JOURNAL OF SEX & MARITAL THERAPY, *00*(0), 1–12, 2014

ISSN: 0092-623X print / 1521-0715 online
DOI: 10.1080/0092623X.2013.864363

Routledge
Taylor & Francis Group

Pelvic Floor Muscle Activity, Quality of Life, and Sexual Function in Peri- and Recently Postmenopausal Women With and Without Dyspareunia: A Cross-Sectional Study

Renata Schvartzman

Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Adriane Bertotto

School of Physical Therapy, Centro Universitário La Salle, Canoas, Brazil

Luiza Schvartzman

School of Medicine, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Maria Celeste Osório Wender

Graduate Program in Medical Sciences, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Pelvic floor alterations during menopausal years, resulting from aging and hormonal decline, may lead to several forms of sexual dysfunction. Dyspareunia—pain during sexual intercourse—is among the most frequent. Nevertheless, few studies so far have evaluated pelvic floor muscle function in postmenopausal women with dyspareunia. The authors thus carried out a cross-sectional study to assess myoelectric activity in pelvic floor muscles in peri- and postmenopausal women with and without dyspareunia receiving routine care at an outpatient clinic. In addition, sexual function (using the Female Sexual Function Index) and quality of life (using the Cervantes Scale) were assessed. Fifty-one peri- and postmenopausal women between 45 to 60 years of age ($M = 52.1$, $SD = 4.9$) were evaluated, 27 with and 24 without dyspareunia. There were no statistically significant differences in resting muscle activity, maximal voluntary contraction, and sustained contraction between women with and without dyspareunia. There were statistically significant between-group differences on the Cervantes Scale ($p = .009$) and in all Female Sexual Function Index domains except desire and satisfaction (arousal, $p = .019$; lubrication, $p = .030$; orgasm, $p = .032$; pain, $p < .001$; desire, $p = .061$; satisfaction, $p = .081$), indicating that women with dyspareunia experience worse quality of life and less satisfactory sexual function as compared with women without dyspareunia.

Address correspondence to Maria Celeste Osório Wender, Serviço de Ginecologia e Obstetrícia, Hospital de Clínicas de Porto Alegre, Rua Ramiro Barcelos, 2350/11° andar-sala 1125, CEP 90035-903, Porto Alegre, RS, Brazil. E-mail: mceleste@ufrgs.br

Pain during sexual intercourse, or dyspareunia, is among the most common complaints in peri- and postmenopausal women (Kao, Binik, Kapuscinski, & Khalife, 2008). As reported in a critical review study, the prevalence of dyspareunia in this age group, described in large-scale population-based studies, ranges from 2% to 29%, with more recent studies showing higher prevalences. The occurrence of dyspareunia seems to contribute to poor quality of life in younger and older women (Channon & Ballinger, 1986; Meana, Binik, Khalife, & Cohen, 1997).

Dyspareunia in postmenopausal women is usually attributed to the characteristic hormonal decline in this period. For example, vulvar and vaginal atrophy is a chronic postmenopausal health condition that occurs because of a hypoestrogenic state (Al-Baghdadi & Ewies, 2009; Mac Bride, Rhodes, & Shuster, 2010). Vulvar and vaginal atrophy symptoms, including dyspareunia, reach up to approximately 60% of postmenopausal women (Bachmann & Komi, 2010; Santoro & Komi, 2009). Nevertheless, there is evidence that in a large proportion of postmenopausal women, dyspareunic pain is not associated with hypoestrogenism, and therefore, other causes should be investigated. One possible cause is musculoskeletal dysfunction (Fisher, 2007). Pelvic floor muscles are among the most complex muscles in the human body (Dickinson, 1889), making them prone to a variety of functional problems (Smith & Witherow, 2000); there is evidence in the literature that dyspareunia may be related to abnormally increased muscle activity (FitzGerald & Kotarinos, 2003; Messelink et al., 2005; Prendergast & Weiss, 2003).

Hormonal decline may contribute to pelvic floor muscle dysfunction because it alters vaginal epithelial thickness, smooth muscle layer bundle density, blood vessels, nerve-ending morphology and density, extracellular matrix, and collagen structure, leading to diminished vaginal wall resilience (Lara et al., 2009) and to a significant decrease in the cross-sectional area of the muscle in postmenopausal women (Noguti et al., 2008). Age also affects pelvic floor muscle (PFM) function. A study with 645 Dutch women has shown decreasing PFM function with increasing age (Slieker-ten Hove et al., 2009). In addition, women older than 60 years of age have been found to have thinner PFMs as compared with younger females (Bernstein, 1997).

Physical therapists can teach women to improve their use of PFMs. For that, however, PFM function and strength must be measured (Bo & Sherburn, 2005). Several methods are currently available for assessment of PFMs. These include vaginal palpation, dynamometry, ultrasound, magnetic resonance imaging, surface electromyographic (sEMG) and pressure biofeedback. Of these, electromyography (EMG) is currently recognized as a precise method to determine neuromuscular integrity (Olsen & Rao, 2001) through the recording of the electrical signals (myoelectric activity) generated by depolarization of the muscle cell membrane and, consequently, of muscle activity during contraction (Dursun, Dursun, & Alican, 2004; Moreland & Thomson, 1994; Olsen & Rao, 2001). The information provided by EMG can be used by physical therapists to help patients (a) stretch, relax, or better control PFMs and (b) monitor the progress of these interventions.

Therefore, this study aimed to assess resting muscle activity, maximal voluntary contraction (MVC), and sustained contraction in PFMs of peri- and recent postmenopausal women with and without dyspareunia using EMG. In addition, to better characterize the difference between these two groups, quality of life and sexual function were also investigated through the application of two scales. Our hypothesis was that muscle activity, sexual function, and quality of life would be compromised in the presence of dyspareunia in peri- and postmenopausal women.

METHOD

Sample and Participants

This was a prospective, cross-sectional quantitative study carried out at the outpatient Menopause Clinic of the Department of Obstetrics and Gynecology, Hospital de Clínicas de Porto Alegre, Brazil, from February 2011 to May 2012. Inclusion criteria were being in the late perimenopausal/early postmenopausal period (stages –1 to +1a, +1b, +1c) according to the updated Stages of Reproductive Aging Workshop criteria (Harlow et al., 2012) and presence of dyspareunia for at least 6 months. Exclusion criteria were neurological disorders, impaired cognition or understanding, pelvic organ prolapse, urinary tract infection or genital tract bleeding, endometriosis, lichen sclerosis, and a history of perineal surgery.

Dyspareunia was defined as presence of recurring or persistent genital pain right before, during or after sexual intercourse (American Psychiatric Association, 2000). Patients with a diagnosis of dyspareunia recorded in their medical chart were invited to participate. The diagnosis was then confirmed by one of the investigators (R.S.) through visual inspection, palpation, and a questionnaire about the duration and location of pain (vaginal opening, indicating superficial dyspareunia, or abdominal area, indicating deep dyspareunia).

The sample size was calculated using the PEPI 4.0, on the basis of the results of a pilot study including 10 participants to determine resting muscle activity in the group with ($n = 6$) and without dyspareunia ($n = 4$). The difference between group means was of approximately 1.8 μV ($p = .049$, Student's t test). The maximum standard deviation for group means was 1.5 μV. Therefore, the stricter criterion of 1 standard deviation was used to detect differences between the groups in the larger study. Thus, considering a significance level of 5%, a power of 90%, and an effect size of at least 1 standard deviation to detect the difference in resting muscle activity between the groups, a minimum total of 23 patients were required for each group (with or without dyspareunia).

Women with and without dyspareunia were consecutively enrolled until completing the groups. All patients who agreed to participate provided written informed consent.

Procedures

This study was approved by the Hospital de Clínicas de Porto Alegre Research Ethics Committee (project 100353). Participants completed an initial demographic assessment form to collect data on age, body mass index, age at onset of sexual intercourse, frequency of sexual activity, number or pregnancies, number of vaginal and cesarean deliveries, number of abortions, orgasms, antidepressant use and hormone therapy, and stress incontinence. This initial interview was followed by application of a health-related quality of life scale (Cervantes Scale) and the Female Sexual Function Index. EMG was performed on the same day.

Health-Related Quality-of-Life Scale (Cervantes Scale)

The Cervantes Scale is a questionnaire designed for assessment of health-related quality of life in women during peri- and postmenopause. It was originally developed and validated in Spain

(Palacios et al., 2004) and has since been translated and validated into Brazilian Portuguese (Lima, Palacios, & Wender, 2012). The instrument comprises 31 items across four domains: *menopause and health* (divided into three subdomains: vasomotor symptoms, health, and aging), *sexuality* (levels of satisfaction and interest, changes in the frequency of sexual relations), *psychical domain* (changes in quality of life resulting from anxiety and depression issues), and *couple relationship* (level of satisfaction and patient's role in relationship with her partner). Each item is scored on a scale of 0 to 5. The total score ranges from 0 to 155. Because it is a negative scale, higher scores represent worse quality of life. Cronbach's alphas for this scale were .756 for couples relationship, .737 for sexuality, .873 for psychical domain, and .777 for menopause and health. Overall Cronbach's alpha was .826.

Female Sexual Function Index

The Female Sexual Function Index is a scale for evaluation of female sexual function. It was developed and validated in the United States (Rosen et al., 2000) and later translated and validated into Brazilian Portuguese (Hentschel, Alberton, Capp, Goldim, & Passos, 2007). The instrument consists of 19 multiple-choice questions across six domains: desire, arousal, lubrication, orgasm, satisfaction, and pain. Each item is scored on a scale of 0 to 5. It should be noted that a score of 0 (zero) indicates that no sexual activity was reported in the past 4 weeks. Domain scores are obtained by adding individual item scores and multiplying the sum by a correction factor. The resulting domain scores are then added up to obtain the total score, which ranges from 2 (*worst*) to 36 (*best sexual function*).

Assessment of Myoelectric Activity

Before PFM assessment, the investigator instructed participants as to the location and function of the PFMs and the importance of isolated PFM contraction.

With participants in the lithotomy position, intravaginal/perineal massage was performed during 3 min to sensitize and improve perception of the area of interest. Last, under digital palpation, participants were asked to contract and relax their PFMs so as to understand the process and commands of EMG.

After that, assessment of the PFMs through EMG was performed to measure the electrical signals of PFM activity. We used a Miotool 400 EMG biofeedback device (Miotec) with Biotrainer Uro 2008 software to assess myoelectric activity of the pelvic floor and synergistic activation of the abdominal muscles.

The Miotool 400 is a two-channel sEMG system with 14 bits of resolution for acquisition of EMG signals, 5000-volt insulation, a sampling rate of 2000 samples per second per channel, USB interface, and rechargeable nickel–metal hydride battery. The Biotrainer Uro 2008 software suite, which is available in Portuguese, enables simultaneous visualization of two channels. The channel 1 input was a MultiBioSensors sterile intracavitary EMG electrode set for urogynecological use (microvolt measurement). The channel 2 input consisted of a sEMG sensor attached to Meditrace external electrodes for isolation of the external oblique accessory muscle. Sensor type and placement followed the recommendations of Surface Electromyography for the Non-Invasive Assessment of Muscles, a project in the Biomedical Health and Research Program of the European

Union (Hermens, Freriks, Disselhorst-Klug, & Rau, 2000). The reference channel was placed over the right anterior superior iliac spine.

We devised a protocol for EMG testing of the PFMs using muscle physiology assessment. Resting muscle activity, MVC (rapid contractions), and sustained contraction (slow contractions) were measured as follows:

Screen 1: 60 s of rest for assessment of resting muscle activity.

Screen 2: Rapid contractions over 15 s, followed by 30 s of rest, to assess MVC, number of peaks, upstroke and downstroke, relaxation between contractions, relaxation after exercise, and activation of accessory muscles.

Screen 3: Assessment of sustained contraction for 10 s, followed by 15 s of rest, to assess duration of sustained contraction, upstroke and downstroke, relaxation after exercise, and activation of accessory muscles.

Statistical Analysis

We analyzed data using SPSS 17.0. Quantitative variables were expressed as means and standard deviations or medians and interquartile ranges as appropriate. Categorical variables were expressed as absolute and relative frequencies.

Student's t test for independent samples was used for comparison of means. We used the Mann-Whitney U test in case of asymmetric distribution. We used Pearson's chi-square test or Fisher's exact test to evaluate potential association between categorical variables. The significance level was set at 5% ($p \leq .05$).

RESULTS

In this study, 60 patients were eligible; of these, 5 declined to participate. Thus, 55 women with routine appointments at the clinic during the study period, who met the inclusion criteria, were assessed. We excluded 4 because of myoelectric signal interference during the examination, for a final sample of 51 women (27 in the dyspareunia group and 24 in the nondyspareunia group).

In the dyspareunia group, 13 patients (48.1%) had superficial dyspareunia and 14 (51.9%) had deep dyspareunia. Stress incontinence was reported by 3 (23.1%) of the women with superficial pain and by 6 (42.9%) of the ones with deep pain. Stress incontinence was present in 14 patients or 27.5% of the overall sample; although it was reported more frequently by women with dyspareunia, the between-group difference was not significant (p =.363).

Demographic characteristics of patients are shown in Table 1. Mean age and body mass index were similar in both groups. There were significant between-group differences in the number of vaginal deliveries (p = .002) and cesarean deliveries (p = .012), the latter being more common in the dyspareunia group.

We assessed postmenopausal patients, who accounted for 82.4% of the sample, regarding their use of hormone replacement therapy. Hormone replacement therapy was reported by 35.7% of all postmenopausal women—32% with dyspareunia and 41.2% without dyspareunia (p = .645). More than half of all participants (56.9%) were on antidepressants of

TABLE 1
Demographic Characteristics of Patients

Variable	*Overall* (n = *51*)	*Dyspareunia* (n = *27*)	*No dyspareunia* (n = *24*)	p
Age (years)	52.1 ± 4.9	52.1 ± 5.5	52.2 ± 4.3	*ns*[a]
Body mass index (kg/m^2)	27.1 ± 3.9	26.9 ± 4.1	27.4 ± 3.8	*ns*[a]
Onset of sexual intercourse	20.0 ± 3.7	21.2 ± 4.1	18.7 ± 2.6	.011[a]
Menopausal status				
Perimenopausal	9 (17.6)	2 (7.4)	7 (29.2)	
Postmenopausal	42 (82.4)	25 (92.6)	17 (70.8)	*ns*[c]
No. of pregnancies	3 (2–4)	2 (1–4)	3 (2–4.8)	*ns*[b]
No. of vaginal deliveries	2 (0–3)	0 (0–3)	2.5 (2–3)	.003[b]
No. of cesarean deliveries	0 (0–1)	1 (0–2)	0 (0–0)	.002[b]
Abortion	0 (0–1)	0 (0–1)	0 (0–1)	*ns*[b]
Postmenopause (years)	4 (2–7)	4 (2–7)	4 (1.3–6.8)	*ns*[b]
Frequency of sexual activity (times/month)	4 (1–8)	3 (0.5–8)	4 (2.3–8)	*ns*[b]
Orgasm	24 (47.1)	10 (37)	14 (58.3)	*ns*[c]
Antidepressants (selective serotonin reuptake inhibitors)	29 (56.9)	17 (63)	12 (50)	*ns*[c]
Stress incontinence	14 (27.5)	9 (33.3)	5 (20.8)	*ns*[c]

Note. Of the total sample, 81.5% women were sexually active (81.5% in the group with dyspareunia and 100% in the group without dyspareunia). Also, 47.06% of the total sample had orgasm (37.04% in the group with dyspareunia and 58.33% in the group without dyspareunia). Quantitative variables are expressed as mean ± standard deviation or median (interquartile range). Categorical variables expressed as n (%).

[a]Student's *t* test.

[b]Mann-Whitney *U* test.

[c]Pearson's chi-square test.

the selective serotonin reuptake inhibitor class—63% of women with dyspareunia and 50% of group 2 ($p = .516$). Therefore, there were no significant between-group differences in the rate of Table 2. hormone replacement therapy and selective serotonin reuptake inhibitor use.

TABLE 2
Use of Hormone Replacement Therapy by Postmenopausal Women

Variable	*Overall* (n = *42*)	*Dyspareunia* (n = *25*)	*No dyspareunia* (n = *17*)	p
				.645[a]
No hormone replacement therapy	27(64.3)	17 (68.0)	10(58.8)	
Topical	5(11.9)	3 (12.0)	2(11.8)	
Systemic	9(21.4)	4 (16.0)	5(29.4)	
Topical + systemic	1(2.4)	1 (4.0)	0 (0)	

Note. Categorical variables are expressed as *n* (%).

[a]Pearson's chi-square test.

TABLE 3
Results of Electromyographic Examination

Variable	*Overall (*N = *51)*	*Dyspareunia (*n = *27)*	*No dyspareunia (*n = *24)*	p
Mean resting muscle activity (μV)	3.6 ± 1.5	3.9 ± 1.5	3.3 ± 1.4	0.152[a]
Mean maximal voluntary contraction (μV)	9.4 ± 3.1	9.9 ± 2.9	8.8 ± 3.4	0.223[a]
Mean sustained contraction (μV)	10.9 ± 4.2	11.3 ± 4.7	10.5 ± 3.6	0.475[a]
Plateau(s)	7.9 ± 1.2	7.7 ± 1.3	8.1 ± 1.1	0.164[a]

Note. Quantitative variables are expressed as mean ± standard deviation or median (interquartile range). Categorical variables are expressed as *n* (%). Mean sustained contraction refers to the myoelectric activity during the sustained phase of contraction; plateau refers to the duration of sustained contraction.

[a]Student's *t* test.

[b]Fisher's exact test.

The results of EMG examination are shown in Table 3. Mean resting muscle activity was similar in both groups: 3.9 ± 1.5 μV in women with dyspareunia and 3.3 ± 1.4 μV in group 2 ($p = .152$). Between women with dyspareunia (19.7 ± 7.5 μV) and women without (17.1 ± 7.5 μV), we found no significant differences in MVC ($p = .223$).

Analysis of Channel 2 data (from the external oblique muscle) showed that women with dyspareunia (59.3%) and without dyspareunia (58.3%) used their abdominal muscles during pelvic floor contraction, again with no significant between-group differences ($p = 1.00$).

As expected, there was a statistically significant between-group difference in Cervantes Scale ($p = .009$), with higher scores among women with dyspareunia than in those without dyspareunia, which denotes worse quality of life in the dyspareunia group. Because the Female Sexual Function Index is more appropriate for the analysis of subjects who have had some level of sexual activity during the assessment period (Rosen et al., 2000), the factor analysis of the questionnaire was performed excluding data from the 5 women in the group with dyspareunia who reported that they had no sexual activity within the past month (score of 0). There was a statistically significant between-group difference in Female Sexual Function Index domain scores ($p = .001$), with lower scores among women with dyspareunia than in those without dyspareunia, which indicates worse sexual function in the dyspareunia group. These data are shown in Table 4.

DISCUSSION

In the present study, dyspareunia was associated with health-related quality of life and sexual function, but not with myoelectric activity of PFM, in peri- and postmenopausal women. One interesting finding was the increased resting muscle activity in both groups, with (3.9 ± 1.5 μV) and without dyspareunia (3.3 ± 1.4 μV), consistent with evidence that dyspareunia may be related to abnormally increased muscle activity (FitzGerald & Kotarinos, 2003; Messelink et al., 2005; Prendergast & Weiss, 2003). This indicates that, despite the lack of association with dyspareunia,

TABLE 4
Cervantes Scale and Female Sexual Function Index Scores

Variable	*Overall* (n = *51*)	*Dyspareunia* (n = *27*)	*No dyspareunia* (n = *24*)	p
Cervantes				
Menopause and health	38 (26–46)	42 (32–47)	31 (17–45)	.063
Sexuality	13 (10–17)	15 (12–17)	11 (6.5–14.8)	.013
Couple relationship	6 (2–10)	7 (4–10)	3.5 (1–7.8)	.037
Psychical domain	17 (12–28)	24 (14–32)	14 (5–23.8)	.016
Total score	79 (50–92)	86 (76–99)	56.5 (44.3–88.5)	.009
Female Sexual Function Index[a]				
Desire	2.4 (1.2–3.6)	1.8 (1.2–3.0)	3.0 (1.2–4.8)	.061
Arousal	2.7 (1.5–3.6)	1.8 (0.0–3.1)	3.3 (1.7–4.5)	.019
Lubrication	3.6 (1.8–5.4)	3.3 (0.0–4.4)	4.5 (2.7–5.7)	.030
Orgasm	2.8 (1.2–4.4)	2.2 (0.0–3.7)	4.0 (1.6–5.2)	.032
Satisfaction	3.2 (2.4–4.8)	2.8 (1.1–4.0)	3.6 (2.6–5.2)	.081
Pain	4.0 (1.6–6.0)	2.2 (0.0–4.0)	6.0 (5.2–6.0)	<.001
Total score	19.5 (14.4–26.1)	15.0 (3.8–20.5)	22.9 (17.9–29.0)	.001

Note. Quantitative variables are expressed as median (interquartile range).

[a]Factor analysis was performed excluding data from the 5 women in the group with dyspareunia who reported that they had no sexual activity within the past 4 weeks (score of 0): overall ($n = 46$); dyspareunia ($n = 22$); no dyspareunia ($n = 24$). Mann-Whitney U test.

PFM function is an important parameter for assessment in peri- and postmenopausal women, and should be focused in future studies.

In a study of 32 women with a mean age of 33 years, White, Jantos, and Glazer (1997) reported several EMG values in women with provoked vestibulodynia, including resting muscle activity above 2 ± 0.2 μV. Other intravaginal EMG studies (Glazer, Jantos, Hartmann, & Swencionis, 1998; White et al., 1997) have shown that women with vestibulodynia exhibit higher resting muscle activity, decreased strength and sustained contraction, and increased PFM instability (ineffective and weak contraction). In this study, instability and increased resting muscle activity were found in both groups (with and without dyspareunia).

It is remarkable that 62.7% of participants had pelvic floor dysfunction, and activation of the external oblique (an accessory abdominal muscle) was detected in 58% of the sample. This may have been the result of inability to contract the pelvic floor. Three other studies (Junginger, Baessler, Sapsford, & Hodges, 2010; Sapsford & Hodges, 2001, 2012) reported increased electrical activity in the vagina with activation of the abdominal muscles. However, abdominal muscle contraction may exceed pelvic floor contraction, thus increasing it inappropriately. This has been shown in previous studies (Benvenuti et al., 1987; Bø et al., 1988; Bump, Hurt, Fantl, & Wyman, 1991; Kegel, 1952), in which 30% of women were unable to contract the PFMs correctly.

Women with dyspareunia had a higher rate of cesarean delivery, whereas more vaginal deliveries occurred among women without dyspareunia. There are few data on labor- and delivery-related characteristics and risk factors in women with dyspareunia (Rosenbaum & Padoa, 2012). An Israeli study (Goldsmith et al., 2009) of deliveries occurred during 1988–2007 found that, of 192,954 deliveries, 118 occurred in patients with vaginismus, who tended to have higher rates of cesarean delivery when compared with the control group (39% vs. 14.5%). The predominance

of cesarean delivery among women with dyspareunia in this study may be associated with the fact that women with this condition prefer cesarean sections because of fear of discomfort and pain.

There were no significant differences in hormone replacement therapy rated between the dyspareunia and no dyspareunia groups ($p = .645$). According to Rosenbaum, topical or systemic hormone replacement therapy is often used as first-line therapy for dyspareunia. When hormone replacement therapy proves insufficient or inadequate, a combined multidisciplinary approach with physical therapy and sexual counseling is indicated (Rosenbaum, 2005).

Some changes may contribute to dyspareunia. The incidence of urogenital disorders (e.g., prolapse, urinary incontinence) is exceedingly high in postmenopausal women, and these conditions are correlated with sexual dysfunction (Barber et al., 2002; Salonia et al., 2004). In this study, however, urinary incontinence was not related to presence of dyspareunia ($p = .363$). As described in the Methods section, we did not include women with pelvic organ prolapse (rectocele, cystocele, uterine prolapse) in the sample.

Regarding aspects of quality of life, at the present age the number of socially, sexually, and economically active peri- and postmenopausal women has increased, driving a pursuit for better quality of life. Anorgasmia was reported by 52.9% of patients in the sample. It is well known that orgasm can be triggered by a variety of physical and mental stimuli, promoting a muscle response characterized by involuntary contraction of the PFMs. The high frequency of anorgasmia in the sample may be associated with the large number of women with pelvic floor dysfunction. Graber and Kline-Graber (1979) reported a correlation between pelvic muscle strength and intensity of the orgasmic response, showing that pubococcygeus contraction strength was decreased in anorgasmic women as compared with other women.

Even though other methods have been proposed for assessment of PFMs (Morin et al., 2010; Shek & Dietz, 2013), EMG remains a useful and reliable tool for that purpose. One advantage of EMG is that it can be used by physical therapists in outpatient settings. In addition, it is the method of choice in our setting.

Some limitations of this study must be addressed. First, the lack of significance between the groups might have been related to the small sample size. However, because difference was noted in quality of life and sexual function, and because the numbers were in accordance with the calculated sample size, we believe that a sufficient number of women were studied. Also, because psychological disorders may be associated with dyspareunia, the absence of such an evaluation could have affected our results. Last, the diagnosis of dyspareunia is inherently limited by subjectivity and absence of standardized criteria, because this sexual dysfunction involves a variety of co-occurring causes and factors and its diagnosis and management are challenging. Nevertheless, we believe that the present results provide an interesting insight into an understudied group.

This study showed no difference in resting muscle activity between peri- and postmenopausal women with and without dyspareunia. However, there were between-group differences in quality of life and sexual function, which shows that women with dyspareunia experience worse quality of life and less satisfactory sexual function as compared with women without dyspareunia.

Other studies on physical therapy evaluation of sexual dysfunction are required to improve the quality of investigation in this field, including standardization of the methods used for assessment and the terminology used to describe sex-related pelvic floor dysfunction, as well as studies with women of younger age groups and presenting with sexual dysfunctions other than those analyzed in the present work (i.e., dyspareunia and anorgasmia).

ACKNOWLEDGMENTS

The authors are grateful to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior and to Miotec for partially supporting the present study.

FUNDING

This research was funding by the Incentive Fund for Research and Events - Hospital de Clínicas de Porto Alegre

REFERENCES

Al-Baghdadi, O., & Ewies, A. A. (2009). Topical estrogen therapy in the management of postmenopausal vaginal atrophy: An up-to-date overview. *Climacteric*, *12*, 91–105.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4*th *ed.)*. Washington, DC: Author.

Bachmann, G. A., & Komi, J. O. (2010). Ospemifene effectively treats vulvovaginal atrophy in postmenopausal women: Results from a pivotal phase 3 study. *Menopause*, *17*, 480–486.

Barber, M. D., Visco, A. G., Wyman, J. F., Fantl, J. A., Bump, R. C., & Continence Program for Women Research Group. (2002). Sexual function in women with urinary incontinence and pelvic organ prolapse. *Obstetrics and Gynecology*, *99*, 281–289.

Benvenuti, F., Caputo, G. M., Bandinelli, S., Mayer, F., Biagini, C., & Sommavilla, A. (1987). Reeducative treatment of female genuine stress incontinence. *American Journal of Physical Medicine*, *66*, 155–168.

Bernstein, I. T. (1997). The pelvic floor muscles: Muscle thickness in healthy and urinary-incontinent women measured by perineal ultrasonography with reference to the effect of pelvic floor training. Estrogen receptor studies. *Neurourology and Urodynamics*, *16*, 237–275.

Bø, K., Larsen, S., Oseid, S., Kvarstein, B., Hagen, R., & Jørgensen, J. (1988). Knowledge about and ability to correct pelvic floor muscle exercises in women with urinary stress incontinence. *Neurourology and Urodynamics*, *7*, 261–262.

Bo, K., & Sherburn, M. (2005). Evaluation of female pelvic-floor muscle function and strength. *Physical Therapy*, *85*, 269–282.

Bump, R. C., Hurt, W. G., Fantl, J. A., & Wyman, J. F. (1991). Assessment of Kegel pelvic muscle exercise performance after brief verbal instruction. *American Journal of Obstetrics and Gynecology*, *165*, 322–327; discussion 327–329.

Channon, L. D., & Ballinger, S. E. (1986). Some aspects of sexuality and vaginal symptoms during menopause and their relation to anxiety and depression. *British Journal of Medical Psychology*, *59*(Pt. 2), 173–180.

Dickinson, R. (1889). Studies of the levator ani muscle. *American Journal of Obstetrics*, *22*, 897–917.

Dursun, E., Dursun, N., & Alican, D. (2004). Effects of biofeedback treatment on gait in children with cerebral palsy. *Disability and Rehabilitation*, *26*, 116–120.

Fisher, K. A. (2007). Management of dyspareunia and associated levator ani muscle overactivity. *Physical Therapy*, *87*, 935–941.

FitzGerald, M. P., & Kotarinos, R. (2003). Rehabilitation of the short pelvic floor. II: Treatment of the patient with the short pelvic floor. *International Urogynecology Journal*, *14*, 269–275; discussion 275.

Glazer, H. I., Jantos, M., Hartmann, E. H., & Swencionis, C. (1998). Electromyographic comparisons of the pelvic floor in women with dysesthetic vulvodynia and asymptomatic women. *Journal of Reproductive Medicine*, *43*, 959–962.

Goldsmith, T., Levy, A., Sheiner, E., Goldsmith, T., Levy, A., & Sheiner, E. (2009). Vaginismus as an independent risk factor for cesarean delivery. *Journal of Maternal-Fetal, and Neonatal Medicine*, *22*, 863–866.

Graber, B., & Kline-Graber, G. (1979). Female orgasm: role of pubococcygeus muscle. *Journal of Clinical Psychiatry*, *40*, 348–351.

Harlow, S. D., Gass, M., Hall, J. E., Lobo, R., Maki, P., Rebar, R. W., . . . Group, S. C. (2012). Executive summary of the Stages of Reproductive Aging Workshop +10: Addressing the unfinished agenda of staging reproductive aging. *Climacteric*, *15*, 105–114.

Hentschel, H., Alberton, D. L., Capp, E., Goldim, J. R., & Passos, E. P. (2007). Validação do Female Sexual Function Index (FSFI) para uso em língua portuguesa [Validation of the female sexual function index (FSFI) for Portuguese language]. *Revista HCPA*, *27*, 10–14.

Hermens, H. J., Freriks, B., Disselhorst-Klug, C., & Rau, G. (2000). Development of recommendations for SEMG sensors and sensor placement procedures. *Journal of Electromyography and Kinesiology*, *10*, 361–374.

Junginger, B., Baessler, K., Sapsford, R., & Hodges, P. W. (2010). Effect of abdominal and pelvic floor tasks on muscle activity, abdominal pressure and bladder neck. *International Urogynecology Journal*, *21*, 69–77.

Kao, A., Binik, Y. M., Kapuscinski, A., & Khalife, S. (2008). Dyspareunia in postmenopausal women: A critical review. *Pain Research & Management*, *13*, 243–254.

Kegel, A. H. (1952). Stress incontinence and genital relaxation: A nonsurgical method of increasing the tone of sphincters and their supporting structures. *Ciba Foundation Symposium*, *4*, 35–51.

Lara, L. A., Useche, B., Ferriani, R. A., Reis, R. M., de Sa, M. F., de Freitas, M. M., ... Rosa e Silva, A. C. (2009). The effects of hypoestrogenism on the vaginal wall: Interference with the normal sexual response. *Journal of Sexual Medicine*, *6*, 30–39.

Lima, J. E., Palacios, S., & Wender, M. C. (2012). Quality of life in menopausal women: A Brazilian Portuguese version of the Cervantes Scale. *The Scientific World Journal*. doi:10.1100/2012/620519.

Mac Bride, M. B., Rhodes, D. J., & Shuster, L. T. (2010). Vulvovaginal atrophy. *Mayo Clinic Proceedings*, *85*, 87–94.

Meana, M., Binik, Y. M., Khalife, S., & Cohen, D. R. (1997). Biopsychosocial profile of women with dyspareunia. *Obstetrics and Gynecology*, *90*(4 Pt 1), 583–589.

Messelink, B., Benson, T., Berghmans, B., Bo, K., Corcos, J., Fowler, C., . . . Van Kerrebroeck, P. (2005). Standardization of terminology of pelvic floor muscle function and dysfunction: Report from the pelvic floor clinical assessment group of the International Continence Society. *Neurourology and Urodynamics*, *24*, 374–380.

Moreland, J., & Thomson, M. A. (1994). Efficacy of electromyographic biofeedback compared with conventional physical therapy for upper-extremity function in patients following stroke: A research overview and meta-analysis. *Physical Therapy*, *74*, 534–543; discussion 544–537.

Morin, M., Gravel, D., Bourbonnais, D., Dumoulin, C., Ouellet, S., & Pilon, J. F. (2010). Application of a new method in the study of pelvic floor muscle passive properties in continent women. *Journal of Electromyography & Kinesiology*, *20*, 795–803.

Noguti, A. S., Jarmy-Di Bella, Z. I., de Oliveira, E., Castro, R. A., Lima, G. R., Baracat, E. C., . . . Girao, M. J. (2008). Ultrasonographic and doppler velocimetric evaluation of the levator ani muscle according to the hormonal status. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *141*, 183–185.

Olsen, A. L., & Rao, S. S. (2001). Clinical neurophysiology and electrodiagnostic testing of the pelvic floor. *Gastroenterology Clinics of North America*, *30*, 33–54, v–vi.

Palacios, S., Ferrer-Barriendos, J., Parrilla, J. J., Castelo-Branco, C., Manubens-Grau, M., Alberich, X., & Marti, A. (2004). Calidad de vida relacionada con la salud en la mujer española durante la perimenopausia y posmenopausia. Desarrollo y validación de la Escala Cervantes [Health-related quality of life in the Spanish women through and beyond menopause. Development and validation of the Cervantes Scale]. *Medicina Clinica*, *132*, 205–211.

Prendergast, S. A., & Weiss, J. M. (2003). Screening for musculoskeletal causes of pelvic pain. *Clinical Obstetrics and Gynecology*, *46*, 773–782.

Rosen, R., Brown, C., Heiman, J., Leiblum, S., Meston, C., Shabsigh, R., . . . D'Agostino, R., Jr. (2000). The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex & Marital Therapy*, *26*, 191–208.

Rosenbaum, T. Y. (2005). Physiotherapy treatment of sexual pain disorders. *Journal of Sex & Marital Therapy*, *31*, 329–340.

Rosenbaum, T. Y., & Padoa, A. (2012). Managing pregnancy and delivery in women with sexual pain disorders. *Journal of Sexual Medicine*, *9*, 1726–1735; quiz 1736.

Salonia, A., Zanni, G., Nappi, R. E., Briganti, A., Deho, F., Fabbri, F., . . . Montorsi, F. (2004). Sexual dysfunction is common in women with lower urinary tract symptoms and urinary incontinence: results of a cross-sectional study. *European Urology*, *45*, 642–648; discussion 648.

Santoro, N., & Komi, J. (2009). Prevalence and impact of vaginal symptoms among postmenopausal women. *Journal of Sexual Medicine*, *6*, 2133–2142.

Sapsford, R. R., & Hodges, P. W. (2001). Contraction of the pelvic floor muscles during abdominal maneuvers. *Archives of Physical Medicine and Rehabilitation*, *82*, 1081–1088.

Sapsford, R. R., & Hodges, P. W. (2012). The effect of abdominal and pelvic floor muscle activation on urine flow in women. *International Urogynecology Journal*, *23*, 1225–1230.

Shek, K. L., & Dietz, H. P. (2013). Pelvic floor ultrasonography: An update. *Minerva Ginecologica*, *65*, 1–20.

Slieker-ten Hove, M. C., Pool-Goudzwaard, A. L., Eijkemans, M. J., Steegers-Theunissen, R. P., Burger, C. W., & Vierhout, M. E. (2009). Pelvic floor muscle function in a general female population in relation with age and parity and the relation between voluntary and involuntary contractions of the pelvic floor musculature. *International Urogynecology Journal*, *20*, 1497–1504.

Smith, C. A., & Witherow, R. O. (2000). The assessment of female pelvic floor dysfunction. *BJU International*, *85*, 579–587.

White, G., Jantos, M., & Glazer, H. (1997). Establishing the diagnosis of vulvar vestibulitis. *Journal of Reproductive Medicine*, *42*, 157–160.