

## CAN RESTING TONE OF THE PUBOVISCERAL MUSCLE BE ASSESSED DIGITALLY?

### Hypothesis / aims of study

Elasticity of the pubovisceral muscle is likely to be important for pelvic organ support and in childbirth. There is evidence that distensibility of the hiatus is associated with progress in the 2<sup>nd</sup> stage of labour[1]. The fact that levator trauma is much more common in older primiparae[2] also points towards biomechanical factors as a determinant of levator trauma. Independent of this relationship there is a clear association between distensibility of the hiatus and pelvic organ descent[3]. Distensibility or elasticity of the levator hiatus is likely to be an independent aetiological factor for female pelvic organ prolapse. Consequently, there is a need to develop methods for assessing biomechanical properties of the pubovisceral muscle as this may help in risk stratification for women approaching parturition and in the assessment of women complaining of urinary incontinence and/or prolapse. A reliable method would be particularly valuable for determining the relative efficacy of interventions.

The most basic method of assessing the biomechanical properties of any material is digital palpation, and the pubovisceral muscle lends itself to such an assessment. Resting tone, that is, resistance to deformation, can be assessed during a normal vaginal examination with minimal effort, no additional cost, and is associated with very limited inconvenience to the patient. In this study we test a 6-grade scale for resting tone, analogous to the Oxford Grading scale used for assessing contractility, for repeatability and validity.

### Study design, materials and methods

Ninety-eight consecutive patients referred to a Pelvic Floor Diagnosis and Treatment Unit with symptoms of lower urinary tract dysfunction and/or prolapse were investigated by two urogynaecologists (second/third authors). All patients underwent a physical examination, which included vaginal digital palpation for Modified Oxford Grade and pubovisceral muscle Resting Tone Grade (0: muscle not palpable, 1 muscle palpable but very flaccid, wide hiatus, minimal resistance to distension; 2 hiatus wide but some resistance to distension; 3 hiatus fairly narrow, fair resistance to palpation but easily distended; 4 hiatus narrow, muscle can be distended but high resistance to distension, or pain; 5 hiatus very narrow, no distension possible, 'woody' feel, possibly with pain: 'vaginismus'). Patients also underwent 4D translabial ultrasound imaging for levator hiatal dimensions and prolapse assessment as previously described [3].

### Results

In a blinded test-retest series on 58 patients we obtained an intraclass correlation coefficient (ICC, absolute agreement definition) of 0.53 (CI 0.38- 0.65) for Resting Tone, and an ICC of 0.71 (CI 0.61- 0.80) for Oxford Grading. This implies 'moderate' agreement for Resting Tone, as opposed to 'substantial' agreement for Oxford Grading. Resting tone on palpation correlated with Oxford grading ( $r = 0.54$ ,  $P < 0.0001$ ) and anterior (ANOVA,  $P = 0.005$ ) as well as posterior compartment prolapse (ANOVA,  $P = 0.014$ ). Conversely, Oxford Grading was not associated with cystocele, and only weakly associated with rectocele (ANOVA,  $P = 0.025$ ). As regards levator hiatal dimensions, again resting tone showed a significant association (ANOVA between  $P = 0.16$  and  $P = 0.009$ ), as opposed to Oxford grading, the association of which with hiatal dimensions was only clearly evident on pelvic floor muscle contraction.

### Interpretation of results

Resting tone of the pubovisceral muscle can be determined by digital palpation. The method seems less repeatable than Oxford Grading for muscle contractility, the repeatability of which in our study is consistent with literature data. Interestingly and despite the limitation of poorer repeatability, resting tone seems to be more strongly associated with pelvic organ prolapse than Oxford Grading. It is postulated that resting tone of the pubovisceral muscle may be more important for pelvic organ support than strength. Consequently it may be preferable to focus on resting tone rather than contraction strength as a measure of muscle function and quality, especially in patients with pelvic organ prolapse.

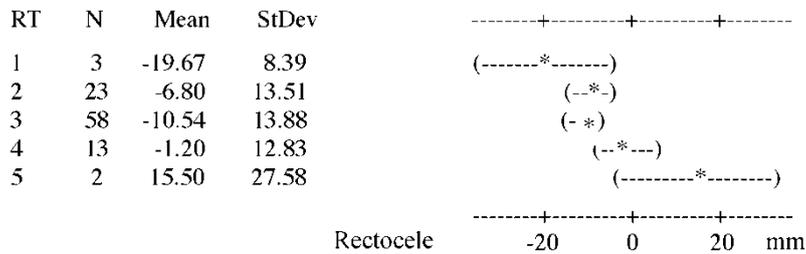
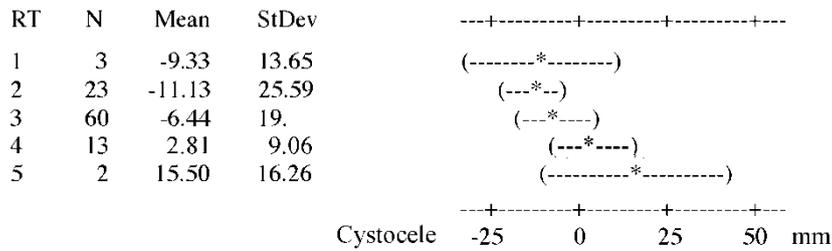


Figure: Relationship between resting tone determined by vaginal palpation and descent of the bladder (top) and rectal ampulla (bottom) as quantified on translabial ultrasound ( $p=0.175$  for cystocele,  $P=0.014$  for rectocele on ANOVA).

#### Concluding message

Resting tone of the pubovisceral muscle can be assessed clinically with a fair degree of repeatability and seems to be more strongly associated with pelvic organ descent and hiatal dimensions at rest and on Valsalva than Oxford grading for muscle strength. Palpation of resting tone may be a useful new tool for assessing women with pelvic floor dysfunction, in particular in the context of intervention studies aimed at altering pelvic floor biomechanical properties.

#### References

1. Aust NZ J Obstet Gynaecol 2007 (in print).
2. Neurourol Urodyn 2006. **25**: p. 509-510.
3. Br J Obstet Gynaecol 2006. **113**(2): p. 225-30.

**FUNDING:** OZWAC Foundation, Penrith, Australia and Betty Byrne Henderson Foundation, Brisbane, Australia

**HUMAN SUBJECTS:** This study was approved by the Sydney West Area Health Service HREC and followed the Declaration of Helsinki Informed consent was not obtained from the patients.