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THE EFFECT OF GENITAL PROLAPSE ON VOIDING

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ABSTRACT

Purpose: We determined whether genital prolapse causes obstruction that may be relieved by a vaginal pessary as well as the degree to which voiding difficulty, urethral hypermobility, bladder outlet obstruction, occult stress incontinence, detrusor instability and impaired detrusor contractility are associated with prolapse.

Materials and Methods: We prospectively evaluated 60 women with a mean age of 52 years who had genital prolapse, including 35 (58%) with grade 1 or 2 and 25 (42%) with grade 3 or 4 cystocele, using pressure-flow video urodynamics and cotton swab testing. Leak point pressure and uroflowmetry were repeated in patients with severe prolapse after insertion of a ring pessary.

Results: Urethral hypermobility ($p < 0.05$) and symptoms of voiding difficulty ($p < 0.01$) were more common in women with grade 3 or 4 cystocele. Urodynamics revealed bladder outlet obstruction in 2 patients (4%) with grade 1 or 2 cystocele and 18 (58%) with grade 3 or 4 cystocele ($p < 0.001$). After vaginal pessary placement bladder outlet obstruction reverted to normal free flow in 17 women (94%) with grade 3 or 4 cystocele. Seven women (20%) with grade 1 or 2 cystocele versus 13 (52%) with grade 3 or 4 cystocele had detrusor instability ($p < 0.05$). Impaired detrusor contractility was noted in each group ($p > 0.05$). In patients with stress incontinence intrinsic sphincter deficiency did not correlate with the degree of prolapse and urethral hypermobility did not correlate with leak point pressure.

Conclusions: Lower urinary tract symptoms are common in women with genital prolapse. Voiding difficulty, bladder outlet obstruction and occult stress incontinence may coexist and they are associated with prolapse. Detrusor instability and urethral hypermobility also correlate with the degree of prolapse but impaired detrusor contractility and intrinsic sphincter deficiency do not. In women with severe prolapse ring pessary reduction of prolapse during urodynamics is useful to determine symptomatic and occult conditions.

KEY WORDS: bladder; cystocele; prolapse; urodynamics; urinary incontinence, stress

Women with genital prolapse may present with a plethora of lower urinary tract symptoms, such as urinary frequency, urgency, various forms of voiding dysfunction and incontinence. These symptoms may or may not be associated with prolapse or predictive of urodynamic findings. Arnold et al noted that prolapse correlates with decreased success when associated with incontinence procedures.[1] Severe degrees of uterovaginal prolapse may cause increased urethral resistance, which is reversible by reducing the prolapse.[2,3] Severe prolapse may also pull open the posterior wall of the urethra, causing sphincteric incontinence, or dissipate the effects of abdominal pressure on the urethra. Prolapse may impede Valsalva maneuver voiding, cause urethral obstruction and mask sphincteric incontinence.[3-7] Whether detrusor overactivity associated with severe genital prolapse is due to secondary bladder outlet obstruction is not known. This melange of secondary dysfunctions highlights the necessity of careful evaluation of all women with genital prolapse before surgical correction.[3-7] To assess the effect of prolapse on voiding we performed urodynamic studies in women with various degrees of prolapse, testing before and after prolapse reduction with a vaginal pessary in those with severe genital prolapse.

MATERIALS AND METHODS

We prospectively evaluated 60 consecutive neurologically intact women 32 to 78 years old (mean age 52) with various degrees of genital prolapse who were referred to our center for the evaluation of prolapse with or without voiding dysfunction and/or urinary incontinence. In all cases focused history was obtained, urinary questionnaire and voiding diary were completed, and pad test, physical examination, video urodynamics and cystoscopy were done. Physical examination included evaluation of pelvic floor support with the patient in the lithotomy position with the head elevated to 45 degrees above the horizontal. A split speculum technique was used to evaluate the vaginal vault, anterior and posterior vaginal walls, urethral mobility by a modified cotton swab test, uterine or vault prolapse and enterocele according to a modification of the Baden and Walker system.[8] A positive cotton swab test was defined as a resting or straining angle greater than 35 degrees from the horizontal.

Video urodynamics were performed according to the recommendations of the International Continence Society[9] except for cystometry. In contradistinction to these recommendations the patient was not instructed to try to hold urine during the filling phase but rather to report sensations to the examiner. Filling and voiding cystometry at a fill rate of 75 ml. per minute with radiographic contrast material was performed using a 7F dual lumen pressure catheter. Abdominal leak point pressure was evaluated at a volume of 150 ml.[10] Leak point pressure, defined as the lowest abdominal pressure necessary to effect any degree of visible stress incontinence, was assessed with and without the vesical catheter in place. Women with grade 3 or 4 cystocele underwent additional leak point pressure and free flow evaluations with cystocele reduction using a ring plate pessary.

Urodynamic data were sorted according to the presence or

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absence of bladder outlet obstruction, impaired detrusor contractility, detrusor instability and stress incontinence. To our knowledge there is no standard urodynamic definition of bladder outlet obstruction or impaired detrusor contractility in women. Thus, we defined bladder outlet obstruction as maximum detrusor pressure at a maximum flow of greater than 25 cm. water with maximum flow less than 15 ml. per second. Also, impaired detrusor contractility was defined as maximum detrusor pressure less than 15 cm. water with maximum flow less than 15 ml. per second. Patients who had stress incontinence were then categorized based on leak point pressure and the degree of urethral mobility as type 1—leak point pressure greater than 60 cm. water abdominal pressure with urethral mobility 35 degrees or less from horizontal with maximal strain, type 2—leak point pressure greater than 60 cm. water with urethral mobility greater than 35 degrees from horizontal with maximal strain and type 3—leak point pressure 60 cm. water or less regardless of the degree of urethral mobility. For statistical analysis we divided our patients into 2 groups based on the degree of the cystocele defect as those with a mean age of 54 years who had grade 1 or 2 cystocele, and those with a mean age of 74 years who had grade 3 or 4 cystocele. The chi-square test was used for statistical analysis.[11]

RESULTS

Table 1 shows cystocele grade, table 2 shows pelvic surgery history and table 3 shows the distribution of symptoms, including frequency, urgency, urge incontinence, stress incontinence and voiding difficulties (difficult stream initiation, intermittent flow, weak stream, incomplete emptying and retention) with regard to cystocele degree. Patients with a grade 3 or 4 cystocele were far more likely to report difficult voiding symptoms than those with grade 1 or 2 cystocele (chi-square = 10.2, $p < 0.01$).

Table 4 shows the urodynamic diagnoses. All patients had normal bladder compliance, and none had stress hyperreflexia during leak point pressure testing before the vesical catheter was removed. Before prolapse reduction no woman with a grade 3 or 4 cystocele had stress incontinence during urodynamics, while after prolapse reduction with a pessary 10 (40%) had stress incontinence, including 2 who complained of stress incontinence initially. Seven women with a grade 3 or 4 cystocele and stress incontinence had concomitant bladder outlet obstruction due to prolapse before it was reduced by the pessary. Of the 25 patients with a grade 3 or 4 cystocele 18 (72%) had bladder outlet obstruction compared to 2 of the 35 with a grade 1 or 2 cystocele (statistically significant, chi-square 64, $p < 0.001$). Only 1 of the 18 women with a grade 3 or 4 cystocele and bladder outlet obstruction had low flow after prolapse reduction. Obstruction in women with a grade 1 or 2 cystocele was associated with a history of incontinence surgery. In contrast, in 94% of those with a grade 3 or 4 cystocele the cystocele was the cause of obstruction. Of the 18 women with a grade 3 or 4 cystocele and urethral obstruction 7 (39%) also had occult stress incontinence. Detrusor instability was more common in patients with greater degrees of genital prolapse (20% of those with grade 1 or 2 and 52% of those with grade 3 or 4 cystocele, chi-square 7.1, $p < 0.05$). Impaired detrusor contractility did not correlate with the degree of genital prolapse (chi-square 0.02, $p > 0.05$).

We analyzed the presence or absence of urethral hypermobility with regard to leak point pressure and degree of genital prolapse (table 5). Urethral hypermobility was more commonly associated with greater degrees of genital prolapse (chi-square 6.52, $p < 0.05$). In women with a urodynamic diagnosis of stress urinary incontinence there was no statistically significant difference in the rate of urethral hypermobility when leak point pressure was greater than 60 cm. water abdominal pressure or 60 cm. water or less abdominal pressure (chi-square 1.8, $p > 0.05$). All women with a grade 3 or 4 cystocele who had stress incontinence also had leak point

TABLE 1. *Distribution of cystocele by grade*

Cystocele Grade	No. Pts. (%)
1	25 (42)
2	10 (17)
3	12 (20)
4	13 (21)

TABLE 2. *Previous surgical procedures**

Cystocele Grade	No. Pts.					
	Transvaginal Hysterectomy	Anterior & Posterior Repair	Pubovaginal Sling	Marshall-Marchetti-Krantz	Burch	Peyrera
1	8	0	0	2	0	9
2	3	3	1	2	2	4
3	3	1	0	1	0	2
4	3	0	0	0	0	1

* Patients may have undergone more than 1 procedure.

TABLE 3. *Symptoms*

Symptom*	No. Cystocele Grade (%)	
	1–2	3–4
Frequency and urgency	7 (20)	14 (56)
Urge incontinence	5 (14)	4 (16)
Stress incontinence	27 (77)	9 (36)
Difficult voiding	3 (9)	11 (44)†
Overall	35	25

* Patients may have reported more than 1 symptom.

† Patients with severe prolapse were more likely to complain of voiding dysfunction (chi-square 10.2, $p < 0.01$).

TABLE 4. *Video urodynamic diagnosis*

Diagnosis*	No. Cystocele Grade (%)		
	1–2	3–4 With No Pessary	3–4 With Pessary
Urethral obstruction	2 (6)	18 (72)†	1 (8)
Stress urinary incontinence	30 (86)	0	10 (40)
Detrusor instability‡	7 (20)	13 (52)§	Not applicable
Impaired detrusor contractility	5 (14)	3 (12)‖	Not applicable
Overall	35	25	25

* Patients may have had more than 1 urodynamic diagnosis.

† Patients with severe prolapse were more likely to have bladder outlet obstruction (chi-square 64, $p < 0.001$).

‡ Concomitant stress incontinence in 45%.

§ More frequent in patients with greater degrees of genital prolapse (chi-square 7.1, $p < 0.05$).

‖ Not more likely in patients with severe prolapse (chi-square 0.02, $p > 0.05$).

TABLE 5. *Stress incontinence and urethral mobility*

Diagnosis	No. Cystocele Grade (%)	
	1–2	3–4
Stress urinary incontinence type:		
1	1 (3)	0
2	5 (14)	0
3	24 (68)	10 (40)*
Urethral hypermobility†	15 (43)	19 (76)
Overall	35	25

* Patients with severe prolapse had abdominal leak point pressure of 60 cm. water or less (not statistically significant, chi-square 2.35, $p > 0.05$).

† More common with severe genital prolapse (chi-square 6.5, $p < 0.05$) but no correlation with leak point pressure (chi-square 1.8, $p > 0.05$).

pressure of 60 cm. water or less abdominal pressure (intrinsic sphincter deficiency). We did not find a significant correlation between urethral hypermobility and leak point pressure (chi-square 4.2, $p > 0.05$).

DISCUSSION

Women with pelvic floor relaxation often have a plethora of symptoms that may or may not be associated with prolapse. In our series there was a much higher rate of bladder outlet obstruction in women with grades 3 and 4 (70%) than grades 1 and 2 (3%) cystocele. The mechanism causing obstruction appears to involve mechanical obstruction by prolapse, as demonstrated in our study by increasing urine flow after prolapse reduction, and in other studies by decreased maximal urethral closure pressure and the pressure transmission ratio with mechanical prolapse reduction.[2-6,12] Our 2 patients with grade 1 or 2 cystocele and bladder outlet obstruction had undergone a modified Peyrera procedure previously. In contrast, in 94% of those with grade 3 or 4 cystocele and bladder outlet obstruction normal free uroflowmetry returned after prolapse reduction (figs. 1 to 3). This result is consistent with the findings of others of normalization of free uroflowmetry[13] and pressure transmission ratios[3,13] with the reduction of severe cystocele defects. Subsequent data from our laboratory using pressure-flow urodynamics with and without pessary reduction of severe prolapse corroborate our free flow data. We reported previously that 60% of 24 women who underwent pressure-flow analysis with and without a pessary no longer had obstruction.[14]

A challenge of our study was defining bladder outlet obstruction and impaired contractility urodynamic cutoff values, which to our knowledge did not exist at the time of study onset. Work force, linear passive urethral resistance relation, urethral resistance factor, and obstructive bladder index

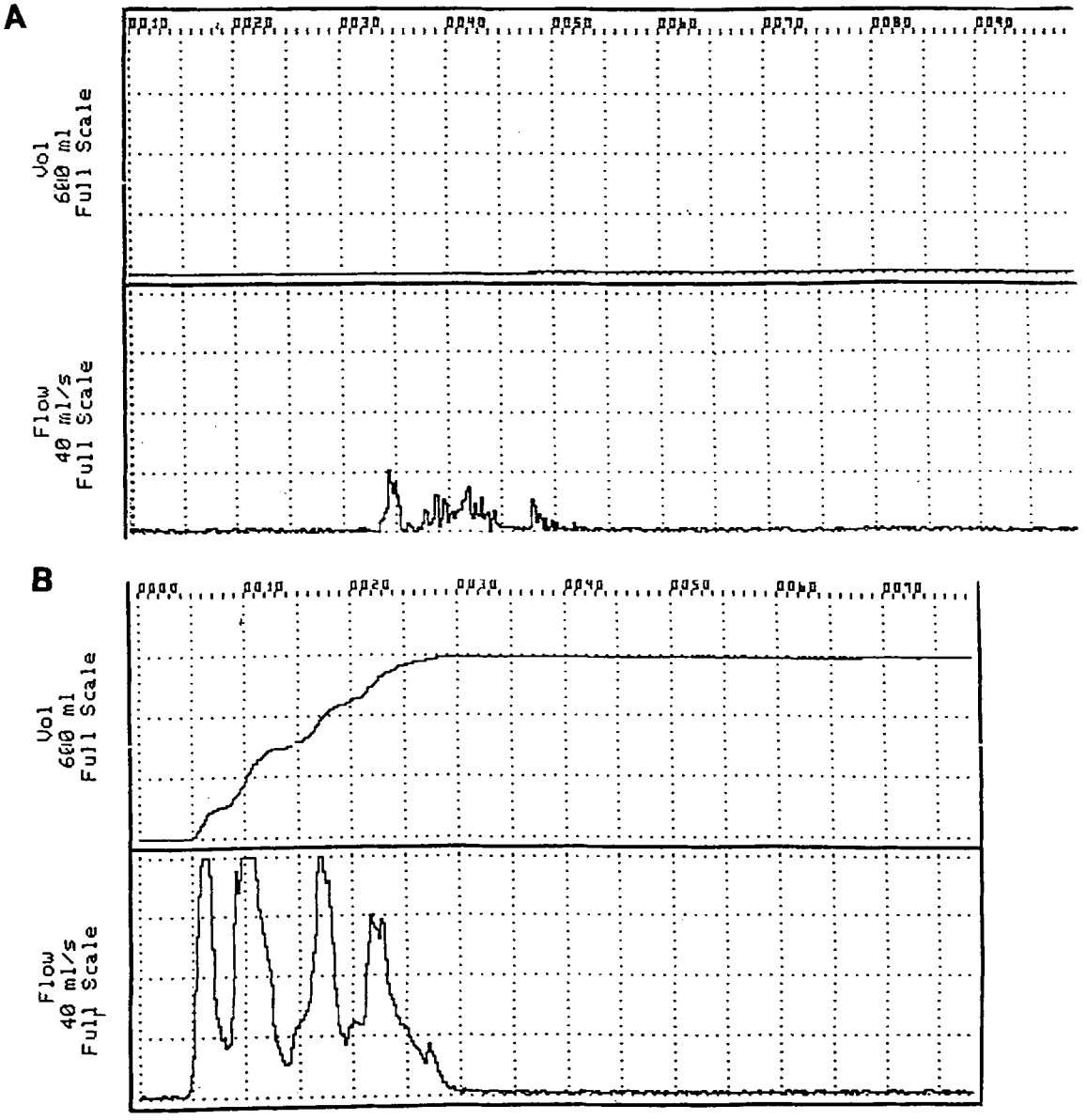

FIG. 1. Uroflowmetry in grade 4 cystocele. *A*, flow without pessary. Voiding is delayed and maximum flow rate is abnormally low. Voided volume of 30 ml. was associated with 350 ml. post-void residual urine. Subsequent multichannel urodynamics confirmed bladder outlet obstruction. *B*, during pessary reduction of cystocele 450 ml. voided volume were associated with 20 ml. post-void residual urine. Straining pattern is typical of bladder outlet obstruction due to prolapse.

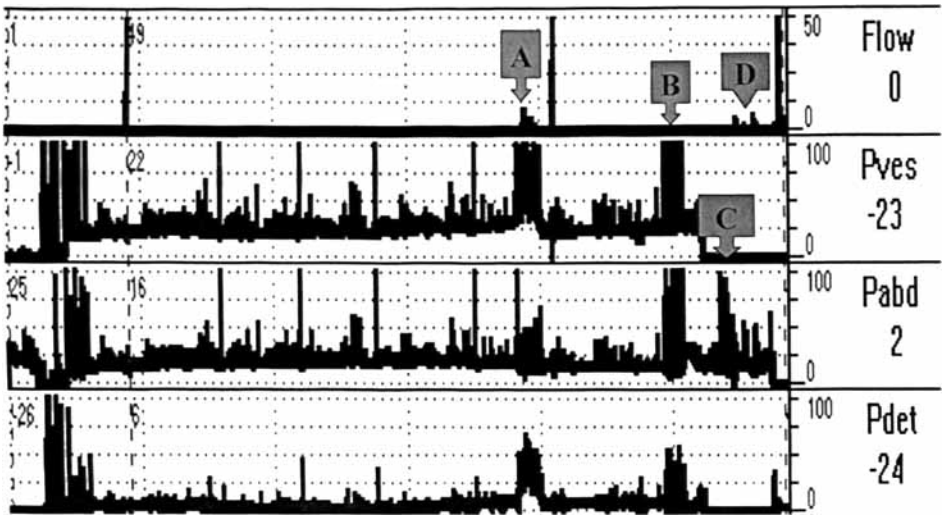

FIG. 2. Multichannel urodynamics in grade 4 cystocele before and after pessary reduction of prolapse. *Pves*, vesical pressure. *Pabd*, abdominal pressure. *Pdet*, detrusor pressure.

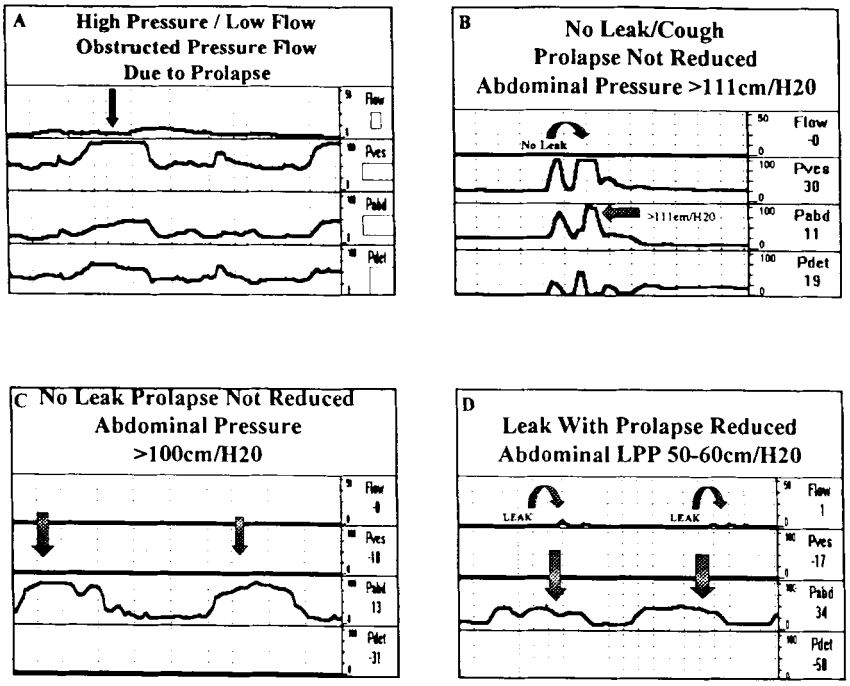

FIG. 3. Pressure uroflowmetry in patient with prolapsed grade 4 cystocele and no history of stress incontinence symptoms. *A*, without reduction there is obstructed pattern of high pressure and low flow at 5 ml. per second maximum flow detrusor pressure at maximum flow of 60 cm. water. *B*, during leak point pressure testing with vesical catheter in place before pessary insertion there is no stress hyperreflexia or urine leakage despite coughing and straining to greater than 110 cm. water abdominal pressure. *C*, before pessary insertion with vesical catheter removed leak point pressure testing is repeated to maximal straining effort of greater than 100 cm. water abdominal pressure without demonstrable leakage. *D*, with ring pessary support of prolapsed cystocele leakage occurs repeatedly with minimal abdominal straining to 50 cm. water abdominal pressure.

data analysis have been helpful for defining bladder outlet obstruction and impaired contractility in men. However, all normal values were established in men and, therefore, they are not applicable to our female study population. While these studies must be done to establish urodynamic cutoff values in women, this was not the focus of our series. In our experience the majority of women void at a maximum flow rate of 15 ml. per second or greater at detrusor pressures of 15 to 20 cm. water. We extrapolated from our clinical experience to define bladder outlet obstruction and impaired contractility for the purpose of evaluating the effect of genital prolapse on bladder function in women. We selected values that made clinical sense, choosing limits that we believed would be well inside any eventually established cutoff values. Since we finished this study, Chassagne et al reported an analysis of pressure-flow data to define bladder outlet obstruction in women. Maximum flow of less than 15 ml. per second and maximum detrusor pressure of 20 cm. water were confirmed as reasonable parameters for the urodynamic definition of bladder outlet obstruction.[15] We believe that their

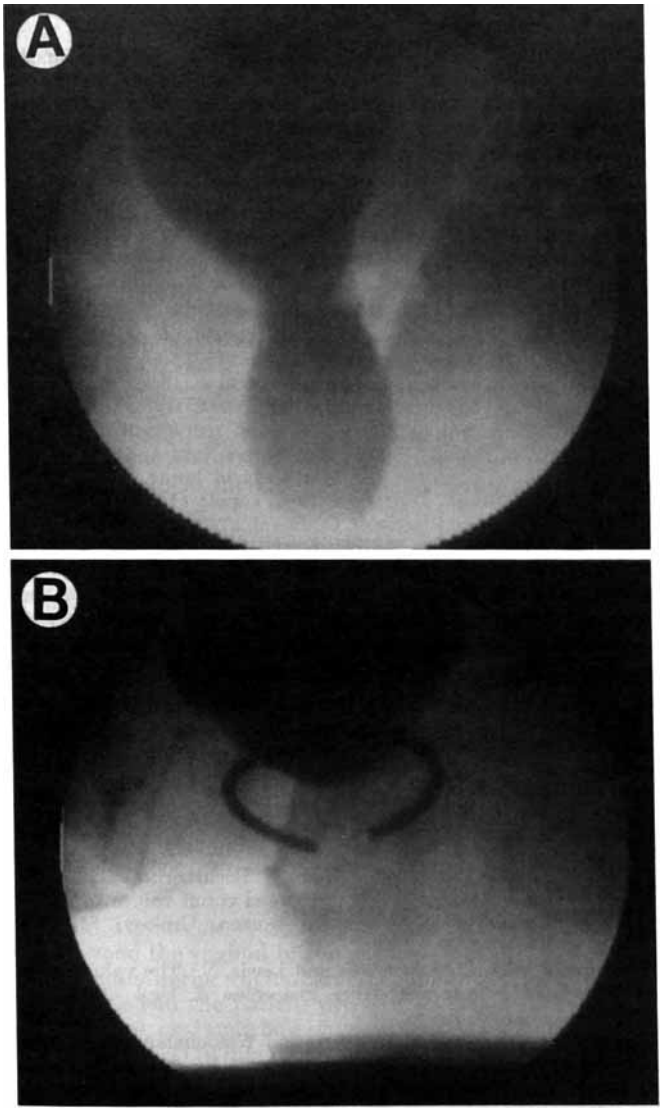

FIG. 4. *A*, full bladder at cystometric capacity has classic hourglass configuration of severe cystocele. Voiding was accomplished only at high detrusor pressure and low flow with resultant high post-void residual volume. *B*, bladder support after ring pessary placement. Patient voided easily to completion and occult intrinsic sphincter deficiency was unmasked.

study confirms our bladder outlet obstruction parameter choices of maximum detrusor pressure at maximum flow of greater than 25 cm. water with maximum flow of less than 15 ml. per second as reasonable for our purpose, which was to define the effects of prolapse on voiding. To our knowledge there are no studies defining cutoff urodynamic parameters for impaired contractility in women. We used the common lower limits of normal voiding detrusor pressures in association with flow below the accepted standard cutoff for normal maximum flow of 15 ml. per second or greater.

Occult stress incontinence was common in women with severe grade 3 or 4 cystocele regardless of the presence or absence of bladder outlet obstruction. Of this group 80% who had stress urinary incontinence with prolapse reduction had no symptom history of stress urinary incontinence (fig. 4). No patient in our series with a grade 3 or 4 cystocele had stress urinary incontinence without pessary prolapse reduction. Others have demonstrated this phenomenon using urethral pressure profilometry rather than leak point pressure studies. Using a vaginal pack Ghoneim et al noted a similar tendency for occult stress incontinence in 16 women with severe cystocele.[16] In their series 11 of the 16 women had occult stress urinary incontinence during urodynamics after genital prolapse reduction. In an assessment of 32 women with severe cystocele Mattox and Bhatia compared genital prolapse reduction with the Smith-Hodge and ring pessaries, and the split Graves speculum during urodynamic testing.[12] They found no difference in urodynamic parameters between the various reduction methods with a 35% rate of occult stress urinary incontinence. In 67 women with severe cystocele Bergman et al noted 36% stress urinary incontinence using pressure transmission data after genital prolapse reduction with the Smith-Hodge pessary.[6] None of the women in this group complained of stress urinary incontinence. Using a ring pessary for prolapse reduction Rosenzweig et al unmasked occult stress urinary incontinence during urodynamics in 59% of 22 women with severe cystocele.[4] Our urodynamic data using abdominal leak point pressure testing confirm these findings and also document a high rate of prolapse induced bladder outlet obstruction in severe genital prolapse. It is unclear whether bladder outlet obstruction masking occult stress incontinence in severe cystocele is due to urethral kinking or external urethral compression. Our experience with forms of severe prolapse other than cystocele is that occult stress incontinence has also been unmasked with the reduction of isolated apical (uterine or vault prolapse) and isolated posterior compartment defects (rectoceles), lending support to the concept of external transvaginal compression of the urethra as the probable mechanism by which stress incontinence may be masked by prolapse. A prospective categorical study of urodynamic findings in forms of genital prolapse other than cystocele is needed to confirm our impression.

Genital prolapse may be reduced using a split speculum, vaginal pack, rectal swab or, as in our study, a vaginal ring pessary.[3,4,12,13,16,17] We believe that the ring pessary creates the most reasonable facsimile of surgical correction, and found no evidence that it introduced an element of urethral obstruction in this pilot study. Rather, 94% of our patients with a grade 3 or 4 cystocele who had obstruction on pressure-flow analysis before prolapse reduction had normal free uroflowmetry after pessary insertion. We believe that the profound decrease in leak point pressure and normalization of free uroflowmetry after pessary placement in our series is evidence against the pessary as an inadvertent cause of urethral obstruction. In a subsequent study we noted normalization of pressure uroflowmetry after ring pessary prolapse reduction in women with demonstrable bladder outlet obstruction due to prolapse.[14]

Considerable controversy exists regarding the wisdom of performing concomitant incontinence procedures in women with severe prolapse in whom stress incontinence is not demonstrated preoperatively. Bergman et al evaluated 67 women with severe cystocele but without complaints of stress incontinence.[6] Of the women 24 had decreased pressure transmission to the urethra during urethral pressure profilometry done with and without a Smith-Hodge pessary. The remaining 43 patients with a good pressure transmission ratio after cystocele reduction underwent surgical prolapse correction without a concomitant incontinence procedure, while the 24 with a poor pressure transmission ratio underwent surgical prolapse correction with needle suspension urethropexy. Bergman et al reported 100% postoperative continence in these women for whom surgical plans were tailored to individual urodynamic findings.[6] In contrast, Cross et al reported 89% continence in continent and incontinent women with severe genital prolapse who underwent surgical reduction and a pubovaginal sling procedure.[18] Similar outcomes were reported by Raz et al in 46 women with severe prolapse, of whom 26 (57%) had urethral hypermobil-

ity but no stress incontinence symptoms preoperatively.[19] While such prophylactic incontinence procedures in continent women with prolapse may be routine at some centers, we believe that the decision to perform concomitant urethropexy or a sling procedure in any woman with severe genital prolapse should be based on urodynamic findings with and without pessary prolapse reduction.

In our series severe degrees of prolapse correlated with increasing patient age. It is unclear whether the increased incidence of certain lower urinary tract symptoms in this group is attributable to age or genital prolapse. To clarify this finding an age matched comparison using controls in women with and without lower urinary tract symptoms and prolapse is necessary.

CONCLUSIONS

In women with a grade 3 or 4 cystocele prolapse induced (reversible) difficult voiding and urethral obstruction are common. When grades 3 and 4 cystoceles are reduced with a ring pessary, occult stress incontinence is often unmasked. Bladder neck obstruction and occult stress incontinence frequently coexist. The etiology of this obstruction is not well understood. Is it due to mechanical urethral kinking, or urethral and/or bladder neck compression by the prolapsed cystocele? If the latter mechanism is the cause, we may expect similar effects on voiding in isolated uterine prolapse, and in isolated severe rectocele and prolapsed enterocele.

Urethral hypermobility was more common in severe with grade 3 and 4 than grade 1 and 2 cystocele. However, urethral hypermobility did not correlate with leak point pressure. Likewise the presence or absence of demonstrable stress incontinence, occult or otherwise, was not more common in women with more severe cystocele. Detrusor instability was more common in women with severe cystocele but impaired detrusor contractility was not. There was no evidence of artifactual bladder outlet obstruction due to ring pessary reduction of severe cystocele. We believe that pessary support of a cystocele during video urodynamics mimics surgical correction without introducing artifactual urethral compression, and it may have prognostic significance.[6, 14]

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