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LEVATOR AVULSION IS ASSOCIATED WITH PELVIC ORGAN PROLAPSE

Hypothesis / aims of study

Female Pelvic organ prolapse (FPOP) is a significant problem requiring surgery in up to 20% of women during their lifetime.(1) The aetiology is likely to be multifactorial. Vaginal childbirth seems to contribute, partly due to excessive stretching of the puborectalis muscle which may result in detachment of its insertion on the inferior pubic rami (avulsion), leading to an enlarged hiatus (2) and FPOP. This study aimed to ascertain the association between levator avulsion and FPOP more than 20 years after delivery.

Study design, materials and methods

This was a cross-sectional study involving 195 women enrolled in a longitudinal cohort study and seen 20 years after an index birth in 1993/4. Assessment included a standardized patient-administered questionnaire, prolapse assessment using the International Continence Society (ICS) Pelvic Organ Prolapse Quantification (ICS-POPQ) and 4D translabial ultrasound (TLUS). The main outcome measures were Ba, C, Bp, Gh and Pb as defined by the ICS POPQ and pelvic organ descent on US. Clinically significant FPOP was defined as ICS POPQ Stage >=2 in the anterior and posterior compartment, and Stage>=1 centrally (3). Offline analysis for pelvic organ descent, diagnosis of levator avulsion and levator ani defect (LAD) score were undertaken at a later date, using proprietary software, blinded against all other data. Levator avulsion was diagnosed on tomographic ultrasound imaging (TUI), when there was discontinuity between the pubovisceral muscle and the pelvic sidewall in 3 central slices (slice 3,4,5 in Figure 1). LAD scores were determined according to the number of slices in which detachment of the puborectalis muscle from its insertion was documented, using the six cranial slices (slice 3 to 8) on each side, yielding a maximum score of 12 (Figure 1). Significant FPOP on TLUS was defined as descent of the bladder or rectal ampulla to >=10mm and >=15mm below the symphisis pubis, respectively, or descent of the uterus to <=15mm above the SP.

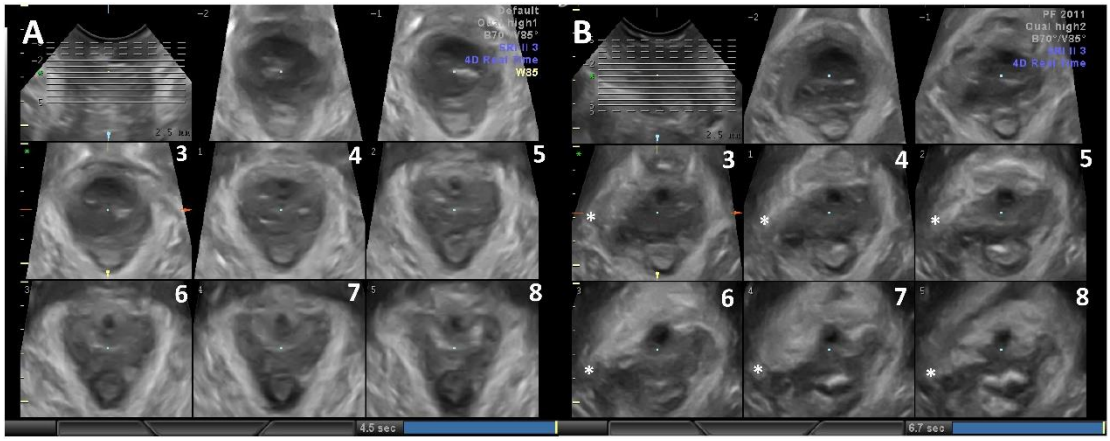

Figure 1*: Tomographic ultrasound imaging (TUI), at 2.5 mm interslice interval showing intact levators (A) and a right sided levator avulsion, marked with * (B), yielding an LAD score of 6.*

Results

Of 195 women, one declined US assessment and was excluded, leaving 194. Mean age was 50.2 (SD5.2, range 36.9-66.5) years with a mean BMI of 27.6 (SD 5.8, range 18.3-54.3) kg/m^2. Median parity was 3 (IQR 2-3, range 1-14) and 91% (n=176) were vaginally parous. Mean age at first birth was 27 (SD 4.85, range 16- 38) years. 23% (n=57) and 6% (n=12) gave a history of instrumental delivery and prolapse surgery, respectively. 18% (n=34) had prolapse symptoms. They were seen on average 23 years after their first birth (range, 19.4- 46.2).

Clinically, 36% (n=69) had significant FPOP which was a cystocoele in 24% (n=46), uterine/vault descent in 13% (n=25) and a clinical rectocele in 20% (n=39). Mean Ba was -1.69 (SD0.86, range -3 to 1.5) cm, mean C was -5.36 (SD1.5, range -10 to 6.5) cm, mean Bp was -1.83 (SD0.85, range -3 to -1.5) cm and mean Gh+Pb was 6.72 (SD1.13, range 4-10.5) cm. On imaging, levator avulsion was diagnosed in 16% (n=31), being bilateral in 5% (n=9/194). Mean LAD score was 2.2 (SD3.2, range 0-12). Mean bladder neck descent was 27.8 (SD11.3, range 3.6-57.7) mm, and on average the bladder descended to 0.3 (SD13.8, range -47.5 to 24.6) mm above the symphysis pubis (SP). Mean uterine descent was to 19.8 (SD17.9, range -34.1 to 63.8) mm above the SP. Mean descent of the rectal ampulla relative to the SP was to -2.5 (SD 16.9, range -34.1 to 36.8) mm. Mean hiatal area on Valsalva was 22.8cm^2 (SD7.6, range 8.2-48).

On univariate analysis, levator avulsion and LAD score were associated with clinically significant FPOP, sonographically determined FPOP, Ba, cystocoele, uterine and rectal ampulla descent, but not FPOP symptoms, C and Bp (Table 1). Multivariate analysis controlling for potential confounders (determined from univariate analysis against objective FPOP ie. P<=0.1) such as age, BMI and instrumental delivery, confirmed our findings. A subgroup analysis excluding those who had FPOP surgery showed similar findings.

	No avulsion N=163	Any avulsion N=31	OR^ / β† (95% CI), P value	LAD Score	AUC for LAD score
Prolapse symptoms (n=34)	29 (17.8%)	5 (16.1%)	0.9 (0.3 – 2.6)^ P=0.86	P=0.44*	54% P=0.473
Clinically significant POP (cm, SD) (n=69)	52 (32%)	17 (55%)	2.6 (1.2-5.7)^ P=0.01	P=0.04*	58% P=0.05
- **Mean Ba (SD)cm**	-1.8 (0.7)	-1.1 (1.2)	-0.7 (-1.1 to -0.3)† P<0.001	r=0.233# P=0.001	-
- **Mean C (SD)cm**	-5.4 (1.4)	-5.0 (1.9)	-0.5 (-1.2 to 0.3)† P=0.13	r=0.087# P= 0.23	-
- **Mean Bp (SD)cm**	-1.9 (0.8)	-1.6 (0.9)	-0.2 (-0.6 to -0.15)† P = 0.20	r=0.079# P=0.27	-
- **Mean Gh + Pb (SD)cm**	6.6 (1.1)	7.1 (1.1)	-0.5 (-1.0 to -0.05)† P=0.02	r=0.127# P=0.08	-
FPOP Stage 2b (n=22)*	14 (9%)	8 (25.8%)	3.7 (1.4-9.8)^ P=0.006	P=0.04*	62% P=0.06
Sonographically significant organ descent (n=70)	49 (30%)	21 (68%)	4.9 (2.1-11.1)^ P<0.001	P= 0.005*	61% P=0.009
- **Bladder descent (SD)mm**	2.2 (12.4)	-9.8 (16.6)	12.0 (5.6-18.4)† P<0.001	r=0.248# P<0.001	-
- **Uterine descent (SD)mm**	22.4 (12.4)	5.5 (15.9)	16.9 (10.1 – 23.7)† P<0.001	r=0.225# P=0.002	-
- **Rectal ampulla descent (SD)mm**	-1.1 (16.8)	-9.7 (15.7)	8.6 (2.3 – 14.9)† P=0.009	r=0.176# P=0.014	-
- **Hiatal area on Valsalva (SD) cm²**	21.4 (6.8)	30.0 (7.7)	-8.6 (-11.6 to -5.6)† P<0.001	r=0.314# P<0.001	-

***Table 1**: Association between levator avulsion and symptoms and signs of FPOP. Categorical data expressed as n(%) and analysed using the Chi-squared test^. Continous data presented as mean (SD). Comparison of means and medians were performed using the Student T test† and Mann-U-Whitney test*. Correlation between two continous variables was analysed using the Spearmans correlation test #, r=Spearmann's correlation coefficient.*

Interpretation of results

There was a strong association between levator avulsion and objective FPOP, especially sonographically determined pelvic organ descent and hiatal dimensions, on average 23 years after a first birth. This confirms data obtained in several other studies in women at shorter time intervals after childbirth, and in those symptomatic for pelvic floor disorders. The link between levator trauma and prolapse appears to be strongest for the anterior and central compartments, as previously shown in other populations. The effect size for those associations appears to be greater in this series compared to those with a shorter follow-up.

Concluding message

Levator avulsion is associated with Female Pelvic Organ prolapse, especially of the anterior and central compartments. This association may become stronger with time after childbirth.

References

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Disclosures

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