133

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SONOGRAPHIC PREDICTORS OF OBSTRUCTIVE DEFECATORY DYSFUNCTION

Hypothesis / aims of study

To evaluate the relationship between obstructive defecatory symptoms and levator ani deficiency, levator plate descent angle, anorectal angle, and minimal levator hiatus.

Study design, materials and methods

Using a cross-sectional study design, patients who had undergone 3D endovaginal ultrasound (3D EVUS) imaging of the pelvic floor were sampled and categorized into two groups – those with and without obstructive defecatory symptoms (ODS). All patients had documented physical examinations, which included POP-Q examination. All patients had also completed the Pelvic Floor Distress Inventory (PFDI-20) and responses from questions4 and 8 on the the CRADI-8 portion of the questionnaire were analyzed. Patients who had responded 'yes' to any of the included questions from the CRADI-8 were considered symptomatic; those with negative responses to either of these questions were classified as asymptomatic. The levator ani (LA) muscle was divided into three subgroups based on our prior work[1], and evaluated and categorized by severity of levator ani deficiency (LAD) into one of three categories: minimal, moderate, or severe deficiency, using previously published criteria. The anorectal angle (ARA) was measured in the midsagittal view as the angle between the anal canal and rectum and measurements were dichotomized as <170° or ≥170°. Similarly, the levator plate descent angle (LPDA) was also measured in the midsagittal plane and the measurements dichotomized as <9° (greater levator plate descent) or ≥9° (less levator plate descent) based on previous work[3].

Summary statistics were calculated for the patient population. Continuous variables were compared using student's t-tests; categorical variables were compared using Pearson's chi square or Fisher's exact tests. Multivariable logistic regression was used to determine predictors of the presence of ODS, with potential covariates evaluated including ARA, LAD status, LPDA, and minimal levator hiatus (MLH). A two-sided p-value of 0.05 was considered significant.

Results

100 patients were included in the analysis: 52 asymptomatic patients and 48 patients with obstructive defecatory symptoms. The mean age was 59 years (SD ±14.97), 94% were Caucasian, the median parity was 2 (range 0, 6), and the mean BMI was 27.93 (SD ±6.75). 19% had a history of anal sphincter injury, 65% were menopausal, 16% were smokers, 80% had either stage 1 or 2 pelvic organ prolapse, and 68% also had complaints of anal incontinence (AI). The groups were homogeneous in respect to all of the above variables except for AI, with the symptomatic group having a significantly higher proportion of patients with AI (p<0.0001).

There was no difference in the distribution of LAD severity (p=0.1438) or mean MLH (p=0.3326) between groups. ARA and LPDA were significantly different in those with ODS compared to their asymptomatic counterparts (p<0.0001 and 0.0004, respectively (Table 1). On multivariable logistic regression, ARA and LPDA were included in the final model. Patients with an ARA >170° had 7 times the odds of ODS compared to those with an ARA ≤170° (OR=7.01, 95% CI 2.30, 21.35, p=0.0006). Patients with an LPDA <9° had 3 times the odds of ODS compared to those with an LPDA ≥9° (OR=3.30, 95% CI 1.22, 8.96, p=0.0190) (Table 2). There was no interaction or confounding identified in the model.

Interpretation of results

Patients with an ARA >170° had 7 times the odds of ODS compared to those with an ARA ≤170°. Patients with an LPDA <9° had 3 times the odds of ODS compared to those with an LPDA ≥9°.

Concluding message

Of the sonographic measurements obtained, greater levator plate descent, LPDA (<9 degrees) and ARA (>170 degrees) are highly associated with obstructive defecatory symptoms.

Table 1. Summary Statistics

	Total (n=100)	ODS absent (n=52)	ODS present (n=48)	p Value
LAD (n, %)				
Minimal	20 (20.00)	12 (23.08)	8 (16.67)	0.1438
Moderate	44 (44.00)	26 (50.00)	18 (37.50)	
Severe	36 (36.00)	14 (26.92)	22 (45.83)	
MLH (mean, STD)	17.76 (18.09)	19.42 (23.83)	15.61 (3.91)	0.3326
ARA (n, %)				
≤ 170°	71 (71.00)	47 (90.38)	24 (50.00)	<0.0001
>170°	29 (29.00)	5 (9.62)	24 (50.00)	
LPDA				
< 9°	66 (66.00)	26 (50.00)	40 (83.33)	0.0004
≥ 9°	34 (34.00)	26 (50.00)	8 (16.67)	

LAD=levator ani deficiency; MLH=minimal levator hiatus; ARA=anorectal angle; LPDA=levator plate descent angle; ODS=obstructive defecatory symptoms

Table 2. Odds Ratios, 95% Confidence Intervals, and fit statistics for a multivariable logistic regression model associating anorectal angle and levator plate descent angle with obstructive defecatory symptoms.

	OR	95% Wald Confidence Limits		p-value
ARA*	7.01	2.30	21.35	0.0006
LPDA*	3.30	1.22	8.96	0.0190
Fit Statistics	Likelihood ratio	<0.0001		
	AIC	<0.0001		
	c statistic	0.777		

*Reference groups: outcome variable – no obstructive defecatory symptoms; ARA - <170°; LPDA - ≥9°
OR=odds ratio; ARA=anorectal angle; LPDA=levator plate descent angle

References
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