Current Practice

URINARY TRACT DISEASES

Incontinence

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It may seem obvious to say that urine will remain in the bladder as long as the intravesical pressure does not exceed the urethral resistance. Nevertheless, in this statement lies the essential guide to the understanding, and thus the management, of the problems which arise when this balance is involuntarily upset.

The unwitting passage of urine is one of the most serious social disasters which can afflict anyone. Its occurrence may rapidly transform an individual leading a normal life into a social recluse, whose laundry requirements alone may precipitate his relatives into transferring him from his own surroundings to the unpleasantness, both physical and emotional, which he or she will meet under institutional care, even if it be of the most enlightened variety—in itself a rarity today. Hence the understanding and management of such a problem together constitute one of the greatest challenges the general practitioner and urologist have to meet; neither alone can achieve the best results in many of their patients. The size of the problem can be appreciated when it is realized that over 20% of all patients admitted to geriatric units are for reasons of urinary incontinence.

Recently much effort has been spent in trying to understand the mechanics of normal micturition. At present, mathematicians and physicists are applying their exact laws to an act which varies from time to time and from person to person. The result has been to confuse rather than clarify the situation. Whatever the mathematicians may decide, detrusor power and outflow resistance and their interrelationship remain the cardinal features of any problem of urinary incontinence. The bladder, regarded as an inert bag by Galen, was shown to contain muscle and to be capable of independent contraction by Pellacano in the nineteenth century. The hypothetical physiologists then endowed the bladder and its neck with almost magical powers of nerve-inspired reciprocal action, presumably to fit in with all other so-called sphincter mechanics in the alimentary tract. Le Gros Clark (1883) and a generation of anatomists later have conclusively shown that no sphincter composed of muscle exists at the bladder neck and that the bladder muscle itself extends down the posterior urethra in the male and forms the main part of the female urethra. This view is widely held and may in part be true.

Normal Micturition

In normal micturition contraction of the detrusor induces an opening of the bladder neck and just before this occurs the pelvic floor and external sphincter relax completely (Tanagho *et al.*, 1966). Disturbance of this sequence may occur at any point and lead either to retention or incontinence of urine. Though disturbance of detrusor function and alteration in

outflow resistance often occur as part of the same disease, as in multiple sclerosis, it is clearer to consider briefly some common alterations in detrusor function only and outflow resistance only as factors responsible for incontinence.

Detrusor Muscle

The detrusor muscle itself may, though normal, be made to function in such an active fashion that urinary incontinence results. This occurs commonly in severe urinary infections, especially in children, in whom a continual afferent bombardment initiates frequent detrusor contractions, whose inhibition proves impossible with resulting incontinence—*urgency incontinence*. Treatment of the infection rapidly controls the situation. It is important to remember that in all other types of incontinence the presence of infection will aggravate the condition. Interstitial cystitis (Hunner ulcer) in its severer degrees can also lead to incontinence. An abnormal detrusor, whose range of accommodation has been severely damaged by tuberculous cystitis, schistosomiasis, or radiotherapy, may result in a bladder whose capacity is so limited that frequency of micturition reaches such a degree that incontinence results. Replacement and enlargement of the diseased and contracted bladder by some form of enterocystoplasty is necessary and generally strikingly effective.

The detrusor, after struggling for years to overcome an outflow resistance in the form of bladder neck obstruction or prostatic enlargement, may slowly fail in its compensatory attempts and be unable to sustain a sufficiently high tension to evacuate the last part of its contents. This failure will increase until the bladder is passing only a very small proportion of its contents, and it then continues to enlarge until the fundus may reach a point well above the umbilicus. The vastly distended bag becomes inert, and with the final stretching of the bladder outlet a continuous dribbling occurs. This state is more rapidly attained when the efferent nerves have been damaged, as in cauda equina injuries or meningo-myelocoeles. In prostatic obstruction removal of the obstruction generally leads to the continence of controlled micturition. Treatment of cauda equina lesions is less satisfactory because, though the retention with overflow can be helped by reducing the outflow resistance below normal, the bladder remains incapable of contracting, and voiding can be achieved only by abdominal compression. In many cases of meningo-myelocoele, complete destruction of the outflow resistance by transurethral resection of the neck of the bladder and external sphincterotomy may be necessary to achieve complete bladder emptying. This converts incontinence with a full bladder to incontinence with an empty bladder. This situation is kinder to the kidneys, but, owing to the inadequacy of female incontinence appliances, is applicable only to the male and then not always, as the penis may be too small for an appliance.

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There is one situation where the bladder, the outflow resistance, and the nerve supply are all normal, and yet incontinence is readily induced by raising the intra-abdominal pressure. This, the curse of the multipara, is stress incontinence. This condition probably results from an abnormal spatial relationship between the bladder neck and urethra, on the one hand, and the pelvic floor on the other, when the intra-abdominal pressure is raised (see Fig.). Lapidès (1958), suggests that the length of the female urethra is important. Nevertheless, Essenhigh (1967) and others have shown that in animals continence can be retained with virtually the whole urethra removed, and recently at the Royal Northern Hospital a patient has had all but 1 cm. of urethra excised for melanoma, with no impairment of continence.

Attention has also been directed to the angle between the bladder base and the urethra as an important factor, but alteration of this angle seems to be a secondary effect, both of the condition and its cure, rather than a primary aetiological factor. The intra-abdominal, and thus intravesical, pressure may be raised to 200 cm. of H₂O by coughing, sneezing, or laughing. Normally under these circumstances urine does not enter the posterior urethra. This cannot be because there exists a powerful internal sphincter because anatomically it does not exist. Nor could it be due to a mucosal valvular mechanism, as has been postulated to exist at the oesophago-gastric junction, because the urothelium at the bladder neck is not redundant and is fixed to the underlying tissues. Nor is there sufficient alteration in angles at the urethral opening to produce a valvular effect. The explanation is likely to be much simpler and lies in the fact that though the intravesical pressure is at the instant of stress high, the raised intra-abdominal pressure is also transmitted equally to the urethra, and so no alteration in the pressure across the bladder neck exists. The change in pressure occurs at the pelvic floor and

Bladder pressure with descent.

when (as a result of weakness in the pelvic floor) the bladder neck descends through it, the intravesical pressure is raised (see Fig.). Moreover, no counteracting pressure is exerted on the urethra, as it is then below the pelvic floor, with the result that incontinence results.

This conception is supported by the fact that all operations to cure stress incontinence have in common elevation of the urethra, so that it again becomes an intra-abdominal structure when stress occurs. Moreover, if periurethral fibrosis occurs, then any operation is very much less likely to be successful, the urethra then being less able to transmit a rise in intra-abdominal pressure.

Abnormal Outflow

People who are about to have a prostatectomy often fear that they will be rendered incontinent. There still remains some justification for this concern—happily nowadays very little—but a prostatectomy carelessly, or ignorantly, performed can remove both and not just one of the safeguards of continence. Turner Warwick has clearly shown that removal of the

urethra below the verumontanum does not lead to incontinence, as the intact bladder neck is sufficient protection. As a part of a standard prostatectomy, the urethra above the verumontanum and the bladder neck are removed, and continence has been shown by Caine and Edwards (1958) to depend on a small length of the urethra above the external sphincter. This must be preserved at all costs, for the external sphincter alone is not sufficient. Removal of both these zones is a disaster, as perpetual dribbling incontinence occurs directly the catheter is removed and continues until further surgical steps are taken. The normal function of these urethral zones can be interfered with in people who have a prostatic carcinoma spreading downwards into the urethra, rendering it rigid; if the bladder neck has to be removed, to alleviate carcinomatous obstruction, the distal urethral rigidity may also lead to incontinence.

Abnormal Nerve Supply

In all the above examples it has been assumed that the nervous pathways to and from the bladder have been intact. Though neurological abnormalities may be complex, the same principles in their investigation and treatment hold—namely, incontinence will result if detrusor power exceeds the outflow resistance, and this power cannot be inhibited. In this group of patients the very serious additional factor of sensory loss may also be present. The aim in management, though seldom achieved, is the same—namely, full control of micturition with a bladder that can empty itself completely and so protect the upper renal tract from progressive damage.

Cerebral damage due to cerebrovascular accidents or senile cerebral atrophy produces a situation when, though no abnormality of detrusor power or outflow resistance exists, the act of micturition takes place below the conscious level and leads to unrestrained and uncontrolled bladder emptying. This produces situations which rapidly get beyond domestic control and require institutional care. In many cases this can be avoided by understanding that the bladder will empty at a fixed volume—lower than normal—and, by “potting” the patient at suitable times at one or two-hourly intervals in the day, restricting fluid, and perhaps using pitressin snuff at night, a great improvement can be achieved. In the less severe cerebrovascular accidents re-education can occur, exactly as in a young child.

Multiple Sclerosis

Here the problem is often complex, with initially a hyperactive detrusor (which later comes hypoactive) together with a progressively rising outflow resistance from a spastic pelvic floor. The whole situation is often complicated by diminished sensation and by urinary infection. The treatment, therefore, has to be adjusted as the disease progresses. Initially, the patients are troubled by frequency, which results in urgency incontinence only occasionally. The hyperactivity of the detrusor can generally be controlled satisfactorily with propantheline bromide, which must be given in doses of 30 mg. three times daily, as less is seldom effective. At a later stage the outflow resistance is increased both at the pelvic floor and bladder neck. Resection of the bladder neck often helps to reduce the residual urine caused by a decompensating detrusor, and thus diminishes the difficulty in dealing with infection. Sometimes a highly active detrusor can, with advantage, be replaced by intestine. Nevertheless, this is seldom as satisfactory as adjustment of the outflow resistance by removing the bladder neck and incising the external sphincter. Though replacement operation may be satisfactory for a short time, it will give trouble as the disease progresses and the alternative treatment by continual catheterization or diversion will be necessary.

The problem of the traumatic paraplegic patient is one of avoiding infection and protecting the upper urinary tract while maximal recovery of bladder function occurs. The recovery may be adequate and result in the resumption of satisfactory micturition with an uninfected urinary tract, or it may be necessary to destroy the outflow resistance by transurethral resection and external sphincterotomy to eliminate infected residual bladder urine. The resulting incontinence is dealt with by a suitable appliance. Diversion may be necessary to protect the upper renal tract from damage, and this should not be delayed too long, as death from renal failure can be avoided by this measure.

Alleviation of Incontinence

The cause of urinary incontinence may be determined by cinematographic micturating cystograms, micturating and static cystometrograms, and pelvic floor muscle electromyograms. Most patients can be helped by remedying the defects found, by balancing detrusor activity and outflow resistance. There remains a group of patients for whom the incontinence has to be accepted, and their symptoms have to be alleviated, rather than cured.

The Catheter

This, the most ancient of urological devices, has recently been heavily criticized by bacteriologists, obstetricians, and even physicians, and there has been a tendency to exaggerate its defects and overlook its value. In women, for whom no satisfactory external incontinence appliance exists, the catheter is of greatest value—but it must be used properly. It must be made of the least irritating material—that is, plastic. It must be self-retaining—that is, with a balloon of the smallest effective size. It must be of the smallest external diameter which will allow unimpeded urine drainage—drainage of urine around the catheter is not an indication for the use of a larger catheter but an indication to correct blockage of the catheter by infected urine.

A temporary reduction in infection can be achieved by bladder washouts with neomycin or noxythiolin. Any bladder calculi which may be present must be removed. To avoid the formation of bladder calculi the catheter should be changed every two weeks and, though it would be desirable to keep the urine acid, this seldom proves practicable. To reduce infection a high fluid intake is vital—3 l. a day—and Septrin, 1 tablet daily, is very useful. Under this regimen women may be with safety controlled for years. Nevertheless, men will not tolerate continual catheterization for this time, as it is apt to cause urethral diverticula or abscesses, prostatitis, and epididymitis. Thus total destruction of outflow resistance and external appliances are more satisfactory.

External Appliances

The only external appliance in the female which has even limited favour is that invented by Vincent, and this requires considerable training and intelligence in its use. It is not suitable for old or recumbent patients or those who have

neuropathic bladders. For men a vast array of appliances exists and, provided these devices are designed individually, they can be very satisfactory. Nevertheless, each appliance should really be designed to suit not only the patient's anatomical configuration but also his degree of mobility. Information and willing help can be obtained from the instrument fitters of the firms supplying the various appliances.

Penile clamps of the modified Cunningham variety are useful in men who suffer from a minor urinary incontinence. They can only be used intermittently, for otherwise serious penile oedema and pressure sores arise. But for those who only need protection on social occasions they are very useful.

Diversion of Urine Flow

Diversions may be made into the large bowel itself or via a small or large bowel duct between the ureters and the abdominal wall. In the former care is necessary in avoiding an acidotic state from the absorption of ions in the large bowel; all patients should be given sodium and potassium bicarbonate, the latter compensating for the increased potassium losses from the body. Sometimes in the elderly nocturnal rectal incontinence is a problem, and a rectal catheter may be helpful at night. The management of the ileal conduit is again an individual matter, as different appliances and different gums are often required. Information about this can be obtained from the Ileal Conduit Society, c/o Institute of Urology, 10 Henrietta Street, London W.C.2.

Electronic Implants

The introduction by Caldwell of a method by which the increase in outflow resistance can be raised by electrical stimulation of the anterior part of the pelvic floor has increased the range of help for those with urinary incontinence. As yet, the effects and the mechanism of action of these electronic implants have not been fully worked out, but they are helpful, provided they can stop incontinence and still allow the bladder to empty completely. Unless bladder emptying can be achieved, infection will in the long term lead to fatal renal damage.

To sum up, therefore, urinary incontinence is one of the greatest social handicaps. An accurate appraisal based on studying the relation between detrusor activity and urethral resistance will often lead to medical or surgical treatment which will cure or ameliorate the condition. When these methods fail, electronic implants may be helpful, but adequate management can be obtained by the use of catheters in women or external appliances in men. The aim of all treatment is to eliminate static urine—and thus infection—while providing means for removing the urine from the body without soiling clothes or linen.

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