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CAN HIATAL BALLOONING BE DETERMINED BY TWO-DIMENSIONAL TRANSLABIAL ULTRASOUND?

Hypothesis / aims of study

The levator ani muscle encloses the levator hiatus, the largest hernial portal in the human body. This muscle plays a major role in pelvic organ prolapse, which is best regarded as a herniation through this portal. Excessive distensibility of the levator hiatus has been termed 'ballooning', and ballooning is strongly associated with prolapse and prolapse symptoms[1]. To date, the size of the levator hiatus has exclusively been assessed by axial plane imaging using 3D translabial ultrasound[1] or Magnetic Resonance Imaging[2]. In this retrospective study, we aimed to determine the limits of normality for the midsagittal hiatal diameter of the levator hiatus, and to define 'ballooning' i.e., abnormal distensibility of the levator ani muscle, using this measure.

Study design, materials and methods

This is a retrospective analysis of clinical data and translabial ultrasound volume datasets of 577 women seen at a tertiary urogynecology unit between May 2008 and September 2010. Patients underwent a structured local interview, a clinical examination including the ICS POP-Q and palpation of levator muscle strength and morphological integrity. Ultrasound volume data were acquired using a Voluson 730 expert system with RAB 8-4 Mhz transducer, with the patient supine and after voiding. Ultrasound postprocessing analysis was performed by the first author to determine hiatal diameters in the midsagittal plane, at rest, on valsalva and on maximal pelvic floor muscle contraction. Figure 1 shows determination of the midsagittal hiatal diameter in two women, contrasting normal and abnormal findings. The measurement is taken from the posterior surface of the symphysis pubis to the most ventral aspect of the levator ani at the site of the anorectal angle. A significant prolapse was defined as >= stage 2 (ICS POP-Q). On ultrasound, we defined significant prolapse as a cystocele >= 10 mm below the symphysis pubis (SP), uterine descent >=0 mm below the SP, and a rectocele to >= 15 mm below the SP.

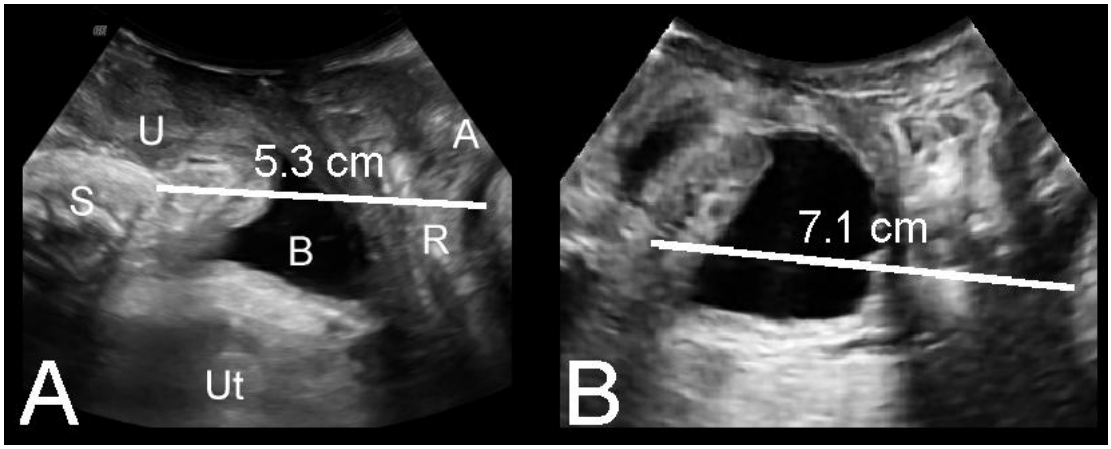

Figure: Determination of midsagittal hiatal diameter on 2D translabial ultrasound (oblique lines). A: 5.3 cm (normal) in patient with Cystocele I and stress incontinence, B: 7.1 cm (marked ballooning) in patient with 2nd degree anterior and posterior compartment descent. S= symphysis pubis, Ut= uterus, U= urethra, B= bladder, R= rectum, A= anal canal.

The study was conducted in the context of a parent project that had been approved by the local institutional Human Research Ethics Committee. Statistical analysis was undertaken using the software Minitab v13 for PC (Mintab Inc., State College, PA, USA) and SAS v9.2 (SAS Institute Inc., Cary, NC, USA.). All quantitative data were found to be normally distributed on Kolmogoror-Smirnov testing. We used t- tests to evaluate the relationship between pelvic organ descent and prolapse symptoms, and receiver operating characteristics (ROC) curve analysis to examine the relationship between hiatal dimensions and reported symptoms of prolapse, in order to obtain a plausible estimate of the cut off value for hiatal dimensions.

Results:

We were able to measure the midsagittal diameter of the hiatus on Valsalva in all 577 cases included within the time frame of the study. There was a strong statistical relationship between reported prolapse symptoms and pelvic organ descent, both on ultrasound and on clinical examination (both P <0.001 on chi square). There was a strong statistical relationship between reported prolapse symptoms and objective prolapse on the one hand and midsagittal (anteroposterior, AP) hiatal diameter on Valsalva (both P< 0.001) on the other hand. ROC analysis confirmed these relationships, with an area under the curve (AUC) of 0.637 (95% CI, 0.59-0.68) for AP diameter on Valsalva/ symptoms of prolapse, 0.71 [95% CI 0.67-0.76]) for AP diameter/ stage 2+ prolapse on ICS POP-Q, and 0.751 [95% CI 0.710-0.792] for AP diameter/ significant prolapse on ultrasound. A cut-off of 6.0 cm for the AP hiatal diameter on Valsalva yielded a specificity of 0.64 and a sensitivity of 0.71 for detecting significant prolapse on ultrasound. On the basis of these results, we propose that an AP hiatal diameter of up to 5.99 cm be regarded as normal.

Category	N	Symptoms of prolapse	Clinical prolapse stage 2+	Prolapse on ultrasound
Normal (<6 cm)	243	n= 82 (34%)	n= 109 (45%)	n= 107 (44%)
Mild ballooning (6- <6.5 cm)	95	n=34 (36%)	n=58 (61%)	n= 57 (60%)
Moderate ballooning (6.5- <7 cm)	97	n=51 (53%)	n=77 (79%)	n=80 (82%)
Marked ballooning (7- <7.5 cm)	61	n=35 (57%)	n=50 (82%)	n=47 (77%)
Severe ballooning (7.5 cm or higher)	81	n=48 (59%)	n=66 (81%)	n= 73 (90%)

Table 1: Stratification of degrees of ballooning on 2D translabial ultrasound (n= 577).

We attempted stratification of abnormal cases similar to ballooning on axial plane ultrasound (2). Table 1 shows the results and the prevalence of symptoms and signs of prolapse in the five groups. A measurement of 6- <6.5 cm for midsagittal hiatal diameter on Valsalva can be defined as mild, 6.5- <7 cm as 'moderate', 7- <7.5 cm as 'marked' and => 7.5 cm as 'severe' ballooning. Such stratification was strongly associated with both symptoms and signs of prolapse (all P< 0.001 on X2).

Conclusion:

Conventional 2D ultrasound, a method that is widely accessible, can be used to diagnose excessive distensibility of the levator hiatus. We propose that a midsagittal hiatal diameter of up to 5.99 cm on maximal Valsalva be regarded as normal.

References

1. Dietz H, De Leon J, Shek K. Ballooning of the levator hiatus. Ultrasound in Obstetrics & Gynecology 2008,31:676-680.
2. Kruger J, Heap X, Murphy B, Dietz H. Pelvic Floor Function in Nulliparous Women Using 3-Dimensional Ultrasound and Magnetic Resonance Imaging. Obstet Gynecol 2008,111:631-638.

Disclosures

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