

INFLUENCE OF VOLUNTARY PELVIC FLOOR MUSCLE CONTRACTION AND PELVIC FLOOR MUSCLE TRAINING ON URETHRAL CLOSURE PRESSURES

Hypothesis / aims of study

Stress urinary incontinence (SUI) is managed with pelvic floor muscle training (PFMT). However, despite consensus regarding the efficacy of PFMT in systematic reviews and meta-analyses, it is less clear how this treatment actually works. One possibility is an increase in urethral closure pressures. Resting maximum urethral closure pressure (MUCP) is significantly lower in women with SUI, but it is unknown whether PFMT can alter MUCP. Accordingly, this systematic literature review evaluated:

1. Whether a single PFM contraction alters MUCP ('augmented MUCP')
2. The effect of PFMT on both resting MUCP and augmented MUCP

Study design, materials and methods

A PubMed search was undertaken with search terms: pelvic floor muscles AND female AND urethra, limited to studies in English language investigating MUCP increment during a single PFM contraction in women. An additional search on PEDro used the terms; incontinence AND clinical trial. Hand search of article reference lists was also undertaken. Clinical trials including pre- and post-test, randomised and quasi-controlled trials designed to investigate the effect of PFMT on UPP variables were evaluated. PFMT was defined as sets of PFM exercises over time, including use of biofeedback or vaginal weighted cones. Studies in animals, men, children, neurological disease, or using treatments other than PFMT were excluded.

Results

Twenty one studies investigating augmented MUCP in women were found. In 9 studies, assessment of the ability of subjects to perform a PFM contraction correctly was not reported. Urodynamic methodology differed between studies. The majority performed UPP supine; in six studies the bladder was empty, one study used full bladder, two studies failed to state bladder volume. The mean incremental rise of MUCP during PFM contraction in healthy women ranged between 8 and 33 cmH₂O; in women with UI it was 6 to 24 cmH₂O. Three studies compared SUI with continent women; continent women had a higher augmented MUCP by 7 to 8 cmH₂O.

Three studies considered whether their subjects achieved an effective PFM contraction, judged as an arbitrarily-defined increase to at least 120% of resting MUCP. In women with either SUI or prolapse, between 39% and 60% achieved an effective contraction. Several studies excluded women who could not perform an effective PFM contraction

Nine clinical trials reporting UPP as an outcome of PFMT were found, mostly investigating subjects with urodynamic SUI. Six studies stated that PFM contraction was confirmed by vaginal palpation. There was wide variation in the PFMT regimes across the nine clinical studies; duration of PFMT ranged from 6 weeks to 12 months. Half the studies assessed the effect of PFMT after 3 to 4 months. The amount of supervision varied from twice weekly to one assessment followed by home exercises only. The protocol for home exercises varied from 5-10 contractions every 30 minutes daily to 8 - 12 repetitions three times per day.

Two studies found significant improvement in MUCP following PFMT of 5 – 18 cmH₂O. Seven studies assessed augmentation of MUCP with a PFM contraction; mean increase in augmented MUCP following PFMT was -0.1cm to 25 cmH₂O.

Five pre-post test studies assessed functional urethral profile length (FUPL); only one found a significant improvement in FUPL. Two RCTs measured FUPL and neither found a significant change. Three studies measured cough pressure transmission ratio (PTR) as an outcome of PFMT including two RCTs. There were contradictory findings in the two RCTs; the study that found a significant difference only investigated women with SUI, while the other included women with a range of diagnoses. Both studies used the microtip transducer technique for measuring UPP. One of the RCTs investigating women with urodynamic SUI found that significantly fewer women had negative pressure in the intensive PFMT group ($p < 0.01$). A pre-post test trial included women with SUI, and found cough PTR significantly improved from 85 to 108%, but this had no control group.

Interpretation of results

We have conducted a systematic review to assess both the influence of a voluntary PFM contraction on MUCP, and the effect of PFMT on MUCP and augmented MUCP. This review includes 30 articles. The wide inclusion criteria ensured a comprehensive systematic analysis of both a single PFM contraction and PFMT on MUCP across healthy women and those with either SUI or MUI. This allowed us to explore UPP findings within each of these categories of participants. Pooled analysis of UPP data was not possible due to the broad heterogeneity of profilometry methods and urodynamic diagnoses. Moreover, there was wide variation in the PFMT protocols throughout the clinical trials.

This review does not support the theory that PFMT is effective in the treatment of SUI through a mechanism of increased resting MUCP. However, there was evidence to suggest that PFMT increased augmented MUCP, the increment ranging from 4 to 25 cmH₂O.

The degree to which a voluntary PFM contraction augments MUCP varies widely. There was evidence to suggest PFMT increased augmented MUCP. It was not possible to conclude whether there was a minimum increase required to achieve continence, because sub group analysis comparing successful with unsuccessful outcome was not available.

Drawing firm conclusions was hampered by study methodologies, incomplete description of urodynamic techniques, and failure to document correct contraction of the pelvic floor. Further research is warranted using standardised UPP in well-defined and stratified populations, with verification of correct PFM contraction.

Concluding message

There is no definitive evidence that PFMT increases resting MUCP as its mechanism of action in managing SUI, but augmented MUCP does appear to increase.

Disclosures

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