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Decreasing dyspareunia and dysmenorrhea in women with endometriosis via a manual physical therapy*: Results from two independent studies

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**Wurn Technique® - Patent pending*

Abstract

Purpose: *To assess the efficacy of a non-invasive, site-specific manual physiotherapeutic technique in ameliorating dyspareunia and dysmenorrhea, commonly associated with endometriosis, by performing a retrospective and prospective analysis, respectively.*

Methods: *Human female subjects, all surgically diagnosed with endometriosis, were enrolled in each of the studies post informed consent. Each subject underwent 20 hours of site-specific manual physical therapy (Wurn Technique) designed to address adhesions and restrictions in soft tissue mobility in the abdomen and the pelvic floor. Post-test was completed 6 weeks after treatment. Evaluation incorporated outcome prediction based on Female Sexual Function Index (FSFI) for analyzing the effect on dyspareunia and sexual function (n=14) and quantitative differences in ratings of average pain during menstrual cycle and intercourse based on the Mankoski Pain Scale for analyzing the effect on dysmenorrhea and dyspareunia (n=18), respectively. Data was analyzed by the Wilcoxon signed-rank test (two-sided).*

Results: *FSFI Full Scale score showed overall statistically significant improvements (P=.001) for all domains of sexual function, inclusive of dyspareunia (P<.001) in the retrospective analyses. Mankoski Pain Scale exhibited statistically significant improvements in menstrual cycle (P<.014), dysmenorrhea (P=.008) and dyspareunia (P=.001) in the prospective analyses.*

Conclusion: *Site-specific manual physiotherapy might offer a non-pharmacologic and non-surgical alternative in the treatment of dyspareunia and dysmenorrhea in endometriosis patients. Further randomized, blinded, and multi-center assessment of the technique is warranted to validate the results and gauge any potential pitfalls.*

Key words: *Adhesion, Dysmenorrhea, Dyspareunia, Physical Therapy, Physiotherapy, Sexual Dysfunction, Wurn Technique*

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INTRODUCTION

Reflux of endometrial fragments in the fallopian tubes during menstruation (retrograde menstruation) and their subsequent implantation and growth in the peritoneal cavity is the most widely believed etiology of endometriosis (1, 2). In addition, immunologic, inflammatory, genetic, environmental, and angiogenic determinants have been indicated as contributory to endometriosis (3-6). Endometrial tissue can form lesions on abdomi-

nopelvic structures, inclusive of the ovaries, fallopian tubes, cervix, uterine ligaments, abdominal cavity lining, bladder, and rectum. In turn, these can result in inflammation, formation of blood-filled cysts, adhesions (scar tissue), and chronic pain (2).

Endometriosis can cause local inflammation, which is a key factor in adhesion formation. Adhesions may form as a result of endometrial implants bleeding onto the area around them, causing inflammation, which leads to the formation of scar tissue as part of the healing process (7). Patients develop adhesions after laparoscopic excision of endometriosis for pelvic pain, and are at an even higher risk to reform after a second surgery (8-10). The glue-like bonding of adhesions has the potential to cause numerous symptoms, including decreased mobility and motility of abdominal and pelvic organs, pain, and dysfunction of the adhered structures (10).

Experimental validation of the benefits of manual therapy techniques to decrease adhesions in laboratory animals has recently been published (11). In addition, we have previously revealed that a site-specific, non-invasive, manual physiotherapy, the Wurn Technique (WT), can improve soft tissue elasticity, mobility, and distensibility, rendering significant improvement in in vitro fertilization (IVF) pregnancy rates (12) and dyspareunia (13) in a general female population. In the current study, we extended the assessment of the efficacy of the site-specific manual physical therapy to ameliorate female sexual dysfunction, including dyspareunia (pain during sexual intercourse) and secondary dysmenorrhea (menstrual pain because of an underlying disease, disorder or structural abnormality) in women surgically diagnosed with endometriosis, and a diagnosis or indication of adhesions.

Our findings corroborate the assumption that certain soft tissue mobilizations can deform or dissolve adhesive cross-links and alter connective tissue mobility and length by means of specific sustained physical force applied to the focus area (11-15). We observed that this site-specific manual physiotherapy significantly improved sexual function and decreased dysmenorrhea and dyspareunia. Given the fact that about 5% to 15% of all premenopausal women suffer from endometriosis and that the treatment cost in 2002 was $22 billion (16), our findings hold positive potential for a site-specific manual physiotherapy to treat dyspareunia and dysmenorrhea in endometriosis patients. In turn, this might help to significantly lower the burden of treatment cost.

MATERIALS AND METHODS

Human Subjects: For Study I (Retrospective analysis of the effect on dyspareunia in women with endometriosis) 14 female patients surgically diagnosed with endometriosis (out of 23 previous participants of a previously conducted Sexual Function Study) (13) were enrolled. A total of 18 female subjects were enrolled for Study II (Prospective analysis of the effect on dyspareunia and dysmenorrhea in women with endometriosis). All subjects were enrolled into the studies after they signed an informed consent form. IRB/Ethics Committee decided approval was not required for this study pursuant to exclusion under Department of Health guidelines for non-identifiable patient cohort under section 45CFR 46.101 (b)(4). Each subject also completed a six-page Patient Intake Questionnaire detailing pain, and medical history augmented by medical records. The physical therapy assessment was performed as previously reported (12-13) and entailed palpatory and biomechanical assessments, as well as an in-depth review of any gynecologic, surgical, or trauma history indicative of possible adhesion formation. The study was performed in the private outpatient clinic of Clear Passage Physical Therapy, Gainesville, Florida, USA.

As shown in Tables I and III, the age range of subjects was 25-43 years (mean: 33.8; median: 34.4) and 31-43 years (mean: 37.4; median: 36.2) for Study I and II, respectively. BMI for the subjects for the two studies ranged between 19.2-24.8 and each was being treated for a variety of abdominopelvic dysfunction and pain complaints. Inclusion criteria were: 1) surgical diagnosis of endometriosis via laparoscopy or laparotomy; 2) presence of adhesions confirmed by physician diagnosis (25/32) or indicative history (7/32); 3) signed consent to undergo 20 hours of non-invasive, site-specific manual physiotherapy; 4) agreement to complete the various pre- and post-treatment assessment instruments; and 5) ability and interest in having sexual intercourse. Thus, 100% (32/32) of subjects had surgically diagnosed endometriosis and 78% (25/32) presented with physician diagnosed adhesions upon entry into the studies. All eligible subjects participated in these two small studies. As a physical therapy clinic, we relied on our patients' surgical reports. We did not have access to medical screening procedures such as transvaginal ultrasonography, nor were we always able to identify the exact sites of the endometriotic lesions.

We noted two confounding variables: 1) two out of 18

TABLE I - SOCIO-DEMOGRAPHIC AND GYNECOLOGIC HISTORIES OF SUBJECTS IN STUDY I

Patient Number	Age (at last tx date)	Race	Weight	Height	Duration of therapy in days	# Hrs of TX	Dyspareunia	Treated for infertility	Treated for abdominopelvic pain	Infectious/Inflammatory Disease	Abdominopelvic trauma	Abdominopelvic surgery	Endometriosis dx by laparoscopy	Physician diagnosed adhesions	Pelvic Inflammatory Disease (PID)	Concurrent pain or infertility Tx?
	Patient Information						***Gynecologic History 1=yes 0=no***									
1	27.8	C	115	5'4"	5	20	1	1	1	1	0	1	1	1	0	0
2	33.1	C	140	5'4"	5	20	1	1	1	1	0	1	1	0	0	0
3	39.7	B	150	5'4"	51	20	1	1	1	1	0	1	1	0	0	0
4	24.6	C	112	5'4"	68	24	1	1	1	1	1	1	1	1	0	0
5	33.7	H	145	5'8"	5	20	1	1	1	1	0	1	1	1	0	0
6	28.1	C	137	5'7"	11	20	1	1	1	1	0	1	1	1	0	0
7	38.5	C	175	5'11"	5	20	1	1	1	1	1	1	1	1	0	0
8	35.1	C	133	5'9"	89	20	1	1	1	1	1	1	1	1	0	0
9	42.9	C	132	5'6"	5	20	1	1	1	1	1	1	1	1	0	0
10	30.8	H	135	5'7"	5	20	1	1	1	1	0	1	1	1	0	0
11	36.5	C	135	5'3"	5	20	1	1	1	1	0	1	1	1	0	0
12	35.9	C	145	5'11"	71	20	1	1	1	1	0	1	1	1	0	0
13	31.8	C	220	5'3"	5	19	1	1	1	1	1	1	1	0	0	0
14	35.3	C	145	5'5"	29	20	1	1	1	1	0	1	1	1	0	0
	33.8		**144**	**Means**		**20.2**										
				Totals			**14**	**14**	**14**	**14**	**5**	**14**	**14**	**11**	**0**	**0**
				Conditions in patient histories			100%	100%	100%	100%	36%	100%	100%	79%	0%	0%

TABLE II - DETAILED PAIN AND SEXUAL FUNCTION PRE-THERAPY VS. POST-THERAPY SCORES (FSFI) FOR SUBJECTS IN STUDY I (N=14)

Patient number	Age (at last tx date)	Duration of Tx in days	Total hours of Tx	Desire (D)	Arousal (A)	Lubrication (L)	Orgasm (O)	Satisfaction (S)	Pain (P)	Total Score (TS) D,A,L,S,O,P	Desire (D)	Arousal (A)	Lubrication (L)	Orgasm (O)	Satisfaction (S)	Pain (P)	Total Score (TS) D,A,L,O,S,P	Desire (D) Difference	Arousal (A) Difference	Lubrication (L) Difference	Orgasm (O) Difference	Satisfaction (S) Difference	Pain (P) Difference	Total Score (TS) Difference
	Patient Information			***Pre-Treatment Survey***							***Post-Treatment Survey***							***Difference (Pre vs. Post-Tx)***						
1	27.8	5	20	1.2	2.4	3.0	4.4	3.2	3.6	17.8	2.4	3.0	3.3	4.4	4.0	5.6	22.7	1.2	0.6	0.3	0.0	0.8	2.0	4.9
2	33.1	5	20	1.8	1.5	1.5	1.2	1.6	1.2	8.8	4.2	5.4	6.0	5.6	6.0	6.0	33.2	2.4	3.9	4.5	4.4	4.4	4.8	24.4
3	39.7	51	20	2.4	5.1	0.0	6.0	1.2	0.0	14.7	3.0	4.2	5.7	6.0	4.0	6.0	28.9	0.6	-0.9	5.7	0.0	2.8	6.0	14.2
4	24.6	68	24	2.4	2.7	4.8	1.2	2.8	1.6	15.5	3.0	2.4	6.0	1.2	3.2	2.8	18.6	0.6	-0.3	1.2	0.0	0.4	1.2	3.1
5	33.7	5	20	3.0	3.6	4.8	5.6	3.2	1.2	21.4	3.6	4.8	5.7	6.0	5.2	4.4	29.7	0.6	1.2	0.9	0.4	2.0	3.2	8.3
6	28.1	11	20	2.4	2.7	3.9	2.8	4.4	1.6	17.8	3.6	4.5	4.8	4.4	6.0	6.0	29.3	1.2	1.8	0.9	1.6	1.6	4.4	11.5
7	38.5	5	20	1.2	1.2	2.7	1.2	2.8	2.0	11.1	1.2	1.5	3.6	1.2	2.0	6.0	15.5	0.0	0.3	0.9	0.0	-0.8	4.0	4.4
8	35.1	89	20	2.4	3.0	4.8	4.0	3.2	3.2	20.6	3.6	4.8	4.8	5.2	5.2	5.2	28.8	1.2	1.8	0.0	1.2	2.0	2.0	8.2
9	42.9	5	20	2.4	3.6	4.2	4.4	2.4	4.0	21.0	4.8	5.7	6.0	6.0	4.8	6.0	33.3	2.4	2.1	1.8	1.6	2.4	2.0	12.3
10	30.8	5	20	4.8	4.8	6.0	5.6	6.0	3.2	30.4	4.2	5.7	6.0	6.0	6.0	5.2	33.1	-0.6	0.9	0.0	0.4	0.0	2.0	2.7
11	36.5	5	20	2.4	0.0	0.0	0.0	1.6	0.0	4.0	3.0	3.0	3.6	1.6	4.0	4.8	20.0	0.6	3.0	3.6	1.6	2.4	4.8	16.0
12	35.9	71	20	4.2	4.2	6.0	6.0	6.0	6.0	32.4	3.6	4.5	6.0	6.0	6.0	6.0	32.1	-0.6	0.3	0.0	0.0	0.0	0.0	-0.3
13	31.8	5	19	2.4	1.8	3.9	2.0	2.0	2.4	14.5	2.4	3.9	5.4	2.4	4.0	6.0	24.1	0.0	2.1	1.5	0.4	2.0	3.6	9.6
14	35.3	29	20	2.4	3.6	3.6	2.8	3.2	2.4	18.0	3.6	4.2	5.4	3.2	2.8	4.0	23.2	1.2	0.6	1.8	0.4	-0.4	1.6	5.2
Means	**33.8**	**25.6**	**20.2**	**2.5**	**2.9**	**3.5**	**3.4**	**3.1**	**2.3**	**17.7**	**3.3**	**4.1**	**5.2**	**4.2**	**4.5**	**5.3**	**26.6**	**0.8**	**1.2**	**1.7**	**0.9**	**1.4**	**3.0**	**8.9**
Totals				**35**	**40**	**49**	**47**	**44**	**32**	**248**	**46**	**58**	**72**	**59**	**63**	**74**	**373**	**11**	**17**	**23**	**12**	**20**	**42**	**125**

subjects from Study II did not have sexual intercourse during the study (but had the 20 hours of physiotherapy) and hence were excluded from subsequent dyspareunia analysis (Tab. IV), and 2) three of the 32 patients in Study II received concurrent acupuncture during or after the treatment, (generally for infertility) (Tab. III).

Intervention: Detailed clinical records were kept of each patient's visit including symptomatic complaints, areas treat-

TABLE III - SOCIO-DEMOGRAPHIC AND GYNECOLOGIC HISTORIES OF SUBJECTS IN STUDY II

Patient number	Age (at last tx date)	Race	Weight	Height	Duration of therapy (in days)	# Hrs of TX	Surgical Dx of endometriosis	Dysmenorrhea	Pelvic pain	Abdominal pain	Dyspareunia	Coccyx pain	Treated for infertility	Treated for abdominopelvic pain	Infectious/Inflammatory Disease	Abdominopelvic trauma	Abdominopelvic surgery	Physician diagnosed adhesions	Pelvic Inflammatory Disease (PID)	Concurrent infertility/pain therapy
Patient Information							***Gynecologic History 1=yes 0=no***													
1	41.1	C	145	5'5"	5	20	1	1	1	1	1	0	1	1	1	1	1	1	0	0
2	31.8	C	220	5'3"	5	20	1	1	1	1	1	1	1	1	1	1	1	0	0	0
3	37.7	C	120	5'4"	5	20	1	1	1	1	0	0	1	1	1	1	1	1	0	1
4	36.2	C	170	5'6"	57	20	1	1	1	1	0	0	1	1	1	1	1	0	0	0
5	35.2	C	148	4'10"	5	20	1	1	1	1	1	1	1	1	1	1	1	1	0	0
6	39.0	C	106	5'3"	5	20	1	1	1	1	1	1	1	1	1	1	1	0	0	0
7	31.1	C	162	5'6"	5	20	1	1	1	1	1	0	1	1	1	0	1	1	0	0
8	37.5	C	161	5'8"	5	20	1	1	1	1	1	1	1	1	1	1	1	1	1	0
9	34.9	C	105	5'0"	9	20	1	1	1	1	1	0	1	0	1	0	1	1	0	1
10	42.3	C	113	5'6"	82	28	1	1	1	1	1	0	1	0	1	1	1	1	0	0
11	34.3	C	110	5'2"	5	20	1	0	1	1	1	1	1	1	1	1	1	1	0	0
12	35.0	C	148	5'9"	5	20	1	1	1	1	1	1	1	1	1	1	1	1	0	0
13	42.7	C	140	5'8"	5	20	1	1	1	1	0	0	1	1	1	1	1	0	0	0
14	34.3	C	180	5'5"	5	20	1	1	1	0	1	0	1	1	1	1	1	1	0	0
15	37.8	O	131	5'4"	162	20	1	0	1	1	1	0	1	1	1	0	1	1	0	0
16	41.9	C	150	5'9"	5	20	1	1	1	1	1	0	1	1	1	1	1	1	0	1
17	36.5	C	115	5'1"	5	20	1	0	1	1	0	1	1	1	1	1	1	1	1	0
18	40.8	C	140	5'8"	5	20	1	1	1	1	1	1	1	1	1	1	1	1	1	0
		Totals					**18**	**15**	**18**	**17**	**14**	**8**	**18**	**16**	**18**	**15**	**18**	**14**	**3**	**3**
	37.41	**Means**			24.8	20.7														
	Conditions in patient histories						**100%**	**83%**	**100%**	**94%**	**78%**	**44%**	**100%**	**89%**	**100%**	**83%**	**100%**	**78%**	**17%**	**17%**

ed, and treatment dates/duration/techniques performed according to the American Physical Therapy Association guidelines (17). Depending on the patient's geographic location and schedule, treatment frequency/duration ranged from two hours/week for approximately five months to intensive sessions of four hours/day for five days. Each therapy session ran 1-2 hours, minus 15 minutes for room preparation, therapist communication, and paperwork. Data showing the number of treatment hours and time periods from the start to end of treatment (duration) for each patient are shown in Tables I-IV.

The rationale for the manual physical therapy protocol used in these two studies was to create microfailure of the attachments of collagen cross-links (14) since previous medical studies (7-10) have shown that endometriosis is frequently accompanied by adhesions. The specific soft tissue physiotherapy (WT) was developed after rigorous testing and involves over 200 individual techniques designed to reduce and eliminate the adhesions by detaching adhesive cross-links that form wherever the body heals. The WT, which is currently pending a US patent application, consists of many individual therapy techniques detailed in a 600 page *Therapist Training Manual*, and impossible to detail in this report. One typical technique can be found in the Methodology section of an earlier study (13). In another example, the therapist uses the leg as a lever in one of the techniques to release adhesions from the uterine fundus (Fig. 1).

Initial physical therapy assessment and palpatory assessment of the patient's body was performed at specific areas of myofascial and visceral restrictions. Sites of collagenous cross-linking were identified as likely adhesion sites because of their restricted mobility. Individualization of treatment occurred as the therapist focused on these areas, engaging the restricted soft tissues until the tissues softened, indicating release of cross-links. Since we had noted signs of increased mobility at these precise sites

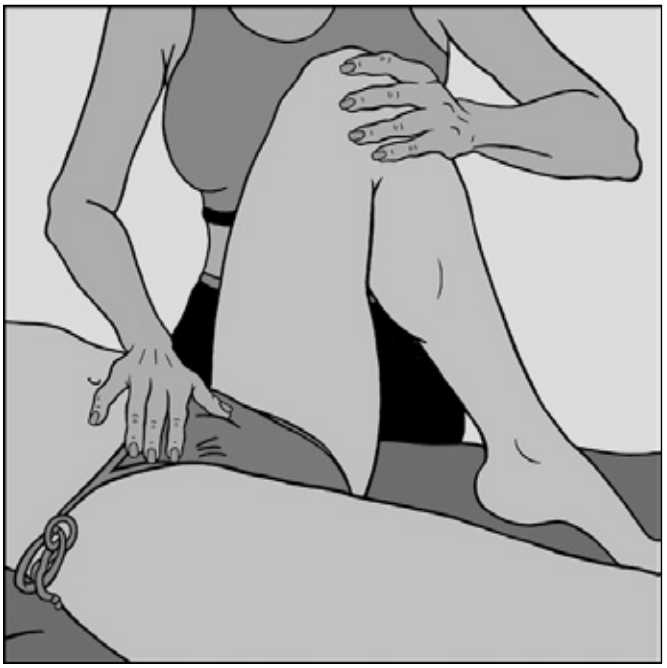

Fig. 1 - *Schematic representation of uterine fundus release using the leg as a lever. The therapist uses the leg as a long lever in one of the techniques to help release adhesive cross-links around the uterine fundus. The therapist may individualize treatment as she focuses on these areas, engaging the restrictions until the tissues soften.*

with repeated treatments (12,13,19-20), a series of therapy sessions appeared beneficial for participants in these two new studies. Of note, other previously observed objective changes included improved pelvic muscle tone and osseous alignment, decreased spasm, and increased range of motion.

Data Collection:

- *Study I:* The purpose of the current study was to determine the effectiveness of the WT in treating female sexual dysfunction with the focus on decreasing dyspareunia in women with endometriosis. The outcome measure (data set) was post-treatment test scores *vs.* pre-treatment test scores on the validated Female Sexual Function Index (FSFI) (18, 24) for the same subject. Thus, each subject acted as her own control. The FSFI, a 19-item questionnaire, was developed in 2000 as a brief, multidimensional self-report instrument for assessing six key domains (dimensions) of female sexual function, including desire, arousal, lubrication, orgasm, satisfaction, and pain. Although problems in one area may interact with those in another, the FSFI was designed to assess the relative severity of dys-

TABLE IV - DETAILED MENSTRUAL AND INTERCOURSE PAIN SCORES PRE-THERAPY VS. POST-THERAPY FOR SUBJECTS IN STUDY II (N=18)

Patient Number	Duration of Tx in days	Total hours of Tx	During ovulation (O)	Pre-menstrual (PM)	During period (P)	Total Menstrual Cycle Score (TS) O,PM,P	During intercourse (I)	During ovulation (O)	Pre-menstrual (PM)	During period (P)	Total Menstrual Cycle Score (TS) O,PM,P	During intercourse (I)	During ovulation (O)	Pre-menstrual (PM)	During period (P)	Total Menstrual Cycle Difference (TD) O,PM,P	During intercourse (I)
Therapy			***Pre-Treatment Pain Levels***					***Post-Treatment Pain Levels***					***Difference (Pre vs Post-Tx)***				
1	5	20	0.0	0.0	5.0	5.0	3.5	0.0	0.0	1.0	1.0	1.0	0.0	0.0	4.0	4.0	2.5
2	5	20	2.0	1.0	1.0	4.0	2.0	3.0	1.0	2.0	6.0	0.0	-1.0	0.0	-1.0	-2.0	2.0
3	5	20	0.5	0.0	2.0	2.5	1.0	0.0	0.0	1.0	1.0	1.0	0.5	0.0	1.0	1.5	0.0
4	57	20	1.0	0.0	2.0	3.0	0.0	2.0	1.0	1.0	4.0	0.0	-1.0	-1.0	1.0	-1.0	0.0
5	5	20	8.0	6.0	8.0	22.0	4.0	3.0	3.0	6.0	12.0	3.0	5.0	3.0	2.0	10.0	1.0
6	5	20	0.0	1.0	5.0	6.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	1.0	2.0	3.0	3.0
7	5	20	2.0	2.0	3.0	7.0	0.0	1.0	2.0	2.0	5.0	0.0	1.0	0.0	1.0	2.0	0.0
8	5	20	6.0	4.0	7.0	17.0	7.0	8.0	6.0	7.0	21.0	3.0	-2.0	-2.0	0.0	-4.0	4.0
9	9	20	4.0	3.0	4.0	11.0	ND	1.0	4.0	5.0	10.0	ND	3.0	-1.0	-1.0	1.0	ND
10	82	28	4.0	2.0	3.0	9.0	2.0	2.0	3.0	3.0	8.0	1.0	2.0	-1.0	0.0	1.0	1.0
11	5	20	0.0	1.0	7.0	8.0	6.5	0.0	0.0	3.0	3.0	1.0	0.0	1.0	4.0	5.0	5.5
12	5	20	3.0	2.5	6.0	11.5	4.0	1.5	2.0	3.0	6.5	0.0	1.5	0.5	3.0	5.0	4.0
13	5	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	-1.0	-1.0	0.0
14	5	20	1.0	2.0	2.0	5.0	1.0	2.0	2.0	2.0	6.0	0.0	-1.0	0.0	0.0	-1.0	1.0
15	162	20	2.0	2.0	4.0	8.0	1.0	2.0	2.0	2.0	6.0	1.0	0.0	0.0	2.0	2.0	0.0
16	5	20	5.5	4.0	6.0	15.5	1.5	3.5	2.5	5.0	11.0	1.0	2.0	1.5	1.0	4.5	0.5
17	5	20	2.0	2.0	2.0	6.0	2.0	1.0	1.0	2.0	4.0	0.0	1.0	1.0	0.0	2.0	2.0
18	5	20	4.0	2.0	6.0	12.0	ND	1.5	1.5	1.5	4.5	ND	2.5	0.5	4.5	7.5	ND
Total			45.0	34.5	73.0	152.5	38.5	31.5	31.0	50.5	113.0	12.0	13.5	3.5	22.5	39.5	26.5
Means	21.1	20.7	2.5	1.9	4.1	8.5	2.4	1.8	1.7	2.8	6.3	0.8	0.8	0.2	1.3	2.2	1.7

ND =no data; thus patients #9 and #18 are not included in the intercourse section of the study

function within each domain. The FSFI full scale score represents the total of the six individual domain scores (21). Since the FSFI asked each patient to rate her responses over the prior four weeks, the pre-test was administered at (or near) the start of their therapy sessions. The post-test was completed six weeks after the last treatment date, allowing time for the body to assimilate the post-therapy changes and undergo a full menstrual cycle. The post-test was mailed to the patients in a pre-paid envelope to arrive on the sixth week after therapy. Since all patients had taken the pre-test at the Clinic, none had access to their pre-treatment responses.

- *Study II:* Since the primary purpose of this prospective study was to determine the efficacy of the WT in reducing dyspareunia and dysmenorrhea in women with endometriosis, the outcome measure was post-test *vs.* pre-test scores on a specifically defined 1-10 point pain scale, enhanced by the specific written descriptions of the Mankoski Pain Scale (22). The zero level indicated no pain, levels from 1 to 4 indicated mild pain, levels from 5 to 8 indicated moderate to severe pain, and 9 to 10 indicated intolerable pain. Patients were asked to rate their best, worst, and average pain during three phases of the menstrual cycle (ovulation, pre-menstruation, menstruation) and during sexual intercourse. Since they were asked to base their responses on their pain level four weeks preceding the pre-test, the pre-test was administered at (or near) the onset of their treatment sessions. The post-test was completed six weeks after the last treatment session, which allowed time for the body to assimilate post-therapy changes and undergo a full menstrual cycle. As in Study I, the post-test was mailed to the patients in a pre-paid envelope to arrive on the sixth week after therapy. Because the patients had completed the pre-test at the clinic, none had access to their pre-treatment ratings.

Statistical analysis: Descriptive statistics were derived to examine and measure pain and function/dysfunction levels before and six weeks after therapy for each participant. The outcome of treatment sessions was reported by using the Wilcoxon signed-rank test (two-sided) to analyze the data in both studies (23). Paired post-test/pre-test was calculated for the values where high scores were good and pre-test minus post-test where high values were unfavorable. This is the standard method for analysis of ordinal qualitative data for changes. Since the questionnaires yielded ordinal (qualitative ranking) data, medians and quartiles were calculated instead of means and standard deviations.

RESULTS AND DISCUSSION

We observed a statistically significant improvement on each of the six different Female Sexual Function Index (FSFI) domains following site-specific manual physiotherapy in the retrospective study group. Pain (dyspareunia) (P<0.001), Desire (P=0.011), Arousal (P=0.0038), Lubrication (P=0.010), Orgasm (P=0.0039) and Satisfaction (P=0.0054) were the respective improvements observed. Hence, the Full Scale scores (P<0.001) and dyspareunia, which were the two primary outcomes measured in this

TABLE V - PAIRED POST-TEST/PRE-TEST DIFFERENCES: FSFI DOMAIN AND FULL SCALE SCORES FOR STUDY I (N=14)

Post-Pre	N	Median	Quartiles	*P*-Value
Desire	14	0.6	0.0, 1.2	.011
Arousal	14	1.05	0.3, 2.1	.0038
Lubrication	14	1.05	0.3, 1.8	.0010
Orgasm	14	0.4	0.0, 1.6	.0039
Satisfaction	14	1.8	0.0, 2.4	.0054
Pain*	14	2.6	2.0, 4.4	<.001
Full scale*	14	8.2	4.4, 12.3	<.001

*Primary outcome measures: *P* values are by Wilcoxon signed-rank test (two-sided); The FSFI individual domain score range is 0–6.0 (except for Desire=1.2–6.0). The Full scale score range is 2.0–36.0.

TABLE VI - PAIRED PRE-TEST/POST-TEST DIFFERENCES: MENSTRUAL AND INTERCOURSE PAIN SCALES FOR STUDY II (N=18)

Pre-post Pain	N	Median	Quartiles	*P*-Value
Ovulation	18	0.25	0, 2	.094
Pre-menstrual	18	0	0, 1	.56
During Period*	18	1	0, 2	.0083
Total Difference	18	2	-1, 4.5	.014
During Intercourse*	16	1	0, 2.75	.001

*Primary outcome measures: *P* values are by Wilcoxon signed-rank test (two-sided); The Pain Scale score range was 0 (no pain) to 10 (maximum pain).

retrospective analysis of dyspareunia and sexual function in women with endometriosis, depicted statistically significant improvement (Tab. V).

The FSFI compares well to other instruments for assessing female sexual dysfunction such as the Brief Index of Sexual Functioning for Women (BISF-W), the Changes in Sexual Functioning Questionnaire (CSFQ), Derogatis Interview for Sexual Functioning (DISF), and the Golombok Rust Inventory of Sexual Satisfaction (GRISS) (25). In addition, the FSFI is simple to administer and psychometrically sound in terms of reliability (test-retest and internal consistency) and construct validity. It was designed and has been validated for use in clinical trials and epidemiologic studies (21,25).

In Study I, all enrolled patients had an inclusion criterion of laparoscopy-diagnosed endometriosis; 78.57% (11 out of 14) had physician diagnosed adhesions whereas none of them had Pelvic Inflammatory Disorder (PID), and only 35.71% (5 out of 14) had a history of abdominopelvic injury (Tab. I). Cumulatively, the data is suggestive of the efficacy of the WT as a non-invasive, site-specific manual physiotherapy in resolution of dyspareunia. Moreover, the high incidence of adhesions in the enrolled subjects and correspondingly scarce or absent abdominopelvic injury or PID appears to indicate that the WT is decreasing pain by deformation or disintegration of the adhesions.

In Study II, a prospective analysis of the effect of the site-specific physiotherapy on dyspareunia and dysmenorrhea in women with endometriosis, intercourse, and period pain were the primary outcome measures using the Mankoski Pain Scale. There was a statistically significant change ($P<.014$) on Total Difference during the menstrual cycle (ovulation, pre-menstrual, menstruation), with the decrease in pain during the period (dysmenorrhea) ($P=0.0083$) accounting for much of the total difference. Of note, no statistically significant decrease in pain was observed either during ovulation ($P=.094$) or in the pre-menstrual phase ($P=.56$). As in Study I, the paired pre-test/post-test difference in dyspareunia was also statistically significant ($P=.001$) (Tab. VI). The Mankoski Pain Scale has been used in other studies for assessing pain and thus augurs well in our analyses.

Of the patients enrolled for Study II, 100% were being treated for infertility and 83% (15 out of 18) and 78% (14 out of 18) had dysmenorrhea and physician diagnosed adhesions, respectively (Tab. III). Given this, our findings are indicative of a role of adhesions in the etiology of dysmenorrhea and dyspareunia. Furthermore, our results show the potential benefit of using a non-surgical, non-pharmacologic alternative in treating these two conditions in endometriosis patients.

Dyspareunia is generally defined as vaginal pain before, during, or after sexual intercourse (2). Thus, one area worthy of further assessment is the relative efficacy of the therapy on the various types of dyspareunia, i.e. painful entry (penetration) *vs.* pain deep within the vagina during intercourse *vs.* post-intercourse pain. While it is often difficult to effectively perform adhesiolysis deep within the vagina, the focus of the WT is to address the attachments of the tiny but powerful collagenous cross-links that comprise adhesions, with the aim of detaching them from neighboring structures. While this theory is unproven, we believe it has merit since the WT achieved statistically significant improvement in dyspareunia in both studies examined in this report.

Dysmenorrhea is recognized as a "functional" symptom, caused by prostaglandin-induced myometrial ischemia. Dysmenorrhea may also involve spasmodic pain. The usual locale is the lower abdomen and pelvis, but the pain may spread to the lower back, hips, and thighs. Although constipation, diarrhea, and nausea are common symptoms, vomiting and fainting may occur in severe cases (2). Further research is needed to determine the efficacy of the WT on the severity and duration of these individual symptoms. Notwithstanding the above etiologies, we noted a statistically significant decrease in dysmenorrhea ($P=0.0083$) in the prospective Study II. Because the focus of the WT is to deform or detach the bonds of adhesive cross-links, we speculate that WT may detach collagenous cross-links which form at sites of endometrial implants, thus relieving pain for these women.

Endometriosis patients have trigger points in the pelvic floor, abdominal wall, gluteal and back muscles (27). Earlier work has shown that applying manual pressure to the aforementioned trigger points can cause resolution of referred pain and tenderness (26-27). It has also been envisaged that trigger points in the abdominal wall are indicative of dysmenorrhea (27-29); in lieu of this we can put our findings into perspective. Our site-specific manual therapy appears to deform or cause failure of adhesive crosslink bonds, which in turn decreases pain, and appears to improve visceral mobility.

A serious limitation of our current study was that both pilot studies were single arm, non-randomized, open-label studies with qualitative endpoints. Although blinding of treat-

ments was not possible, future randomized prospective crossover studies with much larger patient samples are needed to confirm the preliminary observation of efficacy. We also want to investigate other dependent variables in treating dyspareunia and dysmenorrhea in women with endometriosis. Determining the duration of improvement following treatment is also a critical parameter in order to rule out any placebo effect. One of the major drawbacks of the current treatment regimens for endometriosis is the frequency of recurrence of the disease. In the case of the WT, limited anecdotal evidence (data not shown) suggests significant long-lasting (at least one year) decreases in both dyspareunia and dysmenorrhea. Further research to confirm long-term durability of the effect is imperative.

While this is a preliminary report, the data trend across the retrospective and prospective studies (Studies I and II) appears to support the hypothesis that many cases of painful dyspareunia and dysmenorrhea commonly found in women with endometriosis may be reduced via the use of soft tissue mobilization, such as WT. Although future research is needed, this therapy, designed to increase function and reduce pain by restoring soft tissue, visceral and osseous mobility, is a non-pharmaceutical, non-surgical technique that has produced few adverse effects or complications. As such, it offers a promising alternative to physicians, clinicians, and others involved in women's health.

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