

Volløyhaug I¹, Mørkved S², Salvesen K Å³

1. Department of Gynaecology and Obstetrics, Trondheim University Hospital and Department of Laboratory medicine, Childrens and Womens Health, Norwegian University of Technology and Science, Trondheim, Norway, 2. Department of Public Health and General Practice, Norwegian University of Science and Technology, Trondheim, Norway, 3. Department of Laboratory Medicine, Childrens and Womens Health, Norwegian University of Technology and Science, Trondheim, Norway

IS AVULSION OF THE LEVATOR ANI MUSCLE ASSOCIATED WITH URINARY AND FECAL INCONTINENCE IN WOMEN FROM A NORMAL POPULATION?

Hypothesis / aims of study

Previous studies have demonstrated a strong association between avulsions of the levator ani muscle (LAM), occurring during vaginal delivery, and symptoms and signs of pelvic organ prolapse (1). There is contrasting evidence regarding associations between LAM avulsion and urinary (UI) and fecal incontinence (FI) later in life (2). Our aim was to study a possible association between LAM avulsion and symptoms of UI and FI in a general population of parous women 15-24 years after first delivery.

Study design, materials and methods

We conducted a cross-sectional study among 3115 women who delivered their first child between 1990 and 1997. Women answered a postal questionnaire in 2013. The Pelvic Floor Distress Inventory (PFDI) was part of the questionnaire, and we used the sub scores (range 0-100) from the Urinary Distress Inventory (UDI) and Colorectal Anal Distress Inventory (CRADI) for quantification of symptoms. We also registered the proportion of women with urge urinary incontinence (UUI), stress urinary incontinence (SUI) and leakage of loose or formed stool, and the proportion of women who had undergone any previous incontinence surgery for UI or FI, as some of them were now asymptomatic.

We invited 847 of the questionnaire responders (regardless of symptom scores) for a clinical examination in 2013-14. The LAM was examined in the supine position after bladder emptying with transperineal ultrasound using a GE Voluson S6 device (GE Medical Systems, Zipf, Austria) with the RAB 4-8RS abdominal three-dimensional probe, angle 85°. Off-line analyses were performed to diagnose the presence of LAM avulsion at pelvic floor muscle contraction. LAM avulsion was rated as unilateral or bilateral if present in all three central slices (the plane of minimal hiatal dimensions and the slices 2.5 and 5 mm cranial to this). The Mann-Whitney U test was used to compare UDI and CRADI symptom scores between women with intact LAM and any LAM avulsion (unilateral or bilateral) with a sub analysis comparing women with intact LAM to women with bilateral LAM avulsion. We performed multiple logistic regression analysis, adjusting for age, BMI, parity and infant birthweight, comparing prevalence of UUI and SUI separately, and a combined variable of UUI, SUI and previous UI surgery and finally a combined variable of leakage of loose and well formed stool and previous FI surgery, between women with intact LAM and any and bilateral LAM avulsion.

Results

A total of 1641 women answered the questionnaire, and 608 women were examined with ultrasound. Mean age was 47.9 years (SD 4.9), mean BMI was 25.8 kg/m² (SD 4.5), mean parity was 2.2 (SD 0.8) and mean birthweight of largest infant was 3861g (SD 506). In total 492 women had intact LAM and 113 had LAM avulsion, of whom 57 were bilateral. The mean (SD) and median (range) UDI and CRADI scores and the proportion of women with UUI, SUI or any symptoms and/ or previous surgery are presented in Table 1. The comparison of symptoms between women with intact LAM to women with any LAM avulsion and bilateral avulsion is presented in Table 2. There was no difference in symptom scores or in proportion of women with UUI, SUI, or combination of symptoms and/ or previous surgery between women with intact LAM and any LAM avulsion or bilateral LAM avulsion.

Interpretation of results

LAM avulsion most likely occurs during first delivery, and a strength of this study is the long time interval since first delivery and assessment of symptoms. Another strength was that women were recruited from the normal population. We performed detailed analyses of symptoms, as we used both symptom scores and positive response to single symptoms and previous incontinence surgery. A sub analysis comparing women with bilateral LAM avulsion and women with intact LAM did not change the results. Intact musculature is important for the support of the anterior vaginal wall, and some authors have suggested that avulsion has impact on the support of the urethra and bladder neck. We would then expect that LAM avulsion was associated with UI, and SUI in particular. The continence mechanism is however complex, and it seems that other factors, such as intrinsic urethral closure pressure, hormonal changes and pelvic floor muscle exercise and strength could be more important than LAM avulsion. Even after adjusting for well known confounders, such as age, BMI and parity, we found no association between LAM avulsion and UI symptoms. Previous studies have identified obstetric anal sphincter tears as the main risk factor for FI after delivery. This was not analysed in this study.

Concluding message

We found no association between avulsion of the levator ani muscle and symptoms of urinary and fecal incontinence 15-24 years after delivery in women from a normal population.

Table 1 UI and FI symptoms according to intact LAM and LAM avulsion.

Symptom	All women N=608		Intact LAM N=492		Any LAM avulsion N=113		Bilat. LAM avulsion N=57	
	Mean (SD)	Median (range)	Mean (SD)	Median (range)	Mean (SD)	Median (range)	Mean (SD)	Median (range)
UDI	12.6 (13.8)	8,3 (0-75)	12.9 (16.0)	8.33 (0-75)	11.3 (14.8)	4.17 (0-62.5)	12.0 (15.5)	4.17 (0-58.33)
CRADI	13.1 (15.6)	6.25 (0-78.13)	13.3 (15.8)	6.25 (0-78.13)	12.6 (14.9)	6.25 (0-62.5)	10.8 (10.9)	6.25 (0-40.63)
	Number/ Total	%	Number/ Total	%	Number/ Total	%	Number/ Total	%
UUI	186/599	31.1	155/486	31.9	30/111	27	17/56	30.4
SUI	257/7604	42.5	214/491	43.6	42/111	37.8	20/56	35.7
UUI, SUI or surgery	311/600	51.8	256/488	52.5	54/110	49.1	25/56	44.6
FI or surgery	65/594	10.9	52/482	10.8	13/111	11.7	3/57	5.3

Table 2 Comparison of symptoms between women with intact LAM, any LAM avulsion and bilateral LAM avulsion.

Test	Symptom	Intact LAM versus any LAM avulsion	Intact LAM versus bilat. LAM avulsion
Mann-Whitney U test <i>p</i>	UDI score	0.35	0.53
	CRADI score	0.90	0.75
Multiple logistic regression aOR (95% CI), <i>p</i>	UUI	0.86 (0.54-1.38), 0.54	1.02 (1.55-1.90), 0.95
	SUI	0.80 (0.52-1.24), 0.32	0.77 (0.43-1.40), 0.39
	UUI, SUI or surgery	0.91 (0.59-1.40), 0.67	0.81 (0.45-1.44), 0.46
	FI or surgery	1.04 (0.53-2.04), 0.92	0.47 (0.14-1.56), 0.22

References

1. Dietz HP, Simpson JM. Levator trauma is associated with pelvic organ prolapse. BJOG. 2008;115(8):979-84
2. Schwertner-Tiepelmann N, Thakar R, Sultan AH, Tunn R. Obstetric levator ani muscle injuries: current status. Ultrasound Obstet Gynecol. 2012;39(4):372-83.

Disclosures

Funding: Norwegian Women's Public Health Association/the Norwegian Extra Foundation for Health and Rehabilitation through EXTRA funds, St. Olavs Hospital, Trondheim University Hospital and the Norwegian University of Science and Technology
Clinical Trial: Yes **Registration Number:** ClinicalTrials.gov Identifier: NCT01766193 **RCT:** No **Subjects:** HUMAN **Ethics Committee:** REK midt, Norway **Helsinki:** Yes **Informed Consent:** Yes