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DOES LEVATOR AVULSION CAUSE CLINICALLY VISIBLE DISTENSION OF THE LEVATOR HIATUS?

Hypothesis / aims of study

Levator avulsion, the traumatic disconnection of the levator ani muscle from the pelvic sidewall during vaginal childbirth, is common and associated with prolapse and prolapse recurrence (1). To diagnose avulsion it has been necessary to use 4D ultrasound or magnetic resonance imaging. It has recently been shown that enlargement of the hiatus can be diagnosed clinically by measuring the distance between the urethra and the anus on maximal Valsalva, a measure known as 'genital hiatus + perineal body' (2), gh+pb.

In this study we set out to determine whether gh+pb can predict levator avulsion. To allow a comparison with the predictive value of imaging data, we also analysed the association between hiatal area on Valsalva and avulsion.

Study design, materials and methods

A total of 295 women attended a tertiary referral service for urodynamic testing and 4D pelvic floor ultrasound imaging (GE Kretz Voluson 730 expert) between September 2010 and October 2011. Patients underwent an interview and a clinical examination using the ICS POP-Q (3), including measurement of the genital hiatus (gh) and perineal body (pb) at maximal Valsalva (see Fig. 1a). Offline analysis of ultrasound datasets was performed retrospectively, and blinded to all other patient data. Analysis of levator avulsion and hiatal area was performed with the software 4DView on a desktop PC. We used multislice or tomographic ultrasound to diagnose avulsion of the puborectalis muscle. Tomographic ultrasound imaging (TUI) was performed on volumes obtained at pelvic floor muscle contraction, requiring an abnormal muscle insertion in all three slices obtained at the level of the plane of minimal hiatal dimensions as well as 2.5 and 5 mm above for a diagnosis of complete avulsion. The measurement of gh+pb was tested against avulsion. We also measured the hiatal area on maximal Valsalva in the plane of minimal hiatal dimensions (see Fig. 1b), and tested its predictive performance for the diagnosis of avulsion.

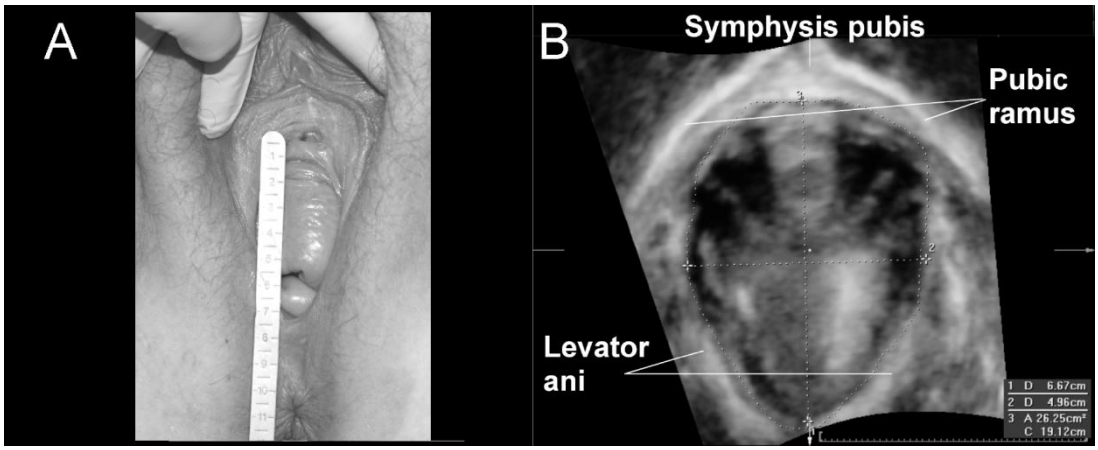

Fig.1: Clinical determination of gh+pb (A), measurement of hiatal dimensions on translabial 4D ultrasound in the axial plane of minimal dimensions (B).

Results

Interobserver reliability data (n=20) was obtained for hiatal area on Valsalva (ICC 0.903, CI 0.696-0.961) and for the diagnosis of avulsion on TUI (k 0.892, CI 0.733-0.961) indicating very good repeatability. Mean age was 56.6 (range, 18.6-85.6), median parity was 3 (range 0-10), mean BMI was 29.2 (range 17.3-59.5). Patients presented with symptoms of stress incontinence (75%, n=222), urge incontinence (73%, n=215), voiding dysfunction such as poor stream, straining to void and/ or hesitancy (29%, n=87), and symptoms of prolapse (vaginal lump or dragging sensation) (53%, n=156). 91% (n=268) had delivered vaginally, and 30% (n=89) had had a forceps or vacuum delivery, 21% (n=62) had undergone previous incontinence or prolapse surgery, and 30% (n=90) had a previous hysterectomy. On clinical examination using ICS POP-Q, 61% (n=171) had a cystocele, 14% (n=25) a uterine prolapse, 5% (n=16) an enterocele and 56% (n=165) a rectocele of stage 2 or more. 77% (n=227) had either a single compartment prolapse, or a prolapse involving more than one compartment.

When adding genital hiatus (gh) and perineal body (pb) on Valsalva, we obtained a mean of 7.9 (range 4.2-13) cm. The mean hiatal area on Valsalva was 28.3 (range 9.7-59.5) cm^2. 70 women (24%) were diagnosed with an avulsion on tomographic ultrasound.

On using ROC characteristics to describe the predictive performance of measuring gh+pb for avulsion, we found that optimal sensitivity (70%, 95%CI 59-79%) and specificity (70%, 95%CI 66-72%) was achieved with a cut off of 8.5 cm for gh + pb (see Fig. 2a). By using ROC characteristics to describe the predictive performance of hiatal area for avulsion, we found optimal sensitivity (81%, 95%CI 71-89%) and specificity (73%, 95%CI 70-75%) with an area of 30cm^2 as a cut off (see Fig. 2b). Avulsion was substancially more likely in women with gh +pb ≥ 8.5cm (OR 5.32, 95%CI 2.85-9.98, RR 3.51, 95%CI 2.20-5.72).

In comparison, a hiatal area of 30cm^2 or more on Valsalva gave an OR of 11.64 (95%CI 5.70-24.15) and a RR of 6.5 (95% CI 3.71-11.94) for avulsion.

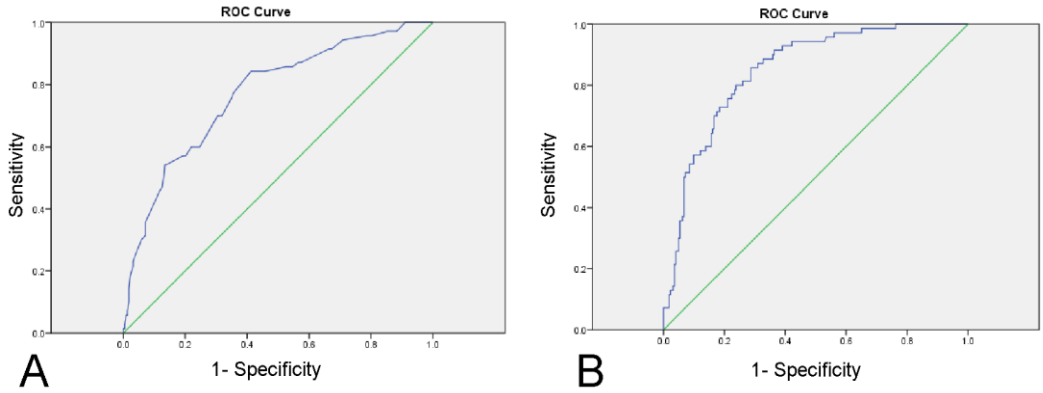

Fig. 2: ROC curves estimating the predictive performance of (A) gh+pb and (B) 'hiatal area on Valsalva' for avulsion diagnosed by TUI. The areas under the curve are 0.77 (0.71- 0.83 for (A) and 0.85 (0.80- 0.90) for (B).

Interpretation of results

The measurement of genital hiatus and perineal body (gh+pb) on maximal Valsalva is a predictor of avulsion of the puborectalis part of the levator muscle. A cut off of 8.5 cm, provides sensitivity of 70% and specificity of 70% for the diagnosis of avulsion on tomographic pelvic floor ultrasound. In comparison, on imaging assessment of the levator hiatus the optimal cut-off for the prediction of avulsion is 30cm^2, giving a sensitivity of 81% and a specificity of 73%, showing superior test performance.

Concluding message

The measurement of genital hiatus and perineal body (gh+pb) on maximal Valsalva is associated with avulsion injury. Values over 8.5cm imply a high risk of this abnormality and allow the identification of women at potentially increased risk of prolapse and prolapse recurrence after corrective surgery. However, imaging evidence of hiatal overdistension seems a more powerful predictor of levator avulsion than the measurement of gh+pb on clinical examination.

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Disclosures

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