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ANTERIOR COMPARTMENT BUT NOT POSTERIOR COMPARTMENT PROLAPSE IS ASSOCIATED WITH LEVATOR HIATUS AREA. A 3D/4D TRANSPERINEAL ULTRASOUND STUDY

Hypothesis / aims of study

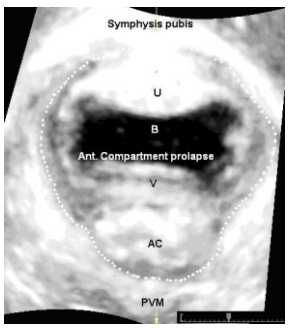
Studies using magnetic resonance imaging (MRI) and 3D/4D transperineal ultrasound have shown an association between size of the levator hiatus (LH) and pelvic organ prolapse (POP) (1.2). These studies have only investigated the most descended vaginal compartment. Many women attending our outpatient clinics, however, have clinically significant POP in more than one vaginal compartment. The aims of the present study were to investigate the relationships between the size of the levator hiatus and degree and anatomical site(s) of pelvic organ prolapse.

Study design, materials and methods

In this cross-sectional study 157 women were included from January 2006 to April 2008. They were originally recruited for a randomized controlled trial investigating the effects of pelvic floor training on POP and/or as controls in a parallel case control study investigating risk factors for POP. Exclusion criteria were breastfeeding, previous POP surgery, radiating back pain, pelvic cancer, neurological or psychiatric disorders. All women answered a validated symptom questionnaire, underwent clinical examination using the pelvic organ quantification system (POP-Q) and a 3D/4D transperineal ultrasound examination at rest and on maximal Valsalva using GE Kretz Voluson E_8 system (GE Medical Systems Norway). The ultrasound volumes were analyzed in the axial plane at level of minimal hiatal dimension using the 4D View (v 5.0) according to previously published methodology(3). One investigator performed all the analyses blinded to clinical data and previous results. Ultrasound measurements analyzed were the area of LH at rest (LHrest) and on Valsalva (LHval).

Degree of POP was defined as the leading edge of the most descended compartment on maximal Valsalva measured in centimetres and translated into stages (0-IV).

To assess the relationship between area of LH and the anatomical site of POP we first analyzed the measurements of the most descended point (cm) in the three separate vaginal compartments, after which women were divided into clinically non-significant (stage 0-I) and significant (≥ stage II) prolapse. Women with stage 0-I were used as a reference group. Women with clinically significant POP in one or more compartment(s) were grouped according to the anatomical site of their POP. The results are given as means with range or 95% confidence intervals (CI). Linear regression analysis was used to investigate how LHrest and LHval are associated with the stage of prolapse and with the position of the most descended point in the three vaginal compartments. Group comparisons were performed using analysis of covariance (ANCOVA). All analyses were adjusted for parity and age at baseline. The level of significance was set at 0.05.



A

B

Figure 1 Axial plane at the level of minimal hiatal dimensions. The area of the levator hiatus on Valsalva in a woman with a single stage II prolapse in A the anterior compartment B the posterior compartment Area is marked by dotted line. U = urethra, B = Urinary bladder, V = vagina, AC = anal canal, PVM = Pubovisceral muscle

Results

The mean age of the study population was 49.1 years (range 27-72). The mean BMI was 25.3 (range 18.5-36.6) and mean parity 2.3 (range1-6). In 149 of the 157 recruited women we were able to correlate LHrest with clinical grading of prolapse. In 17 women, we did not have the necessary anatomical landmarks to assess LHval.

Size of LH and degree of POP

One woman was classified as POP stage 0, 43 women as POP stage I, 76 as stage II, 27 as stage III and one as stage IV. There was a significant positive association between stage of prolapse and LHrest and LHval ($p<0.001$) with the strongest association for LHval.

Size of LH and anatomical site of POP

Measurements of the most descended point of the anterior vaginal wall showed a strong association with LHval ($p<0.001$) No associations were found for measurements of the apical or posterior compartments and LHval ($p=0.152$ and $p=0.406$, respectively).
One hundred and three women had clinically significant prolapse (Table 1). The LHrest and LHval of women with a single anterior compartment POP were larger than those of women with no clinical POP ($p=0.001$ and $p<0.001$respectively).No differences were found in LHrest and LHval between women with a single posterior compartment POP and women, with no clinical POP ($p=0.466$ and $p=0.815$, respectively). There were no differences in LHrest and LHval between women with a single anterior compartment POP and women with an additional apical or posterior compartment POP. There were too few patients with three compartment POP to compare data.

Table 1 Area of the levator hiatus at rest (LHrest) and on maximal Valsalva (LHval) for different sites and combinations of POP. Data presented as mean with 95% CI.

Compartment(s)	LHrest(cm^2)		LHval (cm^2)	
	N (missing	Mean (95 % CI)	N (missing)	Mean (95 % CI)
No clinical prolapse (stage 0-I)	45 (4)	19.9 (18.5; 21.3)	41 (8)	25.9 (23.7; 28.2)
Anterior	37 (1)	24.3 (22.4; 26.2)	33 (5)	33.3 (30.4; 36.3)
Posterior	15 (0)	20.4 (18.3; 22.4)	15 (0)	25.4 (22.0; 29.3)
Anterior+apical	11 (0)	26.0 (22.7; 29.2)	10 (1)	34.2 (30.0; 38.5)
Anterior+posterior	33 (3)	24.2 (22.3; 26.0)	30 (6)	30.6 (27.7; 33.4)
Anterior+apical+posterior	7 (0)	25.5 (21.8; 29.2)	3 (4)	34.0

Interpretation of results

Our data shows that both degree and anatomical site of POP are of importance when investigating associations with the size of LH. The status of the anterior compartment was associated with size of LH irrespective of whether we looked the isolated compartments or at the different groups of clinically significant POP. Having clinically significant prolapse in more than one compartment was not associated with any increase in area of LH.
For the clinician this would imply that examinations using 3D/4D ultrasound in the axial plane are most useful in women with POP involving the anterior compartment.

Concluding message

Degree of prolapse and clinically significant anterior compartment POP but not posterior compartment prolapse are positively associated with area of the levator hiatus measured using 3D/4D transperineal ultrasound both at rest and on Valsalva

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Is this a Randomised Controlled Trial (RCT)?	**No**
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Was this study approved by an ethics committee?	**Yes**
Specify Name of Ethics Committee	**Regional Medical Ethics Committee (212-06078 1.2006.291), and Norwegian Social science Data Service (2008-16703 JE/RF).**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**