








DOI 10.22363/2313-0245-2023-27-1-39-45
EDN: SFNUINREVIEW
ОБЗОРНАЯ СТАТЬЯ

Pelvic floor muscle training as a method of prevention and treatment of pelvic floor dysfunction and genital prolapse

Irina A. Samsonova ✉, Rustam F. Gaifulin , Liliya R. Toktar ,
Mekan R. Orazov , Zarina N. Kamarova ,
Kseniya I. Li , Veronika E. Pak 

Russian People's Friendship University, Moscow, Russian Federation
✉ iris.samsonova@gmail.com

Abstract. *Relevance.* Pelvic floor dysfunction and pelvic organ prolapse are a significant problem today — even the initial manifestations of pelvic floor dysfunction can lead to reduced quality of sexual life, decreased activity, and then to social isolation and decreased self-esteem of women. Due to the growth of general life expectancy, the incidence rate is also increasing. One of the most popular conservative treatments for pelvic floor dysfunction is pelvic floor muscle training. *The aim* of this literature review is to consolidate the scattered information about the effectiveness of pelvic floor muscle training as a prevention and treatment of pelvic floor dysfunction. *Materials and Methods.* In writing the review, publications from the PubMed and Google Scholar databases from January 2019 were analyzed and systematized. *Results and Discussion.* Pelvic floor muscle training is one of the most prospective methods of non-invasive treatment for pelvic organ prolapse. It can take many forms and is represented by a range of different techniques: from the simple short-term muscle contraction and Kegel exercises to more complex and high-tech methods using electromyostimulation and biofeedback. However, timing of introduction and method for pelvic floor muscle training must be carefully considered in order to gain the maximum result. *Conclusion.* Based on the study, it can be concluded that the introduction of pelvic floor muscle training as part of prenatal care and in the antenatal period is the most appropriate way to prevent pelvic floor failure and genital prolapse. Further research is required to confirm the hypothesis.

Key words: pelvic floor muscle training, biofeedback, postpartum urinary incontinence, PFMT, pelvic organ prolapse

Funding. The authors received no financial support.

Author contributions. Samsonova I.A. — collection of literature data, analysis and generalization of data, writing of the text and design of the manuscript; Toktar L.R. — study design development, processing, editing of the manuscript; Orazov M.R. — study design development, processing of the manuscript; Kamarova Z.N. — collecting literature data, analyzing and summarizing data, writing of the manuscript; Pak V.E. — collecting literature data, analyzing and summarizing data, writing of the manuscript; Li K.I. — collecting literature data, analyzing and summarizing data, writing of the manuscript; Gaifulin R.F. — collecting

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literature data, analyzing and summarizing data, writing of the manuscript. All authors have made significant contributions to the development concepts, research and manuscript preparation, read and approved final version before publication.

Conflict of interest statement. The authors declare that there is no conflict of interest.

Ethics approval — not applicable.

Acknowledgements — not applicable.

Consent for publication — not applicable.

Received 08.12.2022. Accepted 16.01.2023.

For citation: Samsonova IA, Gaifulin RF, Toktar LR, Orazov MR, Kamarova ZN, Li KI, Pak VE. Pelvic floor muscle training as a method of prevention and treatment of pelvic floor dysfunction and genital prolapse. *RUDN Journal of Medicine*. 2023;27(1):39–45. doi: 10.22363/2313-0245-2023-27-1-39-45

Introduction

Pelvic floor dysfunction (PFD) and pelvic organ prolapse (POP) is a significant problem of world healthcare: with the increase in life expectancy of the world's population, the incidence is also rising [1, 2]. The effect of this disease on women cannot be overestimated, the manifestation PFD can lead to a decrease in the quality of sexual life, physical activity, and then lead to social isolation and a low self-esteem.

Due to the variety of manifestations and the lack of a unified classification system, epidemiological data on POP vary significantly — from 3 % to 50 % of women have pelvic organ prolapse [1]. And due to the stretched over the years pathogenesis of pelvic floor failure and genital prolapse, a woman's initial request for medical care occurs many years after the onset of the disease.

Over the past decades, methods of treating pelvic floor dysfunction have been actively developed [2]. And although surgery is still considered the «golden standard», the high frequency of recurrence after surgical treatment leads to an increasing interest in conservative methods both as part of the prevention of severe forms of pelvic floor dysfunction and the treatment of initial forms of PFD. One of the most promising is pelvic floor muscle training (PFMT). Aim of this review is to compose and analyze the conflicting

data on the effectiveness of PFMT as a prevention and treatment of pelvic floor dysfunction.

Materials and methods

This review is based on the analysis and systematization of publications, describing the results of randomized trials and literature reviews from the PubMed and Google Scholar databases since January 2019. Search words included «pelvic floor muscle training», «biofeedback», «postpartum urinary incontinence», «pfmt pelvic organ prolapse». 11 clinical trials, 3 meta-analyses and 6 systematic reviews were identified.

Results and discussion

Pelvic floor muscle training is currently one of the most common and promising methods of conservative correction of PFD: skeletal muscles that are part of the pelvic floor can be «trained» and «retrained» to preserve the function of the pelvic floor [3]. PFMT can take many forms and is represented by a range of different techniques: from the simple short-term muscle contraction and Kegel exercises to more complex and high-tech methods using electromyostimulation and biofeedback (BF). The goal of all these interventions is the same: to increase the strength of contractions, endurance and

the ability to relax the pelvic floor muscles (PFM) and thereby minimize symptoms of PFD [3].

PFMT: control and learning process

A wide range of exercises and devices for «imbuilding» has disadvantages rather than advantages: the availability of this method is associated with higher risk of violation of exercise technique and may aggravate the symptoms and postpone seeking medical help.

Improper technique can lead not only to the lack of the desired effect, but also to complications and adverse effects, including myalgia, pain during muscle contraction, as well as worsen the symptoms of PFD and cause progression of urinary incontinence and genital prolapse [4]. The inability to perform exercises independently can also lead to frustration and low compliance [3].

All studies of therapeutic techniques for PF indicate the need for careful questioning and detailed counseling of women to improve the quality of PFMT [3, 5, 6]. Quality control of the exercises performed can be carried out in various ways: palpatory and visual control by a medical professional is most often used, control via the transperineal ultrasound is also possible [3, 7, 8].

Feasibility and economic efficiency of supervised PFMT is still a controversial issue. According to Fitz F.F. et al. (2020) in the study group, the chance of curing stress urinary incontinence was 5 times higher (OR 5.4; 95 % CI 1.71–17.10; $p=0.004$) than in the control group [9]. However, when subjectively assessing symptoms and overall quality of life, the analysis in accordance with the initially prescribed treatment did not yield any statistically significant results (OR 2.26; 95 % CI 0.84–6.11; $p=0.166$) [9]. PROPEL study data also demonstrate the effectiveness of PFMT under the supervision of a medical professional, but there is also a realistic view on the problem: the lack of trained personnel, financial support and time to implement such a course within the framework of public health make it impossible today to routinely perform PFMT as a preventive measure for all women of reproductive age [10]. A possible alternative can be considered training with step-by-step audio guidance: according to Wang

et al. (2020) in the group with audio-guided PFMT, fewer participants suffered from pelvic floor muscle dysfunction compared to the control group (12.5 % and 34.0 %, $p=0.012$; 4.2 % and 18.0 %, $p=0.030$). In addition, a large amplitude was observed during phase, tonic and prolonged contractions of the pelvic floor muscles in the audio-guided group compared to the control group (41.1 vs. 35.8, $p=0.001$; 32.0 vs. 26.9, $p\approx 0.001$; 28.6 vs. 24.7, $p=0.003$) [11].

Biofeedback therapy

A special place in a range of PFMT techniques is occupied by training the pelvic floor muscles using biofeedback (BF) [5]. The vaginal sensor detects the activity of the pelvic floor muscles during training and visualizes muscle activity, which allows you to more accurately assess the correctness, strength and duration of the contraction. According to some studies, this facilitates PFMT training and increases adherence to therapy [5, 6]. According to the study by Sam et al. (2022) BF significantly helped in relieving urological symptoms of PFD: they noted an improvement in uroflowmetry, EMG during urination and a decrease in the UDI-6 questionnaire score in the PFMT group in combination with BF compared to the control group ($p=0.026$, $p=0.009$, $p=0.034$, respectively) [12]. In a prospective study by Liu et al. (2020) the benefit of using BF is noted not only for urological symptoms of PFD, but also for vaginal wall descent — a statistically significant change in the position of the Ba point according to POP-Q ($p<0.01$) was noted [13]. On the other hand, the OPAL RCT (2020) did not reveal a statistically significant advantage of combining PFMT and BF for women with preserved pelvic floor muscle (PFM) contractility [14]. The same results were shown by the study of Hagen et al. (2020) [5]. Thus, the routine use of BF is not effective either therapeutically or economically, but it is to be used if indicated: for example, among women with low contractile activity of PFM, and not injury to pelvic floor muscles and fascia [5, 15]. Comprehensive data on the effect of biofeedback therapy on urinary incontinence symptoms are shown in Table.

Table

Efficacy of biofeedback therapy

Study (year)	Specifications of biofeedback therapy	Duration	Number of participants	Outcomes
Sam et al. (2022)	EMG control, lithotomic position, specialist-guided	12 weeks	Research group	UDI-6 (median)
			n=34	9
			Control group n=34	12 (p=0.023)
Liu et al. (2020)	EMG control, lithotomic, seated and upright position, partially specialist-guided (part of the exercise regimen performed at home)	12 weeks	Research group n=18 Control group n=16	Pad-test 1 h. (before-after) 16,0–1,1 gm P<0,01 4,7–1,1 P<0,05
OPAL RCT (2020)	EMG control, specialist-guided at entry level.	16 weeks	Research group n=230 Control group n=238	ICIQ-SF at 24 months 8.2 (SD 5.1) 8.5 (SD 4.9) MD -0.09 (95 % CI -0.92–0.75)
Hagen et al. (2020)	EMG control, partially specialist-guided (part of the exercise regimen performed at home)	Not specified	Research group n=221 Control group n=223	ICIQ-SF at 12 months 9.1 (SD 4.9) 8.7 (SD 5.0) MD 0.57 (95 % CI -0.17–1.31)

Notes: UDI-6 – urinary distress inventory, short form; Pad-test – quantitative method of urine loss evaluation; ICIQ-SF – international conference of incontinence questionnaire-short form; gm – gram; SD – standard deviation; MD – mean difference; CI – confidence interval

PFMT for post-operative recurrence prevention

Recurrence prevention after surgical correction of prolapse also remains an urgent problem. A combination of Kegel exercises and surgical treatment is one of the options, but to date, convincing data on the effectiveness has not been obtained [16]. According to Nyhus et al. (2020) the difference between the group with preoperative PFMT and the control group was statistically insignificant for all estimated outcomes: a feeling of bulging in the perineum, the strength of contraction of PFM, descent of another compartment de novo [17]. According to the study by Duarte et al. (2020) pelvic floor muscle training after surgical treatment also did not improve the outcomes: a 7-week course of PFMT did not affect the quality of life, symptoms of prolapse and colorectal manifestations of POP after surgery [18].

PFMT and childbirth

A well-known trigger for PFD is vaginal delivery, the traumatism and duration of which, as well as the weight of the child at birth, are additional confounding factors [3, 19–21]. The intact pelvic floor, the ability to

accumulate functional reserve and to develop optimal motor patterns for the pelvic floor muscles make PFMT as a part of prenatal preparation, as well as among pregnant women, the most preferable [3]. According to the Cochrane meta-analysis, PFM training reduced the likelihood of stress urinary incontinence by 62 % in a pregnant woman and within 3 months after delivery (OR 0.38, 95 % CI 0.20–0.72), however, in presence of symptoms of stress urinary incontinence, exercise did not give a statistically significant reduction in the severity of incontinence neither later in pregnancy (HR 0.70, 95 % CI 0.44–1.13), nor after childbirth (3, 6 months, 10 years) (HR 0.94, 95 % CI 0.70) [4]. The positive effect of antenatal PFMT on the symptoms of stress urinary incontinence was noted by Szumilewicz et al. (2020): at the control examination 2 months after delivery, 22 % in the study group and 35 % in the control group complained (P=0.03), and 1 year after delivery — 14 % and 28 %, respectively (p=0.005) [22]. According to Pires et al. (2020) in the study group, the quality of life was statistically significantly improved (p=0.002), as well as the indicators of urine loss (Pad test) (P=0.021) and the Oxford scale (p<0.001) [23].

Data on the benefits of postpartum PFMT vary. On the one hand, a number of researchers (Sigurdardottir et al. (2020), Brennan et al. (2021)) note a decrease in the severity of symptoms of pelvic floor dysfunction due to pelvic floor muscle training [20, 24]. On the other hand, according to Wu et al. (2021), the differences between the indicators of the control group and the study are statistically insignificant: the indicators of sexual dysfunction according to the PISQ-12 questionnaire 6 months after delivery were 36.3 ± 5.2 in the control group and 34.7 ± 8 in the group performing PFMT ($p=0.900$), the severity of dysuria according to the UDI-6 questionnaire was 1.3 ± 1.4 and 0.9 ± 1.7 , respectively ($p=0.13$) [25]. The effect of pelvic floor muscle training after childbirth on the symptoms of prolapse requires further study, but according to Takaoka et al. (2020) PFMT allows to reduce the area of the levator hiatus $\approx 4.03\%$ more effectively than in the control group ($95\% \approx 1.00-7.52$, $p=0.009$) [8].

Conclusion

According to the data obtained in this review, the key factors influencing the effectiveness of PFMT as a method of prevention and treatment are the time of the training introduction, supervision and thorough counseling. The formation of the necessary functional reserve of unchanged PF in nulliparous women without symptoms of pelvic floor dysfunction gives the most lasting results and increases women's compliance to training in the future. PFMT with the use of BF did not increase the effectiveness of exercise and, therefore, is not the method of choice for the general population. Performing Kegel exercises as preoperative preparation and postoperative rehabilitation also did not significantly reduce the frequency of recurrence of PFD after surgical treatment.

Thus, the most promising from the point of clinical and economic efficiency are prenatal counseling for all women on PFD and routine introduction of standard Kegel exercises as part of preparation for pregnancy and childbirth, as well as immediately after the postpartum period. The probable reason for the disparity of data on the effectiveness of PFMT is the lack of a differential

approach to training, depending on the presence of traumatic damage to the pelvic floor muscles, including avulsion from tendon centers and pelvis. Further studies of higher quality are required to confirm the hypothesis.

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Тренировка мышц тазового дна как метод профилактики и лечения несостоятельности тазового дна и генитального пролапса

И.А. Самсонова  , Р.Ф. Гайфулин , Л.Р. Токтар ,
М.Р. Оразов , З.Н. Камарова , К.И. Ли , В.Е. Пак 

Российский университет дружбы народов, г. Москва, Российская Федерация
 iris.samsonova@gmail.com

Аннотация. *Актуальность.* Несостоятельность тазового дна и пролапс тазовых органов на сегодняшний день являются существенной проблемой — даже начальные проявления несостоятельности тазового дна могут привести к снижению качества сексуальной жизни, снижению активности, а затем к социальной изоляции и снижению самооценки женщины. В связи с ростом общей продолжительности жизни, растет и заболеваемость. Одним из наиболее популярных методов консервативного лечения несостоятельности тазового дна является тренировка мышц тазового дна. Целью данного обзора является консолидация разрозненных сведений об эффективности тренировки мышц тазового дна в качестве профилактики и лечения дисфункции тазового дна. *Материалы и методы.* При написании обзора были проанализированы и систематизированы публикации из баз данных PubMed и Google Scholar с января 2019 года. *Результаты и обсуждение.* Тренировка мышц тазового дна является одним из наиболее перспективных методов неинвазивного лечения пролапса тазовых органов. Она может принимать различные формы и представлена целым рядом различных техник: от простых

кратковременных сокращений мышц и упражнений Кегеля до более сложных и высокотехнологичных методов с использованием электромиостимуляции и биологической обратной связи. Тем не менее, время введения и метод тренировки мышц тазового дна должны быть тщательно продуманы, чтобы получить максимальный результат. *Выводы.* На основании проведенного исследования можно сделать вывод, что введение тренировки мышц тазового дна в рамках дородовой помощи и в антенатальном периоде является наиболее целесообразным способом профилактики несостоятельности тазового дна и генитального пролапса. Для подтверждения гипотезы необходимы дальнейшие исследования.

Ключевые слова: тренировка мышц тазового дна, биологическая обратная связь, послеродовое недержание мочи, ТМТД, пролапс тазовых органов

Информация о финансировании. Авторы заявляют об отсутствии внешнего финансирования.

Вклад авторов. Самсонова И.А. — сбор данных литературы, анализ и обобщение данных, написание текста и оформление рукописи; Токтар Л.Р. — разработка дизайна и структуры исследования, переработка, редактирование рукописи; Оразов М.Р. — разработка дизайна и структуры исследования, переработка рукописи; Камарова З.Н. — сбор данных литературы, анализ и обобщение данных, написание текста; Пак В.Е. — сбор данных литературы, анализ и обобщение данных, написание текста; Ли К.И. — сбор данных литературы, анализ и обобщение данных, написание текста; Гайфулин Р.Ф. — сбор данных литературы, анализ и обобщение данных, написание текста. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Информация о конфликте интересов. Авторы заявляют об отсутствии конфликта интересов.

Этическое утверждение — неприменимо.

Благодарности — неприменимо.

Информированное согласие на публикацию — неприменимо.

Поступила 08.12.2022. Принята 16.01.2023.

Для цитирования: Samsonova I.A., Gaifulin R.F., Toktar L.R., Orazov M.R., Kamarova Z.N., Li K.I., Pak V.E. Pelvic floor muscle training as a method of prevention and treatment of pelvic floor dysfunction and genital prolapse // Вестник Российского университета дружбы народов. Серия: Медицина. 2023. Т. 27. № 1. С. 39–45. doi: 10.22363/2313-0245-2023-27-1-39-45

Corresponding author: Irina A. Samsonova — postgraduate student of the Department of Obstetrics and Gynecology with a Perinatology Course, Medical Institute of Peoples' Friendship University of Russia, 117198, ul. Miklukho-Maklaya, 8, Moscow, Russian Federation. E-mail: iris.samsonova@gmail.com

Samsonova I.A. ORCID 0000–0002–9403–2921

Gaifulin R.F. ORCID 0000–0002–2485–3994

Toktar L.R. ORCID 0000–0003–4363–3620

Orazov M.R. ORCID 0000–0002–1767–5536

Li K.I. ORCID 0000–0003–2391–1600

Pak V.E. ORCID 0000–0001–5485–3883

Kamarova Z.N. ORCID 0000–0002–8800–1467

Ответственный за переписку: Самсонова Ирина Алексеевна — аспирант кафедры акушерства и гинекологии с курсом перинатологии Медицинского института Российского университета дружбы народов, Российская Федерация, 117198, г. Москва, ул. Миклухо-Маклая, 8. E-mail: iris.samsonova@gmail.com

Токтар Л.Р. SPIN-код 5283–1087; ORCID 0000–0003–4363–3620

Оразов М.Р. SPIN-код 3147–2398; ORCID 0000–0002–1767–5536

Ли К.И. SPIN-код: 2862–1155; ORCID 0000–0003–2391–1600

Пак В.Е. SPIN-код 5734–01255, ORCID 0000–0001–5485–3883

Самсонова И.А. SPIN-код 3057–9093; ORCID 0000–0002–9403–2921

Камарова З.Н. SPIN-код 7509–1575; ORCID 0000–0002–8800–1467

Гайфулин Р.Ф. SPIN-код 2312–5729; ORCID 0000–0002–2485–3994