

CONTINENCE AND INCONTINENCE

A CLINICAL STUDY OF THE DYNAMICS OF VOIDING AND OF THE SPHINCTER MECHANISM

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A RECENT LECTURE to this College stressed again the opportunities for research in the day-to-day work of the busy clinician, and illustrated this theme with some remarkable studies of gastrointestinal function after surgery¹. I will follow this lead by describing results of studies performed as part of a routine investigation of patients referred with symptoms related to the bladder and its outflow tract.

Pressure/flow studies have been used in this context for some years; in particular, reports by Claridge² and Smith³ in this country relate the findings of such studies to bladder outflow obstruction.

Ciné-cystography alone has been used in the routine investigation of urinary symptoms at the Middlesex Hospital for a number of years. This also gave valuable information, particularly on the behaviour of the sphincter regions of the urethra during normal and abnormal micturition and the results of this experience have been recently reviewed⁴. But a need was felt in some situations for a method which combined pressure measurement and ciné-cystography⁵, still simple enough for clinical use, so that the reaction of the bladder could be assessed in relation to the actual behaviour of the urethral sphincters seen on cystography.

This lecture is based on the evolution of a method of combined simultaneous ciné/pressure/flow cystography; it aims to outline the method used for the investigation, and to describe those of the results which relate bladder function to disorders of continence.

APPARATUS AND METHOD

The apparatus and method now used have been described more fully elsewhere⁶ (Fig. 1).

Pressure flow measurements

The total bladder pressure is measured *per urethram*, by a 1-mm. E.D. fluid-filled pressure catheter and transducer system. The rectal pressure is measured similarly by a 2-mm. catheter, the end protected from faecal blockage by a finger stall, and the flow rate by the system of von Garrelts⁷. The filling volume is also measured continuously with a weighing strain gauge.

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The intrinsic detrusor pressure has been estimated by subtracting the rectal from the bladder pressure electrically. This estimate of the detrusor contribution to the total bladder pressure has been crucial to the results to be described, in particular to detect underlying detrusor activity when there are large alterations in total bladder pressure due to changes in posture, and coughing. It will be seen that throughout it is the contribution of the detrusor to the total pressure which is of diagnostic importance.

Five values are thus recorded on a Devices polygraph (Fig. 2), three of which are viewed by a Link television camera with attached mixing facilities, which superimposes this recording on the image of the bladder on the television monitor. This combined picture is recorded on videotape or ciné-film (Fig. 4).

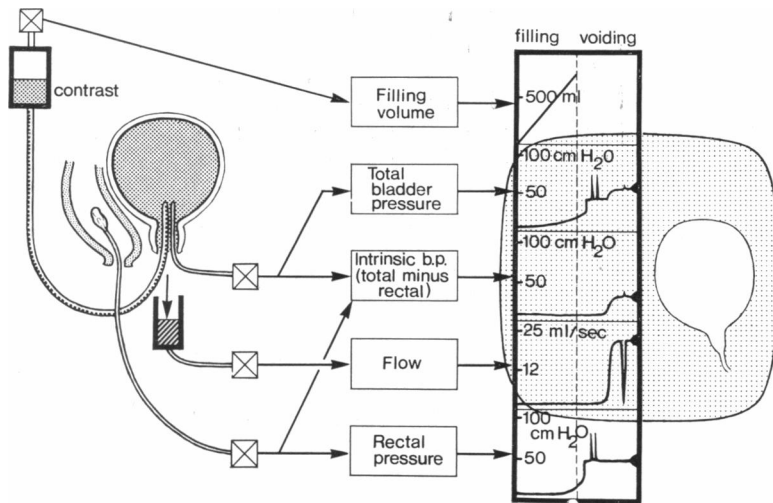


Fig. 1. Diagram of apparatus.

Method

A 12F catheter is passed into the bladder, alongside which the pressure catheter is introduced simultaneously and a specimen of urine taken for culture. The bladder is filled with 35% Diodrast over a period of 2 to 4 minutes until the patient is uncomfortably full. A continuous filling cystometrogram is thus recorded, *throughout which the patient is asked to hold his urine*. The table is tilted to the upright position; the patient screened into position (about 15° oblique which usually exposes the bladder neck) and then asked to cough to test for stress incontinence and check the subtraction mechanism. The patient is then asked to void. If the flow rate is slower than expected, as occurs in about one in five women, the patient is asked to stop and micturition is completed in the

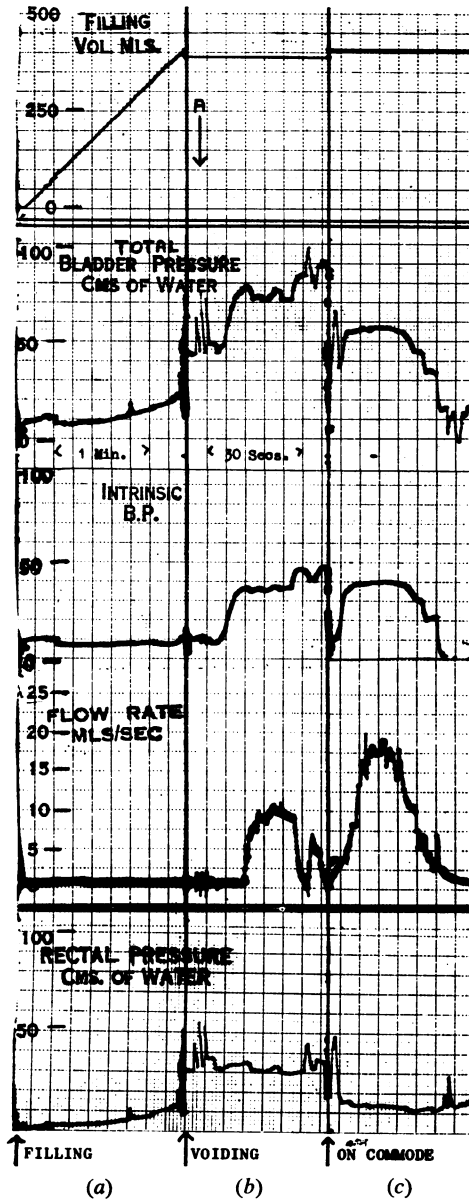


Fig. 2. Full paper recording of a normal patient. The left-hand column (a) represents filling. (b) The patient is tilted to the upright position and asked to cough (A), and then to void. Flow unexpectedly slow. (c) Rises to normal at same intrinsic pressure on commode.

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privacy of a side room sitting on a transducer fitted commode. The pressure and flow information appear as a continuation of the record, without cystography. This enables one to decide whether in a particular case the slow visualized flow rate (and any associated urethral narrowing) represent true pathology or, as in the case shown, are an artefact of the method (Fig. 2, cf. *b* and *c*).

The X-ray dose to the ovaries has been estimated at 1,000 millirads/min. which approximates to that of a routine I.V.P. series.

The investigation does appear complicated; in practice it has been simplified to the extent that it can be used as a routine investigation, taking about 30 minutes per patient.

Clinical material

One thousand seven hundred studies have been completed on 1,400 patients, who may be broadly classified into clinical groups as shown in Table I.

TABLE I
SUMMARY OF PATIENTS STUDIED

Non-prostatic outflow obstruction in males	145
Recurrent infection in females	196
Cystoplasty reviews	42
Neuropathic bladder	142
Diabetic bladder dysfunction	26
Voiding dysfunction after pelvic surgery	36
Post-prostatectomy symptoms	65
Stress and urge incontinence	421
Normal findings	361
Total	1434

Although these figures include children, they have been excluded from the results to be described, which will be confined to those which illustrate the rôle of the bladder in causing the symptoms, in particular in patients with:

1. Infection and other inflammatory disorders,
2. Neurological disease,
3. Bladder outlet obstruction,
4. Stress and urge incontinence.

OUTLINE OF NORMAL ANATOMY AND FUNCTION

The bladder consists of interwoven smooth muscle cells. These are innervated by parasympathetic motor fibres from the sacral outflow where there are reflex connections. There is also a sympathetic nervous supply from the thoraco-lumbar region of the spinal cord, thought to have a sensory function alone. The sacral nerves run as a multitude of separate fibre bundles in close relation to the lower end of the ureter

to spread out over the surface of the bladder. Impulses from this lower reflex arc are modified by higher centres, so that within limits micturition occurs at will. This unique situation of voluntary control of a part of the autonomic system, present in both man and animals, is of extreme importance in the consideration of certain disorders of micturition.

It is important to reiterate that, although the bladder neck mechanism is an important, functionally competent sphincter, there is no separate circular sphincter muscle in this region. Rather the fibres are continuous with those of the detrusor, and are so arranged that as they contract, together with those of the detrusor, they open the bladder neck at the beginning of micturition.

RESULTS

The filling cystometrogram: introduction

The bladder can be considered to have two functions: to act as a reservoir for the storage of urine, and to contract and empty completely only when willed to do so.

It is widely accepted that the storage function involves some form of central inhibition which tends to prevent contraction during filling, and that in neurological disorders affecting the upper motor neurone, such as multiple sclerosis, it is primarily uninhabitable contractions of the bladder which cause the incontinence.

This function of the bladder has been studied in animals and man since the days of Sherrington by means of the filling cystometrogram, and this investigation remains the only reasonably precise method used for assessment of such disorders to-day. A typical 'normal' trace is shown in Figure 3 (a). The rising phase is often referred to as the tonus limb; a term which implies (probably wrongly) some activity of the detrusor muscle during filling. As usually performed, towards the end the patient is encouraged to pass his urine (despite the fact that he is lying down and has a catheter in his bladder); this is done to test the micturition reflex, but if there is no response it is known to be of no significance, as many normal patients are unable to initiate micturition in these circumstances. Of some interest are the small waves of contraction which have been noted in man and animals and have been considered to play a part in our awareness of a full bladder⁸.

Findings: the normal patient

All the patients had a filling cystometrogram performed routinely prior to the voiding study. The only significant differences from standard procedure were that the patients were asked to hold their urine, that contrast medium was used for filling the bladder, and that, after filling to capacity, the patient stood up and a voiding ciné/pressure study was performed. This allowed findings on filling to be related to other patho-

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logy, such as incontinence or obstruction which were demonstrated more objectively than is usually possible. Figure 3 (b) shows a typical normal trace from this study and shows that after subtraction of the abdominal pressure the tonus limb has largely disappeared; in fact, excluding those with neurological disease, obstruction and an unstable bladder (see below), the mean rise for the whole series was only 5.6 cm. H₂O, for a mean volume of 490 ml.

Of more significance was the fact that in this study of the normal there were no waves which might suggest detrusor contraction during filling despite marked discomfort towards the end. Furthermore, these normal patients could also inhibit their detrusor when they stood up and when

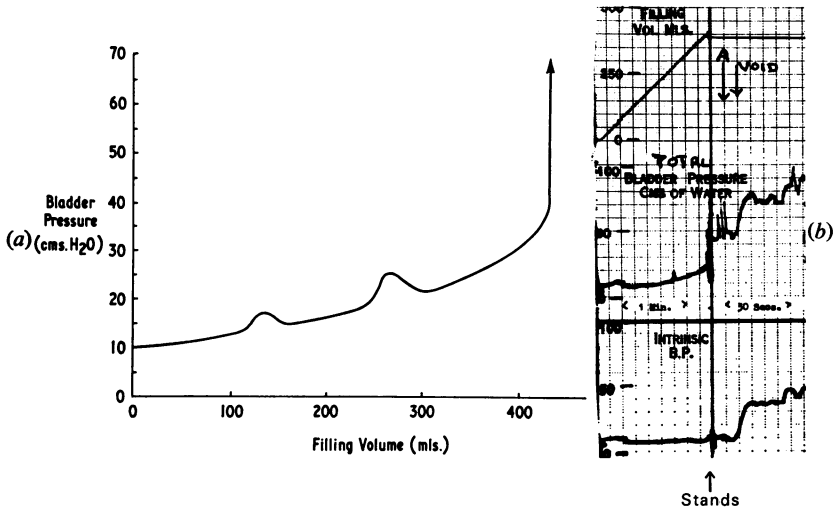


Fig. 3 (a). Usual representation of a 'normal' cystometrogram. Note small detrusor contractions during filling gradual rise towards the end (tonus limb) and terminal powerful contraction. (b) Normal filling cystometrogram from present study which records filling volume, total and intrinsic bladder pressure. Note no change in intrinsic bladder pressure on filling, standing up, or coughing (A).

they coughed. It appeared that continence is normally maintained even when the bladder is uncomfortably full, not so much by the contraction of the urethral sphincters as by inhibition of the bladder. This suggestion is supported by studies on several patients whose sphincters, apart from the bladder neck, had been entirely destroyed by injury or operations. Despite this they were entirely continent. If in fact the detrusor contracted in these patients, other than when willed to do so, it would have opened the bladder neck and incontinence would have been inevitable. Excluding those with neurological disease, in only 51 patients did the bladder contract on filling. As the study progressed it became apparent that contraction while filling was only the most obvious and severe

manifestation of a more common abnormality. A further 240 patients with similar symptoms of urgency or incontinence were, again in contrast to normal, unable to inhibit detrusor contraction when they stood up or when they coughed (Fig. 6c). This loss of the ability to inhibit normal detrusor activity appears to be of considerable importance in clinical practice, and will be called in this lecture 'The Unstable Bladder'.

This concept is not new^{9, 10}, but appears from these studies to be more important in practice than is generally supposed and to be defined particularly well by this technique of pressure/flow/cystography. The remainder of the lecture will be devoted to further consideration of this problem, in relation to the clinical abnormality and the patient's symptoms.

Neurological disease

All these patients have been carefully screened for associated neurological disease, many by the same neurological colleague by whom the project as a whole is supported. Few cases were in fact found, and these, including some of the very old patients with possible cerebral ischaemia, have been excluded. Furthermore, in contrast to the spastic neurological bladder, the unstable bladder emptied normally, without residue, and the urine was usually sterile. It seems unlikely that many of these patients had an underlying neurological abnormality.

Infection

Some 200 patients were investigated with recurrent urinary infections, the urethral syndrome and other inflammatory disorders. An important feature of the results in these patients, who included 27 with actual infection at the time of the study and five with interstitial cystitis, was that only three had an unstable bladder. Although filling was more than usually uncomfortable and the volume tolerated often less, they were still able to inhibit detrusor contraction.

Urgency

It is important to relate the finding of an unstable bladder to the symptom of urgency because, while this is an extremely common symptom, there is very little known of the underlying functional abnormality. As might be expected, bladder contractions were responsible for urgency in some of these patients. *But these contractions also occurred without urgency. Per contra* a great many patients with marked urgency and frequency, due to inflammatory disease, had no bladder contractions. Inflammatory disorders do cause urgency but this is due to the hypersensitivity; the patient is still able to inhibit detrusor activity and so is usually continent.

These findings suggest that urgency may be classified into two groups with fundamentally different causes.

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1. Motor urgency due to an unstable bladder (incontinence common).
2. Sensory urgency due to inflammatory disorder (incontinence rare).

The majority of patients who did have an unstable bladder fell into two of the clinical groups, outlet obstruction in the male, and stress and urge incontinence in the female, and its relation to these conditions will be considered in further detail.

Obstruction

Nearly half the male patients studied who were shown to have outlet obstruction at the proximal urethra on voiding cystography had an un-

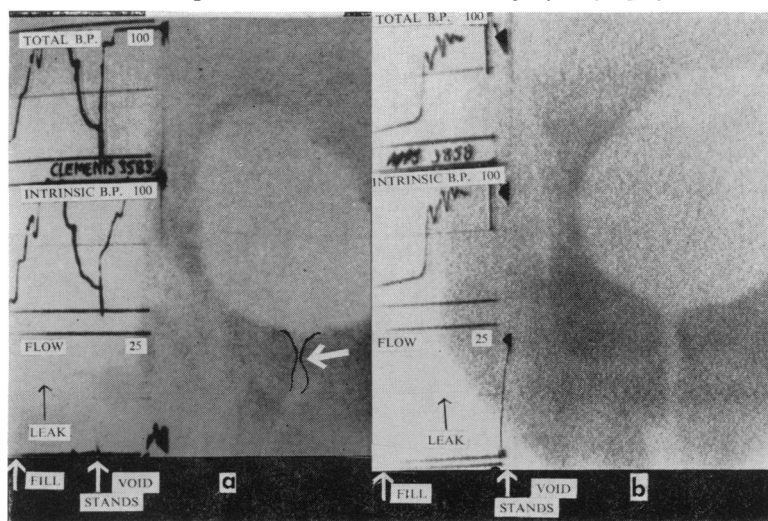


Fig. 4. Single frames of ciné record during voiding of two male patients with similar symptoms of urgency and incontinence. Black pointers (◄) indicate pressure and flow at time picture was taken. Graph to the left represents previous information as indicated. In both the bladder contracts and leaks during filling (↑). (a) Narrowing at bladder neck; symptoms and contractions relieved by prostatic resection. (b) No obstruction shown by voiding study.

stable bladder, and it was clear that this accounted at least in part for the symptoms of urgency, frequency and nocturia so characteristic of this condition. These occurred before the development of a residual urine had reduced the effective capacity of the bladder. It was almost certain also that uninhibited contractions accounted for the paradoxical incontinence sometimes seen in this condition. In 10 patients the bladder contracted so violently during filling that leakage occurred around the catheter (Fig. 4a). As these findings were appreciated it was difficult to be sure whether these patients represented the few seen by most surgeons who return with symptoms of urgency undiminished after prostatectomy. An increasing number of follow-up studies suggest, however, that in

these patients with definite obstruction on the voiding study, both the urgency and the contractions usually resolve after relief of the obstruction. There were, however, eight patients studied with similar symptoms and contractions during filling who had no suggestion of obstruction on voiding cystography (Fig. 4*b*). It seems probable that it is patients from this group whose symptoms are not relieved by prostatic resection. Such patients could be excluded by routine measurement of the flow rate as a screening test to confirm the presence of obstruction.

Twenty-one patients were referred for study of incontinence after prostatectomy. In sixteen of these the leakage was clearly due to an unstable bladder, although this was not always easy to detect from the history.

Stress and urge incontinence

Stress incontinence is usually defined as leakage on coughing, sneezing or other sudden rise in intra-abdominal pressure due to sphincter weakness alone, and a number of satisfactory sphincter repair operations have been devised to relieve the condition. Many studies on such patients by this technique have confirmed this definition and the success of these operations. It is also well recognized that patients with symp-

TABLE II
RESULTS OF PRESSURE/FLOW/CYSTOGRAPHY ON 75 PATIENTS WITH SYMPTOMS OF INCONTINENCE AFTER A REPAIR OPERATION

Unstable bladder	45%
Pure stress incontinence	30%
No incontinence demonstrated	25%

toms of urgency of micturition benefit little if at all from such procedures, and surgery is usually avoided in them.

As our interest in this problem has become known at Middlesex Hospital, an increasing number of patients have been referred with persistence or recurrence of symptoms after a repair operation for supposed stress incontinence. Seventy-five such patients have been studied in the past 18 months, which suggests that the management of stress incontinence is not as simple as is sometimes supposed. The results of these studies are shown in Table II. Despite the care of the surgeons involved to avoid operating on patients with urgency, nearly half were found to have an unstable bladder. The probable reason for this is demonstrated by the analysis of the symptoms of these patients (Fig. 5). As the data for this graph were collected, from a combination of the hospital records and the history taken at the time of the study, it was obvious that in this selected group the history was variable and many patients had both stress and urgency. Nevertheless, the graph shows that in a number of cases an unstable bladder was associated with symptoms of pure stress incontinence; they leaked when they coughed without any urgency. The explanation of this is that many had so-called cough-urge

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incontinence (Fig. 6a). The cough actually caused the detrusor to contract and open the bladder neck, this rather than sphincter weakness being the cause of the incontinence. These patients had no symptoms by which this could be diagnosed.

This situation is extremely difficult to detect without estimation of the intrinsic detrusor activity. Figure 6 shows two tracings of the same patient, that on the left taken before introduction of electrical subtraction shows the bladder contraction nearly masked by the cough spikes (A), even though the rectal pressure is recorded for comparison. The subsequent study clearly shows detrusor contraction accompanying each cough. Simultaneous cystography showed incontinence on each occasion.

It might be thought that still film radiography using chain beads or catheters to measure the urethro-vesical angle as advocated by Jeffcoate¹¹

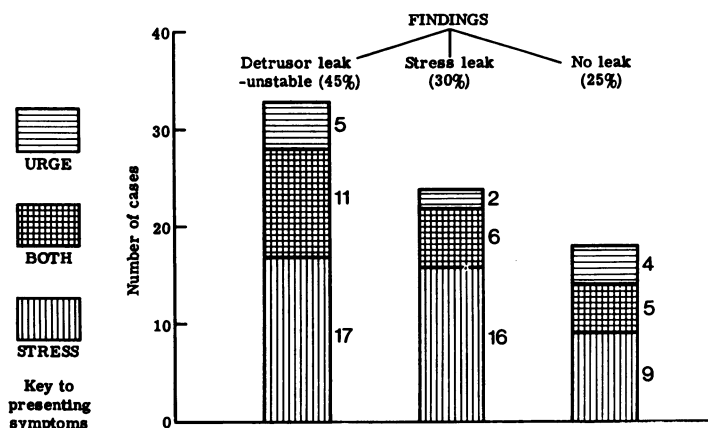


Fig. 5. Graph which shows lack of relation between the symptoms and findings on pressure/flow/cystography in 75 patients with persistent incontinence after repair operation for supposed stress incontinence.

would demonstrate these problems more simply. A constant finding in simple stress incontinence studied by pressure/flow cystography is an open bladder neck on straining; it is this which, seen in the lateral view, causes loss of the posterior urethro-vesical angle. The first thing that happens when the bladder contracts is the same opening of the bladder neck with precisely the same loss of the angle (Fig. 7). Jeffcoate himself makes this point and emphasizes the importance of ascertaining that the bladder is not contracting when the strain film is taken. Pressure flow cystography, in recording the intrinsic pressure, has demonstrated the difficulty of detection of bladder contraction without this measurement.

The overall value of the method for complete functional bladder and urethral assessment is particularly demonstrated by this group of patients. Ten of the 75 had other urological abnormalities (Table III) which were

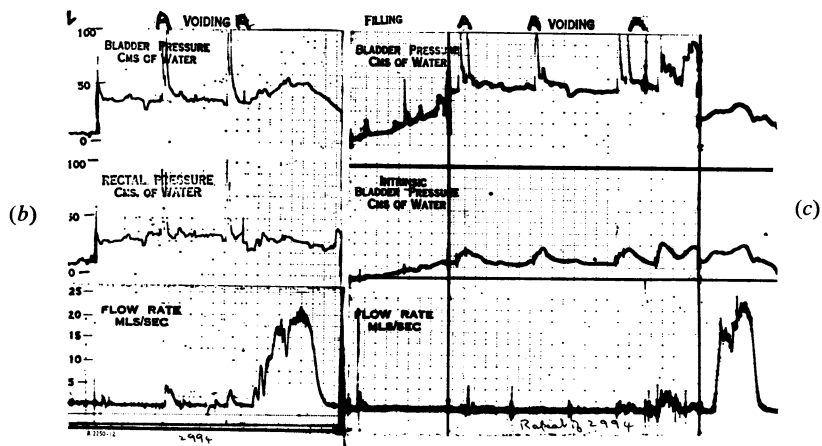
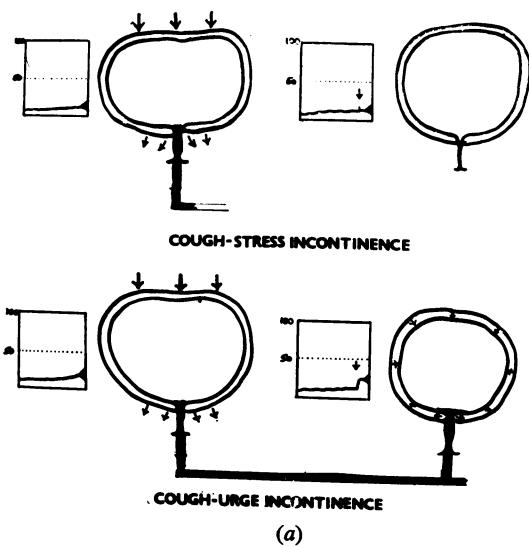


Fig. 6 (a). Diagram to illustrate functional difference between genuine stress incontinence due to sphincter weakness and cough urge leak, due to bladder contraction. (b, c) Two pressure tracings on the same patient. (c) Trace of intrinsic pressure shows that coughs (A) cause detrusor to contract. (b) Taken before introduction of subtractor shows total bladder and rectal pressures separately. The detrusor contraction was in fact present but is difficult to detect. Marked 'stress' incontinence seen on both occasions.

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STILL FILM OF PATIENT STRAINING

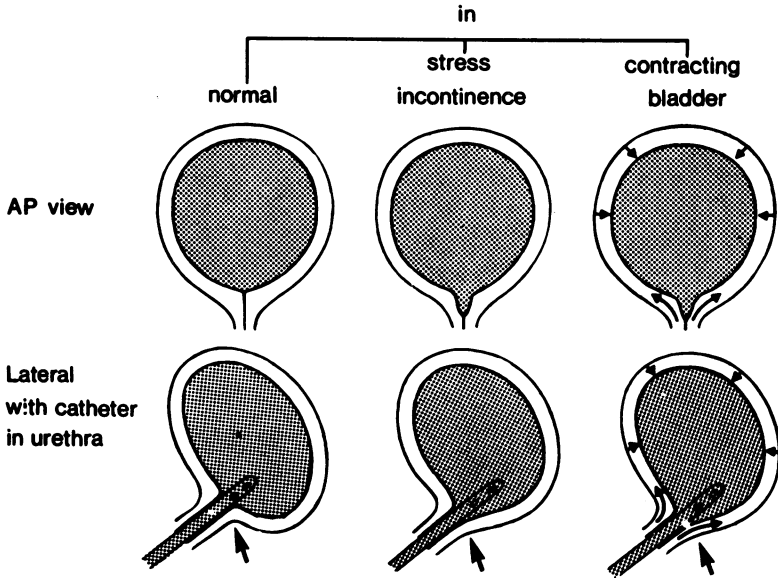


Fig. 7. Diagram of A.P. and lateral cystograms showing that loss of urethro-vesical angle on the lateral view (Jeffcoate) is due to an open bladder neck. Loss of the angle occurs with both stress incontinence and bladder contraction.

either causing their symptoms or were a potential hazard to renal function. Twenty-five per cent had no demonstrable incontinence; some of these appeared on review to be unduly disturbed by amounts of leakage too small to be significant to the majority of patients, in others the symptoms were related to other urological disorders of a potentially more serious nature as just mentioned. In neither situation would further repair operation probably benefit the patient.

The problem of an unstable bladder has now been defined, and its rôle in the causation of symptoms suggested. Furthermore, it appears to be

TABLE III

'INCIDENTAL' FINDINGS IN PATIENTS WITH PERSISTENT SYMPTOMS AFTER A REPAIR OPERATION

Residual urine (over 80 ml.)							
Associated acontractile bladder	...	...	...	...	...	1)	5
Associated outlet obstruction	...	...	...	...	...	4)	
Marked ureteric reflux	...	...	...	...	...	...	3
Urethral diverticula	...	...	...	...	...	...	2
Total	...	...	...	...	...	...	<u>10</u>

a significant factor in the unexpected failure of patients to respond to standard treatments. Voiding pressure/flow/cystography suggests that in the male the majority of cases are associated with outlet obstruction, and are then cured by its relief. But there remain a number of patients, particularly women, with extremely distressing symptoms of incontinence, many of whom have had multiple procedures without benefit, in whom no cause for these contractions can be found. The situation has therefore been investigated further.

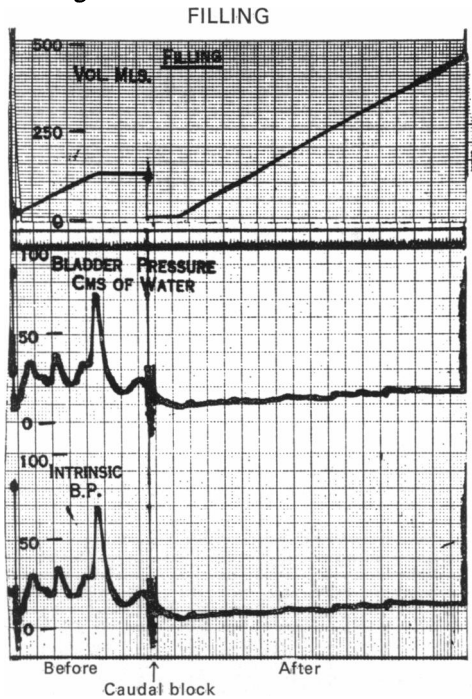


Fig. 8. Filling cystometrograms in patient with marked bladder instability during filling. Repeat study shows uninhibited contractions abolished by caudal blockade.

Investigations

It was of the first importance to ascertain whether the bladder in these patients, had broken away from neurological control and was contracting independently of its central nervous connections, as does the bowel. Fifteen patients with the most severe symptoms were therefore given a caudal anaesthetic using 1.5% Lignocaine aimed to block the sacral nerves in the cauda equina. In every patient where the block was effective, as judged by loss of sensation in the perineum, these contractions were abolished (Fig. 8). It would seem, therefore, that nervous connections are necessary for these contractions to occur. Three patients with cough urge incontinence were studied in the same way,

with the same result.

The effect of atropine and related drugs was also assessed objectively. It is known from clinical experience and in particular the work of Brocklehurst¹² that while they seem to benefit a few patients on the whole the results are disappointing.

Six patients with the most severe symptoms were given atropine 1.2 mg. I.V. and the filling study repeated when the effect was at its height judged by a marked dryness of the mouth. This demonstrated no significant diminution of the contractions. Further studies were carried out using probanthine orally and emepromium bromide, a drug of similar action, said to be particularly effective in bladder disorders. Thirty-four patients were studied before and after a three-week trial of these drugs given in a dose sufficient to cause side effects. In only six were the uninhibited contractions abolished and the symptoms significantly relieved. It must be noted that these cases were highly selected as many had had trials of similar drugs from their own doctors before referral to hospital; if these were successful they would not have been referred further. Nevertheless, it is valid to conclude that, of those seen in hospital, few will respond to simple medication, which to be effective must be given in a dose which often causes intolerable side effects.

MANAGEMENT

For some years Turner-Warwick has been undertaking the treatment of these problems by selective denervation¹³, and the need for accurate pre-operative evaluation provided an originating stimulus for the development of ciné/pressure/flow cystography.

The management may now be considered under the following headings:

- Sensory.* Bladder contracted.
Bladder distensible to normal capacity under anaesthetic.
- Motor.* Unstable bladder.
Neurological.

Sensory urgency

Sensory urgency as described in this lecture is usually due to infection or some relatively mild urethral or trigonal inflammation; these conditions only occasionally require this investigation to exclude motor abnormality, and their management will not be considered further. There is a minority of patients, however, who have more serious non-infective bladder conditions such as healed tuberculosis or interstitial cystitis, who will be considered in more detail. In them the crucial measurement is the capacity of the bladder under anaesthetic. Of these the majority with a contracted bladder have had caecal or ileocaecal replacement of nearly all of the bladder, leaving only a minimal area of trigone to ensure sensation. The post-operative results in 42 patients have been

assessed by this technique, and will be reported separately, but in outline they confirm the importance of the element of abdominal straining in the voiding mechanism and the features in management previously described¹⁴.

The filling studies were, however, of some interest in the context of this lecture. They showed that the bladder invariably contracted during filling. This is not surprising as it is the characteristic response of the bowel to distension — but unlike the patient with an unstable bladder, which behaved in this way, they had no sensation of urgency with these contractions; they were aware of bladder filling as the contractions became more powerful, but they did not have the overwhelming desire to pass urine with leakage around the catheter often experienced by the patients I have been considering. Questioning of patients after cystoplasty showed that neither urgency nor incontinence were a serious complication of this operation. It seems possible, therefore, that it is not the uninhibited contractions of detrusor muscle themselves which cause the incontinence, but rather a reduced threshold of the entire micturition reflex, which these patients are unable to suppress.

Sensory denervation

There are occasional patients with early but nevertheless distressing symptoms from interstitial cystitis affecting the dome of the bladder whose bladder is still easily distensible to 400 ml. or more under anaesthetic. These have been treated by a simple form of supratrigonal denervation, dissecting the dome of the bladder free from all attachments down to a level just above the ureteric entry. The clinical results of this procedure have been remarkably encouraging and two patients from this series have been available for study. Investigation showed that they also had diminished detrusor activity, voiding being completed by abdominal straining.

Motor denervation

When the symptoms due to motor urgency are severe the problem is to relieve the bladder contractions without abolishing all trigonal sensation and without damaging the sphincter mechanism. Simple supratrigonal denervation appeared from earlier investigations to be an unreliable means of reducing bladder contractions, and the problem was investigated further in two patients with severe uninhibited contractions due to multiple sclerosis who required ileal diversion. The diversion was performed in the usual way, but at the time the ureters were detached from the bladder a near total denervation was performed dividing also the inferior vesical pedicle. The post-operative course was uneventful and after 10 days the bladder response was retested. The uninhibited contractions had been abolished, but after instillation of 100 ml. the pressure rose steadily and leakage occurred. This suggested that the

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bladder had become contracted either due to ischaemia or to inelastic healing of the perivesical tissues, following the dissection.

A number of technical modifications, including unilateral and lower segment denervation¹⁵, have been tried in subsequent patients whose symptoms were so severe that diversion was being considered. Three of these, assessed six months after operation, are subjectively extremely satisfied with the result. The pre- and post-operative study on one patient is shown in Figure 9; before operation three separate studies had shown marked contractions and leakage after 150 ml. After operation 350 ml. were tolerated without undue distress and no bladder contractions occurred. It did contract on standing, but this could be controlled and

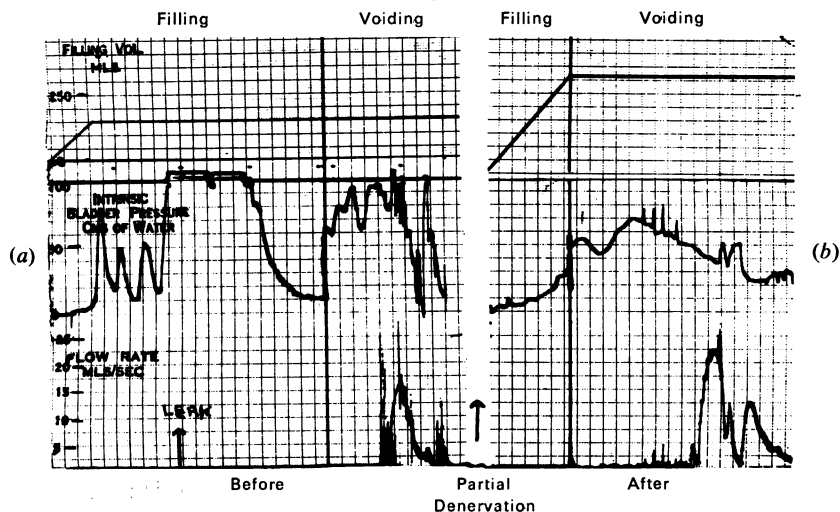


Fig. 9. Filling and voiding cystometrograms on the same patient before and after partial denervation. Post-operative study shows no contractions during filling despite large volume, and height of bladder contraction reduced on standing. Clinically incontinence abolished by operation.

there was no incontinence — the detrusor pressure never approached pre-operative levels.

It is not my intention at this early stage to give the formal results of these procedures nor even to suggest that this will be the best way to manage this undoubtedly very real and difficult condition in the long term, but to indicate the value of pressure/flow cystography in analysis of the underlying dysfunction and its ability to give objective post-operative assessment, which provides the basis for the logical development of the procedure.

Conclusions

1. The measurement of total bladder pressure alone is of relatively little value in the assessment of the rôle of bladder dysfunction as a

cause of symptoms. If objective pressure measurements are going to be used in the evaluation of the underlying abnormality, the small addition to the time and expense involved in simultaneous measurement of rectal pressure and its electrical subtraction adds immensely to the diagnostic value of the study. Furthermore, simultaneous visualization of the urethra adds considerably to an understanding of the rôle of the different sphincters, and increases the objectivity of the investigation for quantitative evaluation of incontinence.

2. Filling cystometry is of limited clinical value as a screening test to exclude bladder dysfunction as a cause of incontinence. The bladder, in those patients in which this situation is most difficult to detect clinically, only contracts and causes incontinence when they stand up or cough, which is not revealed by the filling cystometrogram as it is usually performed.

3. Disorders involving loss of the ability to inhibit detrusor contraction have perhaps been more clearly defined. It would appear that it is the difficulty of recognizing this abnormality by the usual clinical methods which often accounts for the unexpected failure of a straightforward urethral operation such as repair for stress incontinence, or prostaticectomy. Pressure/flow cystography can detect bladder contractions and objectively demonstrate any incontinence. It has been shown that they are often associated with outlet obstruction in the male, and then cured by its relief. Of the remaining patients with this abnormality there is a suspiciously large number whose symptoms date from pelvic injury or operation, but no reason for this is yet apparent. The problem is being investigated by a prospective study involving pre- and post-operative screening of patients undergoing repair operation, which may improve our understanding of the abnormality.

Studies using caudal blockade show that the uninhibited contractions are abolished by interruption of the reflex arc, and so, until the cause of these contractions is more clearly defined, the most severely affected patients are being treated by selective denervation procedures, which will be described more fully in a subsequent joint communication.

ACKNOWLEDGEMENTS

I wish to thank the President and Council for the privilege of giving this lecture.

An important principle underlying the conception of this study was the value of the multidisciplinary approach to the difficult problems of urology. It is therefore a pleasure to have this opportunity to acknowledge the help of so many departments at the Middlesex Hospital.

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THE NUFFIELD COLLEGE OF SURGICAL SCIENCES

Residential Accommodation

FELLOWS OF THE ROYAL COLLEGES OF SURGEONS are reminded that they are entitled to apply for accommodation in the Nuffield College of Surgical Sciences, which is adjacent to the Royal College of Surgeons. Rooms may be booked for long or short periods.

There are invariably vacancies between June and September, but enquiries are invited at other times of the year also. At present only male Fellows can be accommodated.

There is, in addition to the individual rooms, a small flat suitable for a married couple which is occasionally available to senior Fellows.

Further information may be had from the Warden, Nuffield College of Surgical Sciences, Lincoln's Inn Fields, London, W.C.2.

JACKSONIAN PRIZE

THE COUNCIL ANNOUNCES the award of the Jacksonian Prize for 1970 to Professor M. Balasegaram, F.R.C.S., of the Department of Surgery, General Hospital, Kuala Lumpur, Malaysia. Professor Balasegaram's essay was on 'Modern Concepts in Surgery of the Liver with special reference to hepatic surgery during large-scale civil disturbances'.

Six essays were submitted for the 1970 award and the Jacksonian Committee was gratified by the high standard of material and presentation. The decision taken in 1967 to allow authors to select their own subjects for their dissertations, subject only to the Council's prior approval of the subject as a suitable one, has undoubtedly been an encouragement to Fellows to compete for this, the oldest Prize in the gift of the College.

HAROLD C. EDWARDS,

Chairman, Jacksonian Committee