

Impact of core stability exercises vs. interferential therapy on pelvic floor muscle strength in women with pelvic organ prolapse

H.M. EMBABY¹, M.M. AHMED², G.I. MOHAMED³, M.H. KOURA⁴, H.H. SALEM⁵, M. ELBANNA⁶, A. ABOELENEEN³, A.F. EL-SAYED⁷, E.M. ELNAHAS¹

¹Department of Physical Therapy for Women's Health, Faculty of Physical Therapy, Cairo University, Egypt

²Department of Physical Therapy for Internal Medicine and Geriatrics, Faculty of Physical Therapy, May University, Cairo, Egypt

³Department of Basic Sciences, Faculty of Physical Therapy, Cairo University, Egypt

⁴Department of Physical Therapy for Pediatrics and its Surgery, Faculty of Physical Therapy, Benha University, Benha, Egypt

⁵Department of Obstetrics and Gynecology, Faculty of Medicine, Al-Azhar University, Al-Azhar, Egypt

⁶Department of Physical Therapy for Pediatrics, ⁷Department of Physical Therapy for Surgery, Faculty of Physical Therapy, Cairo University, Cairo, Egypt

Abstract. – OBJECTIVE: Pelvic organ prolapse (POP) is the descent of the pelvic organs into or through the vaginal walls. Females who have prolapse have symptoms that interfere with their daily lives, sexual function, and exercise. POP can have a negative effect on one's sexuality and body image. This study attempted to assess the significance of core stability exercises vs. interferential therapy on the power of the pelvic floor muscles in females with prolapsed pelvic organs.

PATIENTS AND METHODS: A randomized control trial was conducted on forty participants (aged between 40-60 years, diagnosed with mild degree pelvic organ prolapse participated in the research. Participants were randomly divided into two groups: (group A; n = 20) and (group B; n = 20). The participants were tested twice, before and after 12 weeks, during which group (A) performed core stability exercises while group (B) received interferential therapy. A modified Oxford grading scale and the perineometer were used to assess how the vaginal squeeze pressure changed.

RESULTS: The study's findings demonstrated that the modified Oxford grading scale values and vaginal squeeze pressure had a non-statistically significant difference (p -value ≥ 0.05) between both groups pre-treatment while had a statistically significant difference (p -value ≤ 0.05) between both groups post-treatment in favor of group A.

CONCLUSIONS: It was concluded that both training programs are efficient at strengthening the pelvic floor muscles, but the core stability exercises were more effective.

Key Words:

Pelvic organs prolapse, Core stability exercises, Interferential Therapy, Pelvic floor muscle strength.

Introduction

The American College of Obstetricians and Gynecologists defines pelvic organ prolapse (POP) as the descent of pelvic organs downward through the vaginal canal. POP involves the collapse of the anterior or posterior vaginal wall (urethrocele, cystocele) (enterocele, rectocele). Based on how severe it is, POP is split into five stages^{1,2}.

POP is a common and distressing condition. When the tissues that support the pelvic floor deteriorate, the viscera of the pelvis may sink. Prolapse seldom results in death, but it is commonly associated with a deterioration in the quality of life and can impair sexual, bowel, and bladder function³.

The prolapse symptoms are frequently confusing and challenging to correlate with the physical location or size of the "bulge". A "lump" or "heaviness" in the vagina is a common indication of prolapse in women, as are ongoing signs of an irritated bladder, difficulty voiding, incontinence, or defecatory issues. Prolapse and other symptoms like low back or pelvic pain may or may not be related³.

The pelvic floor, which consists of a collection of bones, muscles, and connective tissues, supports the uterus, rectum, vagina, bladder, and other pelvic organs. Women's pelvic floor muscles may be affected or weakened more frequently by pregnancy, delivery, and menopause, as well as by other factors such as inefficient urination, constipation, high-impact sports, and occupational activities. Genital prolapse, urine incontinence, fecal incontinence, sexual problems, and pelvic pain are among the so-called "pelvic floor dysfunctions" that may result from this⁴.

The lumbar, pelvic and hip joints are all located within the torso, which stretches from the chest to the pelvic floor. The pectoralis major, abdominal, gluteal and pelvic floor muscles are only a few of the major muscular groups found in the torso. On the other hand, the torso is shaped like a cylinder with the diaphragm at the top, the extensor muscles of the vertebrae and the gluteal muscles at the back, the abdominal muscles at the front and the pelvic girdle and pelvic floor muscles at the bottom. So, increasing or decreasing strength as well as stabilizing the spine and trunk is the main role of torso muscles⁵.

The pelvic floor has a big impact on the body's core. The back and deep abdominal muscles also contract simultaneously as the pelvic floor does. As a result, during physiological motions, these muscles support and stabilize the spine and internal organs. The pelvic organs are supported by strengthened core muscles, which also help to stop urine leaks. It can therefore lessen urinary incontinence. Therefore, improving core strength can lower UI⁶.

By inducing the pudendal nerve reflexes, pelvic floor stimulation is a cutting-edge, low-risk stimulation therapy that enhances the body's incontinence mechanism. Pelvic floor stimulation is a more affordable, non-surgical, drug-free therapeutic alternative. As medical professionals develop their ability to identify and treat the huge population of people who experience incontinence, pelvic floor stimulation has become more significant as a treatment option⁷.

To stimulate the pelvic floor, interferential current (IF) can be delivered with two or four electrodes. Its effective low frequency occurs in the pelvis region where the medium frequencies intersect. The main benefits of this treatment are its simplicity and ability to be applied externally without damaging the surface tissues. Patients tolerate the current's strength well, which has positive physiological effects⁸.

Patients and Methods

Patients

A random-controlled trial design was adopted to assess the impact of core stability exercises vs. interferential therapy on the power of the pelvic floor muscles in females with prolapsed pelvic organs. The study examined 40 women treated at the gynecology outpatient clinic at El-Sayed Galal Hospital for mild pelvic organ prolapse. All participants were informed that their data would be done privately and utilized only for research.

Inclusion Criteria

In the present study, we included participants suffering from a mild degree of POP. Their age ranged between 40-60 years and their BMI did not exceed 30 kg/m².

Exclusion Criteria

Exclusion Criteria were POP surgery, pelvic organ cancer, neurological disease, medication for psychological issues, untreated urinal infection, stages 0, 3, or 4 of the POP-Q, and inability to contract pelvic floor muscles were excluded from the study.

According to the Pelvic Organ Prolapse Quantification System (POP-Q)⁹, all patients showed mild pelvic organ prolapse. The phases of prolapse are as follows: Stages include Stage 0, where no prolapse is visible. Stage 1 occurs when the prolapsed most distal portion protrudes more than one centimeter above the hymen. Stage 2 occurs when it protrudes one centimeter or less proximally or distally to the plane of the hymen. Stage 3 occurs when the prolapsed most distal portion protrudes more than two centimeters less than the total vaginal length and Stage 4 is the occurrence of complete vaginal eversion.

Group (A) core stability exercises

Twenty patients were suffering from mild pelvic organ prolapse. They ranged in age from 40-60 years and their BMI does not exceed (30) kg/m². All performed core stability exercises 3 times per week for 12 sessions.

Group (B) interferential therapy

Twenty patients were suffering from mild pelvic organ prolapse. They ranged in age from 40-60 years and their BMI does not exceed (30) kg/m². All received Interferential therapy, 3 times per week for 12 sessions.

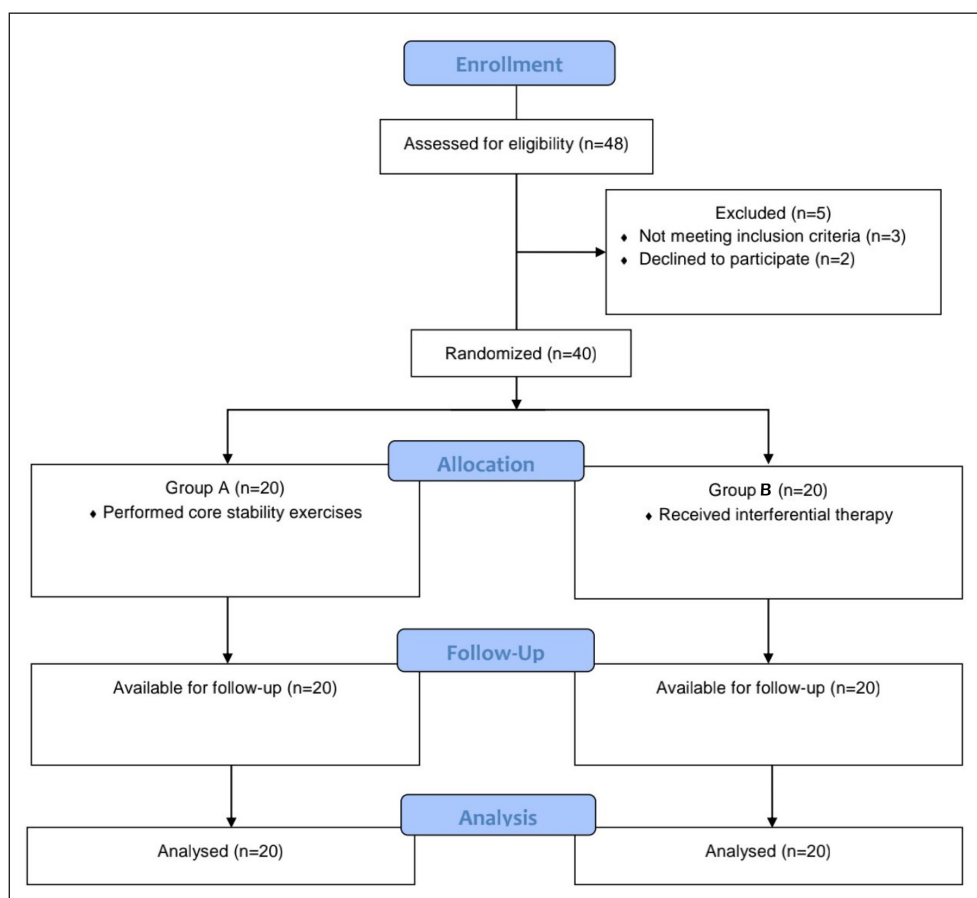


Figure 1. Flow Chart.

Randomization

An independent person had chosen numbers from sealed envelopes which were created by using a random number generator to place participants in group (A) (Core stability exercises) ($n = 20$) or group (B) (Interferential therapy) ($n = 20$). The randomization was restricted to permuted blocks to guarantee that there were the same number of participants in each group. At the end of the randomization, there was no dropout (Figure 1).

Outcome measures

The perineometer and the modified Oxford grading scale were used to evaluate changes in intervaginal pressure. Before and after treatment, the result measurements were recorded (after 12 weeks).

Methods

Evaluative methods

Personal data: Basic information for each patient was taken, including (name, age, BMI, and parity).

Measurement of pelvic floor muscle strength: Intervaginal squeeze pressure was measured before and after the end of treatment through the modified Oxford grading scale and perineometer.

Modified Oxford grading scale: Placing two fingers in the distal portion of the vagina and asking the patient to contract. The strength of the pelvic floor muscles was assessed by lifting inward and squeezing around the two fingers together. On a scale of 0 to 5, 0 indicates no contraction, 1 indicates flickering contraction, 2 indicates weak contraction, and 3 indicates moderate contraction, 4 means good (with lift), and 5 means strong.

Intravaginal Perineometer: Each participant was told to lie down with their hips slightly abducted in the “crook lying” position. The main unit’s wiring was connected to the vaginal probe, and the perineometer’s battery was checked. The vaginal probe was covered with a condom lubricated with a sterile lubricant and inflated with air from a T connection. It was then introduced into the vagina after cleaning the vulva with an anti-septic solution.

Table I. Patients' demographic data.

	Group (A) (n = 20) Mean ± SD	Group (B) (n = 20) Mean ± SD	t-value	p-value
Age (yrs)	47.35 ± 4.87	48.70 ± 5.12	0.8544	0.3983 ^{NS}
BMI (kg/m ²)	27.73 ± 1.21	27.89 ± 1.52	0.3596	0.7211 ^{NS}
Parity	2.25 ± 0.79	2.30 ± 0.66	0.2182	0.828 ^{NS}

*p-values based on ANOVA test.

Table II. Statistical analysis for Modified oxford grading scale values.

		Group (A) (n = 20)	Group (B) (n = 20)	t-value	p-value
Modified Oxford grading scale	Pre-treatment	2.55 ± 0.51	2.30 ± 0.18	1.17	0.24 ^{NS}
	Post-treatment	4.40 ± 0.50	3.10 ± 0.72	6.63	0.0001 ^{HS}
	t-value	22.58	5.811		
	p-value	0.0001 ^{HS}	0.0001 ^{HS}		

NS: Non-significant. HS: Highly significant.

The woman was then instructed to tighten the muscles in her pelvic floor, tuck her hips in, and squeeze the vaginal probe. The evaluating value was computed using the mean value of five contractions of the pelvic floor muscles. The vaginal probe was taken out of the vagina and the condom was taken off after recording the evaluation value. The device was then placed in its bag until the next application, while its probe was returned to the autoclave.

Treatment methods

All subjects were directed in brief and precisely describing the type of treatment and its result to appreciate their cooperation throughout the study.

Group (A)

All the patients in this group performed core stability exercises 3 times per week for 12 sessions.

Core stability exercises

1) Abdominal exercise (Transversus abdominis): The patient was in a supine lying position on a plinth with the therapist's inner hand under the lumbar region and outer hand above the abdomen at the waistline level to feel the contracted muscle. The subject was asked to contract abdominal muscles, press the lumbar region down, hold for 5 seconds, and then relax.

2) Back exercise (Multifidus): The patient was in a side-lying position with the therapist's hand next to the lumbar spine to feel the contracted muscle. The subject was asked to imagine if there's an elastic cord running between the two pelvic bones in the back and think about tightening the cord between the bones to contract the multifidus muscle and hold for 5 seconds.

3) Pelvic floor muscles exercises: The patient was in a croock lying position. The therapist's hands were around the buttock and fingers were

Table III. Statistical analysis for vaginal squeeze pressure values.

		Group (A) (n = 20)	Group (B) (n = 20)	t-value	p-value
Vaginal squeeze pressure (CmH ₂ O)	Pre-treatment	7.90 ± 1.25	7.20 ± 1.70	1.48	0.14 ^{NS}
	Post-treatment	10.40 ± 1.96	8.20 ± 1.99	3.52	0.001 ^{HS}
	t-value	10.16	5.62		
	p-value	0.0001 ^{HS}	0.0001 ^{HS}		

NS: Non-significant. HS: Highly significant.

spread around the anal sphincter to feel the contracted muscle while looking at the lower abdomen to detect the contracted muscle of the vagina. The subject was asked to squeeze the vaginal orifice and the anal sphincter and repeat for a maximum of 10 times to increase the endurance of the pelvic floor muscles. Then the subject was asked to contract as above but with maximal strength for 10 seconds to increase their pelvic floor muscles strength. The exercise was done without contracting the buttock or the abdomen.

4) Breathing exercise (Diaphragm): The patient was in a crook lying position. The therapist's hands were on the anterior costal margins, and the patient was asked to take a deep breath in and then expire with a sigh pushing the therapist's hands outward. The exercise wouldn't be done for more than 3 times in one minute to avoid hyperventilation.

All the exercises were repeated 10 times per session, 3 sessions per week for 12 sessions.

Group (B)

All the patients in this group received interferential therapy 3 times per week for 12 sessions.

Interferential Therapy

The patient was in a crook lying position. The quadripolar technique was used. Two electrodes were placed on the abdomen above the inguinal ligament and the other two on the thigh's inner side below the inferior border of the femoral triangle. The frequency of the interferential was 10-100 Hz and the treatment duration was 15 minutes.

Statistical Analysis

Comparison of the mean: paired *t*-test of intravaginal pressure in each group before and after the treatment, unpaired *t*-test for comparison of means between groups before and after of the treatment. In the data analysis, the statistical relevance level was defined as p -value ≤ 0.05 .

Results

The descriptive statistics of the cases are given in Table I. The evaluation of the modified Oxford grading scale values showed a non-statistically significant difference (p -value ≥ 0.05) between both groups pre-treatment while showing a statistically significant difference (p -value ≤ 0.05) between both groups post-treatment in favor of group (A) as given in Table II. The evaluation

of the vaginal squeeze pressure values showed a non-statistically significant difference (p -value ≥ 0.05) between both groups pre-treatment while showing a statistically significant difference (p -value ≤ 0.05) between both groups post-treatment in favor of group (A), as shown in Table III.

Discussion

POP is a common condition that can be recognized by the presenting section protruding and appearing to the naked eye, along with urine or bowel issues. When protrusion, bowel, urinary, or sexual problems appear, POP management is carried out; however, asymptomatic POP typically doesn't require therapy. Depending on their preferences, patients with symptoms are managed either conservatively or surgically. The conservative approach is preferable for patients at high risk for problems and recurrence following surgical therapy or who refuse surgical interventions. Treatment options include pessaries, pelvic floor exercises, and hormone therapy¹⁰.

A meta-analysis¹¹ of 2,300 patients' pelvic floor muscle training revealed that muscle-strengthening exercises significantly reduced prolapse stage and symptoms.

The research aimed to compare the results of core stability exercises and interferential therapy on the strength of the pelvic floor muscles in patients with mild pelvic organ prolapse. After treatment, the difference between the groups' modified Oxford grading scale scores and vaginal squeeze pressure was statistically significant (p -value ≤ 0.05), favoring group (A). Although the strength of the pelvic floor muscles can be improved with any training regimen, the core stability exercises were more successful.

Exercise training continuously taxed the muscles' metabolic capacities, which led to adaptive muscle modifications that could support the study findings. Muscular fiber growth and increased motor unit activation lead to an increase in muscle strength. Additionally, muscular strength and endurance increased due to the exercises' extensive effects on the metabolic requirement associated with creating a muscle force. Exercise training also improves the slow-twitch (ST) and fast-twitch (FT) muscle fibers, increasing the FT fiber content that increases muscle strength¹².

According to a different study¹³, co-contraction workouts for the transverse abdominis and pelvic floor are crucial for any pelvic floor disorder. Ad-

ditionally, it has been demonstrated that the abdominal and pelvic floor muscles act in harmony. This is a typical reaction to a contraction of the pelvic floor muscles, which is why it is advised that these individuals perform activities to increase their core stability¹⁴.

Additionally, the results of this investigation are similar with other research¹⁵ that shows a core training program increases posture, balance, tension, and strength of the deep core muscles and PFMs. It also improves the back, abdomen, and hip muscles' stability and strength. Between 8 and 12 weeks, it is advised to perform proper core muscle training on non-sequential days.

Abdominal muscular contractions have been shown to activate PFMs. The evidence suggests that TA active contraction is related to the co-activation of PFMs detected in MRI, US, and electromyography investigations¹⁶.

The findings of this study are in line with those of a previous study¹⁷, which suggested that core exercises, such as postural and hypopressive maneuvers, diaphragmatic breathing, and neuro-facilitation reflex techniques, could improve abdominal and perineal muscle tone while normalizing the tension of the musculoaponeurotic structures to prevent prolapse and UI. The PF can also be protected from excessive intra-abdominal pressure by executing practical and synergistic abdominal contraction and vigorous expiration. Another study¹⁸ found that an 8-week program of community-driven nutrition and exercise concentrated on the pelvic floor and core stability, healthy nutrition, and breastfeeding counseling significantly reduced the incidence of pelvic floor dysfunction, urinary, and colorectal-anal distress symptoms as improved breastfeeding and healthy nutrition. The fact that abdominal muscular activation is a typical response to pelvic floor training in persons without symptoms of pelvic floor muscle dysfunction offers preliminary proof that some abdominal activities stimulate the pelvic floor¹⁹.

By starting the necessary pudendal nerve reflexes, pelvic floor stimulation supports regular bodily functions. When slow-twitch pelvic floor muscles are stimulated, a reflex inhibition of the detrusor occurs after contraction, which encourages stronger contraction. Additionally, this reflex stimulus induces extensive pelvic floor muscle contractions, which might tone them. With IF therapy, the pelvic floor muscles may be stimulated more deeply, with less discomfort for the individual, and with the slow and fast twitch muscles being activated utilizing the rhythmic sweep frequency⁸.

Additionally, a prior study that revealed IF stimulation to be useful in improving the POP stage, Pelvic floor muscle strength/endurance, and quality of life in women with POP supports the findings of this one. Women with POP may benefit from current stimulation in addition to alternative therapy²⁰. The study's findings supported our theory that IF therapy may enhance the functionality of the pelvic floor musculature.

Conclusions

It could be concluded that core stability exercises are more effective than interferential therapy in improving the pelvic floor muscle strength in cases of mild pelvic organ prolapse.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Authors' Contributions

All authors conceived and designed the study. Heba Embaby, Engy Elnahas, Mai Magdy Ahmed and Ghada Ismail Mohamed participated in manuscript writing, data collection and data analysis. Manal Helmy Koura, Hossam El-Din H. Salem, Mohamed Elbanna, Ahmed Aboeleneen and Asmaa Fawzy El-Sayed critically reviewed and edited the manuscript. All authors read and approved the final manuscript.

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Ethics Approval

The study was approved by the Physical Therapy Faculty's Ethics and Research Committee (P.T. REC/012/004054).

Informed Consent

Written informed consent was obtained from each patient.

ORCID ID

H.M. Embaby: 0000-0002-7012-5250.
M.M. Ahmed: 0000-0001-8185-2755.
G.I. Mohamed: 0000-0002-9195-5114.
M.H. Koura: 0000-0003-0217-5798.
H.H. Salem: 0000-0002-3196-756X.
M. Elbanna: 0000-0001-6538-2300.
A. Aboeleneen: 0000-0002-7947-4123.
A.F. El-Sayed: 0000-0003-2281-3697.
E.M. Elnahas: 0000-0002-0828-1770.

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