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PREDICTORS OF ANAL INCONTINENCE IN THE ABSENCE OF ANAL SPHINCTER DEFECT: A 3D ENDOVAGINAL AND ENDOANAL STUDY

Hypothesis / aims of study

The aim of this study is to evaluate predictors of anal incontinence (AI) in patients with a normal anal sphincter, with the hypothesis that patients with levator ani deficiency will increase the risk of AI.

Study design, materials and methods

We retrospectively evaluated 200 ultrasound data sets of patients who presented to a tertiary Urogynecology care unit with symptoms of pelvic floor disorders All the patients underwent a POP-Q examination and high resolution 3D endovaginal (3D EVUS) and endoanal (3D EAUS) 360 degree ultrasound imaging. All patients had a detailed history and completed the Pelvic Floor Questionnaire (PFDI-20)

Patients were categorized into 2 groups by the presence or absence of AI. The levator ani (LA) muscle was divided into three subgroups based on our prior work[1]. Subgroups were evaluated and scored by origin and attachment points, then categorized as 0-6 = mild, 7-12 = moderate, and >13 = severe defect. The anorectal angle (ARA) was measured in the midsagittal view as the angle between anal canal and rectum and measurements were dichotomized as <170° or ≥170°. Colonic motility abnormality (CMA) was defined as diarrhea, constipation or both intermittently 3D endoanal (3D EAUS) volume datasets were analyzed in a blinded fashion to detect external (EAS) and internal (IAS) anal sphincter (EAS) defects. Only patients with intact anal sphincters were included in this analysis.

Results

From 97 available data sets, 56 patients were included in the analysis that had normal anal sphincters: 21 asymptomatic patients and 35 with AI symptoms. The mean age was 57.14 (SD±12.22), median parity 2 (range 0, 7). Summary of demographic data is in Table 1.BMI, smoking, hysterectomy status or history of sphincter laceration did not differ between groups. Prolapse stage did not differ between groups. On multivariable logistic regression, covariates that remained in the final model after assessing for interaction and confounding included ARA, and CMA, with excellent model fit (Table 2). LAD was not associated with AI in women without sphincter defect. However 63.6% of women with incontinence to solid stool and 52.1% of women with incontinence to just gas had sever LAD but prevalence of sever LAD in normal group was 42.8%. Age was a significant confounder of the relationship between AI and ARA and CMA and the model was adjusted accordingly. The odds of AI in women with an ARA ≥170° was nearly 8 times greater than the odds of AI in women with a more acute ARA (OR 7.76, 95% CI 1.25, 48.20, p=0.028). A similar relationship was seen between CMA and AI, with women with CMA having higher odds of AI than those without CMA (OR 7.29, 95% CI 1.262, 42.17, p=0.026).

Interpretation of results

Patients with an ARA >170 degrees and the presence of CMA symptoms have a 7-fold odds of having anal incontinence symptoms in women with normal anal sphincter complex. Severe LA defects were present in 21% of women with solid stool incontinence in the absence of a sphincter defect

Concluding message

Greater ARA and CMA are associated with increased odds of AI in women with normal anal sphincters. While there was a trend towards worsening defect status among those with major AI, this did not reach statistical significance in this patient sample.

Table1

	Total (n=56)	No AI (n=21)	AI (n=35)	p Value*
Age (mean, SD)	57.18 (12.22)	54.33 (12.85)	58.89 (11.68)	0.0975
Race (n, %)				
Caucasian	49 (92.45)	19 (95.00)	30 (90.95)	1.000
African American	3 (5.66)	1 (5.00)	2 (6.06)	
Hispanic	1 (1.89)	0 (0.00)	1 (3.03)	
Parity (median, range)	2 (0, 7)	3 (0, 7)	2 (1, 5)	0.2455
BMI (mean, SD)	28.33 (5.51)	27.11 (5.31)	29.03 (5.58)	0.3705
Sphincter injury (n, %)	3 (8.82)	1 (7.14)	2 (10.00)	0.7725
Menopausal (n, %)	36 (81.82)	12 (66.67)	24 (92.31)	0.0321
Smoker (n, %)	5 (9.26)	1 (4.55)	4 (12.50)	0.6377
Prior hysterectomy (n, %)	46 (86.79)	17 (85.00)	29 (87.88)	1.000
Stage of prolapse (n, %)				
0	10 (22.22)	6 (35.29)	4 (14.29)	0.5342
1	5 (11.11)	2 (11.76)	3 (10.71)	
2	24 (53.33)	8 (47.06)	16 (57.14)	
3	4 (8.89)	1 (5.88)	3 (10.71)	
4	2 (4.44)	0 (0.00)	2 (7.14)	
Stage of posterior prolapse (n, %)				
0	12 (26.67)	6 (35.29)	6 (21.43)	0.5907

1	9 (20.00)	4 (23.53)	5 (17.86)	
2	20 (44.44)	7 (41.18)	13 (46.43)	
3	3 (6.67)	0 (0.00)	3 (10.71)	
4	1 (1.22)	0 (0.00)	1 (3.57)	

based on one-way ANOVA or Kuskal-Wallis for continuous variables and Pearson's Chi-square or Fisher's exact test for categorical variables
AI=anal incontinence; BMI=body mass index

Table 2

	Total (n=56)	No AI (n=21)	AI (n=35)	p Value*
LA defect (n, %)				
Minimal	12 (21.05)	5 (22.73)	7 (20.00)	0.6529
Moderate	20 (35.09)	9 (40.91)	11 (31.43)	
Major	25 (43.86)	9 (36.36)	17 (48.57)	
ARA (n, %)				
< 170°	30 (52.63)	15 (68.18)	15 (42.86)	0.0623
≥ 170°	27 (47.37)	7 (31.82)	20 (57.14)	
CMA (n, %)	37 (68.52)	11 (52.38)	26 (78.79)	0.0417

* based on Pearson's chi square tests or Fisher's exact test
LA=levator ani; ARA=anorectal angle; CMA=colonic motility abnormality

Table 3. Odds Ratios, 95% Confidence Intervals, and fit statistics for a multivariable logistic regression model associating anorectal angle and colonic motility disorder with anal incontinence

	OR**	95% Wald Confidence Limits		p-value
ARA*				
Crude	4.183	1.123	15.580	0.0329
Adjusted	7.756	1.248	48.204	0.0280
CMA*				
Crude	4.712	1.231	18.037	0.0236
Adjusted	7.294	1.262	42.171	0.0264
Fit Statistics[†]	Likelihood ratio p=0.0021			
	AIC 50.031			
	c statistic 0.820			

*Reference groups: Incontinence – no FI; ARA - <170°; CMA – no disorder
**Adjusted for menopausal status
[†]Fit statistics for final adjusted model
OR=Odds Ratio; ARA=anorectal angle; CMA=colonic motility abnormality

References

1. 1. Shobeiri SA, Chesson RR, Gasser RF (2008) The internal innervation and morphology of the human female levator ani muscle. American Journal of Obstetrics and Gynecology 199 (6):686.e681-686.e686. doi:10.1016/j.ajog.2008.07.057

Disclosures

Funding: No fundings **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** IRB of the Oklahoma University Health Sciences Center **Helsinki:** Yes **Informed Consent:** Yes