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DIFFERENCES IN EMG SIGNALS OF PELVIC FLOOR MUSCULATURE (PFM) IN WOMEN WITH AND WITHOUT THE OVERACTIVE BLADDER SYNDROME

Hypothesis / aims of study

The overactive bladder syndrome (OAB) is defined as urinary urgency, usually accompanied by frequency and nocturia, with or without urgency urinary incontinence. The function of the lower urinary tract represents a complex interaction between the bladder, its outlet and the muscular closing mechanism, acting under the control of the central nervous system. While in the past attention was principally focused on the motor (efferent) control of the bladder, today sensory (afferent) innervation is an important therapeutic target as well. This change in emphasis is strongly supported by both basic science and clinical evidence demonstrating the efficacy of therapy directed at the afferent system(1).

The ICS has classified the underlying mechanism of OAB into underlying increased afferent activity and mechanisms involved in abnormal handling of afferent signals(2). Pelvic floor muscle training (PFMT) is a first-line treatment option for persons with lower urinary tract symptoms (LUTS) including urinary incontinence (UI), overactive bladder (OAB), urgency, frequency, nocturia, incomplete bladder emptying, and pelvic floor muscle (PFM) overactivity. PFM rehabilitation attempts to decrease incontinence and OAB symptoms, and aid bladder emptying through increasing awareness of the function and coordination of the PFMs, so as to gain muscle identification, control, and strength and to decrease bladder overactivity(3). Apart from histopathology, electrophysiological techniques are the only tests to reveal neuromuscular involvement in the absence of gross anatomical lesions.

Multicomponent behavioural training induces a new response to urgency based on the use of PFM contraction as a critical component to suppress urgency, control incontinence and restore a normal voiding interval. These contractions act by preventing internal sphincter relaxation produced by the micturition reflex, which then results in detrusor relaxation. Although strong PFM contractions will be more effective than weak contractions in suppressing urgency, simply making the patient aware of the importance of a well-timed PFM contraction is also likely to provide benefit. The basic concept is that with feedback, improved muscle awareness and control may subsequently improve pelvic floor dysfunction and in the case of OAB assist modulation of urinary symptoms through enhanced inhibition of detrusor activity. To the best of our knowledge the EMG patterns of the different muscle layers of the PFM of healthy volunteers versus women with OAB has not been investigated yet. The aim of this study was to determine the differences of electromyography (EMG) signals of PFM in healthy volunteers and patients with OAB.

Study design, materials and methods

EMG signals of PFM of 33 parous postmenopausal healthy volunteers (mean age 58 years, range 51–72 years) were compared to 38 parous postmenopausal patients (mean age 60 years (range 47-72 years), with OAB. The two groups were asked to perform three consecutive tasks according to a standardized protocol: 1 min rest, 10 maximum voluntary contractions (MVC) lasting 3 seconds and 3 endurance contractions lasting 30 seconds. For the vaginal registration of the Electromyography (EMG) activity of the PFMs a probe (MAPLe) was used. The MAPLe is a probe with a matrix of 24 electrodes enabling measuring EMG activity from the different sides and layers of the PFM.

Mean EMG values per electrode were calculated for tone at rest, MVC and endurance.

Comparisons of specific electrodes between groups were made using Student's t-test with Bonferroni correction and one-way analysis of variation (ANOVA). SPSS software Windows version 20.0 (SPSS INC, IL) was used to perform these analyses. A 95% confidence interval ($p < 0.05$) was used as the level of significance.

Results

For tone at rest, MVC and Endurance, the mean EMG values were significantly lower nearest to the bladder and urethral sphincter (0.0001≤<p≤0.04) for the patient group compared to the healthy volunteers. Also for the puborectal muscle the EMG values were significantly lower at the left, right and posterior side of the pelvic floor ($0.001 \leq p \leq 0.02$). For the pubococcygeus muscle the EMG values were significantly lower at the right side of the pelvic floor ($p \leq 0.02$). For the bulbospongiosus and ischio cavernosus muscle the EMG values were significantly lower for both the left and right side ($p \leq 0.002$). The MVC and the Endurance EMG values were more significantly different from the healthy volunteers than the EMG values for tone at rest.

Interpretation of results

EMG signals of individual pelvic floor muscle sides and layers of patients with OAB differ from the muscular activity of healthy volunteers. On one hand, it could be that muscle activity of the pelvic floor is affected by OAB. This implicates that loss in muscle functions could be a symptom of OAB. On the other hand, it could be that the decreased muscle activity is one of the causes of OAB. Further research is needed to fully understand the role of muscle function in the cause and effect of OAB.

Concluding message

This original study shows that shows the differences of electromyography (EMG) signals measured with the MAPLe in healthy volunteers and patients with OAB. This implicates that the muscular activity is effected by or has a role in the symptoms of OAB.

References

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Disclosures
Funding: Unrestricted grant Novuqare **Clinical Trial:** Yes **Registration Number:** Nl 1799705808 **RCT:** No **Subjects:** HUMAN **Ethics Committee:** Medical Ethical Committee of the Leiden University Medical Center, Leiden, The Netherlands **Helsinki:** Yes **Informed Consent:** Yes