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Title (type in CAPITAL LETTERS. leave one blank line before the text)	
A COMPARISON OF THREE DIFFERENT TECHNIQUES FOR THE ASSESSMENT OF PELVIC FLOOR MUSCLE STRENGTH	

Aims of Study

The assessment of levator function plays a central role in pelvic floor physiotherapy and urogynaecology. Muscle strength has traditionally been determined by palpation and perineometry (1) More recently, translabial or transvaginal ultrasound has been used to perform this task Vesical neck elevation (2,3, 4), a change in angle between urethrovesical junction and symphyseal margin (5) and changes in the inclination of the proximal urethra (6) have been described Apart from the latter however, direct comparisons of ultrasound data and perineometry/ palpation have not been undertaken This study was designed to compare the three most commonly used ultrasound parameters to perineometry data and palpation

Methods

48 patients with symptoms of lower urinary tract dysfunction and/or prolapse were investigated by a physiotherapist and a gynaecologist Physiotherapy assessment included vaginal palpation of levator strength based the Oxford muscle grading scale (grade 0= nothing, 1= flicker, 2= weak squeeze, 3= moderate squeeze & lift, 4=good squeeze & lift, 5=strong squeeze and lift) and perineometry (1) via an air filled vaginal sensor connected to a pressure transducer (Peritron™) The patient's muscles were graded via palpation and then evaluated via perineometry for maximum contraction pressure, average contraction pressure & hold ability Translabial ultrasound was carried out at rest and on pelvic floor muscle contraction Vertical and horizontal displacement were entered into a database and the oblique or total displacement calculated Changes in the angle γ (5) and in inclination of the proximal urethra (6) were also recorded Both investigators were blinded against each others' results In 2 cases palpation and perineometry were impossible due to vaginal stenosis, in another 2 only palpation was possible This left 44 datasets for analysis The data was analysed using Pearson's correlation co-efficients on minitab v12

Results

The tables show correlations between perineometry and vaginal palpation (Tab 1), ultrasound and vaginal palpation (Tab 2) and ultrasound and perineometry (Tab 3) The three ultrasound parameters correlated highly ($r= 0.8- 0.95$) with each other

Perineometry	Correlation with vaginal palpation
Max squeeze pressure	$r= 0.78, p<0.001$
Average squeeze pressure	$r= 0.67, p<0.001$
Hold	$r= 0.31, p=0.053$

Tab. 1 Correlation between perineometry and vaginal palpation (not blinded)

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Ultrasound parameters	Correlation with vaginal palpation
Angle change (symphysis)	r=-0.46, p= 0.001
Angle change (prox urethra)*	r= 0.50, p= 0.002
Oblique displacement	r= 0.56, p< 0.001

Tab. 2 Correlation between Ultrasound parameters of levator function and vaginal palpation (modified Oxford Scale, *n=40)

Ultrasound parameters	Perineometry (max. squeeze pressure)
Angle change (symphysis)	r=-0.38, p= 0.012
Angle change (prox urethra)*	r= 0.40, p= 0.017
Oblique displacement	r= 0.46, p= 0.002

Tab. 3 Correlation between Ultrasound parameters of levator function and perineometry (*n=38)

Conclusion

Vaginal palpation, perineometry and ultrasound measurements of trigonal displacement all measure different aspects of a levator contraction. Perineometry assesses intravaginal pressure generated by the contraction, vaginal palpation assesses squeeze pressure and most importantly lift (grade 3 & above = ability to generate a lift via a levator contraction). Ultrasound determines changes in bladder neck geometry (lift). The best correlations were observed between perineometry and palpation, and these (non-blinded) results are comparable with literature data (7). Of the blinded comparisons, bladder neck displacement on ultrasound correlated best with vaginal palpation (r= 0.56) - both methods detect lift ability - and with perineometry (r= 0.46). Other ultrasound parameters correlated less closely.

Staff assessing pelvic floor function will have varying expertise and access to equipment. The methods tested here assess different aspects of levator function and all can be used in making the patient aware of her ability to contract her pelvic floor muscles. Of the ultrasound methods used, bladder neck displacement seemed to agree most closely with palpation and perineometry. It remains to be shown which of these methods correlates best with treatment success.

Literature

- 1 In: *Pelvic floor re-education Principles and practice*, London:Springer, 1994, p. 42-48.
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