URINARY DISORDERS IN PARKINSON’S DISEASE AND MULTIPLE SYSTEM ATROPHY

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PARKINSON’S DISEASE AND THE BLADDER

The cause and nature of bladder symptoms in patients with genuine Parkinson’s disease (PD) may be difficult to establish and treatment is often unsatisfactory. Typically patients present with longstanding neurological disease, the bladder symptoms coming on some years after treatment for PD was started. A recent study has shown that the severity of urinary symptoms is related to the neurological disability, not the duration of the disease or the patient’s age (1). Typically patients complain of urgency and frequency which may be severe, and urge incontinence, particularly if poor mobility compounds their bladder disorder (2).

Many male patients with PD will be in the age group in which bladder outflow obstruction due to benign prostatic hyperplasia (BPH) is a common co-existent disorder. Those with outflow obstruction complain of voiding symptoms such as hesitancy and a poor flow and furthermore may also have urgency since obstruction itself can cause detrusor overactivity. It is likely that a number of the earlier studies on PD and the bladder included patients with multiple system atrophy (MSA) and the reputation that patients with PD have a poor outcome following prostatic surgery may be due to the inadvertent inclusion of some men with MSA in the surveys. Urological intervention is not contraindicated in men with PD but it is reasonable to try these patients on anticholinergic
medication first if storage symptoms are prominent. If conservative measures fail then a voiding cystometrogram to demonstrate obstructed voiding should be performed before transurethral resection of the prostate is considered (3).

If no urological cause for bladder symptoms is demonstrated, a neurological cause can be proposed.

There are several possible neurogenic causes of bladder symptoms in PD. Urodynamics studies of several series of patients have found that the most common abnormality is detrusor hyperreflexia, the incidence ranging from 45 to 93% (4-10). As regards the cause of detrusor hyperreflexia in PD, the most widely held hypothesis is that, in health, the basal ganglia have an inhibitory effect on the micturition reflex, and with cell loss in the substantia nigra this is lost. Experimental evidence of an inhibitory role for the basal ganglia comes from animal MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) models (11).

Clinical studies that have looked at the effect of L-dopa or apomorphine on bladder behaviour in patients with PD have produced conflicting results. In patients showing “on-off” phenomena, cystometry done in both states showed a lessening of hyperreflexia with L-dopa in some patients, and an increase in others (10). A similar unpredictable effect was found on detrusor hyperreflexia when subcutaneous apomorphine was given in one study (12), although in another all those with detrusor hyperreflexia improved (13).

Some authors have suggested that an impaired relaxation or “bradykinesia” of the urethral sphincter can result in voiding dysfunction due to bladder outflow obstruction (7,12,14), while an earlier study suggested the effect of L-dopa was to increase bladder neck obstruction. One study, in which subcutaneous apomorphine was given to patients with PD and urinary symptoms, showed that apomorphine reduced bladder outflow resistance and improved voiding in all 10 patients (12). It was proposed that this intervention be used to demonstrate the reversibility of outflow obstruction in men with PD before prostatic surgery is undertaken - an excellent suggestion but unfortunately rarely acted upon.

MSA AND THE BLADDER

Neuronal atrophy in MSA affects the central nervous system at many different sites concerned with the neurological control of micturition. Because of this, premonitory urinary symptoms are not unusual (15).

It is thought that detrusor hyperreflexia is due to cell loss in the midbrain, whereas incomplete bladder emptying and poor flow is due to loss of parasympathetic drive on the detrusor following atrophy of preganglionic cells in the intermediolateral cell columns (16). The pathophysiological balance may change during the course of the disease and whereas early on symptoms due to detrusor hyperreflexia predominate, as the disease progresses symptoms may change to those of incomplete bladder emptying (17).

Of particular importance is the group of anterior horn cells in the sacral spinal cord, which innervate the striated muscles of the urethral and anal sphincters. This was first described by Onufrowicz in 1900 and hence became known as the “Onuf’s nucleus”. Postmortem studies in patients dying of Shy-Drager syndrome demonstrated a selective loss of anterior horn cells in the Onuf’s nucleus (18), which are spared in amyotrophic lateral sclerosis (19). The resulting denervation of the urethral sphincter together with detrusor hyperreflexia is a further reason why urge incontinence is such a pronounced and early feature of MSA.

Postural hypotension, a disorder characterised by faintness on standing and also nocturnal polyuria, affects a proportion of patients...
with MSA. This is thought to be due to a combination of factors, which include compensatory supine hypertension at night leading to increased glomerular filtration and alterations in the production of atrial natriuretic peptide.

The onset of urinary symptoms in relation to other neurological symptoms in MSA is fundamentally different from that which occurs with PD. Retrospective studies have confirmed that approximately 60% of patients with MSA develop urinary symptoms either preceding or at the time of presentation with parkinsonism. The severity of the incontinence in patients with MSA was more marked than in patients with PD and many of these patients seek urological advice early in the course of their disease.

A recent retrospective study of patients with MSA showed that urinary symptoms were more common than symptoms of orthostatic hypotension and that in patients who had both, the bladder complaints were usually the earlier (21).

Incomplete bladder emptying may be a factor that contributes significantly to the incontinence in MSA and a raised post micturitional residual volume is much more likely in MSA than in PD (2,22). Worsening urinary control after urological surgery (transurethral resection of the prostate or anti-incontinence procedures in women) is usual in patients with MSA: in one study all patients who underwent prostatic surgery were incontinent either immediately after or within a year after surgery (20).

Male erectile dysfunction (MED) is often the first symptom of MSA. The clinical uro-genital criteria favouring a diagnosis of MSA are shown in Table I (2). The urologist confronted with a patient showing these features should be cautious of embarking on an operative approach. The neurologist encountering a patient with marked urinary symptoms might consider future investigation by sphincter EMG if available.

<table>
<thead>
<tr>
<th>Table I - Uro-genital criteria in favour of MSA.</th>
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<td>Urinary symptoms preceding or presenting with parkinsonism</td>
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<td>MED preceding or presenting with parkinsonism</td>
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<tr>
<td>Urinary incontinence</td>
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<tr>
<td>Significant post micturition residue (&gt; 100 ml)</td>
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<td>Worsening bladder control after urological surgery</td>
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Selective atrophy of the anterior horn cells (the Onuf’s nucleus) is a characteristic feature of MSA. The changes of chronic reinnervation that occur in the motor units of the anal sphincter and the urethral sphincter have been demonstrated by electromyography. Since the anterior horn cells of the Onuf’s nucleus are not affected in PD, sphincter EMG was proposed as a means of distinguishing between PD and MSA using a concentric needle electrode (23). Both the anal and urethral sphincters are innervated by the anterior horn cells in the Onuf’s nucleus and similar changes of chronic reinnervation i.e., prolongation of the mean duration of motor units, have been demonstrated in both sphincters in patients with MSA. As the anal sphincter is more superficial and needle EMG of this causes less discomfort, this is the muscle usually studied. By varying the position of the needle electrode, 10 different motor units can be identified and the overall mean duration calculated. It is important to include the highly stable but low amplitude late components, which may be separated from the initial part of the complex by an isoelectric period of several milliseconds in the measurement of duration of individual units. The mean prolongation of the duration of sphincter motor units is the most useful measurement by which changes of chronic reinnervation are identified. The control range of motor unit duration values is wide but a mean duration of greater than 10 msec is over the upper limit of all normal studies. In a ret-
rospective analysis of sphincter EMG in 126 patients with parkinsonism, Palace et al. found that 82% of patients who were subsequently diagnosed as having MSA had had a mean duration > 10.0 msec of motor units on sphincter EMG (24). Others found no difference between the motor units in patients with PD and those with MSA. However these authors state that they did not include the late satellites that are so characteristic of the sphincter EMG changes occurring in MSA and consequently demonstrated a mean duration of less than 10.0 msec in both groups (25). A recent comparison of the mean duration of sphincter motor units in patients with PD and MSA found no significant statistical difference between the groups (26). In the study by Palace et al., only mean values of more than 10 msec were taken as abnormal. Single fibre needle EMG can also be used to show changes of chronic reinnervation (27).

A potentially serious criticism against the sphincter EMG test is the reporting of false positives for a condition with such a poor prognosis. As with all neurophysiological investigations the clinician must assess the result of the investigation in the light of the patient’s clinical condition and progression of their neurological disease. Using a mean duration of more than 10 msec as the upper limit of normal reduces the risk of false positives.

Although there are differences on urodynamics between patients with PD and MSA (9,22) these are not sufficiently specific to be of diagnostic significance.

TREATMENT OF URINARY SYMPTOMS IN MSA

It is important to avoid inappropriate urological surgery in patients with MSA and a conservative approach with medical measures to manage incontinence can be highly effective. Detrusor hyperreflexia is treated with anticholinergic medication such as oxybutynin or tolterodine, which diminishes the parasympathetic effect on bladder smooth muscle. This is usually tried in patients with urgency and frequency but anticholinergic side effects, a dry mouth in particular, may summate with those of anticholinergic medication given to treat parkinsonian tremor.

Many patients with MSA go on to develop incomplete bladder emptying. An estimate of the post void residual urine volume is a simple and useful test in such patients as they maybe unaware that their bladders do not empty completely (28). If a patient has a significant post micturition residue and is symptomatic, this aspect of his problem should be managed by intermittent catheterisation if possible. However, in patients with severe neurological disability, a permanent indwelling catheter or urosheath drainage may be required.

Nocturnal polyuria can be lessened by desmopressin, which may also be beneficial for raising the ambulant blood pressure in those with postural hypotension.

REFERENCES

2. Chandiramani VA, Palace J, Fowler CJ. How to recognise patients with parkinsonism who should not have urological surgery. Br J Urol 1997;80:100-104
4. Andersen JT, Hebjorn S, Frimodt-Moller
25. Schwarz J, Kornhuber M, Bischoff C, Straube A. Electromyography of the external anal sphincter in patients with Parkinson’s disease and multiple system atrophy: frequency of abnormal spontaneous activi-