

THE EFFECT OF LEVATOR AVULSION ON OXFORD GRADING OF MUSCLE FUNCTION

Hypothesis / aims of study

Levator avulsion injury seems to be a common consequence of vaginal childbirth (1). While this form of trauma is associated with anterior and central compartment prolapse (2), it is not clear as to how much such injuries affect pelvic floor function. One of the most basic forms of functional assessment of the levator ani is palpation and the grading of contraction strength and endurance according to the Oxford grading system (3). We therefore conducted a retrospective study to investigate the relationship between levator trauma and Oxford Grading on vaginal palpation.

Study design, materials and methods

Over a period of 2 years 1112 women had been seen for pelvic floor assessment in a tertiary urogynaecological unit. They were investigated by standardised interview, an examination using the ICS POP-Q staging system, and assessment of the levator ani muscle by 3D/ 4D translabial ultrasound (n= 661) and/ or digital assessment.

On digital palpation an avulsion injury of the pubovisceral muscle was diagnosed if the inferior aspects of the muscle were detached from the inferior pubic ramus. Oxford Grading was registered for both sides separately, with intermediate grades (e.g. 3-4) being allowed. All examinations were performed by the first author, with Oxford Grading decided prior to assessment of muscle insertions for trauma. GE Kretz Voluson 730 expert and Medison SA 8000 systems were utilized to acquire volume imaging data at rest, on maximal Valsalva (best of 3+ attempts) and on maximal pelvic floor contraction, supine and after bladder emptying. Whenever there was a discrepancy between ultrasound and palpation, findings were reviewed until an unequivocal decision could be reached.

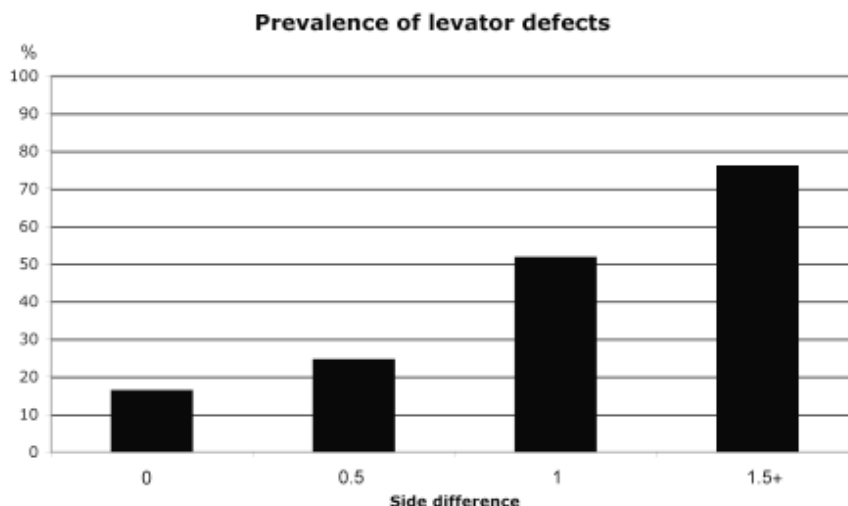


Figure: Prevalence of levator avulsion injury relative to the side difference in Oxford Grading ($p < 0.001$ on χ^2 test).

Results

Mean age was 55 (range 17- 90) years, median vaginal parity was 2 (range 0-12). 843 Patients (76%) complained of stress incontinence, 830 of urge incontinence (75%), and 355 of prolapse (32%). 23 women could not be assessed digitally due to vaginal stenosis, scarring or refusal, leaving 1089 datasets for analysis. Levator defects were found in 252 women (23%), with 223 on the right, 103 on the left, and 74 bilateral defects. This difference between right and left is highly significant ($P < 0.001$). On levator palpation the median for right and left Oxford grades were equal at 3; interquartile ranges were also equal at 2- 3.5.

The presence of defects (uni- or bilateral) was associated with a highly significant reduction in mean overall Oxford Grading (2.07 vs. 2.81, $P < 0.001$). The side affected by a palpable avulsion injury showed a significantly lower Oxford grading (1.9 vs. 2.78, $P < 0.001$) compared to the contralateral normal side. The prevalence of avulsion injury increased markedly depending on side differences in Oxford grading: from 16% when there was no difference, to 25% at 0.5 difference, to 52% when there was a side difference of one degree, and to 76% when the side difference was 1.5 or higher ($P < 0.001$ on χ^2 test).

Interpretation of results

To date, assessment of levator strength has generally been performed without distinguishing side differences although it is not uncommon to find a difference of one or more Oxford grades between right and left. Such side differences to date were clinically irrelevant since palpation for morphological abnormality was not taught, neither by physiotherapists nor by Gynaecologists. The situation has changed significantly over the last 5 years, with imaging research showing

that major levator trauma is common, due to vaginal childbirth and associated with female pelvic organ prolapse. Such trauma can be identified by palpation, but this requires significant teaching, and any other findings that may assist palpatory diagnosis would be helpful in teaching and clinical practice.

This study has shown that avulsion injury of the levator ani as diagnosed on translabial 3D/4D ultrasound and/ or palpation is associated with a highly significant reduction in Oxford grading. This implies that such a finding on palpation may help in identifying trauma and should alert the examiner to the possibility of levator avulsion. On the other hand, this association also suggests that levator avulsion markedly impairs levator function as measured by Oxford grading.

Concluding message

Avulsion injury of the levator ani muscle is associated with a highly significant reduction in Oxford Grading. A side difference of one Oxford Grade or more implies that an avulsion injury is likely on the weaker side and should be sought on digital palpation and, if possible, on ultrasound or magnetic resonance imaging.

References

1. Obstet Gynecol **106**: 707-712.
2. Br J Obstet Gynaecol 2006; **113**(2): 225-30.
3. Thesis, Postgraduate School of Biomedical Sciences. Bradford, University of Bradford.

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HUMAN SUBJECTS: This study was approved by the Sydney West Ares Health Service HREC 05-029 and followed the Declaration of Helsinki Informed consent was not obtained from the patients.