

BLADDER NECK ELEVATION DURING DIFFERENT PELVIC FLOOR ACTIVATION TECHNIQUES: AN MRI STUDY

Hypothesis / aims of study

Although active pelvic floor muscle (PFM) contractions are generally used to train the PFM, recent EMG experimental data suggest that transversus abdominis (TrA) contractions may also be used for this purpose [1]. In addition, contractions of the hip external rotators (ExtRot) have been shown to engender co-activation of the PFM [2]. Yet the impact of these muscle contractions on bladder neck elevation has not been studied. The aims of this study are a) to describe the effect of TrA contractions and ExtRot contractions on bladder neck position and b) to compare bladder neck elevation during PFM contractions to bladder neck movement during TrA and ExtRot contractions using magnetic resonance imaging (MRI).

Study design, materials and methods

Eleven female health care professionals volunteered to participate in the study. Inclusion criteria were absence of urological symptoms or prolapse, ability to contract PFM and TrA muscles correctly and willingness to participate in the study. Prior to the MRI measurement, the women were given detailed instructions on how to contract the PFM, TrA and ExtRot muscles and their ability to contract was verified by digital palpation. All individuals were asked to void before going in the scanner. MRI was performed in a GE Sigma Twin speed, 1.5 Tesla magnet using a torso phased array coil wrapped around the pelvis. Subjects were placed in a supine lying position with hips and knees flexed and supported by pillows. A spoiled gradient sequence for T1-weighted images of the bladder neck region were applied: TR= 70 ms, TE min full, 24-cm field of view, 5 mm slice thickness, 2.5-mm gap, resolution 256 x 256. Eight sagittal slices with a recording time of 36 s were obtained at rest, during PFM, TrA and isometric ExtRot contractions.

Each manoeuvre was separated by a 1-min rest period to avoid fatigue. To determine the bladder neck position, a reference line was drawn from the inferior border of the symphysis pubis to the inferior border of the sacral bone [3]. The distance from this reference line to the bladder neck was measured at rest and during each contraction. Bladder neck movement was computed by subtracting the bladder neck position during a specific contraction from bladder neck position at rest. Comparison of the different conditions was performed using a Friedman test and paired conditions were then compared by means of a Wilcoxon signed rank test. P values < 0.05 were considered statistically significant. Values are given as mean and SD.

Results

The subjects' mean age was 38 years \pm 7.00, mean BMI was 22.9 \pm 1.70 and mean parity 1.45 baby \pm 1.21. The majority of subjects demonstrated an inward movement of the bladder neck during a PFM contraction (11/11), TrA (11/11) and ExtRot (10/11). Table 1 shows the mean bladder neck elevation \pm SD, median and range for each condition. A global test between conditions was performed with the Friedman test ($p = 0.002$). The instruction to perform a PFM contraction produced a significantly greater elevation of the bladder neck than the instructions to perform a TrA ($P = 0.023$) or an ExtRot ($P = 0.004$). Bladder neck elevation during TrA contractions was higher than but not significantly different from ExtRot ($P = 0.06$). The instructions to contract PFM were 31.4% and 50.8% more effective than those to contract TrA and ExtRot respectively.

Table 1

Mean bladder neck displacement \pm SD (mm) during PFM, TrA and ExtRot contractions in 11 female health care professionals

<i>Bladder neck displacement during different contractions</i>	<i>n</i>	<i>Mean \pm SD (mm)</i>	<i>Median (mm)</i>	<i>Range</i>
PFM contraction	11	3.31 (1.76)	3.4	1.30 – 6.20
TrA contraction	11	2.27 (1.15)	2.1	0.50 – 4.70
ExtRot contraction	11	1.63 (1.25)	1.6	-0.20 – 4.30

Interpretation of results

The results of the present study showed the presence of bladder neck elevation during TrA contractions and ExtRot contractions. Instructions to contract the PFM were significantly more effective in lifting the bladder neck than those to produce contractions of the TrA or ExtRot.

Concluding message

Evidence is provided to indicate the presence of a synergistic effect of TrA and ExtRot contractions on pelvic floor activation and bladder neck elevation in continent women. Considering that the PFM contraction results in a greater elevation of the bladder neck, it is suggested that PFM training should not be limited to indirect training via TrA or ExtRot. Further MRI studies are needed to better understand the synergistic effect of TrA and ExtRot contractions in incontinent women.

References:

1. Archives of Physical Medicine Rehabilitation 2001; 82:1081-1088.

2. International Continence Society & International Urogynecology Association. Read by title. Paris, August, 2004:551.
3. Neurourology and Urodynamics 2001;20:167-174.

FUNDING: NONE

DISCLOSURES: NONE

HUMAN SUBJECTS: This study was approved by the The regional committee on biomedical research ethics of Aarhus County, Denmark and followed the Declaration of Helsinki Informed consent was obtained from the patients.