysis of the vaginal health index in baseline conditions and at the end of treatment showed a

Id Patient	Baseline Score	Final Score	Age
1	12	23	51
2	14	22	56
3	19	23	47
4	9	21	63
5	15	15	54
6	13	20	50
7	8	22	60
8	14	25	50
9	14	22	51
10	13	18	57
11	17	22	49
12	15	22	54
13	14	20	48
14	13	22	56
15	15	22	50
16	18	25	47
17	15	20	50
18	10	18	61
19	14	22	56
20	17	23	52
21	14	21	59
22	15	20	57
23	13	20	56
24	16	20	47
25	9	20	59
26	18	25	46
27	15	20	49
28	12	20	58
29	20	25	48
30	14	20	52
31	13	22	37
32	7	15	60
33	13	20	57
34	17	23	49
35	14	22	39
36	16	24	55
37	15	22	56
38	17	22	60
39	7	15	42
40	15	22	46
41	13	19	47
42	9	18	50
43	14	20	48
44	13	19	49
45	12	18	52
46	15	20	46
47	12	8	58
48	13	19	56
49	14	22	54
50	12	20	51
51	13	21	49
52	15	21	58
53	16	24	57
54	13	20	42
55	10	15	59

**Table 2:** VHI score before and after three sessions with microablative CO<sub>2</sub> laser system.

significant score change in comparison to the baseline conditions. Moreover, all patients indicated subjective improvement in all the symptoms of vaginal atrophy. Table 2 and graphic 1 show that all symptoms



**Graphic 1:** Comparison of VHI score before and after three treatment sessions with microablative CO<sub>2</sub> laser system.

improved significantly: the older patients with a poor score on vaginal health index at baseline were the best performers.

## Discussion

Vulvo-vaginal atrophy is a well-known public health problem. The treatment options currently available fail to resolve the source symptoms with a molecular type intervention. The **SmartXide<sup>2</sup>V<sup>2</sup>LR** (Vulvo-Vaginal Laser Reshaping) is a complementary alternative to local hormone replacement therapy and, as such, has been shown to produce safe, effective and long-term effects for patients (previous experiences have shown the effectiveness of the treatment in generating definitive histological changes).

Prignano et al.19 verify in their study with fractional CO<sub>2</sub> laser the photobiomodulation of tissue remodeling process through the activation of the tissue repair cytokine pathway.

Here below the list of cytokines involved in wound-healing processes and their major function:

- TGF B (Transforming growth factor beta): Stimulates matrix proteins (such as collagen), inhibits protease production, and enhances mitogenesis, activates the chemotaxis of macrophages and granulocytes, and releases proinflammatory cytokines: interleukin-1, interleukin-6, and tumor necrosis factor- $\alpha$ .
- Vascular endothelial growth factor (VEGF): Regulates vasculogenesis and angiogenesis.
- Platelet-derived growth factor (PDGF): Chemotactic activity for monocytes, macrophages, and neutrophils, mitogenic activity for fibroblasts and



stimulates them to produce extracellular matrix and to contract collagen matrix.

- Epidermal growth factor (EGF): Re-epithelization activity (i.e., keratinocyte proliferation, keratinocyte marginalization, hyperproliferative wound epidermis, etc.).
- Basic fibroblast growth factor (bFGF): Angiogenetic and mitogenic activity, provides the initial stimulation of endothelial cell migration and proliferation.
- Vimentin: Fibroblast protein involved in matrix and intercellular substance production.

Nowak et al.<sup>20</sup> suggest in their study that superpulsed CO<sub>2</sub> may be an effective wound modulator by increasing basic fibroblast growth factor (bFGF) secretion and suppressing transforming growth factor-β1 (TGFβ1) secretion. Consequently, CO<sub>2</sub> laser promotes cell replication, but at the same time, it is potentially able to balance collagen organization against excessive fibrosis, thus avoiding aberrant wound healing. Besides, it has been observed, in an animal model, how the tissue concentration of two growth factors, such as the TGF-β1 and the bFGF, can have an impact on the quality of tissue repair.

The present study achieved very impressive results in treated patients: it was demonstrated that the proper use of fractional CO<sub>2</sub> laser produces biomodulators and cytochemical effects on the vaginal mucosa, with the new production of elastic fibers, the stimulation of neocollagenesis that leads to the recovery of acid pH and proper lubrication, ultimately leading to an improvement in all symptoms of menopausal vaginal atrophy.

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