Vaginal Health and Wellness: Vaginal Laser Therapy

Rochell Burton, APRN-BC

Vulvovaginal atrophy (VVA) is a common and underreported condition associated with decreased estrogenization of the vaginal tissue that can be significantly bothersome and can even affect intimacy. It is thought to affect about 50% of postmenopausal women, and only a small number seek help or are even offered help by their providers (The North American Menopause Society [NAMS], 2013). Vulvovaginal atrophy can occur at any time in a woman's life cycle but is most commonly seen in the postmenopausal phase or midlife and in older women. It is a progressive condition and, most likely, will not resolve without intervention. Other conditions have been associated with VVA including surgical menopause, lactation, hypothalamic amenorrhea caused with excessive exercise or disordered eating, hyperprolactinemia, various cancer treatments that render the ovaries inactive including pelvic radiation, chemotherapy, and/or antihormone therapy, and use of certain medications such as gonadotropic-releasing hormone. Most treatments have been directed at symptom relief, but fractionated CO_2 laser shows promise in treating both the symptoms and the underlying cause. It is the responsibility of the plastic surgical nurse to be knowledgeable and anticipate the condition so that the appropriate education and early intervention can be forthcoming.

ANATOMY AND PHYSIOLOGY

Estrogen is a dominant regulator of vaginal physiology and health. During a woman's reproductive years, estrogen is abundant and fulfills this regulator role sufficiently to maintain the normal vaginal environment including a thickened rugated vaginal surface, increased blood flow and lubrication, *Lactobacillus*-dominant flora, and a low pH (<4.5) (MacBride, Rhodes, & Shuster, 2010; NAMS, 2013; Figure 1). With estrogen withdrawal, as with menopause and other conditions identified earlier, changes are produced within the urogenital tissues. The vaginal epithelium becomes thin, pale, less elastic, and progressively smoother as the rugal folds decrease (Lev-Sagie, 2015; MacBride et al., 2010). Fewer epithelial cells result in less exfoliation of cells into the vagina. As epithelial cells exfoliate and die, they release glycogen, which, in turn, is hydrolyzed to glucose. Glucose is then broken down to lactic acid by the action of the *Lactobacillus*, a normal vaginal commensal organism (MacBride et al., 2010). Without this cascade of events, the pH in the vagina rises, resulting in a loss of the *Lactobacillus* and an overgrowth of other bacteria predisposing to a symptomatic infection or inflammation (MacBride et al., 2010). Other changes include reduction in collagen content and hyalinization, decreased elastin, altered appearance and function of smooth muscle cells, increased density of connective tissue, and fewer blood vessels (Lev-Sagie, 2015). The vagina can shorten and become narrow, the labia minora may become thin and recede, and the introitus may constrict (NAMS, 2013). With a decrease in blood flow, the secretions lessen, flexibility and elasticity of the vaginal vault decrease, and the tissues become more friable (Lev-Sagie, 2015). These changes may be reversed by the use of estrogens (MacBride et al., 2010; NAMS, 2013). The effects of endogenous estrogens on urogenital tissues are mediated through estrogen receptors, both α and β, which are found throughout the urogenital tissues including the vagina, vulva, labia, urethra, and the bladder trigone (MacBride et al., 2010; NAMS, 2013). The use of hormones, both local and systemic, poses a potential risk in women with estrogen-dependent breast cancer including those receiving antiestrogen adjuvant therapies. First-line treatment of this population will include lubricants, moisturizers, and fractional CO_2 laser.

CLINICAL SIGNS AND SYMPTOMS

With the physiological changes previously described occurring in the vulvar and vaginal tissues, symptoms of VVA are evident. The evaluation of VVA includes a thorough history and pelvic examination. A careful medical history may identify contributing factors (NAMS, 2013). Symptoms of VVA can include vaginal dryness, vaginal irritation that includes itching and/or burning, soreness/achiness, dyspareunia (painful intercourse), vaginal discharge, and

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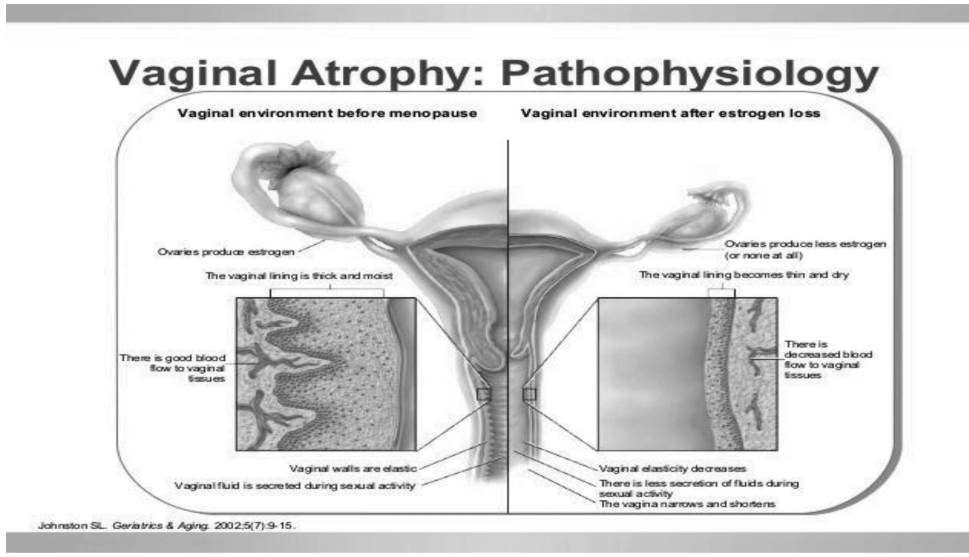

FIGURE 1. Note the thin, pale, and dry vaginal lining that develops with lack of estrogen, decreased blood supply, elasticity, secretions, and a shorter and narrower vagina that develops with lack of estrogen. From "The Recognition and Management of Atrophic Vaginitis," by S. Johnston, 2002, *Geriatrics & Aging, 5*, pp. 9–15. Used with permission from Cynosure and MonaLisa Touch. Retrieved from http://www.monalisatouch.com

postcoital bleeding. Associated urinary symptoms include frequency, urgency, and urge incontinence (Edwards & Panay, 2016; MacBride et al., 2010; NAMS, 2007). Vulvar and vaginal atrophic changes increase the likelihood of trauma, infection, and pain.

A pelvic examination helps exclude other valvovaginal conditions that may exhibit the same symptoms of VVA (NAMS, 2013). On examination, the epithelium of the vestibule may be thin, pale, and dry and the vagina mildly erythematous. Petechiae may or may not be present. The cervix may become flush with the vaginal wall, and the vagina may become shortened and narrowed. As the atrophy progresses, there is also loss of the labial fat pad and the labia minora become less distinct. With time, there may not even be a clear definition between the labia minora and majora (NAMS, 2013). There may be a thin, watery, yellow vaginal discharge. A urethral caruncle (small, soft, friable red outgrowth along the edge of the urethra) may occur (Lev-Sagie, 2015). The urethral meatus may be beefy red secondary to eversion. Clinical findings of VVA can also include microscopic hematuria and recurrent urinary tract infections. Both signs and symptoms vary on the degree of atrophy.

TREATMENT

Many women look for treatment options not only for symptom relief but also to aid with intercourse; but, unfortunately, only a minority of women seek help or are offered help by their providers (NAMS, 2013). The use of nonhormonal vaginal moisturizers for VVA symptoms includes over-the-counter lubricants and moisturizers for dyspareunia. Lubricants are mainly used to relieve vaginal dryness during sexual activity but do not provide a long-term solution. Moisturizer may have a long-lasting effect, especially if women maintain regular sexual activity (Salvatore et al., 2014). Also, hormonal treatments, specifically low-dose vaginal estrogen preparations that come in formulations as creams, tablets, and vaginal rings, may be options to alleviate symptoms and are the most common treatment of VVA. However, women with breast cancer and other estrogen-dependent gynecological malignancies with symptoms of VVA require special consideration and individualized counseling before prescribing any king of local estrogen therapy (Pruthi, Simon, & Early, 2011). These topical treatments provide variable symptom relief depending on compliance and continued use. Treatment of the underlying pathology of the aging vulvar and vaginal tissues that produce the symptoms of VVA is desirable.

The newest treatment of VVA is CO_2 fractional laser treatment and is the focus of this article. Fractional CO_2 laser has been shown to be safe in remodeling tissue properties in many body regions including the skin of the face, neck, and chest (Gold, 2010; Ong & Bashir, 2012; Peterson & Goldman, 2011; Tierney & Hanke, 2011). One such CO_2 fractional laser utilized to treat VVA is the MonaLisa Touch (Cynosure, Westford, MA). The MonaLisa Laser is Food and Drug Administration cleared and indicated for incision, excision, ablation, vaporization, and coagulation of body soft tissues in medical specialties including aesthetics (dermatology and plastic surgery), podiatry, otolaryngology (ENT), gynecology, neurosurgery, orthopedics, general and thoracic surgery (open and endoscopic), dental and oral surgery, and genitourinary surgery. The mechanism of action from a laser is that it causes an "injury" triggering

a complex and coordinated series of events that include chemotaxis, phagocytosis, neocollagenesis, and collagen remodeling (Cynosure, 2014). In addition, angiogenesis, epithelialization, and the production of new glycosaminoglycans and proteoglycans are vital to the "wound" healing process and important in revascularization of the vaginal epithelium (Cynosure, 2014).

The MonaLisa Touch utilizes the SmartXide^2 fractional CO_2 laser system for the treatment of vaginal health. The treatment restores vaginal health by generating new collagen, elastin, and vascularization. The laser treatment creates a pattern of small ablative wounds without damaging the surrounding area. The spared tissue receives sufficient amount of energy to create a lateral thermal damage causing coagulation. The specifications include a maximum power of 60 W, with emission laser energy at 10,600 nm. The laser energy is highly absorbed by water. The laser is delivered through a seven-mirror articulated arm and a versatile scanner. The surface area treated is less than 10% from the energy delivered.

The laser has three probes to treat the vaginal/vulvar area. There is a 90° vaginal probe, a 90° narrow vaginal probe, and also a straight vulvar probe (Cynosure, 2014; Figure 2). The scanning fractional ablative mode treats by fractionated beams of light penetrating small areas of tissue (Figure 3). This method creates small wounds in the epithelial layer and lamina propria of the vaginal mucosa that triggers fibroblast activity, stimulating new collagen production. The scanning shape is related to the ratio of micro-spots and type of probe. A colposcopic view of the vaginal wall immediately after a session of fractional CO_2 therapy shows the ablation zone (Figure 4).

Internal vaginal treatment regimen is recommended in a series of three, spaced 6 weeks apart, and then once a year to maintain the epithelium. Thus far, based on the total worldwide experience, more than 90% of patients at 1-year follow-up who had the full three treatments continued to show significant improvement over their pretreatment status (Pagano et al., 2016; Pitsouni et al., 2016; Sokol & Karram, 2016). The treatment session takes approximately 5 min to perform, and there is minimal pain and no downtime. It is at the provider discretion to determine with the patient whether any additional treatments

FIGURE 2. The MonaLisa Touch laser has three probes to treat the vaginal/vulvar area. There is a 90° vaginal probe, a 90° narrow vaginal probe, and also a straight vulvar probe. Used with permission from Cynosure.

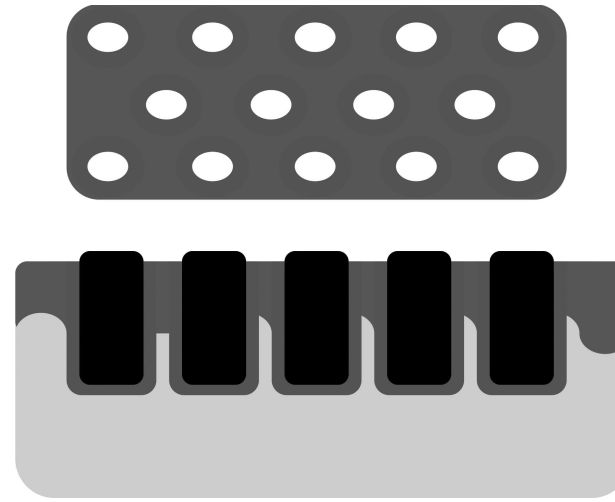

FIGURE 3. The scanning fractional ablative mode treats by fractionated beams of light penetrating small areas of tissue much as the CO_2 fractionated lasers is used for facial resurfacing. Used with permission from Cynosure.

are needed and whether external treatments are required (Cynosure, 2014).

Prior to treatments, the probe should be inspected for any defects. The use of a vaginal ring on the probe can be helpful to define how far to withdraw the probe after each completed series of pulses. The ring around the probe can also decrease pinching of tissue when rotating the probe. The laser is fired six times at each mark, considering clockwise fire at 12, 2, 4, 6, 8, 10, or every 60°. The graduated marks on the 90° probe is to gauge how far to withdraw for the next area of treatment (laser firing) and repeat the rotation of the probe through six positions

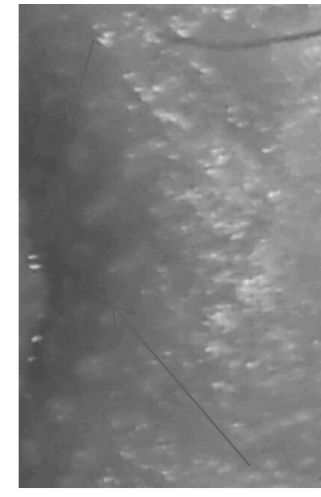

FIGURE 4. The arrows indicate microscopic ablation zones from a colposcopic view of the vaginal wall immediately after a session of fractional CO_2 therapy creating an injury and triggering a complex and coordinated series of events that include chemotaxis, phagocytosis, collagen formation, and remodeling. Used with permission from Department of Urology, Vanderbilt University Medical Center.

on the "clock face." Treatment coverage should be 360° from the apex to the fourchette of the vagina (Figure 5).

Histological results 2 months after baseline show that the mucosa is well nourished with extended three-dimensional papillae-rich blood vessels. The glycogen of the epithelial cells is clearly visible and is present in a larger amount than in the initial condition. The extracellular matrix (collagen fibers and ground substance) has increased with numerous fibroblasts that can be identified after treatment (Figure 6).

Candidates for the vaginal laser treatment are patients who present with vaginal health changes due to decrease in estrogen. This includes patients with a history of breast cancer, thrombophlebitis, or other contraindications to estrogen therapy. Also, patients who have had an inadequate response to estrogen therapy or decline of treatment results with estrogen are candidates (Cynosure, 2014).

Contraindications for treatment would include vaginal, cervical, or other lesions in the treatment area that have not been evaluated and diagnosed. Patients with an active vaginal or vulvar infections, which include herpes, *Candida* infection, human papillomavirus infection, or sexually transmitted diseases should be treated and cleared prior to treatment. Pregnant or within 3 months postpartum woman should not undergo the laser therapy. Any prolapse beyond the hymen as well as radiation to the vaginal or colorectal tissue would be contraindicated. Performing the laser treatment in patients with a history of reconstructive pelvic surgery with "mesh kits" is not advised. Patients who have impaired wound healing or keloid formation should not be considered for this treatment. Finally, any patients with known anticoagulation treatment or thromboembolic conditions should not be considered (Cynosure, 2014). As always, it is advisable to follow manufacturer's directions and suggestions for optimal results.

Pretreatment patient discussion should include that there may be a slight discomfort during insertion of the probe, as the tissue will be dry. Let the patient know that as the treatment nears the introits, there may be a "tingly" sensation and the introits may feel irritated after treatment. The sound of a slight "sizzle" during the pulsing is normal. Buzzing sounds may be more evident as treatment nears the vaginal opening. There is a possibility of some minor spotting lasting 1–2 days. Some patients have reported a "watery discharge" occurring for 2–3 days after treatment, which is considered normal. Most patients treated by this author report minimal pain, 1/2 on a 10-point scale.

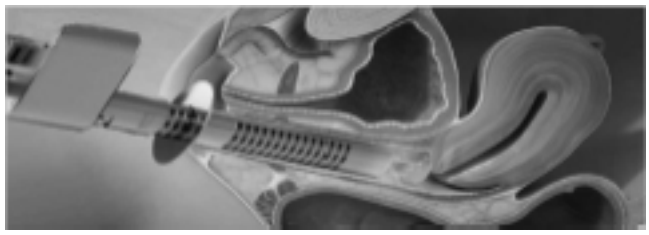

FIGURE 5. The graduated marks on the 90° probe are to gauge how far to withdraw the probe for the next area of treatment (laser firing). The rotation of the probe is repeated through six positions like on the face of a clock. Treatment coverage should be 360° from the apex to the fourchette of the vagina. From *Vaginal Health and Wellness. MonaLisa Touch*, by Cynosure, 2014. Retrieved from http://www.cynosure.com. Used with permission from Cynosure.

Posttreatment instructions should include refraining from vaginal sexual activity for 48 hr after each treatment. However, any other normal activity may be resumed immediately after the procedure. If the vulva or any external area is treated, applying cold compresses or gel packs immediately after and in 20-min increments may be beneficial. Lidocaine ointment may be applied for comfort to the external treated area before the patient leaves the office, and the patient is encouraged to apply as needed. It is also recommended the patient wait 1 day before taking a shower or bath and avoid using hot water on the treated area until it is completely healed, which could be 1–2 days.

This laser treatment is not covered by insurance. On an average, the treatment charge is $600–$1,000 per treatment. The three initial treatments are recommended for optimal results. The annual touch-up treatment to maintain the epithelium prevents the need for the whole series to be repeated.

There are presently some off-label uses for vaginal health that have been very effective based on this author's experience. Lichen sclerosis, which is very uncomfortable causing severe itching, pain at the external vaginal area down to the anus, and recurrent urinary tract infections, have had excellent results. Most patients have reported they no longer need to use topical steroid treatments for relief after the second treatment.

THE EVIDENCE

As with any new technology and treatment modality, it is our responsibility, as clinicians, to review the evidence and examine the data. Salvatore et al. (2015) examined the effects of microablative fractional CO_2 laser on atrophic vaginal tissue. The CO_2 laser was tested on one side of redundant vaginal epithelium in five women. The contralateral part of the vaginal wall was used as a control. Excessive vaginal tissue was trimmed for histological evaluation to compare the treated and nontreated tissues. Findings showed remodeling of the vaginal connective tissue without damage to the surrounding tissue on the treated area (Salvatore et al., 2015).

Vaginal atrophy does not only come with menopause. Young women being treated for breast cancer and other malignancies experience iatrogenic menopause and the associated symptoms.

Sokol and Karram (2016) evaluated 30 women treated with fractional CO_2 laser for the treatment of

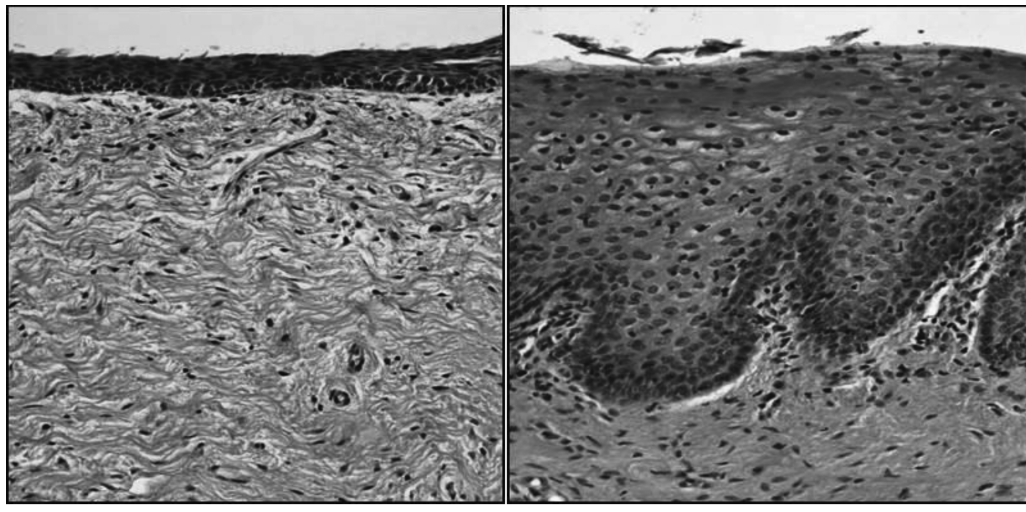

FIGURE 6. Pretreatment and 2 weeks posttreatment; histologically, the mucosa is well nourished with extended three-dimensional papillae-rich blood vessels, larger amount of glycogen of the epithelial cells is visible, and the extracellular matrix has increased with numerous fibroblasts after treatment. Sourced from DEKA M.E.L.A. Srl, Calenzano, Italy, and published in Zerbinati et al. (2014). From *Vaginal Health and Wellness. MonaLisa Touch*, by Cynosure, 2014. Retrieved from http://www.cynosure.com. Used with permission from Cynosure.

genitourinary syndrome of menopause (GSM). Baseline and 3-month evaluations of dilator tolerance and vaginal pH, as well as visual analog scales (VASs), were used to assess pain, vaginal burning, vaginal itching, vaginal dryness, dyspareunia, and dysuria. Vaginal Health Index was completed before each treatment and at follow-up. Female Sexual Function Index and Short-Form 12 questionnaires were also completed. Women received three treatments, 6 weeks apart. All 30 women completed the study. Average improvement in VAS scoring was 1.7 ± 3.2 for pain, 1.4 ± 2.9 for burning, 1.4 ± 1.9 for itching, 6.1 ± 2.7 for dryness, 5.1 ± 3.0 for dyspareunia, and 1.0 ± 2.4 for dysuria; improvement in average Vaginal Health Index and Female Sexual Function Index scores were statistically significant (p <.001). Twenty-five of 30 participants (83%) showed increase in comfortable dilator size at 3-month follow-up. Before the second and third treatments, 86.6% (26/30) of women reported they were better or much better than at the previous treatment; 26 of 27 women (96%) were reportedly satisfied or extremely satisfied at follow-up. The authors concluded that the fractional CO_2 laser was effective and safe for the treatment of the symptoms associated with GSM (Sokol & Karram, 2016).

Pagano et al. (2016) evaluated the effects of fractional microablative CO_2 laser on sexual function and symptom relief in women with breast cancer and VVA induced or exacerbated by iatrogenic menopause. This study included 26 women affected by hormone receptor-positive breast tumors and treated for VVA symptoms with the fractional microablative CO_2 laser system. Every 30–40 days, women underwent a cycle of treatment for a total of three cycles. A gynecological examination was completed with each cycle as well as a VAS questionnaire designed to assess the degree of symptoms and procedure-related discomfort. Treatment resulted in a significant regression of VVA symptoms and procedure-related discomfort versus baseline ($p < .001$ in almost all cases). No adverse reactions were observed, nor reported by the subjects. The authors concluded that fractional microablative CO_2 laser treatment was associated with a significant improvement of VVA symptoms affected by hormone-driven breast cancer with the advantage of not using the contraindicated estrogen preparations, the most effective therapy to date (Pagano et al., 2016).

In a 12-week pilot study by Salvatore et al. (2014), 50 women dissatisfied with previous local estrogen therapies were treated with fractional CO_2 laser for symptomatic VVA. The researchers found that fractional CO_2 laser treatment was effective in improving symptoms of vaginal dryness, burning and itching, dyspareunia, and dysuria at 12-week follow-up ($p < .0001$). Both physical and mental scores of quality of life were significantly improved in comparison with baseline ($p < .001$). Satisfaction with the laser treatment was reported by 84% (42/50) of women, with only minimal discomfort experienced at time of insertion and movement of the probe. Overall, the authors concluded that fractional CO_2 laser was feasible and induced a significant improvement in VVA symptoms, but assessment of long-term effects would be warranted in control-led trials (Salvatore et al., 2014).

Pitsouni et al. (2016) conducted an observational study to assess the effect of the microablative fractional CO_2 laser therapy on the pathophysiology and the symptoms of GSM. Postmenopausal women ($n = 53$) with moderate to severe symptoms underwent three sessions

of CO_2 therapy at monthly intervals. The subjects were evaluated at baseline and 4 weeks after the last treatment. Using Vaginal Maturation Value, Vaginal Health Index score, Female Sexual Function Index, International Consultation on Incontinence Questionnaires (ICIQ) of Female Urinary Tract Symptoms (ICIQ-FUTS) and Urinary Incontinence Short Form (ICIQ-SF), Urogenital Distress Inventory, and King's Health Questionnaire, scores improved significantly. The authors suggested that intravaginal CO_2 laser for postmenopausal women with clinical signs and symptoms of GSM may be effective in improving both the vaginal pathophysiology and reported symptoms.

Pieralli et al. (2016) evaluated the efficacy of CO_2 laser therapy in breast cancer survivors as a therapeutic modality for VVA dyspareunia. Fifty women underwent fractional microablative CO_2 laser treatment of dyspareunia in oncological menopause. Gloria Bachmann's Vaginal Health Index score was used to evaluate the presence of VVA and its improvement after treatment. The intensity of dyspareunia was evaluated using a VSA. The authors found significant improvement in VVA dyspareunia after three sessions of vaginal fractional CO_2 laser treatment. The majority (52%) of patients were satisfied (mean follow-up of 11 months).

Microablative fractional CO_2 laser therapy is a relatively new nonhormonal based treatment modality for VVA, and studies show promise in controlling VVA symptoms and in treating the underlying cause of vaginal atrophy. Most studies have included small sample sizes and report only short-term outcomes. The plastic surgical nurse must stay abreast of new innovative treatments of VVA so that appropriate discussion and patient guidance may be forthcoming. More studies are needed with larger sample sizes as well as long-term follow-up before long-term safety and durability of this treatment can be appropriately determined.

CONCLUSION

The CO_2 fractional laser (MonaLisa Touch) treatment of VVA has been shown to alleviate symptoms of VVA by remodeling the vaginal epithelium and offers an additional effective treatment. My experience utilizing this technology has shown short-term relief but lacks the evidence of long-standing relief of symptoms and beckons further evaluation. This treatment is directed not only at symptom relief but also at counteracting the urogenital atrophy that occurs with menopause as well as other conditions. More data are needed to assess the long-term effects of this treatment.

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