THE COMPLICATIONS OF INDWELLING CATHETERS

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CATHETERS have been used from the time of the earliest civilisation to relieve retention of urine and there is ample evidence that many of them remained *in situ* for varying periods. That they caused complications is evidenced by Pepys' horror at the thought of the 'tube'. So great was this that he preferred the very considerable risk of lithotomy which, in his case, was fortunately successful. The complications may be briefly summarised as trauma and infection. The latter being an inevitable corollary of the first.

Trauma may be of various types:

1. The initial trauma of the tyro who faced with the same difficulty either from physiological or pathological conditions, desperately tries with smaller, stiffer, and sharper instruments until the inevitable false passage occurs. Let us hope that this is becoming increasingly rare—but it still happens. In Perth we prefer to delay catheterisation if possible until adequate facilities are available.

Mr. J. O'K. Paraplegic T4-5 after a motor vehicle accident on 5 August 1954. Twenty-four hours after admission he was catheterised with a Thiemann's catheter which traumatised his urethra. A bladder washout was set up and five days later the catheter could not be reinserted, thus a suprapubic stab was performed and a self-retaining catheter inserted. On the eleventh day he had a urinary tract infection and pseudomonas was isolated. Urinary flare-ups reported on 27 October 1957, 21 May 1959 (after catherisation). Septicaemia, basilar artery thrombosis and death 6 July 1959.

2. The second, a more gradual process, occurs to the sensitive urethral mucosa from either the pressure or irritation of a foreign body left in contact with the mucosa. This certainly may be minimised or delayed by modern sophisticated appliances but, in my experience, it can never be completely avoided.

3. The third is the strange sensitivity of the organism to the substances used in the manufacture of catheters and, although rare, can be quite alarming.

4. The fourth is the obstructive effect of the instrument on the ducts of the many glands which open into the urethra. This, I believe to be the worst of the four, for it is certainly the cause of the persisting foci of infection which remained after the offending instrument has been abandoned. It is probably due to oedema but the effect of bulky instruments is a large factor.

Mr. R. O'B. The patient had a motor vehicle accident on 4 October 1964, when he sustained a fracture dislocation of C5 on C6. Continuous catheterization and he had an indwelling catheter with straight drainage following a bout of infection. This resulted in urethral diverticulum.

The urinary bladder itself is extraordinarily resistant to infection as Cox and Hinman (1961), in their classic experiments, have so clearly shown. It is possible to introduce virulent organisms into the normal bladder and, at the most, produce a transient infection, but catheters are rarely left indwelling in normal bladders—the

necessity for their use postulates pathology immediately. When that pathology is permanent, as it is so often in institutions, the results are disastrous. Another factor is that a catheter does not empty the bladder, particularly in the recumbent position. This can be shown quite easily by introducing Lipiodol into the bladder and taking radiograms. The resultant residual urine is an excellent medium for the culture of micro-organisms. The resultant exudate, oedema, and ulceration causing incontinence of the uretero-vesical valve mechanism results in the inevitable occurrence of reflux and pyonephrosis, the common cause of death in paraplegics.

We have all seen, however, many cases of neurogenic bladders which do not go on to this disastrous sequence. Where the host resistance is great and bacterial antigen weak, there arises a condition where the host and the organism survive in harmony. This, fortunately, is the commoner state of affairs in our unit, where a dedicated chief insists on adequate nutritional, adequate haematological care, and maximal mobility. It is these three factors which I believe are responsible for the large number of urinary infections found in the unit which cause little or no systemic symptoms or toxaemia. These are the primary complications of indwelling catheters.

The late complications of indwelling catheters:—

1. Stricture formation.
2. Vesiculitis.
3. Epididymitis.
4. Localised abscess formation and fistula.

1. **Stricture Formation.** Inflammation and trauma are followed by fibrosis and strictures can form in any part of the urethral canal including the prostatic urethra. Most are easily treated by dilatation but tend to be overlooked. Particularly this is so with the meatal stricture which is frequently the cause of persisting infection. If it is a long stricture, it may be extraordinarily difficult to treat. Meatotomy is valueless—some form of plastic procedure is necessary. I commonly use that described by Bonnin (1962)—meatotomy, where a flap of penile skin is turned onto the edge of an incised meatus. I have found meatotomy is no guarantee of prevention. In fact it may be the cause of the difficult type, principally because of the infection which inevitably follows.

Mr. C. K. Motor cycle accident on 1 May 1966, sustained fracture dislocation of C5 on C6 with incomplete quadriplegia. The patient was circumcised for obstruction on 7 July 1957. Continuous catheterisation followed by numerous attacks of haematuria. He complained that he was able to initiate micturition without trouble, but his stream was likely to stop and then recommence with suprapubic pressure. In December 1958 transurethral resection without much improvement. A urethral stricture was present near the bulb and was confirmed by cystoscopy. Since then the patient has been re-admitted for the passage of sounds at frequent intervals.

2. **Vesiculitis.** Some degree of vesiculitis is found, I believe, in all cases of urethritis who have had an indwelling catheter. It is caused by the obstruction to drainage by the catheter of the ejaculatory ducts. The vesicle is a complex structure and extraordinarily difficult to free from infection. It is the common cause of persisting infection after diversion of urine. In our hands, often needing total cystectomy to clear a persisting discharge from the functionless bladder.

3. **Epididymitis.** Epididymitis is rare in our experience. I can offer no explanation for this as it is extremely common in most other urological practice. It is probably due to undiagnosed stricture causing back pressure and retrograde spread via the vas. Its relative rarity is probably due to the absence of testicular function during convalescence.

4. **Localised Abscess.** Usually in the perineum—has not been common in our unit. I can find records of only two. It is obviously due to spread of infection to the submucosal tissues, probably following acute trauma during catheterisation plus some form of stricture. It is the obvious precursor of fistula.

Mr. A. W. Paraplegic as the result of a fall from a cliff, in which he sustained a fracture-dislocation of T4 on T5 in 1958. On admission to the Paraplegic Service, he was found to have a urethrocele. On 11 April 1962 an excision of a diverticulum of the penile urethra was performed. In June 1963 he was readmitted for panendoscopy and urethrogram. An irregular dilatation of the proximal end of the urethra was found which corresponded with the area where previously a large urethral diverticulum had been demonstrated. September 1964 re-admitted for investigation of excessive sweating over the previous six weeks. A large retroscrotal swelling was found and a diagnosis of periurethral diverticulum was made with probable abscess formation. This was drained and the patient was discharged with the sinus healed. He was re-admitted in December with a persistent urethral fistula. This was excised in February 1965 and the wound healed.

Various questions arise concerning the prophylaxis of these complications.

1. Does the type of instrument prove a factor? Undoubtedly, the modern sophisticated instruments may modify the cause and time of onset but I do not think they prevent them. One sees fewer strictures with small catheters—particularly the ingenious Gibbon catheter. One must realise however, that these very small catheters are only efficient in clear urine. They are easily blocked by pus or debris and thus may render the control of infection more difficult. For this reason we have found that they cause more nursing problems and, therefore, interference.

2. Prophylactic antibiotics. Few people use antibiotics in this way. It has been conclusively proved that they destroy the sensitive, more easily controlled organisms and leave the resistant ones to multiply. They have been abandoned in our unit.

3. The best prophylaxis is not to use indwelling catheters unless essential. In our unit, intermittent catheterisation is used whenever possible. If they must be used frequently, cleaning and scrupulous catheter and meatal toilet are essential. The early recognition of secondary complications such as stricture formation and vesiculitis and then adequate treatment give the best hope of establishment of the host organism harmony which is the best result we can hope for. Catheters must be changed frequently and introduced with the strictest precautions. I believe with little support, that when urethritis develops, the introduction of a small Riches suprapubic tube is the best treatment. This will not interfere with the establishment of a good reflex bladder, in fact it may even help such a desirable result by removing the cause of scarring of the trigone and vesical neck. We have had one such case where a suprapubic tube, *in situ* for eight years, was removed and a perfect reflex bladder followed. I have had no experience of vesicostomy as

suggested by Lapides (1960). It seems to me to be an unreasonably traumatic procedure, hard to manage and necessitating the wearing of complex and expensive apparatus. The Riches tube performs all that is necessary, is easily managed and changed, and in no way interferes with the physical rehabilitation of paresed muscles. I have seen these tubes remain for many years with little or no infection in people who have been able to carry on their normal occupations with minimal disability.

In conclusion, the somewhat disjointed remarks I have made are the result of observations in the Perth Paraplegic Unit of some 400 patients, and are made by the courtesy of Mr. G. M. Bedbrook, whose dynamic leadership has made such good results possible.

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