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LEVATOR CO-ACTIVATION IS A SIGNIFICANT CONFOUNDER OF PELVIC ORGAN DESCENT ON VALSALVA

Hypothesis / aims of study

A Valsalva manoeuvre is defined as forced expiration against a closed glottis, requiring contraction of the diaphragm and abdominal muscles, in order to obtain markedly increased intra-abdominal pressures. The manoeuvre is used clinically and on imaging in order to determine female pelvic organ prolapse (FPOP). Consequently, correct performance of the manoeuvre is important in the assessment of women with incontinence and prolapse. Performing a Valsalva can be embarrassing for the patient since involuntary passage of urine, wind or even stool may occur. As a consequence subjects often co-activate the levator ani muscle which may be the main reason as to why normal values for pelvic organ descent in nulliparous women vary markedly in the published literature[1-3]. To prevent co-activation it may be necessary to provide the patient with biofeedback training in order to obtain a correct Valsalva manoeuvre. In this study we examined the potential confounding effect of levator co-activation at the time of a Valsalva manoeuvre and tried to determine the impact of biofeedback instruction on parameters of pelvic organ descent.

Study design, materials and methods

In a prospective observational study we examined 50 nulliparous, pregnant women at 36-40 weeks' gestation. 3D/ 4D translabial ultrasound was performed using a Voluson 730 expert system with 8-4 MHz volume probe. Data volumes were obtained in the dorsal resting position, after bladder emptying. Women were first instructed orally to perform a strong 'push', and this first Valsalva was recorded as a cine- loop of volume datasets. After this repeated trials were performed until an optimal result was obtained. Again, this was stored as a cine loop of volume datasets. Off-line analysis was undertaken at a later date using the software 4D View v 5.0, in order to obtain standard measures of pelvic organ descent such as bladder neck descent and hiatal dimensions (sagittal hiatal diameter and hiatal area on Valsalva. This project was performed as part of a larger study into pelvic floor function before and after childbirth which was approved by the local Human Research Ethics Committee.

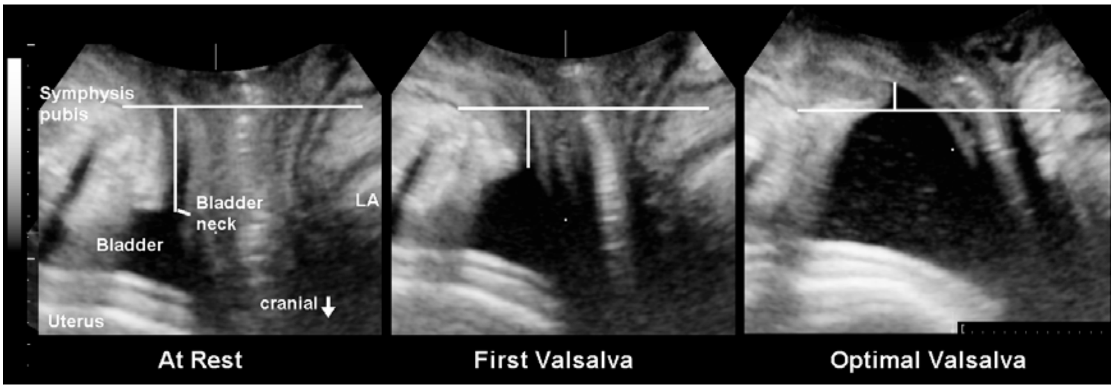

Figure: The effect of levator co-activation on bladder neck descent. Migsagittal views at rest (left), on first Valsalva, confounded by levator co-activation (central image) and on optimal Valsalva, after biofeedback teaching (right image). Translabial ultrasound, 8-4 MHz transducer. The horizontal line signifies the inferior margin of the symphysis pubis.

Results

In all 50 patients we assessed both the first volume dataset (documenting the first Valsalva) and a second dataset documenting the most effective of at least three manoeuvres. Table 1 shows a comparison of results for the two volume datasets per patient. Significant differences were found for position of the bladder neck on Valsalva, total bladder neck descent, hiatal sagittal diameter and hiatal area on Valsalva. Figure 1 demonstrates a case of moderate levator co-activation, resulting in much less bladder neck descent on first Valsalva compared to optimal Valsalva.

In a significant minority of women we observed a reduction in the sagittal hiatal diameter on first Valsalva indicating levator co- activation. This was common on first Valsalva (22/50) and still seen in 11/50 after instruction (P= 0.03 on Fisher's exact test).

	First Valsalva	**Best Valsalva**	P=
Position of BN at rest	29.4 (3.7)	28.8 (3.9)	0.4
Position of BN on Valsalva	19.0 (9.9)	12.8 (9.9)	0.002
BND	10.4 (9.9)	16.0 (8.7)	0.003
Hiatal diameter (sagittal) at rest	55.8 (10.3)	56.6 (7.6)	0.6

Hiatal diameter (sagittal) on Valsalva	57.2 (12)	62.7 (10.6)	0.018
Change in hiatal diameter	1.4 (6.7)	6.0 (9.0)	0.004
Hiatal area on Valsalva	20.4 (5.9)	23.1 (6.5)	0.038

Table 1: A comparison of parameters of pelvic organ descent and hiatal dimensions obtained on first Valsalva (left) and maximal Valsalva (right).

Interpretation of results

It is evident from our results that levator co-activation is likely to be a major confounder of the effect of a Valsalva manoeuvre. As we rely on an effective Valsalva for assessing pelvic organ descent, this is of major importance for the evaluation of female pelvic organ prolapse. Without some form of biofeedback, either digital (on examination) or auditory/ visual (on imaging), women may not perform a correct Valsalva manoeuvre and inadvertently reduce the accuracy of the assessment. Biofeedback reduced the likelihood of levator co-activation markedly, but did not abolish it completely.

A correct Valsalva manoeuvre requires pelvic floor muscle relaxation. Without levator relaxation, there is a high likelihood of false-negative findings. This may explain the wide range of values reported for bladder neck descent, both in nulliparous, asymptomatic women, and in women symptomatic for stress urinary incontinence and/ or pelvic organ prolapse.

Concluding message

Women are likely to co- activate the levator ani muscle when asked to ‘push’ or ‘bear down’. Biofeedback, i.e., proper instruction, is necessary to reduce the impact of this confounder, otherwise false-negative findings are likely. This may apply in particular to situations where prolapse assessment is attempted without the opportunity for either digital (at the time of a clinical assessment) or visual (on ultrasound imaging) biofeedback, e.g, when using magnetic resonance imaging.

References

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