EMG BIOFEEDBACK ADDED TO PELVIC FLOOR MUSCLE TRAINING IN WOMEN WITH STRESS URINARY INCONTINENCE

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Aims of the study

The aim of our study was to compare in a sample of women with urodynamically diagnosed stress urinary incontinence the bioelectrical signals (amplitudes) of the pelvic floor muscle (PFM), rectus abdominis (RA) and internal oblique (IO) obtained in supine and standing positions before and after two months of electromyographic (sEMG) biofeedback added to pelvic floor muscle training, to determine differences in muscle activity. The secondary aim was to compare changes in the results of urodynamic tests, voiding diary vis-à-vis baseline values.

Methods

The study involved women with stress urinary incontinence (n=15).
The mean sEMG amplitude of the pelvic floor muscle was tested during two trials (5 repeated short contractions and 5 repetitions of 10-second voluntary contractions) at two time points and two positions (supine lying and standing). Voiding diary and urodynamic tests were used to asses all study participants at the same two time points.
The sEMG of the pelvic floor muscles was recorded using an endovaginal probe. Two surface electrodes were located along muscle fibers of the rectus abdominis (RA) and two electrodes of the internal oblique (IO) according with the standards for surface EMG. Training sessions with visual biofeedback were held over two months, 3 times a week (24 training sessions altogether). At the outset of sEMG biofeedback training each participant performed maximal voluntary contraction (MVC) of the pelvic floor muscles. The MVCs values were used as a reference threshold for the training. Phasic contractions lasting 3 second, with 6 second relaxation, increased progressively every two weeks from 21 repetition (7 contraction/relaxation repetition in 3 series) to 60 repetition (12 contraction/relaxation repetitions in 5 series) at 80% of the EMG MVC. Sustained contractions lasting 10 second, with 10 second relaxation time, increased progressively every two weeks from 35-120 repetitions (15 contractions/relaxation repetition in 3 -8 series) at 60% of the EMG MVC. The study protocol was approved by the Bioethics Committee.

Results

Table 1. Two-way interaction (time point x position) and post hoc analysis of sEMG amplitude of the rectus abdominis (RA), internal oblique (IO) and pelvic floor muscles (PFM) during short contraction and sustained contraction from the pelvic floor muscles (PFM).

	short contraction			10-second contraction		
Parametrs	Mean ampl. PFM (uV) ± SD	Mean ampl. RA (uV) ± SD	Mean ampl. IO (uV) ± SD	Mean ampl. PFM (uV) ± SD	Mean ampl. RA (uV) ± SD	Mean ampl. IO (uV) ± SD
supine 1	10.73±5.3	1.75±0.6	4.34±2.5	7.73±3.6	1.69±0.4	4.78±2.3
supine 2	13.26±8.9	1.99±1.1	4.51±3.4	9.33±4.8	1.98±0.8	5.18±2.1
standing 1	10.01±5.1	1.69±0.5	2.99±1.2	9.15±4.5	1.87±0.6	4.08±1.8
standing 2	12.66±9.1	1.56±0.4	3.55±1.2	10.26±3.5	1.87±0.6	4.43±1.9
interaction (time points x position)	0.3*	0.2*	0.3*	0.2*	0.4*	0.37*
p (supine 1 vs vs supine 2)	0.8**	0.1**	0.9**	1**	1**	1**
p (standing 1 vs standing 2)	1**	1**	1**	1**	1**	1**
p (supine 1 vs standing 1)	1**	1**	0.7**	1**	1**	0.4**
p (supine 2 vs standing 2)	1**	0.2**	0.08**	1**	1**	0.3**

*ANOVA (interaction time and position) **Bonferroni's post hoc test

Table 2. Comparison of quantitative variables of filling and voiding cystometry obtained at two measurement time points.

Urodynamics variables	before treatment		after treatment		p*
	Mean ± SD	Mdn	Mean ± SD	Mdn	
Maximum cystometric capacity [ml]	378.4±93.2	398	433.9±122.7	443	**0.01**
Volume at first desire to void [ml]	143.5±46	140	253.7±80.8	256	**0.0006**
Volume at strong desire to void [ml]	317.9±92.8	325	383.6±114	363	**0.02**
Compliance [ml/cmH2O]	80.1±59.5	60	84.6±30.9	60	0.2
Maximum flow rate [ml/sec]	23.2±13.3	21	24.9±10.1	22	0.2
Detrusor pressure at maximum flow rate [cmH2O]	11.9±7.9	12	18.5±13.6	15	**0.008**
Maximum detrusor pressure [cmH2O]	22.4±17.9	17	23	23	**0.03**

Mdn - median, Q1 - lower quartile, Q3- upper quartile, *Wilcoxon test

Conclusions

The sEMG biofeedback training did not significantly improve the bioelectrical activity of the pelvic floor muscles, but it was shown to be capable of relieving the symptoms of urinary incontinence.