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LATER MANAGEMENT OF THE PARAPLEGIC BLADDER[1]

By N. O. K. GIBBON, F.R.C.S.
United Liverpool Hospitals

BEARING in mind that the urological management must always be dovetailed into the programme of total care, the three main aims at this stage are:

1. The maintenance of a free flow of urine from the kidneys.
2. The avoidance of urological complications.
3. The control of incontinence.

1. THE MAINTENANCE OF A FREE FLOW OF URINE FROM THE KIDNEYS

Preferably, the paraplegic should be discharged without a catheter, but this ideal should not be regarded as sacrosanct—good drainage is infinitely preferable to poor emptying.

During the phase of catheterisation there is ample opportunity to assess the status of the vital mid-sacral segments upon which the pattern of future bladder emptying will depend. In this respect, the upper level of sensory or motor loss can be misleading on account of descending ischaemic necrosis which can involve the conus from as high as the mid-thoracic region. Fortunately, the bulbo-cavernosus and anal reflexes, which give a reliable indication of the probability of return of reflex bladder activity, are positive within a few hours of a supra-sacral injury. When these reflexes are active, reflex bladder emptying will usually commence within a month or two, especially with intermittent catheterisation. With an indwelling catheter, recovery may take longer and deliberate trials of micturition will be required. In either case, the most effective stimulus is repeated sharp suprapubic tapping (Glahn, 1970). Absence of sacral reflex activity indicates that the bladder will always have to be emptied by manual compression or abdominal straining. Attempts are made to express urine in this way as soon as the patient is fit. With either type of bladder function, catheterisation, preferably intermittent, is continued as required. Unfortunately, a high residual urine is common, due in supra-sacral cases to uncoordinated activity of the external sphincter, and in sacral lesions to failure of the bladder-neck opening mechanism. Occasional obstruction in addition at the membranous level is due to longitudinal compression or posterior angulation of the urethra against the triangular ligament as the result of flaccidity of the levatores ani (Vincent, 1966). An acceptable residual urine is one that is compatible with continued sterility of the specimen and radiological normality of the upper urinary tracts. Occasionally this may be as high as several hundred millilitres, which makes nonsense of attempts to establish arbitary limits for volumes or percentage.

Between 20 and 40 per cent of paraplegics will fail to achieve satisfactory bladder emptying, the higher figures being met when a programme of rapid

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rehabilitation is in force. The measures required to deal with this situation will depend upon the presence or absence of good detrusor contractions (at least 30 to 40 cm. of water).

(a) *With good detrusor contractions* the bladder neck will open normally (unless there is inflammatory stenosis or prostatic obstruction) and the obstruction is due to spasticity of the external sphincter. Drug therapy (*e.g.* with diazepam 10 or even 20 mg. q.i.d.) may produce temporary benefit, but external sphincterotomy is likely to be required in the male (Gibbon, 1973). Pudendal neurectomy is rarely performed nowadays in the male on account of the high risk of impotence. In the female, overstretching of the urethra is often all that is required.

(b) *With poor or absent detrusor contractions* the pelvic floor will be usually but not always flaccid and satisfactory funnelling of the bladder neck may occur on straining. This point should preferably be confirmed by cysto-urethrography which will indicate any need for a bladder-neck resection in the first instance. If the bladder neck is opening well, or has been opened up by operation, there must be obstruction at external sphincter level, and this, whether active or passive, will respond to external sphincterotomy (Gibbon, 1973). Care must be taken to establish pre-operatively in such a case the existence of sufficient expulsive force (at least 30 cm. of water) from manual pressure or abdominal straining. For example, a tetraplegic without reflex bladder contractions (sometimes following an ill-judged subarachnoid alcohol block) is usually doomed to permanent drainage because he cannot use his hands or his abdominal muscles apart from the diaphragm.

When, for one reason or another, satisfactory emptying cannot be achieved then some form of permanent drainage will be required:

(**A**) **Urethral Catheter.** Some male papraplegics can be relied upon to carry out intermittent self-catheterisation, safely and effectively, the main risk being overdistension of the bladder which may produce reflux or bacterial invasion of the ischaemic bladder wall. In other cases an indwelling catheter is preferable and modern materials are permitting the development of balloon catheters with a more favourable ratio of internal to external diameter, and a surface which resists deposition of organic and crystalline matter. Pure silicone catheters offer the best prospects at present and the high cost may be offset by longer periods of safe usage. The catheter should be loose-fitting and the desired gauge is therefore governed by the capacity of the urethra.

(**B**) **Suprapubic Cystostomy.** This operation is sometimes required for males with retention and urethral complications. A balloon catheter of the type described is preferable to other varieties and as the track is rigid the balloon need be inflated with only a few millilitres of water, which greatly diminishes the surface area available for encrustation. When a patient has had a cystostomy for some years, it should not be closed without great care being taken to make sure that the bladder is of adequate capacity and capable of emptying per urethram as otherwise rapid dilatation of the upper urinary tracts may develop.

(**C**) **Vesicostomy**. This operation, a tubeless cystostomy designed to be used in conjunction with an adhesive collecting appliance (Lapides *et al.*, 1960), was eventually recommended for all traumatic paraplegics from a very early stage (Lapides *et al.*, 1965). The concept was an attractive one—conversion of the

bladder to a low-pressure conduit incapable of becoming obstructed. Unfortunately, a sump of infected urine usually persisted, local complications were common and leakage proved a serious problem (Brady *et al.*, 1971).

(D) **Urinary Diversion.** This procedure is less often indicated in neurological cases for preservation of the upper urinary tracts than it is for relief of incontinence, which will be referred to later. Uretero-colic anastomosis is usually contra-indicated on account of poor rectal control in the presence of fluid. Uretero-cutaneous diversion, temporary or permanent, is a simple and safe procedure in the presence of large tortuous ureters, usually in children. Occasionally, implantation of the ureters into an ileal or colonic conduit may be advisable in adults of both sexes if there is persistent infection due to gross vesical diverticulosis or ureteric stasis.

(E) **Electrical Stimulation of the Bladder.** Direct stimulation of the detrusor has proved unsatisfactory in practice, the main problems being pain and spread of the current to involve the pelvic floor muscles. Root stimulation (Habib, 1966) is still at an experimental stage, but some success has been claimed for a stimulator implanted directly into the conus (Nashold, 1972). Even if such an operation proved reliable, there are very few paraplegics for whom it would be indicated, as adequate natural expulsive forces are almost always available.

2. COMPLICATIONS

Infective lower urinary tract complications such as urethritis, epididymitis and urethral abscess, diverticulum and fistula have been eliminated by intermittent catheterisation or continuous drainage with a plastic catheter of about 8 Ch.

Vesical calculi still prove troublesome in those of our patients who have long-term drainage by latex balloon catheters. Frequent changes of catheter (even two or three times a week), are required by some patients who rapidly accumulate calcareous debris on the balloon as well as in the catheter lumen. If stones are to be prevented, matter deposited from the deflated balloon must be washed out through a large-bore plastic catheter before another Foley is inserted. Modern developments referred to above greatly diminish this problem, but at present radiography and cystoscopy are called for occasionally, when there is persistently cloudy urine or unexplained fever. Probably because of the prevalence of chronic cystitis, paraplegics have a relatively high incidence of carcinoma of the bladder, sometimes of a virulent squamous variety.

Vesico-ureteric Reflux. In the presence of chronic cystitis, vesico-ureteric reflux is often associated with recurring ascending pyelonephritis. The condition is reversible by the elimination of residual urine and infection provided that the bladder wall has not been damaged by inflammatory fibrosis or sacculation (Ross *et al.*, 1960). In selected cases an anti-reflux operation is called for.

Renal Calculus. Renal stone formation is a serious risk in the paraplegic, who may be subjected to skeletal decalcification from fractures and recumbency as well as urinary stasis and infection. The condition is preventable by good overall management, but when it does occur, renal surgery should be as conservative as possible.

Chronic Renal Failure. This condition is usually due to chronic pyelonephritis, often greatly aggravated by progressive dilatation of the upper urinary tracts, due to inefficient bladder emptying or reflux. Even when these adverse factors have been eliminated, infection may persist in the dilated renal tubules produced by the scars of previous attacks of infection. In this situation only a high fluid intake and antibacterial therapy offer any hope of arresting or slowing up the progressive deterioratian in renal function. The prevention of chronic pyelonephritis is perhaps the most important challenge at the present time in paraplegic urology.

3. INCONTINENCE

In principle, urinary incontinence may result from failure of any of the three aspects of bladder function—storage, emptying and control.

Faulty storage ('stress incontinence') occurs when the bladder neck gives way under abdominal pressure due to inadequate support. It may be present in gross degree in the female when a lesion of the sacral nerve segments results in a flaccid pelvic floor, but in the male it is rarely such a problem, unless the bladder is so full that the bladder neck is already being pulled open. Incontinence of this type is abolished or minimised by elimination of residual urine and regular voiding before the critical degree of bladder distension is reached. In the female child (for example with myelo-dysplasia), ileo-cutaneous diversion may be indicated before school age, but in adult women with an active gracilis, transplantation of that muscle around the urethra should be tried in the first instance.

Faulty emptying ('overflow incontinence') is observed in the acute stage of paraplegia and has been referred to above. In the later phases it occurs only if attempts to achieve efficient bladder emptying have failed, and is then an indication for temporary drainage.

Faulty control ('uninhibited bladder') is characteristic of the supra-sacral cord lesion. Elimination of residual urine will increase the interval between reflex voids and anti-cholinergic or ganglion-blocking drugs may be useful in the short term. Basically, however, the patient must regulate his fluid intake and stimulate the bladder by the clock, the aim being to forestall spontaneous emptying. Women, who will otherwise always be wet, usually make a success of this regime, but most men prefer the freedom of a urinal. In this connection, 'Bladder Training' as defined by Munro (1947) seems a misnomer, and it is doubtful if there is any physiological basis for attempts to 'condition the reflex' in this way, as suggested by Bors (1957).

In some women leakage continues around a urethral catheter, despite the use of ever larger sizes. In these cases, the urethral wall has ulcerated away anteriorly under the pressure of a heavy catheter assembly against the pubic arch. A double balloon catheter (Foley, 1959) (now made by Eschmann) may keep the patient dry, but otherwise diversion will be required. (Suprapubic drainage is usually unsatisfactory because attempts to close the female urethra are, strangely enough, almost always a failure.)

Electrical stimulation of the external sphincter has had some success in general urological practice when it has the advantage that it may be applied through an anal or vaginal plug as well as by an abdominal implant. However, a

totally denervated sphincter cannot respond, and only in partial sacral lesions could any benefit be expected. In supra-sacral lesions the incontinence is due to uninhibited contractions of the bladder, to oppose which would be dangerous on account of interference with efficient emptying. The use of an anal plug stimulator is contra-indicated in the paraplegic because of the risk of electrical burns in an analgesic area.

Finally, it is worth recording at this point that division of the external sphincter is not followed by total incontinence from an empty bladder, as has sometimes been suggested in the literature. There may be some stress leakage, but in the patient with spinal reflex bladder contractions this will not be important because he will almost certainly prefer to use a urinal in any case. In the patient with a low or partial lesion who is ambulant, great care must be taken to ensure that continence is not impaired. This can be done with some confidence if external sphincterotomy is carried out in stages, commencing with very superficial bilateral incisions and proceeding to deepen them at a later date if necessary.

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