52

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A NEW IMAGING METHOD IN UROGYNAECOLOGY: TRANSLABIAL COLOUR DOPPLER

Aims of Study

Translabial ultrasound has become popular as the most convenient form of imaging in urogynaecology (1,2,3,4,5). Its main disadvantage is that actual leakage is difficult to detect. One solution to this problem is to use ultrasound contrast media (6,7). An alternate way to visualize urine leakage from the bladder, hitherto unpublished, is the use of Colour Doppler (CD) ultrasound. We aimed to demonstrate the practicability of this method and to compare its results with fluoroscopic imaging.

Methods

99 patients referred for urodynamic assessment were examined by CDV (Velocity mapping) and CDE (Energy mapping) translabial ultrasound. All patients underwent video-urodynamic testing including resting urethral pressure profilometry and cystometry and fluoroscopic imaging both supine and erect. Most patients were examined using a Acuson 128 XP/10 with 5-7 MHz broadband curved array transducer. Scanning was performed at first with variable bladder volumes (pilot study, n=47) after urodynamics and catheter removal and later at maximum capacity immediately after fluoroscopic imaging (n=52) with microtip transducer catheters in situ. Coughing and valsalva manoeuvres were performed and the effect on bladder neck and proximal urethra noted. Results were recorded manually, on videotape and with b/w and colour videoprinters. Cohen's kappa was used to test for agreement between the finding of leakage on ultrasound and xray imaging. The investigator performing the ultrasound (HPD) was blinded against the result of Xray imaging for all except the first 5 patients.

Results

Complete data sets were obtained for 99 patients. Average age was 53 yrs (21-82). The urodynamic diagnosis was genuine stress incontinence in 62 patients (4 minimal), detrusor instability in 60, sensory urgency in 6, voiding disorder in 3 and normal findings in 6 patients. Hypermobility of the bladder neck (max. descent of >= 20 mm) was observed in 57, funneling in 64 patients. Bladder volume at the time of ultrasound assessment was 334 (10-906) mls on average in the overall series, with a significant difference ($p < 0.001$, unpaired t-test) between the pilot study with random bladder volume (mean 180, SD 169) and the controlled arm with maximum capacity (mean 471, SD 123 ml).

Colour Doppler velocity mapping (CDV) was obtained in all 99 patients. 94 women were also examined by Power Doppler (CDE). Unequivocal leakage was seen in 56 patients by one or both Doppler methods and in 58 by fluoroscopy. CDV was more likely to yield a positive result (53/99 vs. 37/94) compared to CDE.

Table 1 shows the agreement between leakage detected by fluoroscopy and leakage seen on colour Doppler imaging: identical results were obtained in 85/ 99 cases (kappa 0.71 , confidence interval 0.57 to 0.85.). In the pilot group there was agreement in 37/ 47 cases, kappa= 0.57 (0.34- 0.81); this improved to 48/52 in the controlled group (kappa= 0.82 (0.66- 0.99).

	Doppler US	leak	no leak
Xray	leak	50	8
	no leak	6	35

Tab. 1: Agreement between leakage detected on colour Doppler ultrasound and fluoroscopy (n= 99). Cohen's kappa= 0.71.

Conclusion
In this study colour Doppler was able to consistently and reliably demonstrate urine leakage through the urethra with or without indwelling catheter. Agreement between colour Doppler and fluoroscopy was very high in the controlled group with indwelling catheters and identical bladder volumes. Both velocity (CDV) and energy mapping (CDE) were used and their usefulness compared. CDV was more likely to yield a positive result and may be more convenient for producing unequivocal images due to its better motion discrimination. This results in less flash artefact and better orientation, particularly on coughing. The angle- dependency of CDV is generally not a problem. CDE may however have advantages in patients with extreme urethral rotation. Translabial colour Doppler imaging may remove the last remaining argument against the use of ultrasound in the investigation of female urinary incontinence. It has the potential to become a new imaging standard for Urogynaecology.

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53

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EVALUATION OF THE LEVATOR ANI MUSCLE STRUCTURE USING DIFFERENT MR IMAGING TECHNIQUES

Aims of study
Histological investigations have demonstrated age and birth related changes in the levator ani muscle (1). These changes are thought to contribute to the development of urinary incontinence and pelvic organ prolapse. MR technology provides a noninvasive assessment of the levator ani muscle structure. The intensity of the MR signal emanating from a structure reflects the chemical composition of that structure. Striated muscle tissue shows low signal intensity (dark) while fatty tissue has high signal intensity (bright). Changes in chemical composition result in either darkening (lower intensity) or brightening (higher intensity) of the image of that structure. In this study we tested the null hypothesis that levator ani muscle signal intensity would not be reflective of tissue quality and would not correlate with measures of levator ani muscle function.

Methods
MR images (1.5T) were made of 11 healthy continent nulliparous women (mean age 32,SD ±5, range 26-42 years) with normal pelvic organ support and urodynamics and 6 primiparous women (mean age 35,SD ±3, range 32-38 years) with stress urinary incontinence. Continence status was determined by a standing stress test with a full bladder. Multichannel cystometrics and an urethral pressure profile were performed using an 8F Gaeltec dual tip catheter with a bladder volume of 300 ml. Urethral closure pressures during maximum pelvic muscle contractions (Kegel urethral closure pressure: K-UCP) were recorded. Levator ani strength at rest and during a maximum pelvic muscle contraction were also measured using an instrumented intravaginal speculum (2). The pelvic region was imaged using the following sequences: transverse proton density (PD, TR/TE 4000/15), T1 (TR/TE 600/15), T2 (TR/TE 4000/120), short-tau inversion recovery (STIR, TR/TE/TI 4083/22/165), fat-saturated (FS, TR/TE 4000/15),