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IS THE LEVATOR-URETHRA GAP HELPFUL FOR THE DIAGNOSIS OF AVULSION?

Hypothesis / aims of study

Levator avulsion is a risk factor for symptomatic female pelvic organ prolapse (FPOP) and for recurrence after surgical correction of FPOP. This condition can be diagnosed clinically on vaginal palpation, or using translabial ultrasound or magnetic resonance imaging. Standard methodology requires the observation of an abnormal insertion of the muscle on tomographic ultrasound imaging (TUI) [1]. The levator-urethra gap (LUG) is described as the distance between the center of the urethral lumen and the insertion of the levator on the inferior pubic ramus, determined in axial plane slices. An abnormal LUG has been associated with avulsion diagnosed by vaginal palpation [2]. This study was designed to compare the diagnostic performance of the qualitative visual diagnosis of avulsion ('eyeballing') to LUG measurement.

Study design, materials and methods

This study is based on the analysis of data obtained in routine clinical practice in a tertiary urogynaecological unit between January 2013 and July 2013. All subjects underwent a standardised interview, multichannel urodynamic testing, ICS POP-Q examination and 4D translabial pelvic floor ultrasound (US), supine and after voiding. US post- processing was performed by the first author, using proprietary software (4D View v 10.7), blinded against all clinical data. Avulsion of the puborectalis muscle was defined qualitatively as an abnormal levator ani insertion, and quantitatively as a LUG equal to or greater than 25 mm visible on at least three consecutive axial plane slices (slices 3-5 or 'central row slices') at and above the level of minimal hiatal dimensions (interslice interval of 2.5 mm) on pelvic floor muscle contraction (Fig. 1) [3]. Significant prolapse on US was determined against the inferior symphyseal line [3], hiatal ballooning was diagnosed in the midsagittal plane [3].

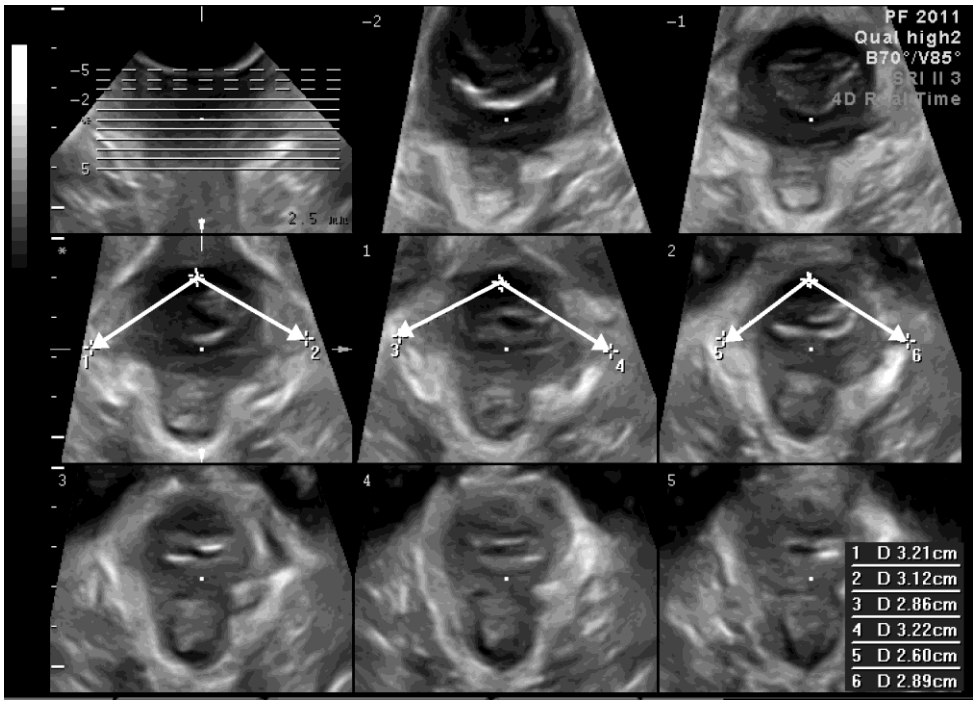

Figure 1: Complete bilateral avulsion in patient with multicompartment prolapse. LUG indicated by arrows. A patient is rated as positive for a full avulsion if the three slices of the central row are all abnormal.

Volumes were first examined qualitatively for abnormal insertion in the three central slices. After determining the presence of avulsion by this method, LUG was measured for each side in these slices. We then examined the correlation of an abnormal LUG with qualitative assessment. We then excluded patients with previous surgery for FPOP to determine the association of levator avulsion with significant FPOP (ICS Stage 2 or higher), significant organ descent on US, and hiatal ballooning, as diagnosed by either method. This was a retrospective pilot study; hence we did not perform power calculations.

Results

Between January and July 2013, 233 patients were seen for assessment. Of those, we were able to retrieve the US volume data sets of 204. Two patients were unable contract their pelvic floor, and were excluded from the sample. The final study group included 202 patients.

Mean age was 53.9 ± 14.5 years. Mean BMI was 28.9 ± 6.6 kg/m^2. Patients had a mean parity of 2.5 ± 1.4, 84.6% were vaginally parous, and 20.8% had had a forceps delivery. Thirty percent of patients had a previous hysterectomy, 15.8% previous FPOP surgery.

Fifty-three percent of patients presented with symptoms of FPOP, 71.7% had a history of stress urine incontinence (SUI), and 68.2% of patients presented with urge incontinence (UUI). On clinical examination, 73.8% of patients had stage 2 or higher

FPOP. Mean hiatal area on valsalva was 28.5±10 cm^2. Sixty percent of patients had an abnormal hiatal area ('ballooning') >= 25 cm^2.

On using the 'eyeballing' method to assess the insertion of the levator on the inferior pubic ramus, we diagnosed avulsion in 22%. This was right sided in 16.3%, left sided in 12.9%. A bilateral avulsion was present in 7.4% of patients. On using LUG measurements, we detected avulsion in 24.3% of patients (right- sided in 15.3%, left-sided in 18.3%, and bilateral in 9.4%). Out of 404 diagnoses (left and right side for each patient) there was a discrepancy for the diagnosis of avulsion in 23 (5.7%). When evaluating single slices, the discrepancy rate was 8.3% (101 of 1.212 slices). Agreement for the diagnosis of avulsion was good, with a kappa of 0.785 (0.701-0.869). Single slice agreement was also good, with a kappa of 0.763 (0.72-0.807).

Thirty-two patients had previous surgery for FPOP and were excluded from further analysis. Of the remaining 170, 18.8% (n=32) had a complete avulsion. The odds ratios for significant FPOP, significant prolapse on ultrasound and hiatal ballooning are shown in Table 1 which attempts to validate both diagnostic methods against measures known to be strongly associated with avulsion.

	Qualitative diagnosis of avulsion		LUG ≥ 25mm in all three central slices	
	OR (95% CI)	P value	OR (95% CI)	P value
Significant POP (>= stage 2)	4.7 (1.4-16.2)	0.008	17.4 (2.3-131.4)	<0.0001
Significant organ descent on US	3.9 (1.5-10)	0.003	4.3 (1.6-11)	0.001
Ballooning (Hiatal area ≥ 25 cm^2)	5.2 (1.9-14.4)	0.001	7.7 (2.5-23.1)	<0.0001

Table 1: Odds ratio of significant outcomes versus avulsion diagnosed by qualitative assessment and LUG measurement (n= 202)

Interpretation of results

Qualitative analysis of slices on TUI and a method utilising LUG measurement show high agreement for the diagnosis of levator avulsion. The LUG method is at least equally valid in its capacity to predict significant prolapse on clinical examination and on ultrasound, as well as ballooning of the levator hiatus.

Concluding message

Our findings support the use of LUG in addition to qualitative assessment of the muscle insertion to increase the validity of a diagnosis of avulsion. In practice, this seems most useful in the evaluation of doubtful cases.

References

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