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Manual of

Urogynecology

Address the Leak Confidently and Cosmetic Gynecology: New Kid on the Block

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CHAPTER 3

Noninvasive Laser Treatment with Functional Electromagnetic Stimulation for the Restoration of Genitourinary Health in Women

Vidya Pancholia

INTRODUCTION

Stress urinary incontinence (SUI) is a major problem in younger women. The main cause is the weakened pelvic floor muscles and connective tissues of the vaginal canal and tissues surrounding the urethra.

This can occur naturally from pregnancy childbirth, excessive straining, chronic cough, neurologic disorders or just as part of the ageing process or also after gynecological and urological operations.

If these adverse effects are pronounced and prolonged, the position of the bladder can change and even involuntary passage of feces and winds can occur.

Older women more often suffer for an urge urinary incontinence, where urine leaks immediately after an urgent need to urinate. A large number of women, especially older patients, are faced with a combination of stress and urge incontinence, the so-called mixed urinary incontinence.

About 76% of people consider urinary incontinence as a normal disorder related to ageing. However, people with urine leakage problems often feel ashamed and begin to avoid social life. Those people rarely talk about their urine leakage problems, they hide it from their close ones and often also from their doctors. This is why only a few people seek professional help on time.

A nonsurgical treatment, which can be used to prevent and also treat the problem, came in the form of the intensive exercises for the pelvic floor muscles (Kegel exercises), which is only effective with high degree of perseverance which unfortunately usually our women do not seem to have.

Several other therapeutic options are available to alleviate genitourinary syndrome of menopause (GSM) symptoms, including hormonal and nonhormonal products. Moisturizers and lubricants tend to provide only temporary relief, whereas local vaginal estrogen administration offers long-term relief and so is the treatment of choice. However, some women may not wish to take hormone replacement therapy (HRT) long term or have contraindications to estrogen therapy. Recently, ospemifene has been introduced as an oral medication for the treatment of dyspareunia. It

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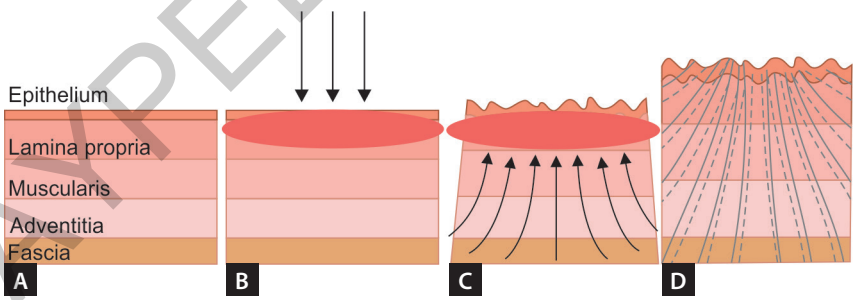
provides an alternative to oral and local estrogen therapies. New management strategies for GSM mean that women can choose from a wide range of options, with due consideration to the benefits and risks associated with each.

Another very promising option is laser therapy, which can be used to stimulate tissue repair and to restore normal vaginal function. The word "Laser" is an acronym for "light amplification by stimulated emission of radiation". Lasers generate a beam of photons released from the laser medium; the medium determines the specific wavelength of the light emitted and also typically gives the type of laser its name. Biological tissues such as blood and substances such as melanin and water absorb, and react to laser of different wavelengths. Laser treatments use this property of these tissue and substances to safely and effectively offer solutions in many areas, such as dermatology, dentistry, ophthalmology, and cosmetic medicine. More recently, several innovative applications on the use of laser in gynecology have also appeared.

Both microablative fractional CO_2 laser and the nonablative vaginal Er:YAG (Erbium:Yttrium-aluminum-garnet) SMOOTH laser (VEL) used in gynecology induce morphological changes in the vaginal tissues, and data from nonrandomized clinical trials suggest that laser therapy can alleviate vaginal dryness and dyspareunia. VEL has been reported to improve SUI as well as vaginal prolapse by acting upon the tissues in the urogenital area. The Er:YAG laser uses precisely controlled, sequentially packaged bursts of long pulses, termed SMOOTH® mode.



Figs. 1A to D: Mechanism of action of nonablative SMOOTH-mode erbium laser on the vaginal mucosa: (A) The structure of vaginal mucosa consisting of the epithelium, lamina propria, muscularis, adventitia and fascia; (B) irradiation by special SMOOTH-mode pulsing sequence of Er:YAG laser produces collagen hyperthermia in the epithelium and lamina propria; (C) Temperature increases to around 65°C on the mucosa surface causes immediate shrinkage of the upper layers of the vaginal wall as well as mechanical pull of the lower lying structures; (D) 6 months after the treatment there is a significant thickening of the vaginal wall due to new collagen synthesis.

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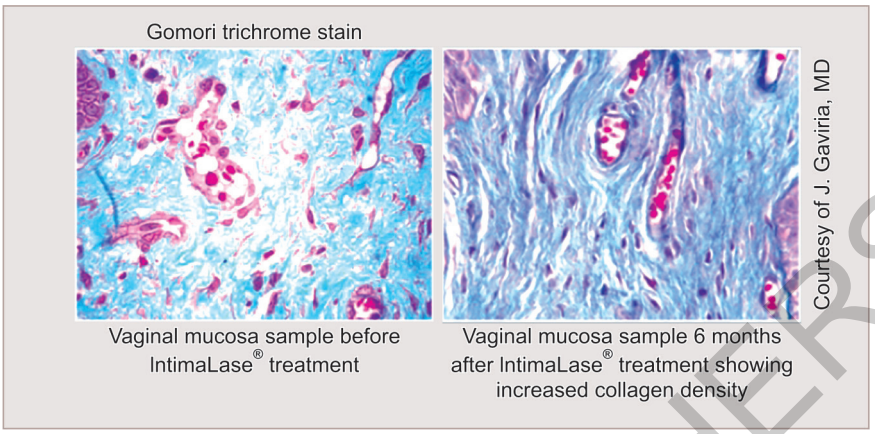

Fig. 2: Pretreatment and post Er:YAG SMOOTH laser treatment—effect on vaginal mucosa.

Dr Fistonic and his team demonstrated that the exposure of tissues to an appropriate controlled temperature increase in the range of 60–70°C using VEL in SMOOTH mode result in a breaking of the intermolecular crosslinks that stabilize collagen's triple-helix structure leading to rapid contraction of the collagen fibers that in turn results in shrinkage and greater tissue rigidity and also initiating neocolla-genesis in vivo. That is, the VEL treatment increased the tissue temperature up to the optimal range (approximately 65°C), but did not exceed the threshold for ablation or irreversible tissue damage. In this way, VEL can increase the density of the connective tissue, stimulating collagen remodeling and neoangiogenesis, leading to a suburethral reinforcement to correct mild-to-moderate SUI. Furthermore tightening of the vaginal canal and consequently the improvement of sexual gratification have also been observed. Specific vaginal probes have been designed to enable a uniform and well-controlled VEL distribution on the whole length and circumference of the vaginal canal.



Fig. 3: G-Set accessories needed for application of the Er:YAG laser beam to the vaginal mucosa, consisting of a laser speculum plus angular and circular adapter.

The use of Erbium SMOOTH technology for vaginal tightening nicknamed IntimaLase and SUI, called IncontiLase has spread around the world and

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many additional studies have been initiated to further assess this technology and treatment approach.

Measurements of an average shrinkage of the vaginal canal after a single IntimaLase treatment, as measured by Dr Rivera, showed 17% shrinkages, while Bezmenko measured an average 56% thickening of the vaginal wall 6 months after two IncontiLase treatments on 77 patients. Using MRI measurements of the shrinkage of the vaginal canal cross section, Bezmenko and colleagues also demonstrated significant shrinkage of the vaginal canal treated with erbium SMOOTH technology. The first results from Rivera showed that better results were achieved if a second session of erbium SMOOTH treatment was additionally performed, and his findings were also confirmed by the results of Garcia. Various evaluation tools were used to measure the efficacy of erbium therapy for SUI. Several investigators used the International Consultation on Incontinence Questionnaire–Urinary Incontinence (ICIQ-UI) and all found significant reductions in the ICIQ-UI score. Fistonic and colleagues reported a reduction of more than 6 points at 6 months after a single treatment, Gambacciani and Levancini reported more than 6 points of improvement after 3 months and three sessions of erbium therapy. Sencar and Bizjak Ogrinc reported 77% of SUI patients cured (dry) after 12 months.

The IntimaLase® and IncontiLase® protocols are based on heating the vaginal wall mucosa up to approximately 65°C and include two treatment sessions with a 4–6-week interval. The time needed to execute the IntimaLase protocol is approximately 8–10 minutes, and for IncontiLase around 15 minutes (as measured by Guimarães). The protocol for treatment of pelvic organ prolapses (ProlapLase®) is based on the same principle of collagen hyperthermia as are the protocols for vaginal tightening and incontinence, although with a difference in the treatment intensity (increased) and the location of the major area treated (the prolapsed part of the vaginal wall). The ProlapLase protocol requires 3–5 sessions at 4–6-week intervals. The number of sessions is dependent on the severity (grade) of the prolapse. The vaginal atrophy protocol (RenovaLase) is based on a slightly different concept of milder hyperthermia, whereby the mucosa is warmed up to some 45°C, thus causing the stimulation of cell proliferation via heat shock protein activation, an increase of collagen production as well as anti-inflammatory action. The RenovaLase protocol consists of three sessions at intervals of 3 weeks.

Radiofrequency (RF) is another treatment option designed on the principle of bulk heating of tissue to reach the required temperature in collagen for shrinkage and neocollagenesis. However, RF heats the epithelium to a higher temperature making treatment highly unpleasant. Furthermore use of RF needles necessitates use of anesthetic.

We now also have the possibility for a faster regeneration of muscles and other tissues of the pelvic floor with functional magnetic stimulation (functional

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magnetic therapy). This therapy replaces and upgrades until now frequently used electrostimulation. In 3–4 weeks with use of magnetic stimulation we can achieve stronger pelvic floor muscles without unpleasant electrode insertion.



Fig. 4: Magnetic Stym device.

Magnetic therapy has proven to be effective for treatment of all types of urinary incontinence. Because people differ from each other, it is important that the treatment is individualized. For optimum performance throughout the treatment, the program is adopted to the progress. In June 1998, the US FDA recognized functional magnetic stimulation as a conservative method of treatment of urinary incontinence.

The magnetic field generated by the current flow in the coil is proportional to the current passing through it, and the electric field in the tissue is proportional to the rate of change of that magnetic field with respect to time. At the frequencies used in magnetic stimulation the magnetic field is not affect by the electrical properties of the body, and passes through both bone and soft tissue (and even clothing and air) without being affected by them. The magnetic field pulse induces an electric field (a voltage difference between two points) in the tissue which causes an ionic current to flow, if the amplitude, spatial characteristics and duration of this induced current are such that they cause depolarization of a nerve membrane, then stimulation, and the generation of an action potential, will occur.

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Magnetic stimulation of peripheral muscles is achieved via a magnetic stimulation of motor nerves, and not by a direct depolarization of the muscle membrane (Machetanz et al., 1994).

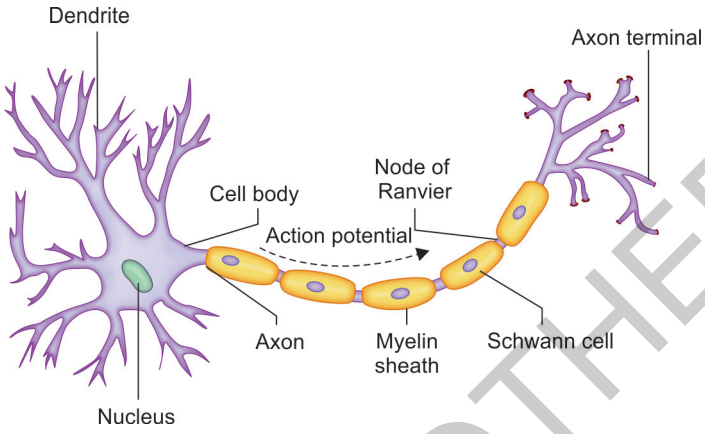

Fig. 5

Results of functional magnetic stimulation treatment collected in three centers in 78 female patients treated for urge urinary incontinence (UUI—11 women), mixed urinary incontinence (MUI—23 women), stress urinary incontinence (SUI—30 women) and incontinence after childbirth (14 women). It was noted that almost 90% of women with UUI, MUI and SUI reported a significant improvement with almost 75% of SUI cases and 60% of UUI and MUI cases becoming fully dry. In the post childbirth incontinence, 100% of women were fully dry post-treatment.

During the therapy, patients are sitting dressed in a comfortable chair and a treatment is carried out twice or three times a week for 20 minutes. In the absence of direct contact with the skin, the treatment is not painful or uncomfortable and has no known side effects.

HOW DOES MAGNETIC STIMULATION WORK?

Magneto Stym device has been developed for the treatment of the weakened pelvic floor muscles and urinary incontinence with special technology of functional magnetic stimulation **(Fig. 4)**. Pulsed magnetic field produced by the device causes the contraction of the pelvic floor muscles, without unpleasant electrode insertion.

Unpleasant, uncontrolled urine leakage (urinary incontinence) is a common and embarrassing problem that affects males and females of all ages.

The treatment is suitable for all types of urinary and fecal incontinence. It is used for faster rehabilitation after surgeries in the urogenital area, after

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childbirth and for some sexual dysfunction and chronic pelvic pain and lower back.

Therapy also has a positive effect on improving sexual intercourse, erection and ability to reach orgasm. It provides intense contraction of thigh and buttock muscles.

INDICATIONS

- Urge urinary incontinence
- Stress urinary incontinence
- Mixed urinary incontinence
- Incontinence after radical prostatectomy
- Fecal incontinence
- Regeneration after childbirth
- Milder forms of drooping uterus and bladder (cistokela, descensus uterusa)
- Rehabilitation after pelvic floor surgery
- Chronic prostate inflammation
- Erectile dysfunction

CONCLUSION

We believe that the noninvasive Er:YAG SMOOTH laser can be combined with the functional magnetic stimulation for an efficacious and safe new method for the treatment of vaginal laxity, SUI, pelvic organ prolapses, vaginal atrophy. The VEL and FMS combine beautifully to treat tissue and muscle disorders, and this type of combined therapy will soon become the treatment of choice for these indications.

FURTHER READING

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