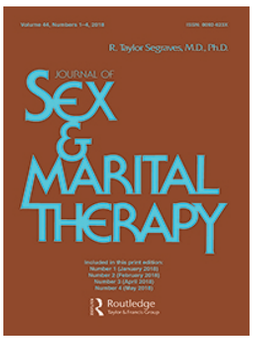

Journal of Sex & Marital Therapy

ISSN: 0092-623X (Print) 1521-0715

Effect of Pulsed Magnetic Stimulation on Sexual Function in Couples With Female Stress Urinary Incontinence Partners

Renly Lim, Men Long Liong, Yong Khee Lau, Wing Seng Leong, Nurzalina Abdul Karim Khan & Kah Hay Yuen

To cite this article: Renly Lim, Men Long Liong, Yong Khee Lau, Wing Seng Leong, Nurzalina Abdul Karim Khan & Kah Hay Yuen (2018) Effect of Pulsed Magnetic Stimulation on Sexual Function in Couples With Female Stress Urinary Incontinence Partners, Journal of Sex & Marital Therapy, 44:3, 260-268, DOI: 10.1080/0092623X.2017.1348417

JOURNAL OF SEX & MARITAL THERAPY
2018, VOL. 44, NO. 3, 260–268
https://doi.org/10.1080/0092623X.2017.1348417

Routledge
Taylor & Francis Group

Effect of Pulsed Magnetic Stimulation on Sexual Function in Couples With Female Stress Urinary Incontinence Partners

Renly Lim[a,b], Men Long Liong[c], Yong Khee Lau[a], Wing Seng Leong[d], Nurzalina Abdul Karim Khan[a], and Kah Hay Yuen[a]

[a]School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia; [b]School of Pharmacy and Medical Sciences, University of South Australia, Adelaide, Australia; [c]Department of Urology, Island Hospital, Penang, Malaysia; [d]Department of Urology, Lam Wah Ee Hospital, Penang, Malaysia

ABSTRACT

We prospectively evaluated the effects of pulsed magnetic stimulation (PMS) on sexual function of couples with stress urinary incontinence (SUI) partners. Female SUI subjects received 16 or 32 biweekly PMS sessions, depending on treatment response. Prior to, immediately after, and at 6-months posttreatment, couples completed the Golombok Rust Inventory of Sexual Satisfaction (GRISS) questionnaire. Fifty-three (80.3%) of 66 couples completed reassessments. Based on the overall GRISS score, there were significant improvements in sexual function in both female subjects (M_{diff} −5.05, *SE* 1.34, $p = 0.001$) and their partners (M_{diff} −3.42, *SE* 1.24, $p = 0.026$). Our findings suggest that PMS improved sexual function of SUI patients and their partners.

Introduction

Urinary incontinence affects approximately 25% to 45% of women, with stress urinary incontinence (SUI) accounting for approximately 50% of all incontinence (Abrams, Cardozo, Wein, & Wagg, 2017). SUI is a condition in which there is an involuntary loss of urine on effort, physical exertion, sneezing, or coughing (Abrams et al., 2017). It is a chronic and debilitating condition that impacts the physical, psychological, social, and economic well-being of affected individuals and their families, and results in diverse detrimental effects on quality of life and sexual function (Abrams et al., 2017; Fatton, de Tayrac, & Costa, 2014; Horng et al., 2013).

Pulsed magnetic stimulation (PMS) has been used as a nonsurgical option for SUI since 1998 due to its established safety, automatic contractions, comfort (no probe insertion into the vagina), and ease of administration (machine-operated) (Galloway et al., 2000). An embedded magnetic coil generates pulsed electromagnetic fields that are able to penetrate deep into the pelvic-floor muscles, leading to pelvic-floor nerve stimulation and contraction. The proposed mechanism of action of PMS for SUI is similar to that of pelvic-floor muscle training, which is to increase the pelvic-floor muscle strength and endurance through repetitive contractions (Galloway et al., 2000). However, unlike PMS, treatment with the pelvic-floor muscle training is often hampered by the lack of standardized regimen and poor patient compliance due to difficulty in contracting the correct muscles (Dumoulin, Glazener, & Jenkinson, 2011; Paddison, 2002). A randomized, double-blind, sham-controlled trial was recently conducted by our study team to investigate its effect on female SUI (Lim, Liong, Leong, Khan, & Yuen, 2015, 2017). At the 14-month follow-up, the results showed that 70% of patients who received active PMS were treatment responders, defined as those who experienced a 5-point decrease in the International Consultation on Incontinence-Urinary Incontinence Short Form (ICIQ-UI SF) score (range 0 to 21) (Sirls et al., 2015). While there

CONTACT Renly Lim renly_lim@hotmail.com School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11700 Penang, Malaysia.

is no standardized method to define treatment response, the 70% response rate was more encouraging than response rates reported using other nonsurgical SUI treatments, including the pelvic-floor muscle training, biofeedback, vaginal cones, and electrical stimulation (Lim, Liong, Leong, et al., 2017).

The International Consultation on Incontinence (ICI) recommended that research in female SUI should assess treatment impact on sexual function (Brubaker, 2013). Various surgical and nonsurgical treatment modalities for SUI have been reported to affect patients' sexual function either positively or negatively (Fatton et al., 2014; Jha, Ammenbal, & Metwally, 2012; Zahariou, Karamouti, & Papaioannou, 2008). A recent systematic review ($n = 1{,}578$) involving 18 studies on female sexual function after SUI surgery (tension-free vaginal tape, transobturator tape, colposuspension, or autologous fascial sling) reported that sexual function was unchanged in 55.5% of patients, improved in 31.9%, and deteriorated in 13.1% (Jha et al., 2012). The only systematic review ($n = 1{,}341$) that evaluated the effect of pelvic-floor muscle training on sexual function in females with SUI, postpartum incontinence, or pelvic organ prolapse found that most studies indicated an improvement in sexual function after treatment (Ferreira et al., 2015).

Furthermore, a growing body of evidence has highlighted the interdependence of sexual function between a heterosexual couple (Jiann, Su, & Tsai, 2013; Witting et al., 2008). It follows that research investigating effects of SUI treatments should take into account both partners' sexual function. However, little is known on how the partners' sexual function is affected following treatments in SUI patients. A previous small study ($n = 39$) that investigated the effect of PMS on female SUI subjects reported significant improvement in sexual function following improvement in SUI symptoms (Chung & Jung, 2003). However, its effect on sexuality of both women and their partners has not been investigated. Thus, the aim of the present study is to determine the efficacy of PMS in improving sexual function of couples with female SUI partners. We hypothesized that treatment with PMS would improve sexual function of both partners via improvements in pelvic-floor muscle function and reduction of SUI symptoms in female patients.

Method

Study design

The study, which took place between September 2013 and October 2015, was undertaken in participating hospitals in Penang, Malaysia. The study was approved by the Joint Ethics Committee of the School of Pharmaceutical Sciences, Universiti Sains Malaysia, USM-HLWE on Clinical Studies [USM-HLWE/IEC/2013(0006)]. All subjects provided written informed consent.

Sexually active females (aged at least 21 years old) diagnosed with SUI were recruited from the outpatient urology and gynecology clinics of participating hospitals. Initial assessments of SUI status included detailed history, urine analysis, uroflowmetry with post-void residual volume, and pelvic ultrasound. Diagnosis of SUI was made by the consultant urologists based on demonstration of urine leak on coughing at a bladder volume of approximately 200 to 250 ml. Potential subjects were excluded if they had (a) acute, severe infections (e.g., pneumonia); (b) severe cardiac arrhythmia; (c) a cardiac pacemaker; (d) neurologic conditions (e.g., stroke, Parkinson's disease, multiple sclerosis); (e) previous treatment with PMS; (f) had recently undergone pelvic-floor surgery; or (g) were pregnant (or within the first two months postpartum). Their partners were also invited to participate.

Subjects and their partners were given an information sheet by the study investigators detailing the purpose and details of the study. After providing written consent, the participants then filled in a series of self-administered questionnaires. One of the study investigators (R.L.) was available on-site if subjects had difficulty understanding certain words or phrases. Each couple was assigned a unique identification code.

Study treatments

The study used rTPMS Technology (CV Puls Magnetic stimulation device) to stimulate automatic pelvic-floor muscle contractions. SUI subjects received 16 or 32 rTPMS sessions (twice a week), depending on treatment

response. Treatment responders were defined as those experiencing a 5-point reduction in the ICIQ-UI-SF score (range 0 to 21) (Nystrom, Sjostrom, Stenlund, & Samuelsson, 2015; Sirls et al., 2015). Subjects who were nonresponders or not satisfied with treatment response after 8 weeks could opt for additional 16 PMS sessions (total 32 sessions).

Baseline assessments

Demographic characteristics such as age, ethnicity, education, income level, comorbidities (e.g., asthma, chronic obstructive pulmonary disease, diabetes, hypercholesterolemia, hypertension, ischemic heart disease), smoking status, alcohol consumption, exercise, circumcision (male), and obstetric and gynecological history (female) were obtained. Other assessments for female patients included examination for prolapse, urine analysis, urine pregnancy test, ultrasound, and uroflowmetry with post-void residual volume.

Main outcome measures

The two key outcome measures measured pretreatment, posttreatment, and at 6-months posttreatment to assess sexual function were: (a) the Golombok Rust Inventory of Sexual Satisfaction (GRISS) questionnaire and (b) a single-item question on subjects' overall sexual experience: "Over the past 4 weeks, how satisfied have you been with your overall sexual life?" GRISS, a 28-item multidimensional measure designed to assess sexual satisfaction of male and female partners individually and of the couple as a whole, has been validated extensively (Meston & Derogatis, 2002; Rust & Golombok, 1986; ter Kuile, van Lankveld, Kalkhoven, & van Egmond, 1999). Twelve subscales were given: erectile dysfunction (male), premature ejaculation (male), vaginismus (female), anorgasmia (female), nonsensuality (male and female), avoidance (male and female), dissatisfaction (male and female), sexual infrequency, and sexual noncommunication (Rust & Golombok, 1986). Each item score ranges from 0 to 4. In accordance with the final subscale structure of the GRISS, only 48 items of the total of 56 items were used to calculate the overall score (range 0 to 96). Both the GRISS and ICIQ-UI SF questionnaires have been translated and validated in the Malaysian population (Lim, Liong, Khan, & Yuen, 2017; Lim, Liong, Lau, & Yuen, 2017).

Changes in pelvic-floor muscle function were measured using the Peritron perineometer (LABORIE International, Mississauga, ON, Canada; Frawley, Galea, Phillips, Sherburn, & Bo, 2006). The Peritron is a pressure-sensitive dynamometer used for objective assessment of the strength of pelvic-floor muscle contractions. For each subject, a sterile latex sleeve was fitted around the silicone rubber sheath and inserted into the vagina. After restoring to point 0, the subjects were asked to perform a maximal pelvic-floor contraction. After each contraction, the calibrated 0 point was restored. The maximum, average, and duration of contraction for three consecutive contractions were measured and recorded.

Statistical analysis

Results were presented as means $\pm$ *SD* (or median and interquartile range if the distribution was not normal) for continuous variables, and frequencies (%) for categorical variables. We assessed normality of continuous variables using histogram, normal probability curves, skewness, and kurtosis. One-way repeated measures ANOVA was used to compare continuous data, while Friedman test was used to compare ordinal data. Subgroup analyses were performed with subjects stratified according to response to PMS treatment at 6-months posttreatment (responder or nonresponder) and treatment duration (16 or 32 PMS sessions). Data entry was performed using Excel 2007 (Microsoft, Redmond, WA, USA). The IBM SPSS Statistics for Windows, version 22.0, (Armonk, NY, USA) was used to analyze the collected data; $p < 0.05$ was considered statistically significant.

Results

A total of 66 couples participated in the study. All couples were married. At six months posttreatment, 53 couples (80.3%) returned and completed the reassessments and were included in the analysis. Of the

Table 1. Demographic characteristics of female patients and their partners.

Characteristics	Female	Male
Mean (*SD*) Length of relationship	23.75 (10.92)	
Mean (*SD*) Age	49.49 (7.82)	54.15 (9.88)
Mean (*SD*) BMI	24.93 (4.01)	24.69 (3.94)
No. comorbidities[a], frequency (%)		
1 or more	12 (22.6)	23 (43.4)
None	41 (77.4)	30 (56.6)
Prolapse, frequency (%)		
Stage 0	6 (10.0)	*na*
Stage 1	34 (56.7)	
Stage 2	20 (33.3)	
No. menopausal status, frequency (%)		
Pre	30 (56.6)	*na*
Post	23 (43.4)	
No. parity, frequency (%)		
0	2 (3.8)	*na*
1 to 3	43 (81.1)	
≥ 4	8 (15.1)	
No. hysterectomy, frequency (%)		
Yes	5 (9.4)	*na*
No	48 (90.6)	
No. circumcision, frequency (%)		
Yes	*na*	1 (1.9)
No		52 (98.1)

Notes. BMI = body mass index; *na* = not applicable; *SD* = standard deviation.
[a]Comorbidities include asthma, chronic obstructive pulmonary disease, diabetes, hypercholesterolemia, hypertension, and ischemic heart disease.

13 couples who did not return for follow-ups, 10 couples did not wish to continue, while three couples could not be contacted. Table 1 summarizes the couples' demographic characteristics.

Effect of pulsed magnetic stimulation on female sexual function

Immediately after treatment and at 6-months posttreatment, there were significant improvements in SUI symptoms (as measured using the ICIQ-UI SF score) and all pelvic-floor muscle function parameters ($p < 0.001$) (Table 2). There was a significant improvement in the overall GRISS score posttreatment (M_{diff} −5.34, *SE* 1.34, $p = 0.001$) and at six months posttreatment (M_{diff} −5.05, *SE* 1.34, $p = 0.001$) compared with baseline ($p < 0.001$) (Table 2). The subscales of infrequency, dissatisfaction, nonsensuality, and vaginismus were significantly improved compared with baseline, with the "dissatisfaction" subscale showing the highest improvement at 6-months posttreatment (M_{diff} −1.48, *SE* 0.38, $p < 0.001$). Using the single-item question on overall sexual experience, there was a significant increase in the number of subjects who felt "moderately satisfied" or "very satisfied" with their sexual life immediately after treatment and at six months posttreatment ($p < 0.001$).

Effect of pulsed magnetic stimulation in female SUI on partners' sexual function

Similarly, there was a significant improvement in the overall GRISS score of their male counterparts posttreatment (M_{diff} of −3.20, *SE* 1.24, $p = 0.042$) and at 6-months posttreatment (M_{diff} of −3.42, *SE* 1.24, $p = 0.026$) compared with baseline ($p = 0.027$) (Table 3). The subscales of erectile dysfunction, premature ejaculation, dissatisfaction, and infrequency were significantly improved compared with baseline. Using the single-item question on overall sexual experience, there was a significant increase in the number of partners who felt "moderately satisfied" or "very satisfied" with their sexual life both immediately after their partners' treatment and at 6-months posttreatment ($p = 0.021$).

Subgroup analysis

Subgroup analysis at 6-months posttreatment showed that couples whose female partners were treatment responders (5-point reduction in the ICIQ-UI SF score) to the PMS treatment had significant reduction

Table 2. Mean GRISS subscale and overall scores of female subjects pre-, post-, and 6 months post-rTPMS treatment.

Female patients		Pretreatment, mean (*SD*)	Posttreatment, mean (*SD*)	6 months posttreatment, mean (*SD*)	*p* value
Total ICIQ-UI SF score ($n = 53$)		9.68 (3.08)	2.94 (3.13)	3.13 (2.73)	< 0.001
Pelvic-floor muscle function ($n = 53$)					
Maximum contraction (cmH_20)		25.58 (13.88)	33.30 (12.34)	33.57 (12.44)	< 0.001
Average contraction (cmH_20)		18.12 (10.28)	25.25 (10.19)	25.01 (9.92)	< 0.001
Duration of contraction (seconds)		6.23 (2.29)	8.04 (1.39)	8.27 (1.58)	< 0.001
GRISS subscales	Infrequency ($n = 52$)	5.19 (1.59)	4.79 (1.63)	4.73 (1.55)	0.010
	Noncommunication ($n = 53$)	3.57 (2.12)	3.57 (1.45)	3.55 (1.37)	0.845
	Dissatisfaction ($n = 46$)	5.52 (2.76)	3.93 (2.37)	4.04 (2.35)	0.001
	Avoidance ($n = 53$)	3.96 (2.68)	3.34 (1.69)	3.42 (1.72)	0.137
	Nonsensuality ($n = 50$)	5.08 (2.62)	4.18 (2.13)	4.32 (2.04)	0.018
	Vaginismus ($n = 51$)	4.96 (2.70)	3.35 (2.12)	3.41 (2.18)	0.001
	Anorgasmia ($n = 51$)	8.04 (2.62)	7.71 (1.74)	7.75 (1.79)	0.538
GRISS total score ($n = 45$)		37.39 (10.05)	32.05 (9.63)	32.34 (9.79)	< 0.001
Overall sexual experience, frequency (%) ($n = 53$)					
Very satisfied		4 (7.5)	11 (20.8)	8 (15.1)	< 0.001
Moderately satisfied		25 (47.2)	31 (58.5)	34 (64.2)	
About equally satisfied and dissatisfied		22 (41.5)	11 (20.8)	11 (20.8)	
Moderately dissatisfied		2 (3.8)	0 (0)	0 (0)	
Very dissatisfied		0 (0)	0 (0)	0 (0)	

Note. GRISS = Golombok Rust Inventory of Sexual Satisfaction; ICIQ-UI SF = International Consultation on Incontinence-Urinary Incontinence Short Form;rTPMS = pulsed magnetic stimulation; *SD* = standard deviation. Higher scores in the GRISS subscales and total score indicate greater problems. One-way repeated measures ANOVA was used for continuous data. Friedman test was used for ordinal data.

in their overall GRISS scores (Table 4). This difference was not significant when comparing responders with nonresponders for females (M_{diff} 4.54, *SE* 2.95, $p = 0.123$), but it was significant for males (M_{diff} 7.41 *SE* 2.47, $p = 0.002$). Thirty-two sessions of PMS achieved twice the mean reduction (M_{diff} −8.64, *SE* 2.09, $p = 0.015$) compared with only 16 sessions (M_{diff} −4.03, *SE* 1.57, $p = 0.002$) for females; however, this difference was not significant (M_{diff} 4.61, *SE* 2.94, $p = 0.117$). There was no significant difference between males whose partners had 16 or 32 sessions (M_{diff} 1.67, *SE* 2.57, $p = 0.517$).

Table 3. Mean GRISS subscale and overall scores in partners of female subjects pre-, post-, and 6 months post-rTPMS treatment.

Male partners		Pretreatment, mean (*SD*) or median (IQR)	Posttreatment, mean (*SD*) or median (IQR)	6 months posttreatment, mean (*SD*) or median (IQR)	*p* value
GRISS subscales	Erectile dysfunction ($n = 50$)	5.02 (2.33)	3.92 (1.99)	4.04 (2.06)	< 0.001
	Premature ejaculation ($n = 51$)	5.78 (2.63)	4.39 (2.10)	4.29 (2.17)	< 0.001
	Nonsensuality ($n = 50$)	4.30 (2.74)	4.04 (2.38)	4.02 (2.41)	0.689
	Avoidance ($n = 50$)	1.00 (0–2.00)	1 (0–3.00)	1.00 (0–3.00)	0.591
	Dissatisfaction ($n = 49$)	5.78 (3.39)	4.82 (2.60)	4.76 (2.57)	0.034
	Infrequency ($n = 53$)	6.00 (4.00–7.00)	5.00 (4.00–6.00)	5.00 (4.00–6.00)	< 0.001
	Noncommunication ($n = 53$)	3.53 (2.03)	3.53 (1.10)	3.60 (1.04)	0.350
GRISS total score ($n = 41$)		28.15 (9.77)	24.95 (9.82)	24.73 (10.48)	0.027
Overall sexual experience, frequency (%) ($n = 53$)					
Very satisfied		7 (13.2)	10 (18.9)	6 (11.3)	0.021
Moderately satisfied		26 (49.1)	26 (49.1)	31 (58.5)	
About equally satisfied and dissatisfied		11 (20.8)	15 (28.3)	13 (24.5)	
Moderately dissatisfied		8 (15.1)	1 (1.9)	2 (3.8)	
Very dissatisfied		1 (1.9)	1 (1.9)	1 (1.9)	

Notes. GRISS = Golombok Rust Inventory of Sexual Satisfaction; IQR = interquartile range;rTPMS =repetitiv transpelvic pulsed magnetic stimulation; *SD* =standard deviation.

Higher scores in the GRISS subscales and total score indicate greater problems. One-way repeated measures ANOVA was used for continuous data. Friedman test was used for ordinal data.

Table 4. Mean score reduction in overall female GRISS score at 6 months post-rTPMS treatment based on responder analysis and treatment duration.

Gender	Analysis	Mean difference (*SE*) within group	*p* value	Mean difference (*SE*) between groups	*p* value
Female	Responder analysis				
	Responder ($n = 34$)	− 6.27 (1.34)	< 0.001	4.54 (2.95)	0.123
	Nonresponder ($n = 11$)	− 1.73 (3.33)	0.615		
	Treatment duration				
	16 sessions ($n = 34$)	− 4.03 (1.57)	0.015	4.61 (2.94)	0.117
	32 sessions ($n = 11$)	− 8.64 (2.09)	0.002		
Male	Responder analysis				
	Responder ($n = 31$)	− 5.32 (1.02)	< 0.001	7.41 (2.47)	0.002
	Nonresponder ($n = 11$)	2.09 (3.17)	0.525		
	Treatment duration of female partners				
	16 sessions ($n = 29$)	− 3.90 (1.32)	0.006	1.67 (2.57)	0.517
	32 sessions ($n = 13$)	− 2.23 (2.64)	0.414		

Note. GRISS = Golombok Rust Inventory of Sexual Satisfaction;rTPMS =repetitiv Transpelvic pulsed magnetic stimulation; *SE* = standard error.

Discussion

Our results showed that treatment of female SUI with PMS resulted in significant improvements in multiple sexual dimensions in both partners. Female subjects demonstrated improvements in overall sexual function, infrequency, dissatisfaction, nonsensuality, and vaginismus as measured using GRISS, and improvements in the overall sexual experience as measured using the single-item question. Their partners had improved overall sexual function, less erectile function, less premature ejaculation, higher sexual satisfaction, and greater frequency of sexual intercourse as measured using GRISS, and improvements in the overall sexual experience as measured using the single-item question.

We postulate that both physiological and psychological factors contributed to the improvement in sexual function in the female patients. The weakened pelvic-floor muscles and their fear of coital incontinence may lead to low self-esteem, anxiety, and frustration (Fatton et al., 2014). Thus, it is postulated that interventions to strengthen the pelvic-floor muscles and reduce SUI symptoms would improve sexual function (Bekker et al., 2009; Kegel, 1952). Our study demonstrated that PMS resulted in significant improvements in pelvic-floor muscle function (maximum, average, and duration of contraction) and reduction in SUI symptoms led to subsequent improvements in sexual function. This is unsurprising since previous studies have shown that women with stronger pelvic-floor muscle function have better sexual function (Lowenstein & Bitzer, 2010; Martinez, Ferreira, Castro, & Gomide, 2014). It is also possible that improvement in sexual function could be directly attributed to PMS treatment not related to improvements in SUI symptoms. Interestingly, female SUI patients also experienced less pain during vaginal penetration. We hypothesize that decreased fear of incontinence may improve arousal, lubrication, and reduce pelvic-floor spasm, resulting in reduced pain.

It is possible that distress due to SUI similarly influenced partner's sexual function negatively. A few studies have shown that sexual problems in female patients preceded the onset of erectile dysfunction and premature ejaculation in their partners (Oberg & Sjogren Fugl-Meyer, 2005; Speckens, Hengeveld, Lycklama a Nijeholt, van Hemert, & Hawton, 1995). Thus, it is likely that improvement in SUI symptoms and sexual function in female patients led to improvement in various domains of male sexual function including erectile dysfunction and premature ejaculation. However, the mean changes in the overall GRISS scores were lower in the male subjects compared to their partners. Successful improvement of SUI symptoms led to both physiological and psychological improvements that positively impact patients' experiences during sexual intercourse. We believe that only the physiological aspect positively affected their partners' sexual function who were not themselves directly treated, which explains less improvement in their sexual function.

There are two clinical implications that can be drawn from our study. Firstly, research investigating effects of SUI treatments should also include sexual function assessments since the treatment modalities may impact sexual function either positively or negatively. Secondly, clinicians (urologists and

gynecologists) and incontinence nurses should be proactive in encouraging patients to be more expressive about the existence of sexual problems and be alert about the possibility of sexual problems in partners of SUI patients. However, asking patients to express any sexual problems may be challenging as Asians (especially in Malaysia, with conservative Muslims forming the majority population) are generally more reserved regarding sexual issues and may be reticent to divulge the intricacies of their sexuality openly (Ahmed & Bhugra, 2007; Tan, Marumo, Yang, Hwang, & Ong, 2009).

Our study had some important strengths. To our knowledge, this is the first reported study examining the effects of PMS treatment on sexual function of heterosexual couples with female SUI partners. The only published report that investigated the effect of rTPMS on female SUI subjects was an open-label, single-arm study ($n = 39$) conducted in Korea that did not take into account the male partners' sexual function (Chung & Jung, 2003). The nonexistence of comparable studies on couples' sexual function post-SUI treatment indicates that this research area requires additional attention. We used the GRISS, which is amongst the few questionnaires designed to assess sexual function of couples. In fact, GRISS is highly recommended by the Fifth International Consultation of Incontinence alongside two gender-specific questionnaires (International Index of Erectile Function and Female Sexual Function Index) (Staskin et al., 2013). Unlike the gender-specific questionnaires, GRISS comprises comparable subscales for both partners and comprehensively assesses the multiple domains of sexual function. Additionally, our research team has translated and validated the GRISS in three main languages (English, Chinese, Malay) in the Malaysian population (Lim, Liong, Khan, et al., 2017). We further included a single-item question on overall sexual experience to simplify the complex interpretation of the multidimensional sexual function. Throughout the study period, no respondent who answered the questionnaires on-site requested any clarification or assistance from the study investigators. This shows that the questionnaires chosen were easy to understand and administer.

Our study also had some limitations. Firstly, our study lacked a control group and had a small sample size. A control group would be necessary due to possible confounders such as communication about sexual function among partners, clinical care by the clinicians and nurses, and tendency to provide socially desirable answers. A randomized controlled trial with an inclusion of a control group and larger sample size will help confirm our findings. Nevertheless, our promising preliminary results provide important data on the effects of SUI intervention on sexual function of both partners. Subjects who refused participation may have underlying sexual problems that they were not willing to disclose. Our study lacked an instrument to assess whether SUI patients were leaking urine during sexual intercourse. In addition, we do not have data on the number of couples who were sexually inactive due to coital incontinence. Generalizability of our results should be considered with caution since our recruitment took place in a hospital setting and thus may not be representative of the general community. Ideally, the GRISS questionnaire should be administered with the International Index of Erectile Function (Rosen et al., 1997) for males and Female Sexual Function Index (Wiegel, Meston, & Rosen, 2005) for females to allow comparison of results with these two standardized questionnaires. We attempted to administer both GRISS and the gender-specific questionnaires, but patients were not keen to participate. As we felt that this put off couples' willingness to participate in the study especially in this conservative country, we decided to only administer the GRISS questionnaire.

Conclusion

Our preliminary findings suggest that effective treatment of the female's SUI symptoms using PMS resulted in simultaneous improvement in the sexual function of both partners. These data show the interdependence of sexual function between a heterosexual couple and underline the importance of including partners in sexual function assessments post-SUI treatment. Future studies should compare the effects of PMS in a randomized controlled trial using a control group.

Funding

The study was partially funded by PROF DR FISCHER AG - Lichtenstein.

References

Abrams, P., Cardozo, L., Wein, A., & Wagg, A. (2017). *Incontinence: 6th International Consultation on Incontinence, Tokyo, September 2016* (6th ed.).

Ahmed, K., & Bhugra, D. (2007). The role of culture in sexual dysfunction. *Psychiatry*, *6*(3), 115–120. doi:10.1016/j.mppsy.2006.12.005

Bekker, M., Beck, J., Putter, H., Venema, P., Lycklama a Nijeholt, A., Pelger, R., & Elzevier, H. (2009). Sexual function improvement following surgery for stress incontinence: The relevance of coital incontinence. *Journal of Sexual Medicine*, *6*(11), 3208–3213. doi:10.1111/j.1743-6109.2009.01395.x

Brubaker, L., Nygaard, I., Bo, K., Tincello, D.G., Homma, Y., Cook, J., . . . Payne, C. (2013). Research methodology. In P. Abrams, L. Cardozo, S. Khoury, & A. Wein (Eds.), *Incontinence: 5th International Consultation on Incontinence, Paris, February 2012* (5th ed., pp. 1863–1894). Paris, France: ICUD-EAU.

Chung, S. Y., & Jung, H. C. (2003). Effects of functional magnetic stimulation therapy on lower urinary tract symptoms and sexual function in female patients with stress urinary incontinence. *Korean Journal of Urology*, *44*(10), 993–998.

Dumoulin, C., Glazener, C., & Jenkinson, D. (2011). Determining the optimal pelvic floor muscle training regimen for women with stress urinary incontinence. *Neurourology and Urodynamics*, *30*(5), 746–753. doi:10.1002/nau.21104

Fatton, B., de Tayrac, R., & Costa, P. (2014). Stress urinary incontinence and LUTS in women—effects on sexual function. *Nature Reviews Urology*, *11*(10), 565–578. doi:10.1038/nrurol.2014.205

Ferreira, C. H., Dwyer, P. L., Davidson, M., De Souza, A., Ugarte, J. A., & Frawley, H. C. (2015). Does pelvic floor muscle training improve female sexual function? A systematic review. *International Urogynecology Journal*, *26*(12), 1735–1750. doi:10.1007/s00192-015-2749-y

Frawley, H. C., Galea, M. P., Phillips, B. A., Sherburn, M., & Bo, K. (2006). Reliability of pelvic floor muscle strength assessment using different test positions and tools. *Neurourology and Urodynamics*, *25*(3), 236–242. doi:10.1002/nau.20201

Galloway, N. T., El-Galley, R. E., Sand, P. K., Appell, R. A., Russell, H. W., & Carlin, S. J. (2000). Update on extracorporeal magnetic innervation (EXMI) therapy for stress urinary incontinence. *Urology*, *56*(6 Suppl. 1), 82–86.

Horng, S. S., Huang, N., Wu, S. I., Fang, Y. T., Chou, Y. J., & Chou, P. (2013). The epidemiology of urinary incontinence and its influence on quality of life in Taiwanese middle-aged women. *Neurourology and Urodynamics*, *32*(4), 371–376. doi:10.1002/nau.22302

Jha, S., Ammenbal, M., & Metwally, M. (2012). Impact of incontinence surgery on sexual function: A systematic review and meta-analysis. *Journal of Sexual Medicine*, *9*(1), 34–43. doi:10.1111/j.1743-6109.2011.02366.x

Jiann, B. P., Su, C. C., & Tsai, J. Y. (2013). Is female sexual function related to the male partners' erectile function? *Journal of Sexual Medicine*, *10*(2), 420–429. doi:10.1111/j.1743-6109.2012.03007.x

Kegel, A. H. (1952). Sexual functions of the pubococcygeus muscle. *Western Journal of Surgery, Obstetrics, and Gynecology*, *60*(10), 521–524.

Lim, R., Liong, M. L., Khan, N. A. K., & Yuen, K. H. (2017). Validity and reliability of the Golombok Rust Inventory of Sexual Satisfaction in Couples with Incontinent Partners. *Journal of Sex & Marital Therapy*, *43*(2), 142–146. doi:10.1080/0092623X.2016.1141817

Lim, R., Liong, M. L., Lau, Y. K., & Yuen, K. H. (2017). Validity, reliability, and responsiveness of the ICIQ-UI SF and ICIQ-LUTSqol in the Malaysian population. *Neurourology and Urodynamics*, *36*(2), 438–442. doi:10.1002/nau.22950

Lim, R., Liong, M. L., Leong, W. S., Khan, N. A. K., & Yuen, K. H. (2015). Magnetic stimulation for stress urinary incontinence: Study protocol for a randomized controlled trial. *Trials*, *16*(1), 279(11 pp). doi:10.1186/s13063-015-0803-1

Lim, R., Liong, M. L., Leong, W. S., Khan, N. A. K., & Yuen, K. H. (2017). Randomized controlled trial of pulsed magnetic stimulation for stress urinary incontinence: 1-year results. *Journal of Urology*, *197*(5), 1302–1308. doi:10.1016/j.juro.2016.11.091

Lowenstein, L., & Bitzer, J. (2010). Pelvic floor disorder and sexual function: How are we doing? *Journal of Sexual Medicine*, *7*(9), 2909–2912.

Martinez, C. S., Ferreira, F. V., Castro, A. A., & Gomide, L. B. (2014). Women with greater pelvic floor muscle strength have better sexual function. *Acta Obstetricia et Gynecologica Scandinavica*, *93*(5), 497–502. doi:10.1111/aogs.12379

Meston, C. M., & Derogatis, L. R. (2002). Validated instruments for assessing female sexual function. *Journal of Sex & Marital Therapy*, *28*(Suppl. 1), 155–164. doi:10.1080/00926230252851276

Nystrom, E., Sjostrom, M., Stenlund, H., & Samuelsson, E. (2015). ICIQ symptom and quality of life instruments measure clinically relevant improvements in women with stress urinary incontinence. *Neurourology and Urodynamics*, *34*(8), 747–751. doi:10.1002/nau.22657

Oberg, K., & Sjogren Fugl-Meyer, K. (2005). On Swedish women's distressing sexual dysfunctions: Some concomitant conditions and life satisfaction. *Journal of Sexual Medicine*, *2*(2), 169–180. doi:10.1111/j.1743-6109.2005.20226.x

Paddison, K. (2002). Complying with pelvic floor exercises: A literature review. *Nursing Standard*, *16*(39), 33–38. doi:10.7748/ns2002.06.16.39.33.c3209

Rosen, R. C., Riley, A., Wagner, G., Osterloh, I. H., Kirkpatrick, J., & Mishra, A. (1997). The International Index of Erectile Function (IIEF): A multidimensional scale for assessment of erectile dysfunction. *Urology*, *49*(6), 822–830. doi:10.1016/S0090-4295(97)00238-0

Rust, J., & Golombok, S. (1986). The GRISS: A psychometric instrument for the assessment of sexual dysfunction. *Archives of Sexual Behavior*, *15*(2), 157–165. doi:10.1007/BF01542223

Sirls, L. T., Tennstedt, S., Brubaker, L., Kim, H.-Y., Nygaard, I., Rahn, D. D., . . . Richter, H. E. (2015). The minimum important difference for the International Consultation on Incontinence Questionnaire—Urinary Incontinence Short Form in women with stress urinary incontinence. *Neurourology and Urodynamics*, *34*(2), 183–187. doi:10.1002/nau.22533. doi:10.1002/nau.22533

Speckens, A. E., Hengeveld, M. W., Lycklama a Nijeholt, G., van Hemert, A. M., & Hawton, K. E. (1995). Psychosexual functioning of partners of men with presumed non-organic erectile dysfunction: Cause or consequence of the disorder? *Archives of Sexual Behavior*, *24*(2), 157–172.

Staskin, D., Kelleher, C., Bosch, R., Cotterill, N., Coyne, K., Kopp, Z., . . . Cherian, P. (2013). Initial assessment of urinary incontinence in adult male and female patients. In P. Abrams, L. Cardozo, S. Khoury, & A. Wein (Eds.), *Incontinence: 5th International Consultation on Incontinence, Paris, February 2012* (5th ed., pp. 363–388). Paris, France: ICUD-EAU.

Tan, H. M., Marumo, K., Yang, D. Y., Hwang, T. I., & Ong, M. L. (2009). Sex among Asian men and women: The Global Better Sex Survey in Asia. *International Journal of Urology*, *16*(5), 507–514; discussion, 514–515. doi:10.1111/j.1442-2042.2009.02283.x

ter Kuile, M. M., van Lankveld, J. J., Kalkhoven, P., & van Egmond, M. (1999). The Golombok Rust Inventory of Sexual Satisfaction (GRISS): Psychometric properties within a Dutch population. *Journal of Sex & Marital Therapy*, *25*(1), 59–71. doi:10.1080/00926239908403977

Wiegel, M., Meston, C., & Rosen, R. (2005). The Female Sexual Function Index (FSFI): Cross-validation and development of clinical cutoff scores. *Journal of Sex & Marital Therapy*, *31*(1), 1–20. doi:10.1080/00926230590475206

Witting, K., Santtila, P., Varjonen, M., Jern, P., Johansson, A., von der Pahlen, B., & Sandnabba, K. (2008). Female sexual dysfunction, sexual distress, and compatibility with partner. *Journal of Sexual Medicine*, *5*(11), 2587–2599. doi:10.1111/j.1743-6109.2008.00984.x

Zahariou, A. G., Karamouti, M. V., & Papaioannou, P. D. (2008). Pelvic floor muscle training improves sexual function of women with stress urinary incontinence. *International Urogynecology Journal*, *19*(3), 401–406.