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ORIGINAL RESEARCH

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Hybrid high- and low-molecular weight chains of hyaluronan is an effective modality treatment for increasing female sexual satisfaction: An interventional, randomized-control parallel study

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Abstract

Background and Aims: Psychological, behavioral, hormonal, surgical, and psycho-pharmacologic approaches are the only acknowledged treatments for Female Sexual Dysfunction (FSD). The study is conducted to assess the efficacy of hybrid cooperative complexes of high and low molecular weight hyaluronan (hybrid H-HA/L-HA) in treating females with varying of sexual dysfunction and to assess the female genital self-image scale (FGSIS), female sexual function index (FSFI), and dermatology life quality index (DLQI) before and after treatment.

Methods: Sixty female patients were divided into two groups. The study group enrolled 30 female patients injected with hybrid H-HA/L-HA, while the control group enrolled 30 female patients injected with saline. Patients were recruited from the clinic searching for medical advice. Controls were selected from close associates of the cases who were attending with the patients or healthy escorts of dermatology patients attending the dermatology outpatient clinic. We assessed socio-demographic, clinical evaluation, the (FGSIS), (FSFI), and (DLQI) before and after treatment. The first assessment was conducted at the first visit, and the second assessment was conducted after 1 month of the second injection.

Result: Significant increase in the frequency of sexual intercourse/week in the study group after the first and second injection sessions compared to the controls was observed ($p < 0.05$). There was statistically significant amelioration in desire, arousal, lubrication, orgasm, satisfaction domains, and total score of the FSFI ($p \leq 0.05$). The study demonstrated significant increasing differences in all domains of the FGSIS ($p \leq 0.05$). The symptoms and feelings, leisure, personal relationships, and total scores were significantly higher post first and second injection of (hybrid H-HA/L-HA) sessions compared to the controls ($p < 0.05$).

Conclusion: The (hybrid H-HA/L-HA) injection for rejuvenating the genital area appears to be a safe and effective way to enhance female genital self-image, sexuality, and quality of life with high levels of satisfaction as a minimally invasive method.

KEYWORDS
DLQI, female sexual function, FGSIS, FSFI, hybrid H-HA/L-HA

1 | INTRODUCTION

Various etiopathogenic factors and response forms of treatment contribute to female sexual dysfunction.[1,2] By ruling out surgical techniques, patients seek therapeutic alternatives that are both safe and effective.[3] Psychotherapy or sex therapy can help women manage the psychological, relational, and sociocultural factors that influence their sexual function.[2,3] Despite the fact that psychotherapy can help many females, there are currently no class A new treatments, topical treatments, or vasodilator gels available. This suggests that further investigations are needed in this area. Several complementary minimal-invasive treatments were used, and a few of them have been reported to have negative side effects, like hyaluronic acid (HA) fillers, calcium hydroxyapatite crystals (CHAC), and Platelet Rich Plasma (PRP).[4–6]

HA controls tissue hydration and the penetrability of small and large molecules.[7] Human fibroblasts were manipulated after intra-dermal injection of HA-containing complexes.[8]

Hybrid cooperative complexes of high and low molecular weight hyaluronan (hybrid H-HA/L-HA) rejuvenate and improve broken and uninjured tissue by stimulating stem cells in the injection site.[9,10] Numerous studies have shown that (hybrid H-HA/L-HA) is safe, with no fibrotic formation, contagion, or other adverse reactions.[11,12] (hybrid H-HA/L-HA) is nonexpansive, nonhazardous, and easily absorbed by the tissue.

This study was conducted to explore the effect of injecting an innovative NAHYCOTM-based filler designed and manufactured (WO/2012/032151) for the treatment, which is available in the market as (Profhilo®)[13] in treating females with varying degrees of sexual dysfunction. Also, to assess the Female Genital Self-image Scale (FGSIS), Female Sexual Function Index (FSFI), and Dermatology Life Quality Index (DLQI) before and after treatment.

2 | METHODS

This is an interventional, randomized-control parallel trial on females suffering from sexual dysfunction. After gaining permission from the institutional ethical committee, the study was carried out in the Dermatological Outpatient Clinic for 12 months, and all participants supplied written informed consent in accordance with the Institutional review board and Research Ethical Committee in accordance with the Helsinki Declaration guidelines. Patients were recruited from the clinic searching for medical advice. Controls were selected from close associates of the cases, such as friends and relatives who were attending with the patients or healthy escorts of dermatology patients attending the dermatology outpatient clinic. The (CONSORT) strengthening guidelines were followed, Figure 1.

2.1 | Patients' inclusion criteria

Females were sexually active, but they experienced varying degrees of sexual dysfunction [dyspareunia, female orgasmic disorder, hypoactive sexual arousal disorders, or anorgasmia]. Female patients aged between 18 and 60 years of age and able to give consent.

2.2 | Patients' exclusion criteria

Patients with a history of incontinence, who were pregnant, who were on a current COVID-19 treatment program, who had a body mass index (BMI) greater than 35, who had a history of pelvic floor prolapse, who used hormonal birth control or intrauterine devices, or who used contraceptive implantable devices, who were taking antidepressant medication, or who had a long-term illness that affects sexual function should be referred to a physician. With exclusion all of this, we emphasize that skin collagen affection can affect patients' sexuality. Our goal with profhilo is to increase collagen formation and stem cell stimulation, which will improve sexuality.

Patients with inflammatory reactions, keloidal potential, immunodeficiency, allergy (hypersensitivity), blood diseases such as sickle cell anemia, photo treatments, filler modalities of treatment in the previous 6 months to 1 year, and infectious diseases like herpes genitals were also barred from inclusion in the research. Also, those who refused to give consent Following computer-based random assignment, we selected a total of 98 participants who agreed to partake in the research; however, only 60 females completed the study. These are patients with various manifestations of sexual dysfunction, but do not respond to any treatment. Before beginning therapy, patients were given a complete history and general and systemic examinations with an emphasis on local dermatological examinations. Patients were informed not to use any therapeutic strategies even during the study.

Using (hybrid H-HA/L-HA) was a new technique but has great similarity to PRP injection. So sampling was dependent on a study using PRP in Female Sexual Dysfunction treatment.[14]

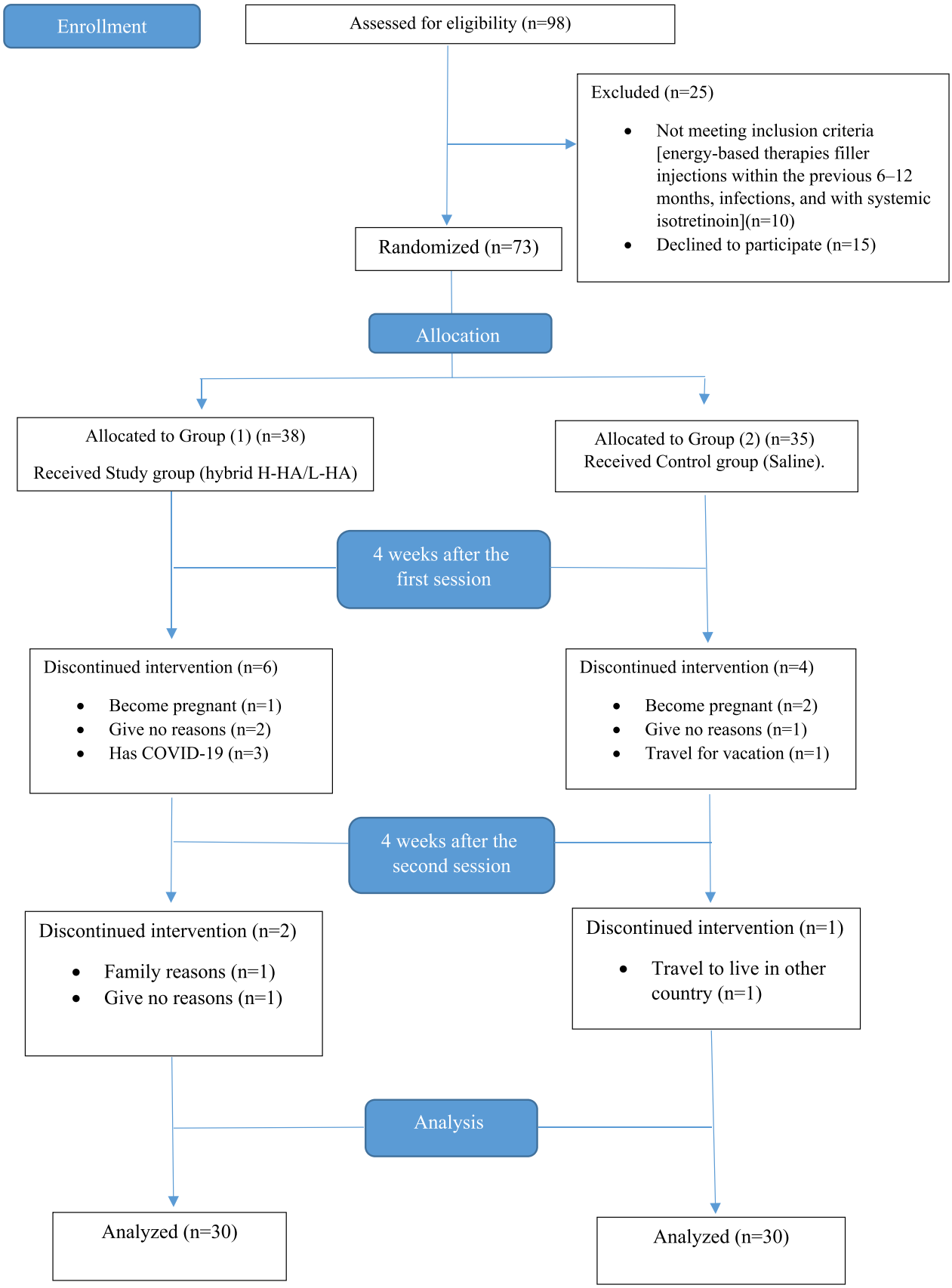

FIGURE 1 Consolidated standards of reporting trials (CONSORT) flow diagram.

2.3 | Sample size

The sample size was calculated using the following formula:

$$n = 2\left[\frac{(Z_{\infty/2} + Z_{\beta})^{*}\sigma}{\mu_1 - \mu_2}\right]^2 \quad (1)$$

where:

n = sample size.
$Z_{\alpha/2}$ = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail).
Z_{β} = 0.84 (The critical value that separates the lower 20% of the Z distribution from the upper 80%).
σ = the estimate of the standard deviation of FSFI = 7.21.[14]
μ_1 = mean in the study group = FSFI before PRP = 24.31.[14]
μ_2 = mean in the control group = FSFI after PRP = 29.63.[14]

So, by calculation, the sample size was equal to 30 subjects after adding a 10% drop rate.

2.4 | Patients are being prepared for both groups

The steps were carried out under identical circumstances, with identical instruments, by the same healthcare professional, and with identical technique.

2.5 | Anesthesia

A local anesthetic cream was used in conjunction with a foundation to reduce irritation while also encouraging absorption through the mucosal barrier during occlusion. The compounds were lidocaine, bupivacaine, and tetracaine in percentage densities of 8/20/8. After 1 h of numbness seneatoin of the clitoris, anterior vaginal wall, and skene's glands, (hybrid H-HA/L-HA) was administered.

2.6 | Preparation before injection

For healthy and noninflamed skin, the operation area was cleaned with saline followed by Povidone Iodine is recommended. Using gloves, inject the hybrid H-HA/L-HA with a sterile syringe and sterile gauze.

2.7 | Position of the patients

The patients were in a lithotomy position during the processe, which highlighted the genital area.

2.8 | Study group (hybrid H-HA/L-HA)

Respondents were adequately educated about the novel treatment before providing consent. The product under investigation (hybrid LMW-HA/HMW-HA), manufactured and dispersed by IBSA Farmaceutici Italia Srl (Lodi, Italy), is a healthcare tool enclosing hybrid LMW-HA/HMW-HA equipped with preloaded hypodermic glass syrenges for local injections. This is focused on the newly developed secure hybrid cooperative HA complexes (NAHYCO).[7] In 2 ml of buffered sodium chloride physiologic solution, the HA concentration was 3.2%, with 32 mg of HMW-HA and 32 mg of LMW-HA. An expression of different HA weights (high and low) in a single syringe enables the integration of intrinsic HA tiers with a system consisting of stabilized HA hybrid compounds.[7] The authors commercially procured (hybrid H-HA/L-HA) and funded the study. Two sessions were conducted 1 month apart.

2.9 | The control group (saline)

Same as a (study group), but we used saline instead of (hybrid LMW-HA/HMW-HA).

2.10 | The posttreatment protocol

Using of fucidic acid cream after the procedure twice per day for 2 days. Intercourse was allowed after 2 days of the procedure.

After receiving hybrid H-HA/L-HA, patients were allowed to return to their homes and had sex and intercourse within 48 h of the procedure. Patients were permitted to resume their usual sexual activity at their usual times and in their usual manner.

2.11 | Assessments

The first assessment was conducted at the first visit after the consent, and the second assessment was conducted 1 month after the second injection. The study used assessment methods for collecting socio-demographic clinical data, clinical assessment, (FGSIS-4),[15] (FSFI),[16] and (DLQI).[17]

2.12 | Data on biometrics and socio-demographics

The bio-data and socio-demographic persona form was a brief questionnaire designed to elicit information about the patient. Among the variables included were name, age, level of education, as well as Fitzpatrick skin type classification (type I is the lightest skin and type VI the darkest one).

2.13 | FGSIS

For assessing females' feelings and beliefs about their genitals, the four-item FGSIS with a 4-point scale format was used (strongly disagree, disagree, agree, and strongly agree).

2.14 | FSFI

The FSFI was used to evaluate sexual performance. The FSFI was a 19-item questionnaire that assesses desire, arousal, lubrication, vaginal penetration pain, satisfaction, and orgasm. The total score was computed, and higher scores indicate better sexual function.

2.15 | DLQI

The DLQI was developed to assess people's quality of life. It contained 10 items about the participant's recent feelings and aspects of the disorder. It addressed symptoms (itching, pain, and irritation), emotions (embarrassment, distress, and anger), daily activities (shopping and housework), clothing, social or leisure activities, physical exercise, educational opportunities, sexual behavior, personal relationships (with wife, friends, and relatives), and treatment options.

2.16 | DSM-IV

The DSM-IV, a widely used manual for diagnosing mental illnesses, was published by the American Psychiatric Association. This was done to rule out other psychiatric conditions.

2.17 | Statistical analysis

For data analysis, IBM SPSS apps were used (version 25). Demography was described using descriptive statistics including percentages, frequency ranges, means, and standard errors. The chi-square test was used to determine whether there was a statistical difference between categorical variables. When the chi-square test's assumptions were breached, Fisher's considered test was used. Statistical significance was defined as p-values less than 0.05.

3 | RESULTS

Table 1 summarizes the biographic and anthropometric characteristics of the study population. There were no substantial variations in age, BMI, smoking, marriage duration, or other variables between the groups. Intriguingly, the results showed a significant growth in the number of sexual intercourses/week in the study group after the first and second injection sessions when compared to controls ($p < 0.05$) (Table 2).

Furthermore, the study revealed significant improvement in all domains; desire, arousal, lubrication, orgasm, satisfaction domains, total score, and decreasing pain of the FSFI in the study group after first and second injection sessions compared with the controls (Table 3).

Furthermore, we found substantial growth in all domains of the FGSIS after the first and second injection sessions of (hybrid H-HA/L-HA) versus controls, including gratification with the appearance of their own genital area, feeling comfortable letting a sex partner take a gander at their genital area, trying to believe that their genitals smell perfectly alright while not being uncomfy about their genitals ($p < 0.05$) (Table 4).

In comparison to the controls, the manifestations and emotions, leisure, personal relationships, and total scores were significantly higher after the first and second injections of (hybrid H-HA/L-HA) sessions ($p < 0.05$; Table 5).

3.1 | Safety and tolerability

Neither the study nor the control groups experienced any undesirable outcomes or side effects during the experiment. Also, no toxicity has been reported from previous studies as it is not absorbed in the liver, kidney, heart, nerves, and other organs.[18–20]

4 | DISCUSSION

The goal of this study was to see how injections of (hybrid H-HA/L-HA) into the lower areas of dorsal and ventral vaginal walls, as well as the clitoris, affected sexual function and perception of sexual organs in patients with sexual issues. We discovered that a beneficial impact began with hybrid LMW-HA/HMW-HA's first treatment based on significant changes in survey results. We discovered an increase in patient satisfaction after the procedure. (H-HA/L-HA hybrid) was used in a variety of applications, including cosmetic and aesthetic procedures, as well as wound healing.[7,21] It is a popular minimal-invasive procedure with various applications.

The biostimulant and anti-inflammatory properties of HA stimulate many signaling pathways via interactions between the different biological membrane receptors.[19]

Among the most key growth factors (GF) released by stimulated keratinocytes, fibroblasts, and stem cell adibocytes, are transforming, vascular endothelial, epidermal, insulin-like, and fibroblast GFs found in the media injected with hybrid LMW-HA/HMW-HA.[7] GF-1 stimulates collagen manufacturing while suppressing collagen breakdown, as well as angiogenesis, connective tissue regeneration, and immune cell relocation.[22] VEGF promotes angiogenesis, which allows nutrients and improved circulation of blood to reach tissue.[22,23] In addition to VEGF, FGF is required to promote angiogenesis. In an earlier findings, PDGF, TGF, and EGF increase significantly VEGF release.[22,23] EGF and IGF-1 stimulate chemotaxis by endothelial cells, angiogenesis, and also mesenchymal cell cell division. Hybrid

TABLE 1 Distribution of female's demographic characteristics

		Study group frequency (*n*)	Control group frequency (*n*)	Significance test
Age		32.6 ± 6.6	29.3 ± 6.1	311.224
BMI	Underweight < 18.5	0	0	611.186
	Normal 18.5–24.9	26	25	
	Over weight 25–29.9	4	5	
	Obese 30–34.9	0	0	
	Extremely obese 35 <	0	0	
Smoking	Yes	2	0	362.122
	No	28	30	
Residence	Rural	0	0	523.135
	Urban	30	30	
Religion	Muslim	30	30	215.233
	Non-Muslim	0	0	
Sexual orientation	Heterosexual	27	28	238.456
	Lesbian	2	1	
	Bisexual	1	1	
	Other	0	0	
Living together(before and after hospitalization for study group)	Yes	30	30	159.753
	No	0	0	
Duration of marriage (years)	<15	16	20	456.222
	≥15	14	10	
Education	Middle School	6	9	321.211
	High School	7	9	
	Associate Degree	9	7	
	University	8	5	
Profession	Civil Servant	9	5	664.411
	Worker	10	13	
	Housewife	6	5	
	Other	5	7	
Chronic illness	No	30	30	232.312
	Other	0	0	
Obstetric history	Duration of marriage (years)	14.54 ± 6.21	12.23 ± 4.13	154.254
	Duration of complaint	5.32 ± 1.45	2.56 ± 2.48	254.368
	Number of vaginal deliveries	2.45 ± 1.14	2.11 ± 1.94	124.147
	Number of cesarean deliveries	1.25 ± 1.05	1.42 ± 1.41	125.364

Note: *n* = number.

*Statistically significant at $p < 0.05$.

LMW-HA/HMW-HA encourages epithelialization and minimizes the healing process significantly.[22,23]

By directly stimulating, LMW-HA spurs keratinocyte and fibroblast proliferation while rejuvenating and profoundly moisturizing the aged skin. D'Agostino et al. discussed the technology, rheological properties, and biological characteristics of the composites.[7] Because of its steadily increasing adherence to molecules of water and interaction with collagen as well as proteoglycans, HMW-HA has a

TABLE 2 Comparison of weekly sexual intercourse frequency between control and study groups

	Study group		Control group			
	Average ± SD	Median (min-max)	Average ± SD	Median (min-max)	Test statistics (ANOVA)	*p*
Before injection session	2.1 ± 1.3	2 (1–4)	2.1 ± 1.3	2 (1–3)	645.113	0.03*
After first injection session	3.1 ± 3.3	2.1 (1–5)	2.2 ± 1.2	2 (1–3)		
After second injection session	3.9 ± 2.8	2.3 (1–6)	2.3 ± 1.4	2 (1–4)		

Note: *p*: *p* value for comparing between the studied group.

Abbreviations: Max, maximum; Min, minimum; SD, standard deviation.

*Statistically significant at $p \leq 0.05$.

TABLE 3 Female sexual function index of the participants

	Study group			Control group			
	Before injection session Mean ± SD	After first injection session Mean ± SD	After second injection session Mean ± SD	Before injection session Mean ± SD	After first injection session Mean ± SD	After second injection session Mean ± SD	ANOVA test *p* value
Desire	2.12 ± 1.24	3.6 ± 1.52	4.7 ± 2.72	3.52 ± 1.56	3.43 ± 1.11	3.89 ± 1.85	0.012*
Arousal	3.11 ± 1.11	4.21 ± 1.13	5.11 ± 2.13	2.95 ± 1.31	2.11 ± 1.11	2.42 ± 2.11	0.041*
Lubrication	2.12 ± 1.23	4.52 ± 1.43	5.82 ± 1.17	2.54 ± 1.43	2.21 ± 2.11	2.35 ± 1.31	0.004*
Orgasm	1.25 ± 1.22	3.25 ± 2.43	5.75 ± 2.11	1.34 ± 1.64	2.11 ± 1.31	2.15 ± 2.31	0.001*
Satisfaction	2.42 ± 1.21	3.21 ± 1.41	5.11 ± 2.51	2.11 ± 1.25	3.01 ± 1.01	3.16 ± 1.23	0.011*
Pain	4.51 ± 1.15	4.89 ± 3.21	5.21 ± 1.21	4.34 ± 2.56	3.11 ± 1.01	4.37 ± 1.21	0.021*
Total	19.21 ± 6.72	30.98 ± 4.12	36.98 ± 5.23	21.96 ± 5.21	22.11 ± 4.33	24.11 ± 4.33	0.003*
p value	0.004*			0.07			0.026*

Note: *p*: *p* value for comparing between the studied group.

Abbreviations: ANOVA, analysis of variance; SD, standard deviation.

*Statistically significant at $p \leq 0.05$.

dermal scaffolding effect. (HMW-HA/LMW-HA hybrid) can stimulate cell growth in facial adipose tissue, which contains noncommittal staminal cells that differentiate into dermal fibroblasts.[24,25]

The injection of a high-osmolality complex (such as a hybrid LMW-HA/HMW-HA) into a lymphatic vessel-enriched area promotes absorption until an osmotic balance is attained. Water molecules are attracted through to the lymphatic semi-permeable barrier capillary endothelium, allowing them to dissipate throughout the interstitium and achieve overall rebalancing, actually results in optimal dermal cell growth (Hybrid LMW-HA/HMW-HA).[26] In close collaboration to growth factors, (hybrid H-HA/L-HA) plays a key role in bolstering collagen synthesis and angiogenesis, which improves sensory experience, perception, and sexual orientation. This technique agrees with other minimal-invasive procedures such as PRP in solving many problems by enhancing and remodeling collagen formation, such as stress urinary incontinence, vaginal lichen sclerosis, perineal scars, and lubrication problems.[27–29]

To the best of our knowledge, no research has been published on the use of (hybrid H-HA/L-HA) in the genital area.

A new era of minimal-invasive and low-risk intervention techniques has emerged to increase sexual function by increasing females' sexual sensitivity. So the rising stars are laser, filler injections, and PRP.[30–32]

At the end of the study, we found a significant difference throughout all disciplines of FSFI upon two (hybrid H-HA/L-HA) sessions separated by 1 month. After the first administration, the FSFI facets began to improve. As the number of rounds repeated increased, so did the acceleration of the positive effect. As a result, the total number of (hybrid H-HA/L-HA) sessions which must be reiterated can be determined based on the participant's requirements and the condition's sophistication. These findings support previous findings.[33,34] Enhancing and remodeling of collagen, elastin, and connective tissue boosted sexuality and FSFI score,[29] this agreed with our results.

Our findings revealed a link between improvements in (hybrid H-HA/L-HA) administration and higher satisfaction levels. Also, there was a link between improved (hybrid H-HA/L-HA) administering and age, duration of marriage, and number of vaginal or cesarean delivery times. There were no reports of negative effects in vaginal applications to date. There were no negative impacts from the management in our study.

Change incident patterns differed statistically significantly across all FSFI disciplines and total scores. Furthermore, across the entire study

TABLE 4 Female genital self-image scale of the participants

	Study group			Control group			
	Before injection session Mean ± SD	After first injection session Mean ± SD	After second injection session Mean ± SD	Before injection session Mean ± SD	After first injection session Mean ± SD	After second injection session Mean ± SD	ANOVA test *p* value
I am satisfied with the appearance of my genitals	2.1 ± 0.23	3.0 ± 0.10	4.0 ± 0.70	2.3 ± 0.12	2.1 ± 0.13	2.9 ± 0.29	0.022*
I would feel comfortable letting a sexual partner look at my genitals	2.5 ± 0.41	2.5 ± 0.50	3.5 ± 0.50	3.1 ± 0.40	3.1 ± 0.31	3.4 ± 0.51	0.031*
I think my genitals smell fine	2.4 ± 0.42	2.5 ± 0.55	3.5 ± 0.60	2.6 ± 0.51	2.35 ± 0.11	2.3 ± 0.52	0.003*
I am not embarrassed about my genitals	2.5 ± 0.50	3.0 ± 0.23	4.0 ± 0.10	2.4 ± 0.71	2.4 ± 0.22	2.6 ± 0.62	0.001*
Total	5.9 ± 0.3	10.1 ± 1.7	13.1 ± 2.7	7.1 ± 0.5	7.1 ± 1.5	6.9 ± 1.5	0.004*
p value	0.003*			0.08			0.026*

Note: *p*: *p* value for comparing between the studied group.
Abbreviations: ANOVA, analysis of variance; SD, standard deviation.
*Statistically significant at $p \leq 0.05$.

population, facets of FSFI were significantly associated with (hybrid H-HA/L-HA) injection. Even if they had a long period of complaint, a high number of vaginal births, or cesarean deliveries, PRP administration correlated positively with all domains of FSFI and total scores.

This study discovered that after (hybrid H-HA/L-HA) sessions, genital self-image improved significantly ($p < 0.05$). Similarly, our study findings indicate that genital improvements caused by increased collagen formation have an impact on female genital self-image. This was the first report to highlight the correlation between collagen formation and female genital self-image.

Sexuality was considerably enhanced in the (hybrid H-HA/L-HA) injection group ($p < 0.05$). After treatment, the FSFI scores in the (hybrid H-HA/L-HA) study groups improved significantly ($p < 0.05$). This was justified by improving nerve ending sensation, hydration, lubrication, and decreasing dryness. Pain decreased after treatment with (hybrid H-HA/L-HA) due to enhanced hydration, lubrication, and decreased dryness. Other studies found that aesthetic or genital diseases had a negative impact on a woman's psychosexual life. As a result, there was vaginal drying throughout sexual activity, decreased sexual willingness, decreased pleasure, little or no erotic, inability to achieve an orgasm, and dyspareunia.[35,36] Maaty and collaborators talked about the same thing in the context of psoriasis, a chronic dermatological disease that causes skin disfigurement.[37]

According to many researchers, a positive genital self-image directly relates to sexuality. Our findings suggested that females' sexual desire and health were influenced by their perception of genital appearance. This was also justified by improving hydration, lubrication, decreasing dryness, and enhancing skin firmness. According to study findings, patients who underwent cosmetic procedures, as well as vulvoplasty, had drastically enhanced sexual performance. In our study, positive genital self-image was associated with sexuality, desire, and quality of life. This agrees with Andersen,[38] who defined women with strong sexual self-schemas as "individuals who are emotionally warm and enthusiastic, affectively accessible to romantic and sexual relationships, liberal in their own attitudes to sex, and commonly free of consciousness, humiliation, or sexual anxiety."

Andersen investigated the effects of previous sexual frequency, disease severity, and menopausal status on gynecological cancer patients' sexual attentiveness to the effects of sexual identity. Females with negative sexual identity were discovered to become the only important predictors of sexual attentiveness; those with negative sexual identity had higher sexual comorbidities after cancer. Andersen hypothesizes that in the existence of a sexually stressful situation, such as cancer, a sexually abusive self-schema leads to sexual problems, whereas positive self-schemas protect against disorder.

Sensations and feelings, leisure, personal relationships leisure, and sexual activity were significantly related to positive genital self-image and sexual activity in lighter genital areas, and our findings agreed with those of Berman and collaborators.[39] Patients with reduced genital self-image experienced lower sexual pleasure and more sexual disorders.[40–44]

Patients with mature genital skin and mucosae are exceptionally emotionally sensitive and abstained from sex at all costs. They continually had a difficult time finding suitable recreational activities.

TABLE 5 Dermatology life quality index characteristics of the studied population between groups

	Study group			Control group				
	Before injection session Average ± SD	After first injection session Average ± SD	After second injection session Average ± SD	Before injection session Average ± SD	After first injection session Average ± SD	After second injection session Average ± SD	Test statistics (ANOVA)	*p*
Symptoms and feelings	1.58 ± 0.817	1.02 ± 0.31	0.17 ± 0.32	1.13 ± 2.12	1.22 ± 1.01	1.41 ± 1.21	1.333	0.031*
Daily activities	0.03 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.121	0.560
Leisure	0.20 ± 1.125	1.12 ± 1.20	2.77 ± 0.20	0.33 ± 1.21	0.11 ± 1.22	0.13 ± 1.32	3.165	0.023*
Work and school	0.94 ± 0.08	0.42 ± 1.20	0.12 ± 0.10	1.22 ± 0.21	1.03 ± 0.21	1.23 ± 0.12	1.113	0.561
Personal relationships	3.46 ± 0.614	2.01 ± 0.10	0.04 ± 0.20	2.21 ± 0.11	2.12 ± 1.21	2.25 ± 1.31	2.121	0.030*
Treatment	3.04 ± 0.435	2.04 ± 0.20	1.05 ± 0.40	3.44 ± 1.13	3.25 ± 1.13	3.16 ± 1.42	3.127	0.632
Total	11.00 ± 1.13	13.11 ± 1.30	15.23 ± 1.30	13.42 ± 2.01	13.58 ± 1.22	13.98 ± 2.61	1.215	0.324
Test statistics	1.288			3.635			3.389	
p	0.031*			0.824			0.039*	

Note: *p*: *p* value for comparing between the studied group.

Abbreviations: ANOVA, analysis of variance; SD, standard deviation.

*Statistically significant at $p \leq 0.05$.

In this study, the DLQI was utilized to assess the nature and extent of the problem's socio-psychological difficulties. According to the findings, patients with low DLQI scores have a negative genital self-image and significantly less sexual performance. These findings agreed with those of other studies.[45–47] It was the first research to examine the impact of genital rejuvenation with (hybrid H-HA/L-HA) on genital self-image and sexual response compared to other rejuvenation modalities. To fit all cases and avert sex differences, we planned to pursue only one gender. As a consequence, the extent of this investigative process was severely limited. Furthermore, only females were studied because sexual issues in women were not widely recognized in our country.

4.1 | Strengths and limitations

Using valid and reliable scales like FGSIS, FSFI, and DLQI for assessing the participants is one of the study's strengths. All self-reported research methods and research information shared some common study limitations, such as broader societal preference and backdated recollection prejudices. Furthermore, the sample's attributes restricted the generalizability of the results.

5 | CONCLUSION

The (hybrid H-HA/L-HA) therapeutic modality for genital revitalization appears to be a simple, and efficient way to revitalize the genital area. The benefits of (hybrid H-HA/L-HA) explained by their pro-collagenogenic and pro-adipogenic properties. (hybrid H-HA/L-HA) injection improves female genital self-image, sexuality, and quality of life while being minimally invasive.

AUTHOR CONTRIBUTIONS

Ghada F. Mohammed: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review & editing. **Mohammed Saleh Al-Dhubaibi**: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review & editing.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Institutional review board and Research Ethical Committee in accordance with the Helsinki Declaration guidelines.

TRANSPARENCY STATEMENT

The lead author Ghada F. Mohammed affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted;

and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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