Pelvic Floor Muscle Training in Prevention and Treatment of Pelvic Organ Prolapse

52

Kari Bø and Ingeborg H. Brækken

Learning Objectives
Readers of this chapter should learn about

- Mechanisms of how pelvic floor muscle training can reduce symptoms and improve anatomic pelvic organ prolapse
- The evidence for the effect of pelvic floor muscle training on symptoms of POP and stage of POP
- How to conduct an effective pelvic floor muscle training program for POP

52.1 Introduction

The prevalence of symptomatic pelvic organ prolapse (POP) is reported to be 3–28% [1–5]. The feeling of vaginal bulge into or out of the vagina is the most common and specific symptom of POP with a prevalence ranging from 5 to 10%. The prevalence increases if pelvic pressure and heaviness are included as symptoms of POP [1, 6, 7], and these symptoms may greatly impair quality of life with restriction of participation in, for example, physical activity. POP may occur in the anterior, middle, and/or posterior compartment of the pelvic floor and it is defined as descent of the anterior vaginal wall (bladder, urethra), posterior vaginal wall (bowel), and/or apex of the vagina (cervix, uterus). Absence of prolapse is defined as stage 0 support; prolapse can be staged from stage I to stage IV (total eversion) [8, 9].

K. Bø (✉)
Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway
e-mail: kari.bo@nih.no

I. H. Brækken
Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

It is estimated that approximately 50% of all women lose some of the supportive mechanisms of the pelvic floor due to childbirth, leading to different degrees of pelvic organ prolapse (POP) [10]. In the UK, POP accounts for 20% of women on waiting lists for major gynecological surgery [11]. Based on databases including more than ten million women in the USA, the lifetime risk of any primary surgery for SUI or POP was 20.0% by the age of 80 years [12]. Prolapse recurs in up to 58% of women after surgery [13], and about one-third of operated women undergo at least one more surgical procedure for prolapse [14]. Stress urinary incontinence, dyspareunia, and mesh exposure are other risk factors associated with surgery [13]. The high prevalence and its increase with age light the need for prevention measures that could reduce the incidence and the impact of POP.

However, prolapse may be asymptomatic until the descending organ is through the introitus, and therefore POP may not be recognized until an advanced condition is present [6, 7]. In some women, the prolapse advances rapidly, while others remain stable for many years. Most clinicians have considered that POP does not seem to regress [10]. However, Handa et al. [15] found that spontaneous regression is common, especially for minor prolapse. This was also confirmed by Miedel et al. [16].

Treatment of POP can be conservative (lifestyle interventions and/or pelvic floor muscle training (PFMT)), mechanical (use of a pessary), or surgical [13, 17]. While systematic reviews and randomized controlled trials (RCTs) have shown convincing effect of PFMT for stress and mixed urinary incontinence [18, 19], the effect on POP is a relatively new area of research. A survey of UK women's health physical therapists showed that several women attending physical therapy practice presented with a mixture of pelvic floor dysfunctions such as stress urinary incontinence and prolapse and that 92% of the physiotherapists assessed and treated women with POP [20]. The most commonly used treatment was PFMT with and without biofeedback. The aim of the present chapter is to give an up-to-date systematic review of RCTs on PFMT to prevent and treat POP.

G. A. Santoro et al. (eds.), *Pelvic Floor Disorders*, https://doi.org/10.1007/978-3-030-40862-6_52

52.2 Methods

The basis for this review is a search on the Cochrane database, PubMed, and the abstract books from the International Continence Society and International Urogynecology Annual Meetings from 2016, for RCTs on PFMT to prevent or treat POP.

52.3 Results

52.3.1 In the General Population

Till date, 11 RCTs have been found applying PFMT to treat POP [21–32]. Typically most RCTs compared PFMT plus lifestyle intervention, against lifestyle interventions alone. Lifestyle intervention included use of pre-contraction of the PFM before and during increase in intra-abdominal pressure, "the Knack" and advice to avoid pushing down during defecation [24, 25, 28], or general lifestyle advice [23, 28, 29]. None have compared the effect of these lifestyle interventions with untreated controls and there is no report of adherence to these protocols. Hence, the effect of lifestyle interventions on POP is still unknown. Brækken et al. [25] did not find any effect of advice to use the Knack on muscle morphology.

The RCTs are all in favor of PFMT to be effective in treating POP, demonstrating statistically significant improvement in symptoms [22–24, 26–29] and/or prolapse stage [21, 23, 24, 26, 27]. Frawley et al. (2012) and Due et al. (2016) did not find a significant change in stage of POP [28, 32]. Methodological score on PEDro ranged from 4 to 8 with most studies scoring 7–8.

52.3.1.1 Hypopressive Technique

The hypopressive technique was developed by Caufriez (1997) and involves a combination of a breathing and postural techniques and contraction of the abdominal muscles which has shown to pull the prolapse upward/inward [33]. It remains to be scientific proven whether the hypopressive exercises can reduce intra-abdominal pressure in a way that prevents the pelvic organs to be pushed down and thereby prevent aggravation of POP. However, based on current evidence hypopressive exercise will not increase the strength nor thickness of the PFM muscles. Resende et al. [34] assessed 36 nulliparous physical therapists with vaginal surface EMG during PFM contraction, hypopressive technique, and a combination of the two. They found that PFM contraction was more effective than the hypopressive technique to increase sEMG activation of the PFM and that there were no additional effects of adding the hypopressive technique. Not surprisingly, the hypopressive technique was significantly more effective than PFM contraction in activation of the transverse abdominal muscle. In an RCT, Stupp et al. (2011) found that both PFMT and PFMT + the hypopressive technique were significantly more effective than lifestyle advice in increasing muscle strength (Oxford grading) and muscle activation (sEMG), but there was no additional effect of adding the hypopressive technique to PFMT [26]. Ultrasound assessment of the cross-sectional area (CSA) of the levator ani muscle showed increased CSA in the PFMT and the PFMT + hypopressive technique compared to the lifestyle group, but there was no additional effect of the hypopressive technique on CSA [35].

52.3.2 FMT to Prevent and Treat POP in the Peripartum Period

We have only been able to find one RCT evaluating the effect of PFMT to prevent and treat POP after childbirth [36]. In a group of 175 first-time mothers stratified on major levator ani injury and randomized to either PFMT or control, no effect was shown either on prevention or treatment of POP. The intervention lasted 4 months and the participants had been taught correct PFM contraction by an experienced physical therapist. The training consisted of group training once a week and daily home training with three sets of 8–12 close to maximum contractions. It was concluded that individual and more intensive training may be necessary, especially if there are major injuries. Further studies are needed to address whether PFMT can restore injured muscles and treat POP in postpartum women.

52.3.3 Prevention

The most important goal would be to prevent POP from occurring in the first place. However, primary prevention studies are difficult, or almost impossible, to conduct. It is not feasible or ethical to randomize women to PFMT or control and follow them for 30–40 years, which would have been the optimal design to answer this research question. No RCTs or studies using other designs have been found in evaluating the effect of PFMT on POP in primary prevention (stop prolapse from developing). Only one prevention study has been found [37]. Four hundred and seven women, not seeking treatment, but still with POP symptoms, were followed for 2 years with a program of two sessions of week with Pilates training, including isolated PFM contractions. The results showed that there were significantly less report of POP symptoms in the PFMT group compared to the controls. Given that it is unlikely to have high-quality studies in this area, one could argue from theory and studies showing that women with POP have weaker PFM than healthy controls [37] and that PFMT has shown to lift the bladder neck and the rectal ampulla, narrowing the levator hiatus, reduce PFM length and increase PFM cross-sectional area [25] that it is

plausible that PFMT can prevent POP in women. However, to date there is no evidence for this proposal. Based on an understanding of functional anatomy and exercise science, we recommend that general exercise programs for women should include PFMT.

52.3.4 PFMT in Combination with Surgery

PFMT has shown to be effective in reducing symptoms and improve stage of POP. Women should be offered PFMT as a first choice treatment for prolapse, before surgery [17]. Most surgeons would also recommend to continue to do PFMT after surgery to prevent relapse and to improve PFM function. To date there are only few RCTs assessing the effect of PFMT in combination with surgery [38–42]. Only one of these studies showed a positive additional effect [42].

However, this is a feasibility study with a small sample size, and the results must be interpreted with caution. Recent systematic reviews have concluded that there is insufficient evidence to conclude whether PFMT has any additional effect to surgical repair of POP [17, 42, 43]. One reason for the lack of effect may be that the follow-up period has been too short to show effect on relapse. And in addition, such expected long-term effects involve that the women continue to perform PFMT regularly for many years.

52.3.5 Long-Term Effect

To date, there is only one abstract reporting long-term effect of PFMT for POP. Hagen et al. [44] reported a 2-year follow-up after PFMT. Unfortunately, only 40% of the original 447 participants responded. There was no longer any difference between the training and control group in Pelvic Organ Prolapse Symptom Score, but fewer women in the PFMT group opted for further treatment and 6% in the PFMT group had surgery vs. 13% in the control group. Further and longer follow-up trials are needed in this area. However, long-term studies imply strict adherence to the training program to allow for meaningful interpretations of results.

52.4 Discussion

The conclusion from 11 RCTs and systematic reviews are consistent that there is strong evidence that PFMT is effective in reducing POP symptoms and improves stage of POP.

The published studies only reported short-term effects. To maintain the effect, similar to the recommendations for general strength training, it is expected that PFMT must be continued, although with a reduced frequency of training, to avoid relapse [45].

There are two main hypotheses for mechanisms as to how PFMT may be effective in prevention and treatment of stress urinary incontinence [46, 47], and the same theories may apply for a possible effect of PFMT to prevent and treat POP.

The two hypotheses are as follows: (1) women learn to consciously contract before and during increases in abdominal pressure (also termed "bracing" or "performing the Knack") and continue to perform such contractions as a behavior modification to prevent descent of the pelvic organs and pelvic floor muscles; and (2) women are taught to perform regular strength training in order to build up "stiffness" and structural support of the pelvic floor over time [45].

52.4.1 Conscious Contraction (Bracing or "Performing the Knack") to Prevent and Treat POP

Research on basic and functional anatomy supports conscious contraction of the PFM as an effective maneuver to stabilize the pelvic floor [48, 49]. However, to date, there are neither studies on how much strength or which neuromotor control strategies are necessary to prevent descent during cough and other physical exertions nor how to prevent gradual descent due to activities of daily living. Brækken et al. (2010) found that advice to do "the Knack" and not to strain on defecation improved stage of POP in 4% [24], but no morphological changes of the PFM were found after this training modality [25].

An interesting, but difficult, hypothesis to test is whether women at risk for POP can prevent development of prolapse by performing bracing or "the Knack" during a rise in intra-abdominal pressure. Since it is possible to learn to hold a hand over the mouth before and during coughing, one would expect that it is possible to learn to precontract the PFM before and during simple and single tasks such as coughing, lifting, and isolated exercises such as performing abdominal exercises. However, multiple task activities and repetitive movements such as running, playing tennis, aerobics, and dance activities cannot be conducted with intentional co-contractions of the PFM.

52.4.2 Strength Training

The theoretical rationale for intensive strength training of the PFM to treat POP is that strength training may build up the structural support of the pelvis by:

- Elevating the levator plate to a permanently higher location inside the pelvis
- Enhancing hypertrophy and increased stiffness of the PFM and connective tissue, reducing muscle length of the puborectalis, narrowing the levator hiatus

As described by DeLancey [50] in the "boat in dry dock" theory, the connective tissue support of the pelvic organs fails if the PFM relax or are damaged, and organ descent occurs. This underpins the concept of elevation of the PFM and closure of the levator hiatus as important elements in conservative management of POP. All the RCTs in this area have used strength training principles in the treatment protocols. However, Brækken et al. [24] measured PFM strength increase in both randomized arms. They found a significant and huge increase in strength in the PFMT group only. They also found statistically significant increases in muscle volume, shortening of the muscle length, narrowing of the levator hiatus, and lifting of the bladder neck and rectal ampulla [25], factors that may be essential in prevention and reversion of POP.

Readers may learn more about how to perform an effective PFMT program by watching www.Corewellness.

52.5 Conclusions

To date there is strong evidence that PFMT can significantly reduce symptoms and improve stage of POP. Further studies are needed to address which women respond to training and if POP can be prevented. A suggested primary prevention strategy for the general female population would be to avoid straining, to learn to contract the PFM during an increase in intra-abdominal pressure, and to conduct regular strength training of the PFM.

Take-Home Message

PFMT has 1A evidence to be effective in treating POP and there are no known side effects or complications. Women with POP stage I, II, and III should be offered PFMT as first-line treatment.

References

1. Milsom I, Altman D, Cartwright R, et al. Epidemiology of urinary incontinence (UI) and other lower urinary tract symptoms (LUTS), pelvic organ prolapse (POP) and anal incontinence (AI). In: Abrams PH, Cardoza L, Khoury AE, Wein A, editors. Incontinence, vol. 2. 6th ed. International Consultation on Urinary Incontinence, Plymbridge United Kingdom: Health Publication Ltd; 2015, p. 62.
2. Nygaard I, Barber MD, Burgio KL, et al. Prevalence of symptomatic pelvic floor disorders in US women. JAMA. 2008;300:1311–6.
3. Tegerstedt G, Maehle-Schmidt M, Nyren O, Hammarstrom M. Prevalence of symptomatic pelvic organ prolapse in a Swedish population. Int Urogynecol J Pelvic Floor Dysfunct. 2005;16:497–503.
4. Slieker-Ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, et al. Symptomatic pelvic organ prolapse and possible risk factors in a general population. Am J Obstet Gynecol. 2009;200:184–7.
5. Lawrence JM, Lukacz ES, Nager CW, et al. Prevalence and co-occurrence of pelvic floor disorders in community-dwelling women. Obstet Gynecol. 2008;111:678–85.
6. Mouritsen L. Classification and evaluation of prolapse. Best Pract Res Clin Obstet Gynaecol. 2005;19:895–911.
7. Miedel A, Tegerstedt G, Maehle-Schmidt M, et al. Symptoms and pelvic support defects in specific compartments. Obstet Gynecol. 2008;112(4):851–8.
8. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Int Urogynecol J. 2010;21(1):5–26.
9. Bo K, Frawley HC, Haylen BT, Abramov Y, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for the conservative and nonpharmacological management of female pelvic floor dysfunction. Int Urogynecol J. 2017;28(2):191–213.
10. Maher C, Baessler K, Barber M, et al. Pelvic organ prolapse surgery. In: Abrams PH, Cardoza L, Khoury AE, Wein A, editors. Incontinence, vol. 2. 6th ed. International Consultation on Urinary Incontinence, Plymbridge United Kingdom: Health Publication Ltd; 2015. p. 1855–992.
11. Thakar R, Stanton S. Management of genital prolapse. BMJ. 2002;324:1258–62.
12. Wu JM, Matthews CA, Conover MM, et al. Lifetime risk of stress urinary incontinence or pelvic organ prolapse surgery. Obstet Gynecol. 2014;123(6):1201–6.
13. Maher C, Feiner B, Baessler K, et al. Surgery for women with anterior compartment prolapse. Cochrane Database Syst Rev. 2016;(11):CD004014.
14. Whiteside JL, Weber AM, Meyn LA, Walters MD. Risk factors for prolapse recurrence after vaginal repair. Am J Obstet Gynecol. 2004;191:1533–8.
15. Handa VL, Garrett E, Hendrix S, et al. Progression and remission of pelvic organ prolapse: a longitudinal study of menopausal women. Am J Obstet Gynecol. 2004;190:27–32.
16. Miedel A, Ek M, Tegerstedt G, et al. Short-term natural history in women with symptoms indicative of pelvic organ prolapse. Int Urogynecol J. 2011;22(4):461–8.
17. Hagen S, Stark D. Conservative prevention and management of pelvic organ prolapse in women. Cochrane Database Syst Rev. 2011;(12):CD003882.
18. Dumoulin C, Hay-Smith EJ, Mac Habée-Séguin G. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. Cochrane Database Syst Rev. 2014;(5):CD005654.
19. Dumoulin C, Bradley C, Burgio K, et al. Adult conservative management. In: Abrams PH, Cardoza L, Khoury AE, Wein A, editors. Incontinence, vol. 2. 6th ed. International Consultation on Urinary Incontinence, Plymbridge United Kingdom: Health Publication Ltd; 2016. p. 1443–628.
20. Hagen S, Stark D, Cattermole D. A United Kingdom-wide survey of physiotherapy practice in the treatment of pelvic organ prolapse. Physiotherapy. 2004;90:19–26.
21. Piya-Anant M, Therasakvichya S, Leelaphatanadit C, Techatrisak K. Integrated health research program for the Thai elderly: prevalence of genital prolapse and effectiveness of pelvic floor exercise to prevent worsening of genital prolapse in elderly women. J Med Assos Thail. 2003;86:509–15.
22. Ghroubi S, Kharrat O, Chaari M. Effect of conservative treatment in the management of low-degree urogenital prolapse. Ann Readapt Med Phys. 2008;51:96–102.

23. Hagen S, Stark D, Glazener C, et al. A randomized controlled trial of pelvic floor muscle training for stages I and II pelvic organ prolapse. Int Urogynecol J Pelvic Floor Dysfunct. 2009;20:45–51.
24. Brækken IH, Majida M, Ellstrom-Engh M, Bø K. Pelvic floor muscle training in treatment of pelvic organ prolapse a single blind randomised controlled trial. Neurourol Urodyn. 2009;28:663–4.
25. Brækken IH, Majida M, Ellstrom-Engh M, Bø K. Morphological changes after pelvic floor muscle training measured by 3-dimensional ultrasound: a randomized controlled trial. Obstet Gynecol. 2010;115(Part I):317–24.
26. Stupp L, Magalhaes Resende AP, Oliveira E, et al. Pelvic floor muscle training for treatment of pelvic organ prolapse: an assessor blinded randomized controlled trial. Int Urogynecol J Pelvic Floor Dysfunct. 2011;22(10):1233–9.
27. Kashyap R, Jain V, Singh A. Comparative effect of 2 packages of pelvic floor muscle training on the clinical course of stage I-III pelvic organ prolapse. Int J Gynaecol Obstet. 2013;121(1):69–73.
28. Frawley HC, Hagen S, Sherburn M, et al. Changes in prolapse following pelvic floor muscle training: a randomised controlled trial. Neurourol Urodyn. 2012;31(6):938–9.
29. Hagen S, Stark D, Glazener C, et al. Individualised pelvic floor muscle training in women with pelvic organ prolapse (POPPY): a multicenter randomised controlled trial. Lancet. 2014;383(9919):796–806.
30. Wiegersma M, Panman CM, Kollen BJ, et al. Pelvic floor muscle training versus watchful waiting or pessary treatment for pelvic organ prolapse (POPPS): design and participant baseline characteristics of two parallel pragmatic randomized controlled trials in primary care. Maturitas. 2014;77(2):168–73.
31. Alves FK, Riccetto C, Adami DB, et al. A pelvic floor muscle training program in postmenopausal women: a randomized controlled trial. Maturitas. 2015;81(2):300–5.
32. Due U, Brostrom S, Lose G. Lifestyle advice with or without pelvic floor muscle training for pelvic organ prolapse: a randomized controlled trial. Int Urogynecol J. 2016;27(4):555–63.
33. Caufriez M. Gymnastique abdominale hypopressive: M. Caufriez; 1997.
34. Resende APM, Stupp L, Bernardes BT, et al. Can hypopressive exercises provide additional benefits to pelvic floor muscle training in women with pelvic organ prolapse? Neurourol Urodyn. 2012;31(1):121–5.
35. Bernardes BT, Resende AP, Stüpp L, et al. Efficacy of pelvic floor muscle training and hypopressive exercises for treating pelvic organ prolapse in women: randomized controlled trial. Sao Paulo Med J. 2012;130:5–9.
36. Bø Bo K, Hilde G, Tennfjord MK, et al. Randomized controlled trial of pelvic floor muscle training to prevent and treat pelvic organ prolapse in postpartum primiparous women. Neurourol Urodyn. 2013;32(6):806–7.
37. Braekken IH, Majida M, Ellstrom EM, et al. Pelvic floor function is independently associated with pelvic organ prolapse. BJOG. 2009;116(13):1706–14.
38. Barber MD, Brubaker L, Burgio KL, et al. Factorial comparison of two transvaginal surgical approaches and of perioperative behavioral therapy for women with apical prolapse: the OPTIMAL randomized trial. JAMA. 2014;311(10):1023–34.
39. Pauls RN, Crisp CC, Novicki K, et al. Impact of physical therapy on quality of life and function after vaginal reconstructive surgery. Female Pelvic Med Reconstr Surg. 2013;19(5):271–7.
40. Jarvis SK, Hallam TK, Lujic S, et al. Peri-operative physiotherapy improves outcomes for women undergoing incontinence and or prolapse surgery: results of a randomised controlled trial. Aust N Z J Obstet Gynaecol. 2005;45(4):300–3.
41. Frawley HC, Phillips BA, Bø K, Galea MP. Physiotherapy as an adjunct to prolapse surgery: an assessor-blinded randomized controlled trial. Neurourol Urodyn. 2010;29(5):719–25.
42. McClurg D, Hilton P, Dolan L, et al. Pelvic floor muscle training as an adjuvant to prolapse surgery: a randomized feasibility study. Int Urogynecol J. 2014;25(7):883–91.
43. Zhang FW, Wei F, Wang HL, et al. Does pelvic floor muscle training augment the effect of surgery in women with pelvic organ prolapse? A systematic review of randomized controlled trials. Neurourol Urodyn. 2016;35(6):666–74.
44. Hagen S. Abstract: Long-term follow-up of a multicentre randomised controlled trial of pelvic floor muscle training intervention for women with pelvic organ prolapse. Int Urogynecol J. 2015;26(Suppl 1):S25–6. Meeting Abstract: PP 02.
45. Bø K, Aschehoug A. Pelvic floor and exercise science strength training. In: Bo K, Berghmans B, Morkved S, Kampen MV, editors. Evidence-based physical therapy for the pelvic floor. Edinburgh: Elsevier; 2007. p. 119–32.
46. Bø K. Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? Int Urogynecol J Pelvic Floor Dysfunct. 2004;15:76–84.
47. Bø K. Pelvic floor muscle training for stress urinary incontinence. In: Bo K, Berghmans B, Morkved S, Kampen MV, editors. Evidence-based physical therapy for the pelvic floor. Edinburgh: Elsevier; 2007. p. 171–87.
48. Miller JM, Perucchini D, Carchidi LT, et al. Pelvic floor muscle contraction during a cough and decreased vesical neck mobility. Obstet Gynecol. 2001;97:255–60.
49. Peschers UM, Fanger G, Schaer GN, et al. Bladder neck mobility in continent nulliparous women. BJOG. 2001;108:320–4.
50. DeLancey JO. Anatomy and biomechanics of genital prolapse. Clin Obstet Gynecol. 1993;36:897–909.