

CHANGES IN EMG SIGNALS OF THE PELVIC FLOOR IN WOMEN WITH THE OVERACTIVE BLADDER SYNDROME AFTER BIOFEEDBACK ASSISTED PELVIC FLOOR MUSCLE THERAPY

Hypothesis / aims of study

The primary symptom of the overactive bladder syndrome (OAB) is urgency(1). One of the treatment options to decrease urgency is biofeedback assisted pelvic floor muscle therapy (BAPFMT) as an urge suppression technique resulting in improved control of the pelvic floor muscles (PFM)(2). In literature there is evidence that the superficial and deeper layers of the PFM play different roles. Also it is not clear whether the left and the right side of the muscles contribute and behave in the same degree. This implies that it may be beneficial to address and register the different muscle layers and the left and right sides separately to have the most complete information about the different muscles. To investigate whether there is an effect of BAPFMT as an urge suppression technique on EMG signals on different sides and layers of the pelvic floor muscles in women with OAB for tone at rest and maximal voluntary contraction (MVC) measured with the Multiple Array Probe (MAPLe®) before and after treatment.

Study design, materials and methods

Women with the OAB syndrome are randomized into an intervention group which received nine sessions of biofeedback assisted pelvic floor muscle therapy (BAPFMT) or into a control group that received no treatment with a follow up after nine weeks. Electromyography (EMG) biofeedback of the pelvic floor musculatures (PFMs) was performed with a probe (MAPLe®), which was placed intravaginal. The MAPLe is a probe with a matrix of 24 electrodes enabling measuring EMG signals from the different sides and layers of the PFM(3). The intervention group received instructions to improve the ability to suppress urgency. BAPFMT was performed to assist in increasing awareness of the function and identification, coordination and strength of the pelvic floor muscles, with the goal to improve reduce symptoms of OAB and aid bladder emptying. Detection of relaxation at onset of urgency followed by quick pelvic floor muscle contractions were used as urge suppression strategies. EMG signals were acquired at start and after nine BAPFMT sessions or after nine week follow-up for tone at rest, 10 maximal voluntary contractions (MVCs) of three seconds and three endurance contractions of 30 seconds. Placement of the electrodes with respect to the anatomy of the PFM was checked by MRI (3, T2). For each task and electrode mean EMG amplitudes per electrode were computed. For the MVC and Endurance the time to come to a contraction (onset) and the time to come to relaxation (offset) were calculated. The mean EMG amplitudes, onset and offset per electrode were compared before and after treatment or nine week follow-up within the groups using paired T-tests, with Bonferroni adjustment for multiple testing.

Results

A total of fifty-eight patients were included in this study. The mean age was 51.7 years (range 16-72 years). At the start of the study the groups were homogeneous for EMG analysis. In the control group, which received no urge suppression techniques with BAPFMT, no significant changes in EMG signals were found after nine week follow-up for tone at rest, MVC, endurance, and for onset and offset. In the intervention group tone at rest was significantly lower for electrodes nearest to the bladder and urethra on the anterior side of the probe ($p < 0.02$) and nearest to the iliococcygues muscle on the left side ($p = 0.011$) after treatment. To a lesser degree tone at rest for electrodes on the left, right and posterior side of the pelvic floor was lower, but not significant. Looking at the data in the conventional way (the average EMG over all electrodes), the tone at rest was slightly lower after treatment, but not significantly. Mean EMG for MVC was significantly higher after treatment on electrodes nearest to the muscles on the right side of the pelvic floor ($p < 0.009$) and for the electrodes nearest to the puborectal muscle and superficial layers ($p < 0.04$). For the average EMG over all electrodes, the mean EMG for MVC was higher after treatment, but not significant. For the MVC onset the time was significantly lower nearest to the left and right side of the pubococcygues muscle ($p < 0.04$) after treatment. For the MVC offset the time was significantly lower for the posterior side of the puborectal muscle. For Endurance onset the time was significantly lower at the posterior side of the puborectal muscle and at the right side of the pubococcygues muscle ($p < 0.02$) after treatment. For the Endurance offset there were no significant differences. For onset and offset of the average over all electrodes there were no significant differences.

Interpretation of results

Significant changes were seen in EMG activity before and after treatment, nearest to specific muscle layers and sides for tone at rest, MVC and endurance. The results show that there is a significant increase in mean EMG values and significant decrease in onset and offset after treatment. This implicates that urge suppression techniques combined with BAPMT have a positive influence on symptom reduction of OAB. The results also show that conventional average EMG over all muscle sides and layers did not show differences before and after treatment. This indicates that in the diagnosis and treatment of OAB should focus more on the individual muscle sides and layers of the pelvic floor, instead of the conventional average EMG of all muscles sides and layers combined.

Concluding message

This is the first study that shows the relevance of EMG registration of individual muscle layers and sides of the pelvic floor for the diagnosis and treatment of pelvic floor dysfunctions and the effect of BAPMT. It is important to realize that average EMG did not show any difference indicating that the layers and sides have to be individually registered to have the most complete information on the activity of the different muscles.

References

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Disclosures

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