

CAN LEVATOR AVULSION BE PREDICTED ANTENATALLY?

Hypothesis / aims of study

Levator avulsion is very likely a major risk factor for pelvic organ prolapse, especially cystocele and uterine prolapse(1), and it seems to increase the risk of prolapse recurrence after surgical correction (own unpublished data). Both prospective and retrospective studies using ultrasound and magnetic resonance imaging have shown maternal age at first vaginal delivery to be associated with trauma to the levator ani, raising the possibility of antenatal prediction. Prediction of levator trauma may enable intervention studies aimed at prevention of female pelvic organ prolapse. We have therefore performed a prospective longitudinal study to identify potential antepartum predictors of levator avulsion.

Study design, materials and methods

488 nulliparous women carrying a singleton pregnancy and aiming for a normal vaginal delivery were seen at a mean 37.1 weeks' gestation (range 36-39). A total of 366 returned on average 5 (range 2.7-21.2) months postpartum. They underwent an interview and 4D translabial ultrasound after voiding in the supine position as previously described (2) at both the antepartum and postpartum appointments. Data analysis were later performed on a desktop PC using the proprietary software 4D sonoview v5 blinded to patients' data. Bladder neck descent (BND), hiatal dimensions and levator muscle strain on Valsalva were determined as previously described (2,3). Levator avulsion was diagnosed on tomographic ultrasound imaging (TUI) (Figure 1). Delivery data were collected from the hospital database. Maternal age, family history of caesarean section (as a measure of difficult delivery), body mass index (BMI), subpubic arch angle, BND, hiatal area and muscle strain on Valsalva were tested against the diagnosis of levator avulsion.

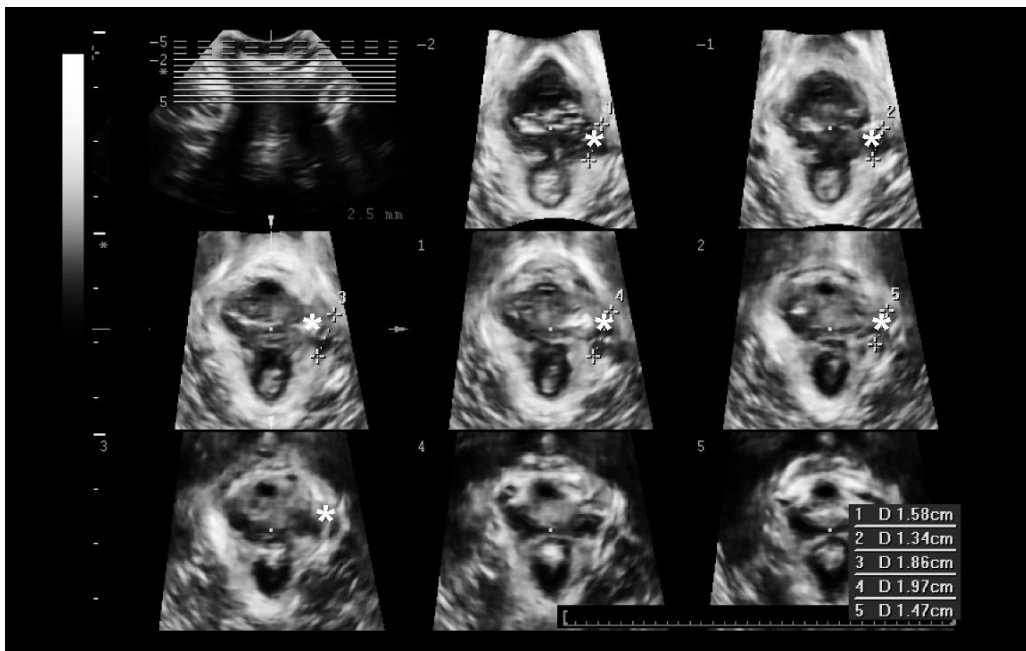


Figure: Left- sided complete avulsion of the puborectalis muscle (indicated by asterisks) on tomographic translabial pelvic floor imaging. The patient's left side is represented on the right of eight individual slices obtained at 2.5 mm intervals, from 5 mm below the plane of minimal hiatal dimensions to 12.5 mm above this plane.

Results

Mean maternal age was 25.9 years (range 17.7 to 45). Mean BMI was 31.02 (range 19.3 to 56.5). 436 (89%) were Caucasian. 120 (24.5%) had a family history of Caesarean section. The mean antepartum strain on Valsalva was 0.22 (\pm SD 0.19). The mean subpubic arch angle was 104° (\pm SD 9°). Mean BND was 22.8mm (\pm 9.4). Of 488 women, 366 (75%) returned for a postnatal assessment after normal vaginal delivery (n=187, 51%), vacuum or forceps (n=54, 15%) and caesarean section (n=125, 34%). No avulsion was diagnosed in the caesarean section group. Levator avulsion was diagnosed in 34 of the vaginally parous women (14%), after normal vaginal delivery in 24/187 (13%) and after vacuum/forceps in 10/54 (18.5%). Levator avulsion was associated with a lower BMI (27.85 vs 30.01, P=0.005). No statistically significant relationship was found for other demographic or ultrasound parameters (Table 1).

| | Avulsion (n=34) | No avulsion (n=207) | P value |
|-------------------------------------|-----------------|---------------------|---------|
| Maternal age in years (\pm SD) | 26.06 (4.26) | 25.56 (4.47) | 0.54 |
| Family history of Caesarean Section | n=6 (17.6%) | n= 43 (21%) | 0.66 |
| Body Mass Index (\pm SD) | 27.85 (3.80) | 30.01 (5.10) | 0.005 |

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| Bladder neck descent in mm (\pmSD) | 21.55 (7.90) | 23.90 (9.50) | 0.13 |
| Hiatal area at rest (cm²) | 14.5 (2.9) | 15.3 (3.3) | 0.18 |
| Hiatal area on Valsalva (cm²) | 20.6 (7.0) | 22.2 (7.0) | 0.24 |
| Muscle strain (\pmSD) | 0.22(0.20) | 0.24 (0.20) | 0.55 |
| Subpubic arch angle (\pmSD) | 103° (8°) | 103° (10°) | 0.79 |

Table 1: Demographic and ultrasound parameters of vaginally parous women with/ without levator avulsion. T- test or X2 statistics.

Interpretation of results

In this longitudinal study on a cohort of 366 primiparous women seen both antepartum and postpartum, levator avulsion was diagnosed in 14% of the vaginally parous women which is compatible with data in the literature. Contrary to expectations and data in the literature we did not find any statistically significant relationship between maternal age and avulsion injury. This may be due to the relatively low average age of our study population. Levator avulsion was associated with a lower BMI, an observation that is intriguing but difficult to explain. None of the other tested demographic or ultrasound parameters were predictive of avulsion. Most remarkably, this was also true for levator hiatal dimensions and a measure of hiatal distensibility, i.e., strain. It appears that antepartum prediction of levator macrotrauma may be more difficult than anticipated, or even impossible. Future studies should focus on modification of current obstetrical practices and antepartum interventions applicable to the general population since the identification of patients at high risk of avulsion may not be feasible prior to the onset of labour.

Concluding message

Levator avulsion is associated with a lower BMI but not with any other tested demographic or ultrasonographic parameter. Antenatal prediction of avulsion injury does not appear to be feasible in our population.

References

1. Br J Obstet Gynaecol 2008; 115: 979-984
2. Ultrasound Obstet Gynecol 2004; 23: 80-92
3. Ultrasound Obstet Gynecol 2008; 31: 201-205

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|---|-------------------|
| Specify source of funding or grant | n/a |
| Is this a clinical trial? | No |
| What were the subjects in the study? | HUMAN |
| Was this study approved by an ethics committee? | Yes |
| Specify Name of Ethics Committee | SWAHS HREC |
| Was the Declaration of Helsinki followed? | Yes |
| Was informed consent obtained from the patients? | Yes |