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ADULT ONSET NOCTURNAL ENURESIS

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ABSTRACT

Purpose: We determined the etiology and prognostic significance of adult onset enuresis with absent daytime incontinence. Adult onset nocturnal enuresis unassociated with daytime incontinence is uncommon and there is a paucity of information about its incidence, significance, evaluation and treatment. We present a retrospective evaluation of this condition based on a database review of more than 3,000 consecutive patients referred for the evaluation of lower urinary tract symptoms.

Materials and Methods: A database of 3,277 consecutive patients was searched for adult onset nocturnal enuresis. Patients with daytime incontinence were excluded from study. Evaluation consisted of history, physical examination, American Urological Association symptom score, voiding diary, uroflowmetry, estimation of post-void residual urine, video urodynamics, cystoscopy and radiographic evaluation of the upper tract.

Results: Of 3,277 patients 8 (0.02%) had adult onset nocturnal enuresis without daytime incontinence as a primary complaint. Average American Urological Association symptom score was 12.6 (range 3 to 25), average maximum urine flow was 8.5 ml. per second (range 5 to 15) and average post-void residual urine volume was 350 ml. (range 50 to 489). All patients were men with severe prostatic or vesical neck obstruction as well as bilateral or unilateral hydronephrosis in 63%, a bladder diverticulum in 38%, vesicoureteral reflux in 50% and low bladder compliance in 50%. Transurethral prostatic resection was recommended to all patients but only 5 agreed. The other 3 cases were managed by α-adrenergic antagonists, including 2 by adjunctive clean intermittent self-catheterization. In all patients who underwent transurethral prostatic resection symptoms resolved, as did hydronephrosis when present.

Conclusions: Adult onset nocturnal enuresis with absent daytime incontinence is a serious symptom that usually heralds significant urethral obstruction, and a high incidence of bladder diverticulum, hydronephrosis and vesicoureteral reflux. It demands urological investigation and aggressive therapy.

KEY WORDS: bladder, enuresis, bladder neck obstruction, urethral obstruction

Enuresis in its strictest definition is synonymous with urinary incontinence. However, it is more commonly used to denote nocturnal incontinence. Nocturnal enuresis may be classified as primary persistent or recurrent enuresis, or secondary adult onset enuresis.[1] More than 1% of adults older than 20 years old have persistent primary enuresis.[2] As in childhood enuresis, the pathophysiology is thought to be related to the lack of diurnal variation in antidiuretic hormone.[2] In patients with primary enuresis unless there are other urinary complaints, such as infectious and obstructive symptoms, the incidence of significant anatomical or functional pathology is no different than in the general population[1] and the incidence of abnormal cystometry is 20% to 70%.[3–5]

Secondary adult onset nocturnal enuresis without daytime incontinence is uncommon. Due to a paucity of information there is no consensus regarding its etiology, significance, evaluation or treatment. In a MEDLINE search we did not identify any previous studies specifically evaluating adult onset enuresis without daytime incontinence. We report our experience in a consecutive group of patients with the chief complaint of adult onset nocturnal enuresis.

MATERIALS AND METHODS

A database of 3,277 consecutive patients was retrospectively reviewed to identify those who presented with adult onset nocturnal enuresis. Patients with daytime incontinence were excluded from study. The database was queried for all patients who indicated on a valid questionnaire that they had nocturnal enuresis but did not have daytime enuresis. After such data were entered into the database the examiner obtained a detailed history confirming or rejecting the data entered after discussing it with the patient. Only those whose contemporaneous history confirmed nocturnal enuresis with absent daytime incontinence based on history, diaries and pad test were included in our analysis. Many patients were excluded from study who had daytime and nighttime incontinence but these data were not recorded. All cases were referred to one of us (K. S.) for evaluation, including 3 from other urologists and 5 from primary care physicians. The evaluation of patients with adult onset enuresis included structured history and physical examination, voiding diaries, American Urological Association (AUA) symptom score, urinalysis, uroflowmetry, post-void residual urine measurement, video urodynamics and cystoscopy.

Based on the voiding diary the nocturnal polyuria index was calculated. The nocturnal polyuria index is the ratio of nocturnal-to-24-hour urinary volume. Nocturnal polyuria is defined as a nocturnal polyuria index of greater than 35%.[6] Functional bladder capacity is the largest voided volume during the recorded 24 hours. The nocturnal bladder capacity index is the difference in the predicted number of nightly voids based on nocturnal urinary volume divided by functional bladder capacity and the actual number of nightly

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voids. A nocturnal bladder capacity index of greater than 2 has been associated with severe nocturia.[6]

The highest maximum urine flow and lowest post-void residual urine volume during initial evaluation were recorded. Video urodynamics were performed at a medium fill rate using room temperature radiographic contrast material infused through a 7Fr double lumen catheter. All methods conformed to the recommendations of the International Continence Society[7] except for cystometry. Contrary to those recommendations during bladder filling the patient was instructed not to void or inhibit voiding but to report sensations to the examiner. Cystometrography was performed with the patient seated. Intra-abdominal pressure was measured with a rectal balloon catheter. All pressures were transduced with external transducers set to 0 atmospheric pressure at the level of the symphysis pubis.

Bladder compliance was defined as the change in bladder volume at bladder capacity divided by the change in bladder pressure. The pressure flow study was performed during voiding with the urethral catheter in the bladder. Maximum urine flow and detrusor pressure at maximum flow were plotted on the pressure flow diagram, as proposed by Schäfer, and the grade of obstruction from 0—none to 6—severe was estimated from linear passive urethral resistance relation pressure.[8] Grades 3 and greater were considered indicative of urethral obstruction. When the patient did not void and detrusor pressure at maximum flow was greater than 40 cm. water, he was considered to have urethral obstruction and the narrowest point in the urethra during voiding on voiding cystourethrography was considered the site of obstruction. Other existing pathological conditions, such as a bladder diverticulum and vesicoureteral reflux, were also noted. Radiographic evaluation of the upper urinary tracts and serum creatinine were done in patients with bladder outlet obstruction and/or vesicoureteral reflux. Cystoscopy was performed in those diagnosed with prostatic urethral or bladder neck obstruction. Followup evaluation included focused history, AUA symptom score, uroflowmetry, post-void residual urine measurement and a repeat upper tract evaluation when upper tract abnormalities had been initially observed.

RESULTS

Of the 3,277 consecutive male and female patients 8 men (0.02%) 48 to 80 years old (mean age 62.5) had adult onset nocturnal enuresis without daytime incontinence. All but 1 man had other lower urinary tract symptoms. Average AUA symptom score was 12.6 (range 3 to 25) (see table). Two of the 5 patients who completed the voiding diaries had nocturnal polyuria. Average functional bladder capacity was 332 ml. (range 240 to 450). None of the patients had a nocturnal bladder capacity index of greater than 2.

Average maximum urine flow and post-void residual urine volume were 8.5 ml. per second (range 4.6 to 15) and 350 ml. (range 50 to 1,333), respectively. The table lists individual maximum urine flow and post-void residual urine values. Five of the 7 patients with radiographic studies of the upper tract available had unilateral or bilateral hydronephrosis. Serum creatinine was normal in all except 2 cases (2.1 and 2.8 mg./dl., respectively). Average cystometric bladder capacity was 705 ml. (range 341 to 1,330). All patients had grade 4 prostatic or primary vesical neck obstruction based on the Schäfer nomogram and voiding cystourethrography during video urodynamics (fig. 1). In all cases video urodynamics revealed associated abnormalities, including a bladder diverticulum in 3, vesicoureteral reflux in 4 and low bladder compliance in 4 (fig. 2).

Transurethral prostatic resection was recommended to all patients but only 5 agreed. Three cases were initially managed by α-adrenergic antagonists as well as clean intermittent self-catheterization in 1. The latter patient was lost to followup. Another patient with severe prostatic obstructions, vesicoureteral reflux and hydronephrosis refused surgical treatment and was started on an α-adrenergic antagonist. After several years urosepsis developed and serum creatinine increased from 1.5 to 2.5 mg./dl. He agreed to clean intermittent self-catheterization but still refused surgical treatment. While on clean intermittent self-catheterization, hydronephrosis resolved but renal insufficiency persisted. Patient D. H. discontinued the α-adrenergic blocking agent after 1 year and enuresis resolved within months of treatment. At 4 years of followup he complained only of vague voiding symptoms. Maximum urine flow was essentially unchanged from 11 to 10 ml. per second and the upper tract remained normal except for a benign cyst. This patient has not been compliant with a voiding diary or pad testing because he has indicated that enuresis is not a problem.

In all 5 men who underwent transurethral prostatic resection symptoms resolved, including enuresis, while hydronephrosis resolved in the 3 who underwent upper tract evaluation preoperatively. Postoperative post-void residual urine volume was 234 ml. in a man with bladder capacity greater than 1,000 ml. preoperatively. Two patients in whom uroflowmetry was done before transurethral prostatic resection had a maximum urine flow of 15 and 24 ml. per second, respectively. The table shows the initial patient evaluation and followup of the upper tract after treatment.

DISCUSSION

In adults older than 18 years old persistent primary enuresis occurs in 2% to 3%[2] and does not seem to have any gender predilection.[3–5] In these cases urodynamic studies are often normal[3–5] and, therefore, extensive evaluation is usually not required unless there has been no previous evaluation. Adult onset enuresis unassociated with daytime incontinence is an uncommon problem, occurring in only 0.02% of

Evaluation of patients with adult onset enuresis

Pt.—Age	AUA Symptom Score	Max. Urine Flow (ml./sec.)	Post-Void Residual Urine Vol. (ml.)	Upper Tract Evaluation	Treatment	Hydronephrosis After Transurethral Prostatic Resection
SL—65	8	5	50	Not done	Transurethral prostatic resection	Not applicable
MP—80	3	14	1,333	Unilat. reflux, unilat. hydronephrosis	Transurethral prostatic resection	Resolved
KK—59	7	15	35	Unilat. reflux, bilat. hydronephrosis	Transurethral prostatic resection	Resolved
FS—74	9	8	489	Unilat. hydronephrosis	α-Adrenergic antagonist, clean intermittent self-catheterization	Not applicable
JW—48	21	5	207	Unilat. reflux, bilat. hydronephrosis	Transurethral prostatic resection	Resolved
RS—49	25	7	172	Unilat. reflux, bilat. hydronephrosis	α-Adrenergic antagonist, clean intermittent self-catheterization	Not applicable
DH—56	15	11	115	No hydronephrosis	α-Adrenergic antagonist, clean intermittent self-catheterization	Not applicable
MM—69	Not available	3	400	Not done	Transurethral prostatic resection	Not applicable

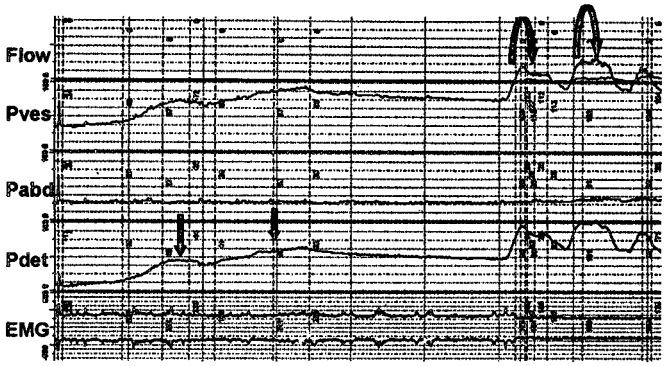

FIG. 1. Low bladder compliance and urethral obstruction. Detrusor pressure (*Pdet*) stopped increasing when bladder filling was stopped (long arrow). When bladder filling resumed, detrusor pressure started to increase again (short arrow). Curved arrows indicate low flow despite high detrusor pressure. *Pves*, vesical pressure. *Pabd*, abdominal pressure. *EMG*, electromyography.

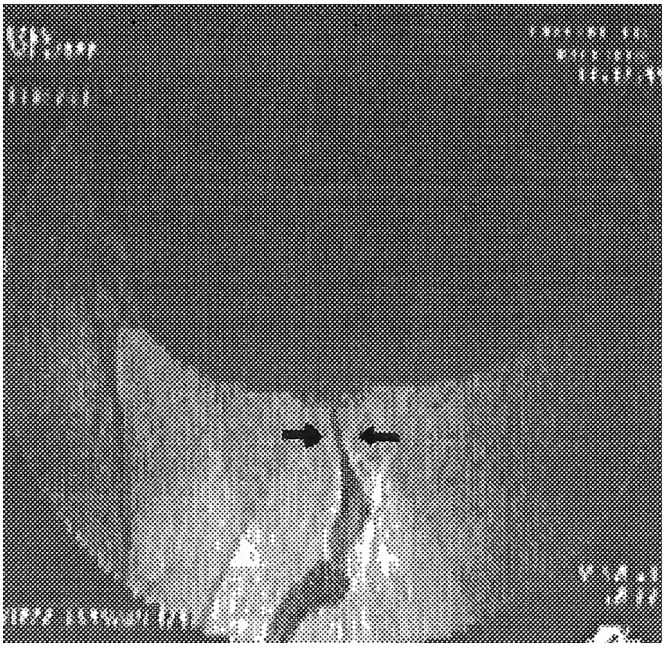

FIG. 2. Voiding cystourethrography at maximum urine flow reveals obstruction site (arrows).

our patient population. In our experience there is a high likelihood of prostatic and/or vesical neck obstruction in these cases but to our knowledge neither this observation nor the association with upper tract pathology has been previously documented in the peer-reviewed literature. The AUA symptom score, voiding diary, uroflowmetry and post-void residual urine volume measurement are some noninvasive tools used to assess lower urinary tract symptoms. However, none of these tests reliably diagnoses bladder outlet obstruction. In view of the high likelihood of significant urethral obstruction, bladder diverticulum and upper tract abnormalities in our group with enuresis we believe that video urodynamics and upper tract imaging should be routinely performed in patients with adult onset enuresis.

Uroflowmetry and post-void residual urine measurement using an ultrasound or bladder scan are excellent tools for baseline evaluation but they do not distinguish bladder outlet obstruction from the common pathological conditions causing lower urinary tract symptoms.[9] In fact, in 1 of our cases maximum urine flow was normal despite severely decreased bladder compliance, renal failure and bilateral hydronephrosis. These symptoms and all of these findings reverted to normal after transurethral prostatic resection. A large post-void residual urine volume indicates inefficient voiding and a volume of greater than 50 to 100 ml. was considered abnormal in several studies.[10,11] Considerable within-patient variability limits the predictive value of post-void residual urine volume for evaluating lower urinary tract pathology.

The etiology of adult onset enuresis is not well understood. Most patients with primary and diurnal enuresis have detrusor instability[5] or decreased functional bladder capacity[3] but only 2 of our patients had decreased functional bladder capacity and only 1 had detrusor instability. Moreover, cystometric bladder capacity was normal in all cases. In our series the most common urodynamic abnormality other than bladder outlet obstruction was low bladder compliance in half of our cases. Increased nocturnal urinary volume in patients with obstructive sleep apnea has been considered to be a cause of adult onset nocturnal enuresis.[12] However, in our study nocturnal polyuria was evident in only 2 of the 5 evaluable patients.

All of our patients with isolated adult onset nocturnal enuresis had significant lower urinary tract pathology, namely severe bladder outlet obstruction. However, none of these patients had daytime incontinence and all except 2 had only minimal to mild daytime symptoms. Because our patients did not consistently have nocturnal polyuria, decreased bladder capacity or decreased nocturnal bladder capacity, we may only theorize that detrusor instability was the most likely cause of enuresis, although urodynamic evaluation revealed detrusor instability in only 1. Perhaps low bladder compliance triggers unstable bladder contractions during sleep. It is interesting that detrusor instability was diagnosed by urodynamics in only 1 man, especially since about two-thirds of the men with prostatic obstruction have detrusor instability.

CONCLUSIONS

Adult onset or secondary nocturnal enuresis without daytime incontinence is a rare but serious condition. It is nearly universally associated with severe prostatic and/or bladder neck obstruction as well as upper tract deterioration. It develops mostly in men, probably because they are anatomically more prone to bladder outlet obstruction. In addition, many of these men have associated urinary pathologies, such as vesicoureteral reflux and a low compliance bladder. Therefore, we recommend that the initial evaluation in these patients should include serum creatinine, uroflowmetry, post-void residual urine measurement, video urodynamics and upper tract imaging.

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