Table of results

	Group A (N=30)	Group B (N=22)	Group C (N=16)	Significance
Reduction in wet episodes per day Mean (S.D.)	**1.00 (1.04)**	**1.20 (1.29)**	**1.13 (1.42)**	**NS**
Reduction in pad score Mean (95% Confidence Bounds +/-)	**2.9 (1.51)**	**2.27 (1.49)**	**1.88 (1.15)**	**NS**
Increase in max. muscle contraction Mean (95% Confidence Bounds +/-)	**9.30 (4.58)**	**11.00 (6.28)**	**7.13 (4.99)**	**NS**
Reduction in VAS Mean (95% Confidence Bounds +/-)	**1.69 (0.71)**	**2.35 (1.33)**	**1.84 (0.68)**	**NS**
Improvement in QOL Mean (95% Confidence Bounds +/-)	**7.03 (2.77)**	**6.14 (2.59)**	**8.13 (4.44)**	**NS**
Compliance score	**77.0%**	**78.8%**	**81.3%**	**NS**

Conclusions
There were no significant differences between the 3 groups in outcome measures; however, some clinical differences were noted.

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DYNAMIC MRI: A NEW GRADING SYSTEM FOR PELVIC PROLAPSE AND PELVIC FLOOR RELAXATION

Aims of Study: In the setting of significant vaginal prolapse, it is often difficult to differentiate among cystocele, enterocele and a high rectocele by physical examination alone. With uterine prolapse, the cervix and uterus often fill the entire introitus, making the diagnosis of concomitant pelvic visceral prolapse difficult. Accurate pre-operative staging of pelvic prolapse and pelvic floor relaxation is necessary for proper surgical planning, and to prevent recurrent prolapse. Dynamic magnetic resonance imaging (MRI) provides excellent visualization of the pelvic organs and musculofascial supportive structures. This test is fast, non-invasive, requires no patient preparation and minimal cooperation, and is relatively inexpensive. We propose a simple and objective grading system for describing, quantifying and staging pelvic organ prolapse and pelvic floor relaxation.

Methods: : From September 1997 to October 1998, 164 consecutive female patients ages 23 to 88 presenting with pelvic or urethral pain (N=39) or pelvic organ prolapse (N=125) underwent half-Fourier-acquisition single-shot turbo spin echo (HASTE) sequence MRI (Siemens) or single shot fast spin echo (SSFSE) T2-weighted sequence (General Electric). These MRI sequences are equivalent, with similar image acquisition settings. Midsagittal and parasagittal cuts were obtained in the supine position, both relaxed and with straining. No pre-examination preparation or instrumentation was utilized. The images were looped as a cine stack for viewing and measuring the relationship among the mobile pelvic organs and fixed anatomical landmarks.

The size of the levator hiatus and degree of muscular pelvic floor relaxation and organ prolapse were measured. The "H-line" (width of the levator hiatus) measures the distance from the pubis to the posterior anal canal. The "M-line" (muscular pelvic floor relaxation) measures descent of the levator plate from the pubo-coccygeal line. The pubo-coccygeal line spans from the pubis to the coccyx. "O" classification (organ prolapse) describes the degree of visceral prolapse beyond the H-line. The degree of cystocele, urethrocele, rectocele, enterocele, and uterine descent were graded as 0 = none, 1 = minimal, 2 = moderate, and 3 = severe. All MRI images and cine loops were obtained and interpreted by a single radiologist (ZB) familiar with these techniques. Results: The total image acquisition time was 2.5 minutes per study. Room time was 10 minutes per patient. The charge for each study was

$540 including interpretation fee. In the pain group, levator hiatus width (H-line) averaged 5.2 ± 1.1 cm versus 7.5 ± 1.5 cm in the prolapse group (p<0.001). The muscular descent of the levator plate from the pubo-coccygeal line (M-line) averaged 1.9 ± 1.2 cm in the pain group versus 4.1 ± 1.5 cm in the prolapse group (p<0.001).

	Pain Group (N=39)	Prolapse Group (N=125)	Significance
H-line width (cm)	7.5 ± 1.5	5.2 ± 1.1	P < 0.001
M-line width (cm)	4.1 ± 1.5	1.9 ± 1.2	P < 0.001

In the urethral pain group 3 patients had a urethrocele, no patient had a cystocele, 9 had a rectocele, 1 had an enterocele, and 1 had vaginal vault prolapse. In the prolapse group 95 women had a urethrocele, 110 had a cystocele, 65 demonstrated a rectocele, in 42 an enterocele was noted, and 74 had vaginal vault or uterine prolapse.

	Pain Group (N=39)	Prolapse Group (N= 125)
Urethrocele	3	95
Cystocele	0	110
Enterocele	1	42
Rectocele	9	65
Vaginal Cuff/Uterine Descent	1	74

Pelvic pathology (both suspected and incidental) was demonstrated by MRI relatively commonly. These findings included uterine fibroids in 43 cases (26%), ovarian cyst in 34 patients (21%), hydroureter in 12 (7%), bladder diverticulum in 8 instances (5%), urethral diverticulum in 11 (7%), Bartholin gland cyst in 16 (10%) and foreign body in 11 patients (7%).

Conclusions: The HMO classification affords a straightforward and reproducible method of describing, staging, and quantifying pelvic floor relaxation and pelvic visceral prolapse. Dynamic MRI provides an inexpensive, non-invasive and comprehensive visualization of the female pelvis. MRI is a vital extension of the physical examination, and is more accurate than physical examination alone in the diagnosis of pelvic prolapse. This technique is ideal for the objective evaluation and follow-up of patients with pelvic visceral prolapse and pelvic floor relaxation. MRI allows the urologist to rule out significant ureteric obstruction that may be associated with severe prolapse, and also detects other pathologic processes that may be germane to the urinary tract, such as fistulae and diverticula. Dynamic MRI obviates the need for cystourethrography, pelvic ultrasound, or intravenous urography, and has thus become the study of choice at our institution for evaluating the female pelvis.

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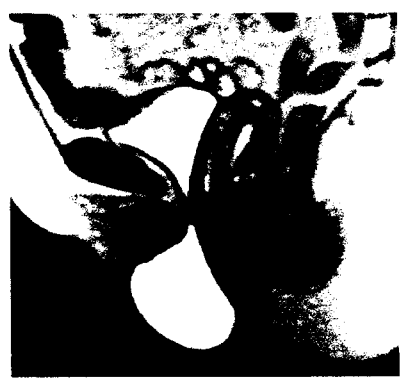
PRE-OPERATIVE EVALUATION OF PELVIC PROLAPSE USING DYNAMIC MAGNETIC RESONANCE IMAGING

Aims of Study: Many of the current methods for evaluating pelvic visceral prolapse and pelvic floor relaxation are invasive, poorly tolerated, or incomplete. For example, voiding cytourethrography does not accurately evaluate the presence or degree of rectocele or uterine prolapse, or pelvic floor relaxation. Defacography and peritoneography are invasive and often uncomfortable. Moreover, fluoroscopy exposes the patient and examiner to ionizing radiation. Sonogrpahy is operator dependent, and provides suboptimal visualization of soft tissue planes, and is not useful for visualizing a rectocele or enterocele. While cystourethroscopy directly visualizes the bladder and urethra, it is not useful for evaluating concomitant organ prolapse. Finally, with significant

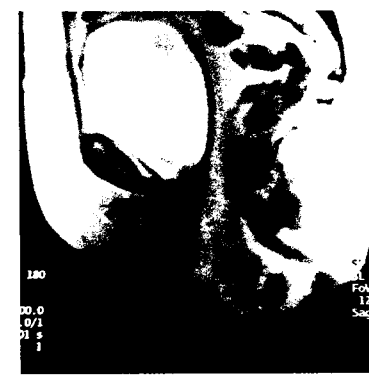
vaginal prolapse, it is often difficult to differentiate among cystocele, enterocele and high rectocele based upon physical examination alone. We examine the utility of dynamic HASTE (half-Fourier-acquisition single-shot turbo spin echo) sequence MRI as a non-invasive and comprehensive method of evaluation in patients with severe pelvic visceral prolapse. We furthermore examine how this technique may alter the surgical approach to such patients.

Methods: : 52 consecutive patients who presented with a chief complaint of an introital bulge were evaluated by physical examination and dynamic HASTE sequence MRI. Midsagittal and parasagittal cuts were obtained in the supine position, both relaxed and with straining. Physical examination, MRI findings and operative findings were recorded. All patients were examined by and operated on by a single urologist (SR), and all MRIs were interpreted by a single radiologist (ZB).

Results: Based on operative findings, 47 patients demonstrated a cystocele, 26 (50%) had a rectocele, 16 (31%) had an enterocele, and 32 (62%) had uterine and/or vault prolapse. In 19 cases (37%), MRI altered the surgical planning. In 14 patients, unsuspected pelvic pathology was revealed, including an ovarian mass in 1, enterocele in 8, rectocele in 1, cystocele in 2, and significant perineal laxity with complete attenuation of the central decussation of the pubococcygeus (perineocele) in 2 patients. In 4 patients (7.6%), a suspected enterocele (on physical examination) was disproved, and in 1 a suspected rectocele was disproved. In 19 patients, surgical planning was not altered, and in 4 patients, an enterocele was missed on MRI. The total image acquisition time was 2.5 minutes per study. Room time was 10 minutes per patient. The charge for each study was $540 including interpretation fee. An example of how MRI can differentiate between cystocele and enterocele is shown below:



Cystocele with uterine prolapse



Entercoele

Uterine prolapse was not evident on physical examination.

Conclusions: In patients with stress incontinence with minimal cystocele, physical examination with or without cystography is sufficient for surgical planning. However, with high grade or multiple organ prolapse, prolapse of one organ may obscure concomitant visceral prolapse. This competition for introital space limits the diagnostic capability of physical examination alone. Rapid sequence dynamic MRI provides excellent visualization of the pelvic viscera and musculofascial support structures. This test is fast, non-invasive, does not expose the patient or examiner to ionizing radiation, requires not patient preparation and minimal cooperation, and is relatively inexpensive. MRI defined the anatomy well and often revealed unsuspected pelvic pathology which altered the operative approach in 37% of patients. In patients presenting with an introital bulge, MRI is a valuable extension of the physical examination. Dynamic MRI obviates the need for cystourethrography, pelvic ultrasound, or intravenous urography, and has thus become the study of choice at our institution for evaluating the female pelvis.