



## **Intimate Esthetics: Radiofrequency and the Vitamin C Association**

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### **Authors' contributions**

*This work was performed in collaboration among all authors. Authors FGTL, APS, AMA and SDSCH designed the study, wrote the protocol, wrote the manuscript and managed the literature research.*

*Authors APS, AMA and RCA performed the statistical analysis. Authors LSNO, AFBM and ASP performed data collection. Authors EBSL and JCLB managed the analysis of the study. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Introduction:** Aging is a natural event, however for women the effects are more drastic, interfering directly in their sexual health, leading to intimate changes such as vulvovaginal sagging and hyperchromic.

**Objective:** To investigate whether the use of radiofrequency associated with vitamin C reduces the signs of aging and decreases the cutaneous hyperpigmentation of the vulvar zone.

**Materials and Methods:** Forty women divided into Radiofrequency (RF) and Radiofrequency associated with Vitamin C (RFC) were selected to meet the inclusion criteria to perform 4 treatment sessions. Data were collected from the photographic visual evaluation of a gynecologist, a dermatologist, and a specialist physiotherapist, from the pre and post-procedure, in addition to the

participant's intimate self-assessment through a questionnaire. At the end of treatment, 35 women with the age group of 40.8 RF and 34.2 RFC were left.

**Results:** Participants reported improvement in sexual satisfaction, however, there was no significant difference between the RF and RFC groups regarding sagging and whitening and the inter-evaluator evaluation was unagreed.

**Conclusion:** If necessary, more sessions are performed for possible evidence of vitamin C use.

*Keywords: Vulva; women's health; aesthetics; ascorbic acid; radiofrequency.*

## 1. INTRODUCTION

Recently women have been concerned about intimate aesthetics and break paradigms, seeking specialized care to minimize functional and aesthetic changes. In the broader care in Women's Health, there is a frequent complaint of tissue sagging and hyperchromic in the intimate genitalia, the vulvovaginal region [1]. Vaginal rejuvenation is used as a treatment when it comes to changes related to the aging of female genitalia given by the sagging of large and small lips [2]. These sensory transformations affect the quality of life, self-confidence, as well as personal intimate satisfaction, this is due to compromised genital aesthetics and the discomfort caused by the negative effects of intimate perception, including affecting the sexual experience of women [3]. Aging is a factor that generates a lot of concern, especially healthy aging, which makes people seek more and more ways to slow this natural process of the body. In particular, in sexual health that is a fundamental part of women's health, with the intention of solving the changes caused by vulvovaginal sagging, these women seek genital plastic surgeries [3]. Currently, in the area of Dermatofunctional Physiotherapy, many noninvasive techniques have emerged to work on both facial and body rejuvenation, including radiofrequency [4]. As a means of non-ablative and repairing procedure of vulvar sagging, radiofrequency is effective in recovering elasticity and increased collagen deposition [5]. Radiofrequency (RF) appears as a totally safe, painless and noninvasive method, and with results as satisfactory as invasive ones, with recommendations both for the treatment of diseases and in the treatment of degenerative processes with decreased or metabolism retardation, irrigation and nutrition [6]. However, RF reaches the deep layers of the skin generating new collagen fibers improving its aspect. In addition, it generates heat in the applied region causing local vasodilation, with increased irrigation, oxygenation, and nutrition of adjacent tissues. Thus, the rejuvenation effect

caused by RF occurs due to the contraction of collagen fibers [7]. The most used theory to explain skin aging is due to the formation of free radicals in the body [8], these cells have unique electrons that try to pair with other cells to become stable, so they destabilize the other cells generating a cascading effect of free radical formation, providing oxidative and degenerative stress of the region [9,10].

However, the body has as defense antioxidant agents that are able to reduce and/or inhibit the formation of free radicals, however only what is produced by the body is not always sufficient for this purpose, requiring the use of medicines or cosmeceuticals to achieve this benefit [11]. The vitamin C is also known as ascorbic acid is a major antioxidative agent, often being used in pharmaceutical industries associated with topical products, since it directly helps in neutralizing free radicals and protect against oxidative stress [9], as well as aids in the formation of collagen fibers and inhibiting melanin synthesis, promoting a skin whitening effect [8]. The RF is used in facial and body treatments already enshrined in the area of Dermatofunctional Physiotherapy [11] in order to slow senile skin aging, improve tissue sagging, increase collagen and vasodilation production, however, the association of vitamin C with RF was used only in the facial region, with positive effects both on improved sagging and reduction of melanogenesis, since vitamin C is an active acid that can be used at any age and assists in collagen production through the fibroblasts, and is also fundamental in the formation of elastin<sup>7</sup>. Therefore, the present study aimed to ascertain whether the use of radiofrequency associated with vitamin C reduces the signs of aging and cutaneous hyperpigmentation of the vulvar zone.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

Cross-sectional experimental research was conducted with 40 women at the Clinic School of

Physiotherapy (CSP) of the University of Gurupi (UNIRG), street 10 between Guanabara and Rio de Janeiro in Gurupi - TO and at the Physiotherapy Clinic Espaço Saúde Reabilitar, Avenue Pernambuco N°1545 Gurupi - TO, between June and November 2019.

## 2.2 Inclusion / Exclusion Criteria

For the selection of participants, it was used as inclusion criteria: women between 20 and 60 years of age, with the dissatisfaction of intimate aesthetics and presenting hyperchromic and vulvar sagging, and who signed the Free and Informed Consent Form (FICF) consenting to their participation. Exclusion criteria were: vitamin C allergy, pacemaker use, presence of tissue lesion in the vulvar region, active or recurrent herpes, vulvovaginitis, diagnosis and/or suspected neoplasms, women in gestational period and participants who gave up research.

## 2.3 Method of Recruitment

The first forty women who sought the researchers were selected and who met the inclusion criteria, the sample size is based on the work of Lordêlo, et al. [12] and Leal [13], these were randomly distributed into two groups, one with radio frequency (RF) and the other with radiofrequency treatment associated with vitamin C (RFC). The random distribution occurred through a draw of the participants, in which the first 20 drawn submitted to the RFC group.

## 2.4 Study Tool

The Radiofrequency device of the Hertix Smart model<sup>®</sup> of KLD was used for treatment. Slow movements were performed until it reaches the ideal temperature of 41°C and the same accelerated so that it remained stable for two (2) minutes per area, respecting the sensitivity of the participant. A digital thermometer was also used to monitor the temperature of the region. For disinfection of the head, a high-level disinfectant was used, GLUTARON<sup>®</sup> 32 days, where its manipulation was made through the activating mixture, which after activation was valid for 32 days, being renewed until the end of the procedures. The head was kept immersed for nine (9) hours before the application of the procedure in the participants, and still being immersed for twenty (20) minutes between each participant, and then rinse with alcohol was performed 70%, ensuring the protection of the

participant, the application in the region was made with glycerin to conduct RF, being removed with paper towel at the end of the procedure. During the application of the technique, a disposable wooden spatula was used for the separation of the large lips. In the group using vitamin C, it was used in the concentration of 20% manipulated by the ARTESANAL Pharmacy, where it consisted of Ascorbic Acid (vitamin C) 20%, Ferulic Acid 1%, Alfa Tocopherol 1% and LC Oil-Free Guirre qsp 30 g and applied before and after radiofrequency. The treatment consisted of four (4) sessions, however, there were six (6) meetings with the participants, because, in the first meeting, anamnesis was held, where the participants answered a self-applicable questionnaire of personal satisfaction regarding their vulvar region used by Oliveira and Barros [14] Next, the photographic record was made with Canon camera<sup>®</sup> Powershot SX400IS model, with the patient lying in dorsal decubitus with legs flexed and abducted in the lotus position, the camera positioned 60 cm from the genital region, fixed on a tripod of 90 cm. To avoid embarrassment and to protect the identity of the patients they received a number of 1 to 20 for RF and from 21 to 40 for RFC. Subsequently, the four treatment sessions occurred and seven days after the 4 sessions, there was a reassessment with photographic registration and the questionnaire, meeting the same initial criteria.

## 2.5 Likert Scale for the Evaluation of the Photographs

The initial and final photographic record was presented to the participant herself to judge the effect of treatment according to the Likert scale of 3 points where 1- satisfied, 2- unchanged, 3- dissatisfied. The registration was also presented to three health professionals, being a gynecologist physician, a dermatologist and a physiotherapist specializing in urology and gynecology, blind in relation to treatment groups, who also evaluated the result of treatment according to the Likert scale of 3 points where 1- improved, 2- unchanged, 3- worsened [12]. The main comparative parameters were the difference between the first and last photographic records, reduction of melanogenesis and skin folds, and retraction of large lips.

## 2.6 Statistical Analysis

In the data analysis, the T-test the P-value < 0.05 was considered significant and was used to

evaluate whether there was a significant difference between the evaluations, and the Kappa Test was used to measure of agreement between the two individuals, that investigated the inter-evaluator agreement and between evaluators and patients in the evaluation of the photographs.

### 3. RESULTS AND DISCUSSION

The sample consisted of 40 women, 5 of which gave up treatment before the 4th session, with 35 participants who completed treatment: 17 from the RF group and 18 of the RFC group. The mean age among women was 40.8 and 34.2 years for RF and RFC, respectively (Table 1). Withdrawal is a common factor found in studies involving another human being, so much so that in Santos' work [15], 32 women between 18 and 60 years old were selected, and 3 did not complete the treatment. Fistonc, 16 elected 19 women aged 27 to 56 years and there were 2 dropouts, and yet Lordêlo [12] 43 were chosen with 7 dropouts. The anatomical and functional characteristics of female external genitalia may interfere with the behavior of women, regardless of their age and sociocultural level [16]. Of the 35 women, 24 consider that their genital is flaccid, however, 31 of these women point out that sagging does not prevent them from having sex or engaging in daily activities. Vaginal walls and their precept, as well as the introitus, are altered by genetic predisposition, with age, parity, hormonal pattern, surgeries or radiotherapy [17]. According to the participants, 20% of them believe that sagging began after pregnancies and 22.8% say it was due to age. During the process of vaginal sagging, the vaginal muscles are relaxed with loss of tone and muscle strength, in addition to the loss of collagen and elastin fibers in the lamina proper to the vaginal mucosa [18]. Thus Millheiser, et al. [19] corroborates this theory by saying that sagging happens after a vaginal delivery, which has worsened with multiparity, as well as by changes in connective tissue through the normal aging process, 77.1% of women had at least one pregnancy, however only 51.4% had a normal delivery, the remainder were cesarean. However, he also states that sagging can occur after suffering a tension beyond its elasticity [19], which refers us to the wax waxing process, where an elastic tension is exerted to remove the hair, thus being directly linked to vulvovaginal sagging, since this process is repeated over several years, at least once a month, 48.5% of volunteers claim to use waxing with hot wax in the genital region.

In addition to the factors mentioned above, Gomes and Damazio [20], affirm that aging and consequently sagging is correlated with free radicals from exogenous factors such as medications, viruses and bacteria, thermal shock, smoking, alcohol, high in fat, industrialized and artificial products, sunlight and artificial light, pollution and stress. However, none of the participants say they are smokers and only 42.8% are alcoholics. Regarding personal satisfaction, 34 women say they are satisfied after the start of treatment, reporting improvement in self-esteem and even increased sexual desire, only 1 reported personal satisfaction as unchanged. However, 94.2% of the participants reported improvement in the sagging of the region shortly after the first session, however, some describe that the effect is lost throughout the week. This can be explained by the effect, "lifting" of radio frequency, which happens after the rise of the temperature in the region, causing the decrease in the extensibility of collagen fibers and the increase in their density, causing elasticity to be reduced tissue [21]. Tagliolato [22], also states that heated collagen fibers denaturation and contract, with an immediate contraction occurring, as well as a stimulus to the formation of new fibers (late neocolagenesis), making them more efficient in skin support [21,23]. In addition Duarte, et al. [24] describe that for the durability of the effects of radiofrequency, repeated applications are necessary, as the effects are continuously established, such as vasodilation and the improvement of local blood circulation. Worldwide, there are already studies that correlate the genital image with the sexual life of the female population. So in addition to the sagging, the darkening of the genital region is another factor that directly bothers women, so much so that 88.57% of women say they have dark spots in the genital region, yet 45.7% believe they are located and 48.5% say they are widespread. Just as vitamin C has multiple functions and is widely used as active in cosmetic formulations, it provides excellent results through three main mechanisms: stimulation of collagen production, depigmenting action, and antioxidant activity [25]. Therefore the main character to be observed was the depigmenting action, with this 82.5% of the women noticed that there was an improvement in bleaching, but expected a more evident effect.

According to kappa's statistical analysis [26], for agreement between the evaluators, it can be observed in Table 2 that there is no agreement that there was no difference between session 0

and after 4 sessions (Figs. 1 and 2). However Fistonik, et al. [27] used radio frequency for the treatment of sagging on large lips, small lips and perineal region, being 4 sessions over a month, and obtained a satisfactory result even in a short period of applications. Vicariotto and Raichi [2], in their study on vaginal introitus sagging, performed the procedure with 5 radiofrequency sessions and also obtained substantial results. And Lordêlo, et al. [12] was used from 8 sessions for the treatment of sagging on the large lips, achieving the personal satisfaction of patients. The only evaluation according to the kappa coefficient that pointed out agreement among the evaluators was the dermatologist's evaluation with the Physiotherapist, however, a divergence in the evaluation was noted since they agreed minimally that the RFC group presented greater difference between session 0 and after 4 sessions, however, in relation to

sagging and whitening the group they reasonably agreed ( $k= 0.43$ ) and substantially ( $k= 0.81$ ), respectively, were in the RF group. This can be explained since, in the difference between the photos, the evaluator observed only the visual aesthetics of the before and after, it became apparently more beautiful, and when it took into account sagging and bleaching, an improvement was observed in the RF group. Another factor that should be taken into account about this disagreement among evaluators is that each professional observes according to their area of activity. The same was described by Leal [13] who according to her in the dermatologist's view this makes a careful analysis of the skin aspect and its conditions, while the gynecologist evaluates the anatomy of the vulva and its dysfunctions and the physiotherapist has a more functional view of the organ.

**Table 1. Clinical and sociodemographic characteristics of the RF and RFC groups**

<b>Variable</b>	<b>RF (N=17)</b>	<b>RFC (N=18)</b>	<b>p value</b>
Age (years)	40,82 ( $\pm 12,78$ )	34,27 ( $\pm 11,88$ )	0.126
<b>Civil state</b>			
Married	11 (64,7%)	4 (22,2%)	0,01*
Single	3 (17,6%)	12 (66,7%)	0,0025*
Divorced	2(11,8%)	2 (11,1%)	0.953
Widow	1 (5,9%)	0 (0%)	0.332
<b>Schooling</b>			
Elementary	2 (11,8%)	0 (0%)	0.163
High Shcool	5 (29,4%)	3 (16,7%)	0.384
Incomplet Graduate Shcool	4 (23,5%)	6 (33,3%)	0.535
Complet Graduate Shcool	4 (23,5%)	3 (16,7%)	0.624
Technical	2 (11,8%)	6 (33,3%)	0.137
<b>Panties</b>			
Cotton	16 (94,1%)	13 (72,2%)	0.088
Laycra	11 (64,7%)	14 (77,8%)	0.407
Sewing	9 (52,9%)	8 (44,4%)	0.628
<b>Depilation</b>			
Blade	8 (47,1%)	9 (50%)	0.867
Hot Wax	9 (52,9%)	8 (44,4%)	0.628
Photohairremoval	0 (0%)	2 (11,1%)	0.594
Laser	1 (5,9%)	1 (5,6%)	0.163
Machine	1 (5,9%)	2 (11,1%)	0.968
<b>Menstruation</b>			
Regular	8 (47,1%)	12 (66,7%)	0.254
Irregular	2 (11,8%)	2 (11,1%)	0.953
Menopause	7 (41,2%)	4 (22,2%)	0.240
Sexual Activity	15 (88,2%)	13 (72,2%)	0.249
Pregnancy	14 (82,4%)	13 (72,2%)	0.490
<b>Type of Childbirth</b>			
Normal	15 (88,2%)	11 (61,1%)	0.134
Cesarian	11 (64,7%)	7 (38,9%)	0.419
Abortion	6 (35,3%)	4 (22,2%)	0.407



Fig. 1. RF group, session 0 and after 4 session

Table 2. Inter-rater agreement analysis using the Kappa test

Evaluation	Kappa					
	Difference 0 e 4		Sagging		Whitening	
	RF	RFC	RF	RFC	RF	RFC
Dermatologist/Physiotherapist	0.12	0.38	0.43	0.05	0.81	0.33
Dermatologist/ Gynecologist	-0.06	-0.17	0.19	-0.01	-0.02	-0.17
Physiotherapist/ Gynecologist	0.18	-0.15	0.19	0.03	0.00	-0.18

Regarding the agreement between patients and evaluators, according to the Kappa test, there was a minimum agreement (Table 3) between patients, physiotherapist, and dermatologist ( $k=0.227$ ) that in the radiofrequency group there was improvement in sagging after 4 treatment sessions, however for bleaching, there was no agreement between them, but the evaluation of

patients with the gynecologist, there was minimal agreement ( $k=0.213$ ) to improve only in the whitening of the RF group.

As presented in Table 4, we can observe that in relation to the RF and RFC group there was no significant difference when comparing between them the improvement in sagging and whitening,

before no evaluator, this means that there was an improvement in sagging and whitening for the two groups since equal radiofrequency was

applied, however, the expected effect of an intensification on bleaching due to vitamin C was not observed.

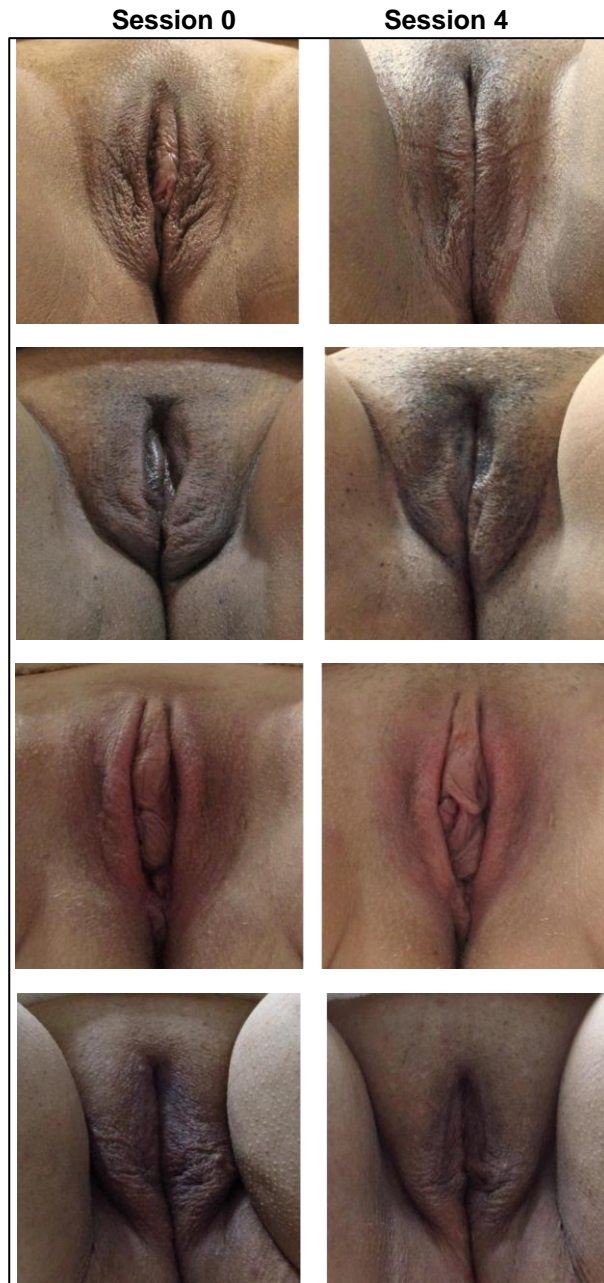


Fig. 2. RFC Group, session 0 and after 4 session

Table 3. Agreement analysis between raters and patients using the Kappa test

Evaluation	Kappa			
	Sagging		Whitening	
	RF	RFC	RF	RFC
Patient/Physiotherapist	0.227	-0.110	-0.077	0.149
Patient/Dermatologist	0.227	-0.005	0.038	0.034
Patient/Gynecologist	-0.079	-0.038	0.213	-0.080

Ho: Kappa=zero; Ha: Kappa#zero



**Table 4. Evaluation of patients and professionals regarding the improvement of skin sagging and Whitening of the genital region of the RF and RFC groups**

Evaluation	Sagging		p-value	Whitening		P-value
	RF (N=17)	RFC (N=18)		RF (N=17)	RFC (N=18)	
Patient	16 (94,1%)	17(94,4%)	0.968	16 (94,1%)	17 (94,4%)	0.968
Dermatologist	11 (64,7%)	7 (38,8%)	0.134	8 (47%)	10 (55,5%)	0.628
Gynecologist	14 (82,3%)	11 (61,1%)	0.594	16 (94,1%)	16 (88,8%)	0.094
Physiotherapist	11 (64,7%)	10 (55,5%)	0.594	9 (52,9%)	10 (55,5%)	0.881

\* $p \leq 0.05$ 

#### 4. CONCLUSION

Radiofrequency is an effective alternative for the treatment of sagging of large lips, improving the intimate personal satisfaction of the participants. It was observed that with only 4 sessions there was no significant difference, both for improvement in sagging and bleaching, in both study groups, if it is necessary that more sessions be performed for possible evidence of vitamin C use.

#### CONSENT

As per international standard guideline, patient's written consent has been collected and preserved by the author(s).

#### ETHICAL APPROVAL

The research began after approval by the Ethics and Research Committee in Human Beings from UnirG University-Gurupi/TO, strictly obeying resolution 466/2012 and CAAE 14410219.8.0000.5518.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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