MINERVA GINECOLOGICA

VOLUME 69 · No.4 · PAGES 342-349 · AUGUST 2017

DYNAMIC QUADRIPOLAR RADIOFREQUENCY TREATMENT OF VAGINAL LAXITY/MENOPAUSAL VULVO-VAGINAL ATROPHY: 12-MONTH EFFICACY AND SAFETY

Franco VICARIOTTO, Francesco DE SETA, Valentina FAORO, Mauro RAICHI

EDIZIONI · MINERVA · MEDICA

PUBBLICAZIONE PERIODICA BIMESTRALE - POSTE ITALIANE S.P.A. - SPED. IN A. P. D.L. 353/2003 (CONV. IN L. 27/02/2004 N° 46) ART. 1, COMMA 1, DCB/CN - ISSN 0026-4784 TAXE PERÇUE

Online version at http://www.minervamedica.it

Minerva Ginecologica 2017 August;69(4):342-9
DOI: 10.23736/S0026-4784.17.04072-2

ORIGINAL ARTICLE

Dynamic quadripolar radiofrequency treatment of vaginal laxity/menopausal vulvo-vaginal atrophy: 12-month efficacy and safety

Franco VICARIOTTO [1] *, Francesco DE SETA [2], Valentina FAORO [3], Mauro RAICHI [4]

[1]Italian Menopause Society, Rome, Italy; [2]University of Trieste and SIGITE (Società Italiana Ginecologia della Terza Età, Italian Society for Golden Age Gynaecology), Trieste, Italy; [3]GCare Multidisciplinary Group for Women Health, Trieste, Italy; [4]Clinical Pharmacology and Biophysics Consultant, Milan, Italy

*Corresponding author: Franco Vicariotto, Italian Menopause Society, Rome, Italy. E-mail: ginecologia@vicariotto.com

ABSTRACT

BACKGROUND: Twelve-month extension of a previous spontaneous exploratory study investigating safety and efficacy of a new low-energy dynamic quadripolar radiofrequency (DQRF) device in: A) premenopausal women with symptoms of vaginal laxity, with special reference to dysuria, urinary incontinence and unsatisfactory sexual life (vaginal laxity arm of the study); B) postmenopausal women with vulvovaginal atrophy/genitourinary syndrome of menopause (VVA/GSM) and VVA/GSM-related symptoms (VVA/GSM arm of the study). DQRF treatment schedule in both study arms: 4 to 6 procedures of 15 to 20 min every 14 days (vaginal laxity, range 12-17 days; VVA/GSM, range 13-16). Operative temperatures in vaginal target tissues during procedure: vaginal laxity, 42 °C (range 40-43 °C); VVA/GSM, 40 °C (range 40-42 °C).

METHODS: In the vaginal laxity arm of the study, 25 women with subjective sensation of vaginal introital laxity (very to slightly loose). Assessment of urinary incontinence, satisfaction with sexual relationship and contribution of pelvic organ prolapse: Vaginal Laxity Questionnaire (VLQ, Italian certified translation) and short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12, Italian certified translation). Further evaluation of sexual gratification: Sexual Satisfaction Questionnaire (SSQ). In the VVA/GSM arm of the study, 32 women with objective evidence of VVA and vaginal dryness and/or dyspareunia as most bothersome symptoms. Assessment of VVA/GSM symptoms and overall satisfaction with sexual life: specifically designed 10-cm visual analogue scales.

RESULTS: All 4 to 6 planned DQRF sessions were well tolerated in both the vaginal laxity and VVA/GSM arms of the study, with no troubling pain, thermal injury or other immediate adverse effects during all the procedures. All screened women completed the planned DQRF treatment sessions in both arms of the extension study. There was no participant attrition with only a few occasionally missing visits over the 12-month follow-up period. Improvements were rapid in self-perception of introital looseness and related symptoms like dysuria/urinary incontinence and unrewarding sexual relationship (vaginal laxity patients) and atrophy-related symptoms including painful and unsatisfactory sexual activity (VVA/GSM patients). Participating women consistently reported wide-spectrum strong clinical improvements by the end of the planned DQRF sessions. Clinical improvements remained steady for the whole follow-up period in postmenopausal women; a statistically non-significant tendency to slight deterioration in VLQ, PISQ-12 and SSQ mean scores was detected after 6 to 9 months of follow-up in the vaginal laxity arm of the study.

CONCLUSIONS: Safety was excellent during all DQRF procedures and over the 12 months following the end of the treatment sessions. VLQ, PISQ-12 and SSQ scores (women with vaginal laxity), VAS self-evaluation of VVA/GSM symptoms and overall satisfaction with sexual life (women with VVA/GSM symptoms) improved rapidly, reaching almost normal levels by the last DQRF session and suggesting rapid, but also persistent, vaginal rejuvenation in both indications. A late tendency to some slight deterioration in women treated for vaginal laxity suggests such women might benefit from new DQRF treatments 6 to 9 months after the previous cycle.

(*Cite this article as:* Vicariotto F, De Seta F, Faoro V, Raichi M. Dynamic quadripolar radiofrequency treatment of vaginal laxity/menopausal vulvo-vaginal atrophy: 12-month efficacy and safety. Minerva Ginecol 2017;69:342-9. DOI: 10.23736/S0026-4784.17.04072-2)

Key words: Vulva - Vagina - Atrophy - Urinary incontinence - Rejuvenation.

The radiofrequency technology for non-surgical thermal treatment and vaginal rejuvenation in women with either vaginal laxity or VVA/GSM is well established and widely considered safe and effective.[1, 2] Increased awareness of these undertreated conditions and technological advances stimulate a steady flow of new surveys and high-level studies.[3-5] A previous paper in 2016 in this journal described for the first time the efficacy and safety of a new technologically advanced low-energy radiofrequency device (EVA™, technology patented by Novavision Group S.p.A., Misinto, Monza-Brianza, Italy) in women experiencing severe quality of life disruption because of either postpartum vaginal laxity or vulvo-vaginal atrophy/genitourinary syndrome of menopause (VVA/GSM). This pioneer short-term investigation was carried out in a private outpatient setting as a spontaneous non-sponsored study.[6]

The 2016 paper also discussed the biophysics leveraged by the patented VDR™ (Vaginal Dynamic Radiofrequency) quadripolar 1.0-1.3 MHz radiofrequency technology of the new device (maximum emitting power, 55 W) to generate radiofrequency fields with high spatial precision in vulvar and vaginal subepithelial layers. Movement and temperature detector sensors specifically designed for high safety (RSS™, Radiofrequency Safety System technology) eliminate any need for systemic analgesia or local anesthesia in the target area — usually a circle of some 12 cm around the hymenal ring.[6]

The herein described two-arm study is the 12-month open-label extension of the previous one with a substantial increase of evaluated women in both indications. In the pioneering office-based pilot study that led to the current extension, 11 women with vaginal laxity and 12 women with VVA/GSM completed a total of, respectively, 5 treatment sessions and 4 sessions every 14±1 and 10±1 days. In this long-term extension, new enrolments have complemented the few participants of the exploratory study up to more than double women with vaginal laxity and almost three times more in the VVA/GSM arm of the study. As the previous investigation, this 12-month extension was also conducted in a private outpatient setting.

Materials and methods

Candidate women with vaginal laxity were screened and treated since early January 2015 and the follow-up was over by mid-January 2017; the total period for candidate women with VVA/GSM was since mid-February 2015 to early February 2017, for both indications within the pool of outpatients regularly attending the investigator's private practice. All candidate women referred either subjective perception of laxity of vaginal introitus and other laxity-associated symptoms or postmenopausal vaginal dryness and other VVA/GSM-related symptoms. All pelvic organ prolapses beyond the hymenal ring, chronic vulvar pain, vulvar lesions (dermatitis, human papillomavirus, herpes simplex, vulvar dystrophy) and poor thickness of the recto-vaginal septum at pelvic examination led to exclusion of candidates. Any active genital or urinary tract infection required treatment before enrolment. All study materials were peer-reviewed for ethical problems and all candidates gave informed consent.

Vaginal laxity arm of the study

Screening criteria

As in the previous short-term exploratory study, the last full-term vaginal delivery (more than 36 weeks gestation) of all premenopausal candidates should have occurred at least one year before study enrollment with currently negative pregnancy tests; candidates should also be reporting a sensation of introital laxity defined as "very loose", "moderately loose", or "slightly loose" — first three categorical levels of response out of the seven of the Likert-type Scale Vaginal Laxity Questionnaire or VLQ in a certified Italian translation.[7] Ancillary screening criteria included age less than 54 years, a normal Papanicolau smear cytology assay obtained no more than 2 months before enrolment, a stable monogamous heterosexual

relationship with at least two vaginal intercourses per month using an acceptable birth control method, and stable doses of any medication known to affect sexuality such as antihypertensives and psychotropics for at least one month. Treatment with medications known to affect collagen metabolism and healing such as non-steroidal anti-inflammatory drugs and steroids, as well as injuries and bleeding of vaginal canal, introitus and vestibule, pelvic surgery in the last 4 years, and severe urinary incontinence with suspected intrinsic sphincteric deficiency and positive empty bladder stress tests also prevented enrollment.

Outcome evaluation

The Italian certified translation of VLQ was the main evaluation instrument; the 12-question short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12, Italian certified translation) was also useful to discriminate the contribution of any concomitant pelvic organ prolapse to vaginal laxity symptoms like dysuria, urinary incontinence and poor sexual satisfaction with couple relationship.[8] An Italian translation of the Sexual Satisfaction Questionnaire (SSQ, 6-level ordered responses: none, poor, fair, good, very good, excellent) was also used to evaluate sexual satisfaction from vaginal intercourse. Categorical responses were translated into ordinal scores for statistical analysis (for instance for the VLQ Scale, very loose=1, moderately loose=2, slightly loose=3, …, moderately tight=6, very tight=7).

VVA/GSM arm of the study

Screening criteria

As in the previous short-term exploratory study, in all postmenopausal candidates (no menstruation for at least 12 months and currently no hormonal replacement therapy) a desire for a still active sexual life should have been coexisting with vaginal dryness, dyspareunia and other VVA/GSM symptoms and/or objective evidence of mucosal atrophy (thinning or loss of vaginal rugae, mucosal pallor, etc.).

Outcome evaluation

Clinical severity of VVA/GSM symptoms (vaginal dryness, burning and itching, dyspareunia, dysuria) was self-assessed by participants at each visit using 10-cm visual analogue scales (VAS) with "no symptom" at the left extreme of the scale and "symptom as severe as it could be" at the right extreme, as in several previous VVA studies including in breast cancer survivors.[9] The overall satisfaction with sexual life was also evaluated by VAS ("worst level of satisfaction" at the left extreme of the 10-cm scale and "best level of satisfaction" at the right extreme).

An overall basal evaluation was performed immediately before the first DQRF procedure in all enrolled women participating in either arm of the study. On the same occasion, all women were asked for a judgement about how they remembered to have felt, compared with their current situation, before either delivery and development of vaginal laxity or development of VVA/GSM.

DQRF operative procedure

Four to six treatment sessions were planned every 14±2 days for both indications. Power was applied, using a coupling gel, for 15 to 20 minutes starting behind the hymenal ring, with circular back-and-forth continuous movements and keeping the tip probe in contact with the vaginal mucosa. Power settings were 14% to 20% of the device maximum power (55 W) to treat vaginal laxity and 12% to 18% to treat VVA/GSM. Follow-up appointments were planned after 1, 2, 6, 9 and 12 months. Safety, with special attention to pain and discomfort, was assessed in all women at each study visit and by telephone calls over the following days.

Statistical analysis

Descriptive statistics (means and standard errors of the mean for continuous variables,

frequency distributions and percentages for categorical variables) were generated for demographics, medical history, and physical examination findings. The nonparametric Wilcoxon Signed Rank Test for repeated measurements on single populations was applied to both repeated measures of ordinal data (VLQ, PISQ-12 and SSQ mean scores) and continuous variables (VAS mean scores); the McNemar test was used to test for differences in ordinal scores. Two-sided 95% confidence levels were used with $P<0.05$ as cut-off for statistical significance.

Results

All women in both arms of the study completed their planned DQRF treatment sessions with only some occasional missing visits. Table I illustrates the demographics of the two study populations as recorded before the first DQRF session. All DQRF sessions were described as comfortable and no burns or other complications were reported. All women resumed their everyday activities, including sexual couple relationship, immediately after all DQRF treatment sessions.

TABLE I.—*Demographics and characteristics of study participants.*

Vaginal laxity arm, demographics	
Women completing the planned DQRF sessions	25
Age (years, mean±SD)	41.4±5.8
BMI (kg/m^2, mean±SD)	24.5±5.0
Parity (N., %)	
0	1 (4%)
1	5 (20%)
2	10 (40%)
3	6 (24%)
≥4	3 (12%)
Current sexual activity (N., %)	24 (96%)
Frequency of sexual activity per week	1-4
VVA/GSM arm, demographics	
Women completing the planned DQRF sessions	32
Age (years, mean±SD)	61.1±6.9
BMI (kg/m^2, mean±SD)	23.9±4.6
Previous live births (N., %)	23 (72%)
Mean parity (range)	1.7 (1-4)
Current sexual activity (N., %)	18 (56%)
Previous HRT (N., %)	9 (28%)

SD: standard deviation; HRT: hormone replacement therapy.

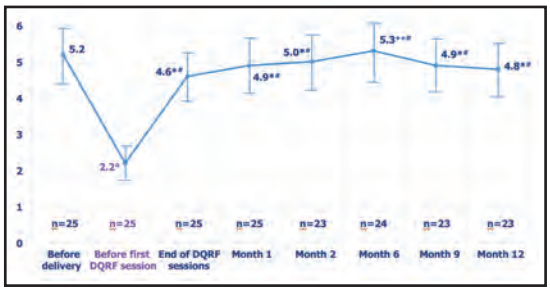


Figure 1.—Vaginal Laxity Questionnaire (VLQ) 7-level rating scale (very loose=1 to very tight=7), mean scores±SEM. Women's estimate before developing vaginal laxity ("before delivery") and evaluations immediately before the first and the last DQRF treatments ("before first DQRF session", "end of DQRF sessions"), and at follow-up visits 1, 2, 6, 9 and 12 months after the last DQRF session.
°$P<0.01$ *vs.* "before delivery". *$P<0.05$ *vs.* "before first DQRF session"; #non-significant *vs.* "before delivery"; ++$P<0.01$ *vs.* "before first DQRF session" and $P<0.05$ *vs.* "end of DQRF sessions".

Vaginal laxity arm of the study

One or more disorders associated with vaginal laxity such as orgasmic dysfunction and stress incontinence were reported before starting the DQRF treatment sessions by 21 out of the 25 women (84%) participating to the study. Before the last DQRF session 17 women (68%) already reported VLQ scores as index of subjective perception of vaginal tightness that were at least 3 levels higher than before the first DQRF session (4.6±1.8 *vs.* 2.2±0.9; $P<0.05$). VLQ scores slowly yet steadily improved over the 6 months after the last DQRF treatment session, with 21 women (84%) reporting VLQ scores at "month 6" visit that were at least 3 levels higher than before the first DQRF session (VLQ mean score, 5.3±2.0; $P<0.01$ *vs.* basal assessment, $P<0.05$ *vs.* last DQRF session). Subjective perception of tightness showed a slow trend towards some deterioration at "month 9" and "month 12" visits with 19 women (76%) reporting VLQ scores at the "month 12" visit at least 3 levels higher than before the first DQRF session (VLQ mean Score, 4.8±1.9; non-significant *vs.* last DQRF treatment session) (Figure 1).

The overall sexual function and sexual satisfaction from vaginal intercourse also showed marked improvements at the first evaluation

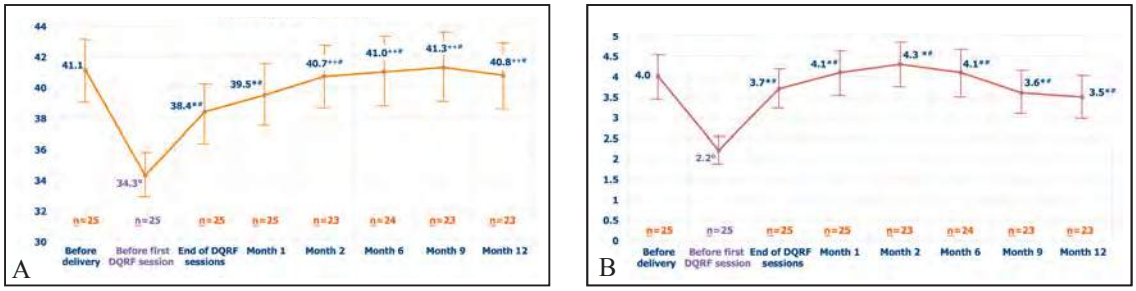


Figure 2.—A) Pelvic Organ Prolapse/Incontinence Sexual Questionnaire, short form (PISQ-12) and (B) Sexual Satisfaction Questionnaire (SSQ) 6-point rating scale (none=1 to excellent=6), mean scores±SEM. Women's estimate before developing vaginal laxity ("before delivery") and evaluations immediately before the first and the last DQRF treatments ("before first DQRF session", "end of DQRF sessions"), and at follow-up visits 1, 2, 6, 9 and 12 months after the last DQRF session. °P<0.01 *vs.* "before delivery". *P<0.05 *vs.* "before first DQRF session"; #non-significant *vs.* "before delivery"; ++P<0.01 *vs.* "before first DQRF session" and P<0.05 *vs.* "end of DQRF sessions".

visit with, respectively, mean total PISQ-12 and SSQ scores ("end of DQRF sessions" *vs.* "before first DQRF session") of 38.4±6.5 *vs.* 34.3±5.8 and 3.7±1.6 *vs.* 2.2±0.9, P<0.05 (Figures 2A, 2B). Twenty and 19 women out of 25 showed a short-term improvement (before the last DQRF session) of at least 3 points in, respectively, PISQ-12 and SSQ scores.

VVA/GSM arm of the study

Clinically significant improvements were observed for all VVA/GSM symptoms at the first evaluation visit ("end of DQRF sessions") compared with the overall clinical picture at basal assessment ("before first DQRF session"). A steady progress of all scored symptoms towards the premenopausal situation, estimated by the "before VVA/GSM" VAS scores, was apparent over the whole follow-up period (Table II).

Ten of the 32 screened women (31.2%) reported being forced to renounce any attempt at sexual intercourse during the three months before the first DQRF treatment visit because of severe VVA/GSM symptoms. Only 25 women reported at least some sexual activity, often unwillingly. All women reported vaginal dryness before treatment while 27 reported vaginal itching and burning, 29 dyspareunia, and 17 dysuria/incontinence.

At the first short-term assessment before the first DQRF session, 27 women out of 32 reported to have resumed having intercourse (84.4%); all women but four had resumed coital activity by the "month 2" visit (87.5%). Only two women reported strong physical and emotional discomfort during attempts at intercourse at

TABLE II.—*Clinical severity of VVA/GSM symptoms, self-assessed mean scores±SEM (10-cm visual analogue scales). Women's estimate before developing VVA/GSM ("before VVA/GSM") and evaluations immediately before the first and the last DQRF treatments ("before first DQRF session", "end of DQRF sessions") and at follow-up visits 1, 2, 6, 9 and 12 months after the last DQRF session.*

	Vaginal dryness	Vaginal itching	Vaginal burning	Dyspareunia	Dysuria/incontinence
Before VVA/GSM (N.=25)	2.9±1.4	2.1±0.9	2.5±1.1	2.1±0.9	2.4±1.0
Before first DQRF session	8.9±2.4 °	7.6±2.8 °	7.2±2.5 °	8.8±2.2 °	5.9±2.5 °
End of DQRF sessions	4.3±1.9 * #	3.8±1.8 *	3.5±1.8 * #	4.4±1.7 *	2.9±1.9 * #
Month 1 (N.=25)	3.4±1.7 * #	3.0±1.7 * #	3.0±1.8 * #	2.9±1.8 * #	2.8±1.5 * #
Month 2 (N.=23)	3.2±1.6 * #	2.6±1.8 * #	2.9±1.6 * #	2.8±1.8 * #	2.7±1.6 * #
Month 6 (N.=24)	3.0±1.5 * #	2.4±1.6 * #	2.6±1.7 * #	2.4±1.5 * #	2.5±1.8 * #
Month 9 (N.=23)	3.1±1.1 * #	2.3±1.3 * #	2.5±1.2 * #	2.4±1.3 * #	2.4±1.4 * #
Month 12 (N.=23)	3.1±1.3 * #	2.3±1.2 * #	2.6±1.1 * #	2.3±1.2 * #	2.5±1.3 * #

°P<0.01 *vs.* "before VVA/GSM"; *P<0.05 *vs.* "before first DQRF session"; #non-significant *vs.* "before VVA/GSM".

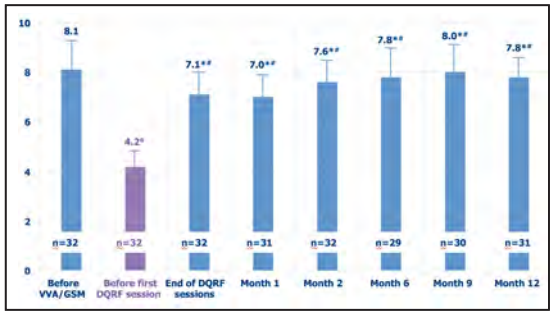


Figure 3.—Overall satisfaction with sexual life, self-assessed mean scores±SEM (10-cm VAS). Women's estimate before developing VVA/GSM ("before VVA/GSM") and evaluations immediately before the first and the last DQRF treatments ("before first DQRF session", "end of DQRF sessions") and at follow-up visits 1, 2, 6, 9 and 12 months after the last DQRF session.
°P<0.01 *vs.* "before VVA/GSM"; *P<0.05 *vs.* "before first DQRF session"; #non-significant *vs.* "before VVA/GSM".

the "month 6" through "month 12" follow-up visits. Mean VAS scores for overall satisfaction with sexual life improved from 4.2±1.2 at baseline ("before first DQRF session") to 7.0±2.1 before the end of the DQRF program ("end of DQRF sessions") and up to 7.6-8.0 after the sixth month of follow-up (Figure 3).

Discussion

The 12-month extension of the previous exploratory investigation of the new dynamic quadripolar evolution of radiofrequency treatment for vaginal rejuvenation confirms the new DQRF technology as most effective in both investigated indications postdelivery: vaginal laxity and postmenopausal atrophy of female genital tissues with associated genitourinary symptoms. The 12-month safety follow-up was also excellent. The long-term clinical benefits of the new technology are in line with the previous evidences with highly effective unipolar radiofrequency and laser devices.[1, 10, 11]

No disturbing thermal injury or pain occurred during all the many performed procedures and, according to treated women, the procedure was painless and often free of any thermal sensation. The new DQRF technology might well be a safety advance over laser technologies that, even if minimally invasive, may cause bleeding, pain and burning.[10] It might also be an advance over available unipolar radiofrequency system because the new DQRF device does not need a grounding pad on the subject's upper thigh, thus avoiding all risk of current flows triggering Ohm's resistances in crossed tissues.

The technological trick is generating electric fields only within the medically certified stainless steel dynamic quadripolar electrodes tipping the anatomically designed probes. After the probes are applied to the vaginal, introital and vulvar mucosa, the configuration of the four electrodes is continuously and electronically controlled between alternating receiver and transmitter states. This allows repelling electric fields to be generated that concentrate energy in topographically localized electric fields in the subepithelial layers of the introitus, vagina and vulva. The operator can thus fine-tune the thermal effect associated with these low-energy electric fields in terms of both tissue volume and mucosal depth. Clinical pharmacology investigations with infrared thermophotographs of treated genital areas confirmed the thermal effect to be highly localized at the desired mucosal depth, and to dissipate rapidly without residual irritation.[6]

VLQ scores as main index of vaginal laxity, and PISQ-12 and SSQ scores as index of overall sexual function and ancillary VVA-related disturbances like sex-related urinary and stool incontinence, rapidly improved in participant women with introital and vaginal laxity even before the end of the planned DQRF sessions. Rapidly improved genital aesthetics and control of sex-associated stool and urinary incontinence were both reported as most gratifying by many women independently of the more relaxed couple relationship. Aside from any real medical consideration and remembering that aesthetic reasons were behind the decision by 90% of patients to undergo elective surgery for vaginal tightening and perineal support,[12] obtaining a more subjectively pleasing aesthetic appearance thanks to non-surgical techniques of cosmetic genitoplasty may even become the foremost field of application of vaginal rejuvenation.

Anatomical re-modeling defines vaginal rejuvenation. Anatomical re-modeling is most likely associated with thermal re-activation of fibroblasts and development of new networks of collagen and elastin fibers in the subepithelial layers of introitus and vagina.[11, 13] The program of 4 to 6 DQRF sessions was over in less than two months, yet the vaginal rejuvenation effect persisted for a whole year after the last treatment. A few participant women reported some slight deterioration in perceived vaginal laxity and sexual satisfaction from vaginal intercourse (VLQ and SSQ mean scores), though there was no deterioration of improved ancillary symptoms like dysuria and urinary incontinence (PISQ-12 mean scores). This suggests consolidating the re-modelling and symptomatic benefits of the previous DQRF vaginal rejuvenation program with some further sessions after 6 to 9-12 months.

The Women's EMPOWER Survey most recently showed that women's awareness and understanding of VVA/GSM is still poor in spite of quite a lot of VVA surveys and wide media coverage of the problem over recent years.[14-16]

Vaginal rejuvenation as an option in VVA/GSM also benefits from direct thermal re-activation of fibroblasts and collagen, elastin, and matrix neosynthesis, but thermal vasodilatation is also a goal. The peri- and postmenopausal fall of estrogens impacts on mucosal elasticity by matrix glycosaminoglycans depletion and by hyalinization, fragmentation and fusion of collagen and elastin fibres.[17,18] These events are associated with urogenital atrophic symptoms even in 15% of premenopausal women.[17] Facilitating diffusion to the atrophic vaginal mucosa of adrenal dehydroepiandrosterone (DHEA) and DHEA-derived estrogens produced in local adipose tissue is likely to counteract vaginal atrophy, and possibly even postmenopausal osteoporosis, muscle loss, fat accumulation and hot flashes.[19, 20] All women but two in the VVA/GSM arm of the study reported control of dyspareunia and resumption of coital activity and gratifying couple relationship at the end of the 12-month follow-up period, but benefits were already impressive before the last treatment session, no later than one month and a half or two months after beginning the DQRF program.

Conclusions

The study data suggest there is no tendency to clinical deterioration even after one year since the last DQRF treatment session. This observation suggests persistent anatomical remodeling and real counteracting of atrophy. As in the pioneer exploratory study, no formal evaluations of thinning/loss of vaginal rugae, mucosal pallor and friability and low vaginal maturation index were formally planned, yet anecdotal observations by the investigator confirmed anatomical rejuvenation.

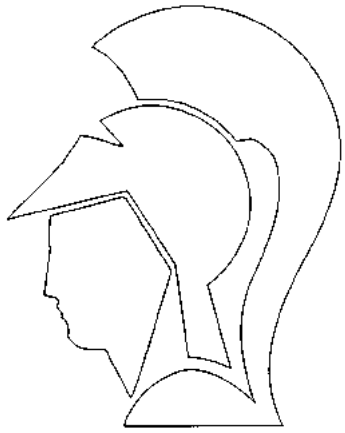
The follow-up of this office-based investigation is still going on with the goal of further defining the clinical and safety profile of the new DQRF device in both indications with the forthcoming evidences after 18 and 24 months.

References

1. Millheiser LS, Pauls RN, Herbst SJ, Chen BH. Radiofrequency treatment of vaginal laxity after vaginal delivery: nonsurgical vaginal tightening. J Sex Med 2010;7:3088-95.
2. Sekiguchi Y, Utsugisawa Y, Azekosi Y, Kinjo M, Song M, Kubota Y *et al.* Laxity of the vaginal introitus after childbirth: nonsurgical outpatient procedure for vaginal tissue restoration and improved sexual satisfaction using low-energy radiofrequency thermal therapy. J Womens Health (Larchmt) 2013;22:775-81.
3. Kingsberg SA, Krychman M, Graham S, Bernick B, Mirkin S. The Women's EMPOWER Survey: identifying women's perceptions on vulvar and vaginal atrophy and its treatment. J Sex Med 2017;14:413-24.
4. Krychman M, Graham S, Bernick B, Mirkin S, Kingsberg SA. The Women's EMPOWER Survey: women's knowledge and awareness of treatment options for vulvar and vaginal atrophy remains inadequate. J Sex Med 2017;14:425-33.
5. Krychman M, Rowan CG, Allan BB, DeRogatis L, Durbin S, Yacoubian A, *et al.* Effect of single-treatment, surface-cooled radiofrequency therapy on vaginal laxity and female sexual function: the VIVEVE I randomized controlled trial. J Sex Med 2017;14:215-25.
6. Vicariotto F, Raichi M. Technological evolution in the radiofrequency treatment of vaginal laxity and menopausal vulvo-vaginal atrophy and other genitourinary symptoms: first experiences with a novel dynamic quadripolar device. Minerva Ginecol 2016;68:225-36.
7. Millheiser LS, Pauls RN, Herbst SJ, Chen BH. Radiofrequency treatment of vaginal laxity after vaginal delivery: nonsurgical vaginal tightening. J Sex Med 2010;7:3088-95.

8. Rogers RG, Coates KW, Kammerer-Doak D, Khalsa S, Qualls C. A short form of the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ-12). Int Urogynecol J Pelvic Floor Dysfunct 2003;14:164-8.
9. Lee YK, Chung HH, Kim JW, Park NH, Song YS, Kang SB. Vaginal pH-balanced gel for the control of atrophic vaginitis among breast cancer survivors: a randomized controlled trial. Obstet Gynecol 2011;117:922-7.
10. Gaspar A, Addamo G, Brandi H. Vaginal fractional CO_2 laser: a minimally invasive option for vaginal rejuvenation. Am J Cosmetic Surg 2011;28:156-62.
11. Sekiguchi Y, Utsugisawa Y, Azekosi Y, Kinjo M, Song M, Kubota Y, *et al.* Laxity of the vaginal introitus after childbirth: nonsurgical outpatient procedure for vaginal tissue restoration and improved sexual satisfaction using low-energy radiofrequency thermal therapy. J Womens Health (Larchmt) 2013;22:775-81.
12. Goodman MP, Placik OJ, Benson RH 3rd, Miklos JR, Moore RD, Jason RA, *et al.* A large multicenter outcome study of female genital plastic surgery. J Sex Med 2010;7(4 Pt 1):1565-77.
13. Gambacciani M, Levancini M, Cervigni M. Vaginal erbium laser: the second-generation thermotherapy for the genitourinary syndrome of menopause. Climacteric 2015;18:757-63.
14. Nappi RE, Palacios S, Panay N, Particco M, Krychman ML. Vulvar and vaginal atrophy in four European countries: evidence from the European REVIVE Survey. Climacteric 2016;19:188-97.
15. Kingsberg SA, Krychman M, Graham S, Bernick B, Mirkin S. The Women's EMPOWER Survey: identifying women's perceptions on vulvar and vaginal atrophy and its treatment. J Sex Med 2017;14:413-24.
16. Krychman M, Graham S, Bernick B, Mirkin S, Kingsberg SA. The Women's EMPOWER Survey: women's knowledge and awareness of treatment options for vulvar and vaginal atrophy remains inadequate. J Sex Med 2017;14:425-33.
17. Palacios S. Managing urogenital atrophy. Maturitas 2009;63:315-8.
18. Sturdee DW, Panay N; International Menopause Society Writing Group. Recommendations for the management of postmenopausal vaginal atrophy. Climacteric 2010;13:509-22.
19. Labrie F. DHEA, important source of sex steroids in men and even more in women. Prog Brain Res 2010;182:97-148.
20. Labrie F. All sex steroids are made intracellularly in peripheral tissues by the mechanisms of intracrinology after menopause. J Steroid Biochem Mol Biol 2015;145:133-8.

Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.



Tip. S.A.E.M.M.