

THE CLASSIFICATION OF MAJOR MORPHOLOGICAL ABNORMALITIES OF THE PUBOVISCERAL MUSCLE

Hypothesis / aims of study

Major morphological abnormalities of the levator ani muscle are common in women presenting with symptoms of pelvic floor dysfunction, with incidences of 15-20% on magnetic resonance (MR) and 3D ultrasound imaging[1, 2]. Such defects are due to vaginal childbirth[3] and likely occur at the time of crowning. In this study we attempted classification of such injuries using 3D Pelvic Floor Ultrasound.

Study design, materials and methods

In a retrospective study the author reviewed the notes of 262 women who had been seen over the course of two years for symptoms of urinary incontinence, pelvic organ prolapse and recurrent urinary tract infections. They had been examined clinically for prolapse and had undergone 3D/ 4D pelvic floor ultrasound, supine and after bladder emptying. A GE Kretz Voluson 730 expert system was utilized to acquire volume imaging data at rest, on maximal Valsalva (best of 3+ attempts) and on maximal pelvic floor contraction. Volume datasets were analysed in a blinded fashion several months after the initial assessment, with the help of the software GE Kretz 4D View V5.0.

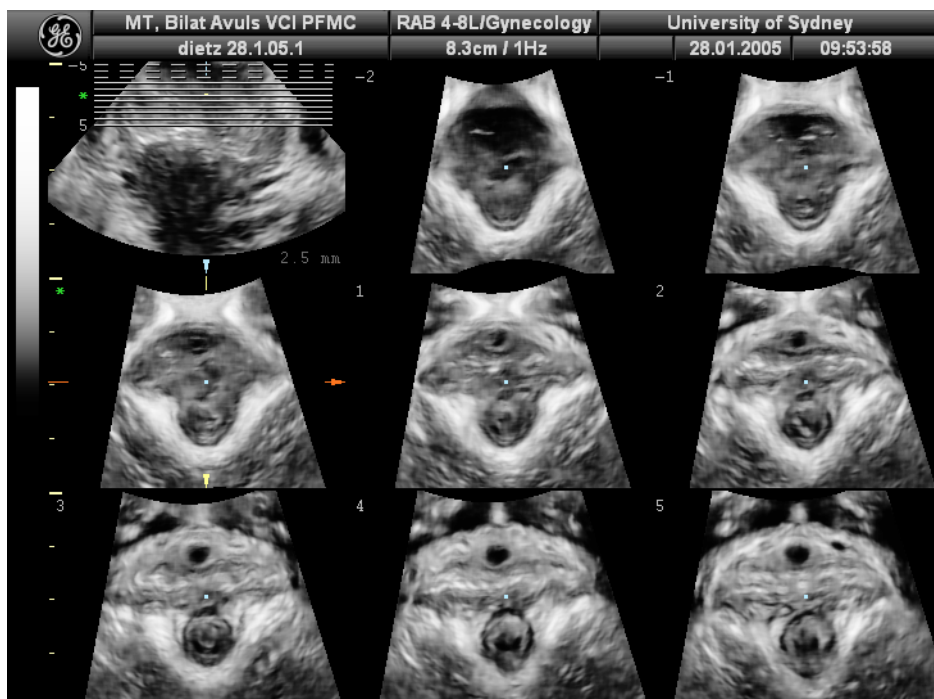


Figure: Tomographic ultrasound imaging of a bilateral avulsion injury in a stress incontinent 42 yr old p3 (rotational Forceps delivery for 1st child). The defect score in this patient is 8+8= 16.

Using multislice imaging (TUITM, Tomographic Ultrasound Imaging), a set of high-resolution tomographic slices were obtained at intervals of 2.5 mm, from 5 mm below to 15 mm above the plane of minimal dimensions, see Figure. Best resolutions were achieved when assessing volumes obtained on pelvic floor muscle contraction. Defects were scored according to the number of slices in which a discontinuity of the muscle with the pelvic sidewall could be documented, with a minimum score of 0 and a maximum score of 16 in a patient with complete bilateral avulsions. Maximum defect width was determined for both sides separately.

Results

Of 262 patients, avulsion injuries were diagnosed in 50 women (19%). All following results relate to this group of 50 women. Mean age was 54 (range 26-82) years, average parity 2.7 (range 1-6). All had delivered vaginally, and 17 had undergone a Forceps delivery. Thirty-one (62%) complained of stress urinary incontinence, and 29 (58%) of symptoms of prolapse. Mean bladder neck descent was 32 mm (range 10-51 mm). In a high proportion of patients (27, 54%), the retrovesical angle stayed intact, but marked rotation of the proximal urethra was common (mean 74.6°, StD 38.5°), as was a marked increase in the dimensions of the hiatus on Valsalva (mean 34.9 cm², range 16 –58.1 cm²). Fifty volume datasets were examined using tomographic ultrasound imaging. Defects were found unilaterally on the right (n=17), unilaterally on the left (n=12) and bilaterally (n=21).

When defects were analysed for depth relative to the reference plane of minimal hiatal dimensions, a wide variety of distributions was documented. In some women defects reached over the entire assessed volume (see Figure), in others defects were only visible in one slice. The mean score was 8 (range 2-16). Mean width of the defects was 16.5 (StD 10.8) mm on the right and 11.1 (StD 11.1) mm on the left. There were weak correlations between defect score

and hiatal area on Valsalva ($r=0.28$, $P= 0.05$) and between total defect width and hiatal area on Valsalva ($r=0.4$, $P= 0.005$), as well as with ICS prolapse grading ($P= 0.02$) and cystocele descent on ultrasound ($P= 0.014$). Defect score ($P= 0.001$) and width score ($P= 0.002$) were significantly higher in women who complained of prolapse, but there was no association with symptoms of bladder dysfunction apart from frequency ($P= 0.05$).

Interpretation of results

Tomographic ultrasound imaging in conjunction with 4D pelvic floor ultrasound allows definition of morphological abnormalities of the pubovisceral muscle to a previously unattainable degree. In this series of 262 women, defects were common (19%), confirming previously reported MR series[1] and own data obtained in an unrelated population[2]. They occurred more frequently on the right (n.s.) but were often bilateral. A grading system is proposed which describes the depth of the injury in mm measured in a craniocaudal direction, as well as the maximal width of the defect in mm. Not just the presence of defects, but also their width and depth, are associated with symptoms and signs of prolapse, especially of the anterior compartment.

Concluding message

Depth and width of levator defects can be quantified by tomographic pelvic floor ultrasound. Those parameters are associated with the likelihood of symptoms of prolapse and cystocele descent, but not with incontinence.

References

1. Obstet Gynecol, 2003. **101**(1): p. 46-53.
2. Br J Obstet Gynaecol, 2005. **113**: p. 1-5.
3. Obstet Gynecol, 2005. **106**: p. 707-712.

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