



## Review

# Beneficial effects of biofeedback-assisted pelvic floor muscle training in patients with urinary incontinence after radical prostatectomy: A systematic review and metaanalysis



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## ABSTRACT

**Objectives:** This systematic review and metaanalysis compared the effects of biofeedback-assisted pelvic floor muscle training with those of pelvic floor muscle training alone in patients with urinary incontinence after radical prostatectomy.

**Design:** A review and metaanalysis study design.

**Data sources:** The metaanalysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and MetaAnalyses guidelines. A systematic search of PubMed/Medline OVID, the Cumulative Index to Nursing and Allied Health Literature, Cochrane Library, BioMedCentral, Web of Science, Chinese Electronic Periodical Services, Chinese Journal and Thesis Database, and China National Knowledge Infrastructure was performed for retrieving records.

**Review methods:** For determining the effects of training type on urinary incontinence, randomized controlled trials on biofeedback-assisted pelvic floor muscle training with or without electrical stimulation were compared with those on pelvic floor muscle training with or without electrical stimulation, respectively, in the metaanalysis. The Cochrane Collaboration tool in the Cochrane Handbook for Systematic Review of Interventions 5.1.0 was used to assess the methodological quality of the included trials. Subjective and objective measurement of urinary incontinence improvement and the quality of life were the primary and secondary outcome measures, respectively. Data were analyzed using Comprehensive Meta-Analysis software 2.0. In addition, subgroup analyses and metaregression were performed to explore the possible sources of heterogeneity.

**Results:** Thirteen randomized controlled trials involving 1108 patients with prostatectomy incontinence were included. The immediate-, intermediate-, and long-term effects of objectively measured biofeedback-assisted pelvic floor muscle training on urinary incontinence were significant (mean effect size =  $-0.316$ ,  $-0.335$ , and  $-0.294$ ; 95% CI:  $-0.589$  to  $-0.043$ ,  $-0.552$  to  $-0.118$  and  $-0.535$  to  $-0.053$ ;  $p = 0.023$ ,  $0.002$ , and  $0.017$ , respectively) when compared with those of pelvic floor muscle training alone. However, when urinary incontinence was measured subjectively, only the intermediate and long-term effects of biofeedback were found ( $p = 0.034$  and  $0.005$ , respectively). Small-to-moderate immediate- and intermediate-term effects on the quality of life were observed

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when biofeedback-assisted pelvic floor muscle training was compared with pelvic floor muscle training alone. No publication bias was observed among studies.

**Conclusions:** Biofeedback can be an adjunct treatment to pelvic floor muscle training for reducing urinary incontinence in patients who have undergone radical prostatectomy.

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## What is already known about the topic?

- Urinary incontinence is a common symptom observed after surgery in patients with prostate cancer.
- Urinary incontinence constitutes a considerable burden to the families and caregivers of patients after prostatectomy and negatively affects the quality of life.
- Pelvic floor muscle training is the first line treatment used to increase the strength and endurance of pelvic floor muscles.

## What this paper adds

- This review shows that biofeedback provides additional benefits for men with urinary incontinence compared with pelvic floor muscle training alone.
- Urinary incontinence measured objectively supported the immediate benefits of biofeedback on urinary incontinence, whereas subjective measurements revealed otherwise.
- The quality of the methodology and qualifications of biofeedback therapists might be key factors explaining the apparent lack of immediate treatment effects in the current metaanalysis.

## 1. Introduction

Urinary incontinence is common in patients who have undergone radical prostatectomy, with a prevalence in men ranging from 2% to nearly 60%, depending on the populations and sites studied, the definitions used, and the timing of assessment of continence after surgery (Milsom et al., 2009). Furthermore, urinary incontinence may restrict patients' physical activities and negatively affect their activities of daily living and health-related quality of life (Kirschner-Hermanns and Jakse, 2002). The literature shows that a misunderstanding of urinary incontinence management might affect urinary incontinence care; thus, families and caregivers must exert considerable long-term care efforts for patients with urinary incontinence (Jansen et al., 2013). Families and caregivers might have negative emotions toward patients with urinary incontinence or even themselves because urinary incontinence-related accidents cannot be predicted or prevented (Garcia et al., 2005).

Although the mechanisms of postprostatectomy incontinence remain unclear, sphincter insufficiency and detrusor over-activity are considered the main causes (Hoyland et al., 2014; Kielb and Clemens, 2005). Pelvic floor muscle training is the first-line treatment for

increasing pelvic floor muscle strength and endurance (Moore et al., 2013). Pelvic floor muscle training can improve urinary incontinence by contracting the pelvic floor muscles, thereby clamping the urethra, and increasing intra urethral pressure when the intraabdominal pressure increases (Di Benedetto et al., 2008). The routine of pelvic floor muscle training recommended by the American Urogynecologic Society is to start by pulling in the pelvic muscles and holding a pelvic muscle squeeze for 3 s and then relaxing it for an equal amount of time when lying down with the knees bent. Biofeedback-assisted pelvic floor muscle training achieves its therapeutic outcomes by using of probes inserted in the vagina or rectum to provide feedback signals on what muscles are being trained, which can assist patients in functioning more effectively and identifying the correct muscle group to train (Aksac et al., 2003). Electrical stimulation that artificially stimulates the pudendal nerve and its branches can cause direct and reflex responses of the urethral and periurethral striated muscles to ameliorate urinary incontinence (Pedraza et al., 2014).

Two previous reviews have compared the effects of pelvic floor muscle training with and without biofeedback with those of usual care in men with urinary incontinence after radical prostatectomy (Anderson et al., 2015; MacDonald et al., 2007). A review of randomized controlled trials concluded that pelvic floor muscle training with and without biofeedback are both beneficial for treating urinary incontinence; however, a statistical metaanalysis was not performed (MacDonald et al., 2007). Another metaanalysis on quasi-randomized controlled trials and randomized controlled trials did not garner sufficient evidence to support the effects of biofeedback on pelvic floor muscle training for urinary incontinence management after prostatectomy (Anderson et al., 2015). Whether biofeedback-assisted pelvic floor muscle training is effective for managing urinary incontinence following prostatectomy remains debatable. Moreover, neither review provided clear evidence on whether biofeedback-assisted pelvic floor muscle training provides additional benefits compared with pelvic floor muscle training alone. To fill these gaps, we searched randomized controlled trials up to 2015 and conducted a systematic review and metaanalysis by comparing and evaluating the additional effects of biofeedback-assisted pelvic floor muscle training with those of pelvic floor muscle training alone in patients with urinary incontinence after radical prostatectomy. Specifically, we assess the immediate-term (after training completion), intermediate-term (3–6 months after training completion), and long-term ( $\geq 6$  months after training completion)

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