Bacterial Endocarditis and Urology

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Although bacterial endocarditis in relation to surgery and manipulation of the lower urinary tract has been stressed in the American literature, there have been comparatively few reports in the British journals, though some of the earlier observations on bacteraemia following urethral manipulations were reported in this country. Three cases of bacterial endocarditis were seen by me in these hospitals recently. On analysing the post-mortem reports since 1955, three further cases were proved at necropsy.

Case Reports

Case 1.—A married woman aged 68 was admitted to St. Philip's Hospital in May 1963 for investigation of haematuria. Cystoscopy, retrograde pyelograms, and renal biopsy were performed and she was proved to have systemic lupus erythematosus; no heart murmur was heard. One week later she developed a fever and petechiae; urine and blood cultures grew *Streptococcus faecalis* (see Table). She was treated with steroids and courses of chloramphenicol, erythromycin, and penicillin. One month later a heart murmur had developed, but after an initial response to treatment she relapsed and died.

Case 2.—A man aged 67 was admitted to St. Paul's Hospital in September 1962 for investigation of haematuria; no heart murmur was heard. At cystoscopy a bladder carcinoma was fulgurated and a biopsy specimen taken. Post-operatively the catheter blocked, he developed rigors, and the urine culture grew *Str. faecalis*. His pyrexia did not respond to courses of sulphafurazole, nitrofurantoin, and chloramphenicol. In October he had a transurethral resection of the prostate, but his fever continued and blood culture grew *Str. faecalis* (see Table). By November Osler's nodes and a heart murmur confirmed bacterial endocarditis. Blood cultures were negative following treatment with ampicillin, but again became

petent; four days after cystoscopy she suddenly developed left ventricular failure, and blood culture then grew *Str. faecalis*. She recovered after treatment with penicillin and probenidol; ampicillin was then continued until March 1964. Four months later her condition remained satisfactory.

Discussion

In each of these three cases of endocarditis the infecting organism was *Str. faecalis*; all three had urological manoeuvres.

In Case 1 the infection was acquired during cystoscopy and retrograde pyelography. The patient developed septicaemia six days post-operatively with an identical organism in the blood and urine. Her course was complicated by the collagen disease and its accompanying leucopenia, with the necessity for treatment with steroids.

In Case 2 the infection probably originated from the cystoscopy and fulguration of the bladder growth, but later a transurethral resection of the prostate was performed. The continued fever was thought to originate in the bladder, but numerous courses of antibiotics did not eradicate it, and the diagnosis then became apparent. It is interesting that ampicillin did not provide prophylactic protection in the dosage given to cover the second cystoscopy.

With regard to Case 3 I can only speculate whether the patient acquired the infection at the original cystoscopies or the subsequent laparotomy. She ran a prolonged pyrexia and was treated vigorously with antibiotics. Four months later, at the check cystoscopy, she already had endocarditis, and it was aggravated by the procedure.

Both Cases 2 and 3 had the additional complication of cancer. The danger is to ascribe the deterioration in their condition mistakenly to a recurrence of growth.

Bacteraemia in Urology

Bertelsmann and Mau (1902) described a fatal case of staphylococcal endocarditis following urethral dilatations for stricture. Barrington and Wright (1930) were the first in this country to investigate systematically the incidence of bacteraemia after operations on the urethra. They obtained 13 positive blood cultures after 23 urethral manipulations, and concluded that the bacteraemia was due to organisms that came from the urinary tract, and that the heavier the bacteriuria the greater the risk of blood invasion. Another factor was thought to be the extent of the trauma produced by the instrument, rigors being more likely to occur if instrumentation was rough. The commonest organism isolated was an *Escherichia coli*. Slade (1958) repeated and confirmed these findings. He also investigated 38 patients with infected urine at the time of catheter removal, obtaining 10 positive blood cultures, and in seven of these the organism in the blood and urine was identical; streptococci were isolated in 3 of the 10 blood cultures. Creevy and Feeney (1949), in a series of 350 cases undergoing transurethral resection of the prostate, obtained 45% of positive blood cultures either at the end of operation or whenever a febrile reaction occurred.

Gillespie (1956) has shown that, in patients undergoing prostatectomy with a sterile urine which subsequently becomes

Sensitivity of Organism to Prophylactic Agents									
Case No.	Date	Culture	Organism	Sensitivity to					
				Penicillin	Streptomycin	Chloramphenicol	Sulphonamide	Tetracycline	Nitrofurantoin
1	20/6/63	Urine	<i>Str. faecalis</i>	MS	R	S	R	R	S
	20/6/63	Blood	" "	MS	R	S	R	R	MS
2	22/10/62	Urine	" "	MS	S	S	R	S	S
	5/11/62	Blood	" "	MS	S	S	R	S	S
3	13/2/63	Urine	" "	S	R	S	R	MS	S
	17/9/63	Blood	" "	MS	R	R	R	R	S R MS

MS = Moderate sensitivity. S = Sensitive. R = Resistant.

positive after a check cystoscopy in January 1963, despite ampicillin coverage. He was referred to a specialized unit and had required several courses of penicillin, streptomycin, and ampicillin before his endocarditis was controlled.

Case 3.—A married woman aged 73 was admitted to St. Philip's Hospital in February 1963 for treatment of a bladder carcinoma; no heart murmur was heard. The urine culture grew *Str. faecalis* (see Table), and after bladder washouts she underwent open diathermy of the bladder tumour. Courses of nitrofurantoin, streptomycin, and chloramphenicol were given. On readmission in September she was pyrexial, and was found to have aortic incom-

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infected, the commonest causative organisms will have been introduced by cross-infection via the indwelling catheter or bladder washouts. When urinary infection is caused by enterococci (as also in our three cases), whose normal habitat is in or around the bowel, one strong possibility is that they were introduced by instrumentation.

Incidence of Enterococcal Endocarditis

The incidence of enterococcal endocarditis in overall series of bacterial endocarditis has been variously estimated as 3–8% (Loewe *et al.*, 1951) to 21% (Geraci, 1952). Geraci found that enterococcal endocarditis accounted for 10% of cases seen during 1944–53 at the Mayo clinic. Romansky *et al.* (1961) isolated the enterococcus in 10 out of 15 cases of endocarditis seen by them in the previous 33 months, confirming the impression of others that the incidence of enterococcal endocarditis has increased in the past few years with the widespread use of antibiotics.

In contrast Volger *et al.* (1962), in their series of 148 cases seen during 1948–60, found no significant difference in the relative proportion of the infecting organism during these years. Robinson and Ruedy (1962), in an analysis of necropsies on cases of endocarditis, found that *Streptococcus viridans* accounted for 32% of cases and enterococci for none during 1933–8, whereas in the period 1950–60 *Str. viridans* accounted for 18% and enterococci for 25%.

Focus of Infection

Pearce and Guze (1961), in their series of 85 cases of bacterial endocarditis seen during 1947–57, found that 25% had a history of genito-urinary surgery, instrumentation, or catheterization within the preceding year. In addition to the accepted criteria for prognosis, they stressed the extremely poor results in the elderly and those with a genito-urinary portal of entry, the endocarditis in these circumstances being caused more often by staphylococci or Gram-negative or penicillin-resistant bacteria. Finn and Kane (1952) described four cases of endocarditis associated with urological procedures. Merriitt (1951) reported eight cases of endocarditis after transurethral resection of the prostate, and gave the incidence of 1 per 1,000 operations. However, 7 out of 70 patients (10%) with known valvular heart disease undergoing the same operation developed bacterial endocarditis. In seven of these eight cases *Str. faecalis* was isolated. Robbins and Tompsett (1951) thought the main dangers of developing enterococcal endocarditis were urinary infections and prostatectomy in elderly men and uterine infections in women.

Prophylaxis

The *Lancet* (1962) stated: "Still less appreciated is the need to give prophylaxis before instrumentation or operation on the urogenital tract; in this instance, since penicillin-resistant organisms are likely to be present, both penicillin and streptomycin should be administered." If a bacteriostatic antibiotic is selected for prophylaxis against enterococcal endocarditis there is no guarantee that it will afford adequate protection (Finland, 1954; Geraci and Martin, 1954); to be effective the antibiotic should be bactericidal. This point is stressed by Havard *et al.* (1959), who described a case of *Str. faecalis* endocarditis resulting from dilatation of a urethral stricture; they were strongly in favour of prophylaxis by bactericidal antibiotics. Geraci and Martin (1954) recommended, inasmuch as enterococcal endocarditis follows urological procedures quite frequently, that all patients with or without a heart murmur should be given a million units of penicillin and 1 g. of streptomycin every 12 hours, beginning the day before operation and continuing post-operatively until the day

after the urethral catheter had been removed. They claimed they had seen no case since that procedure was adopted. Such a regime may be the best prophylaxis to use in patients with known valvular disease; but it should be emphasized strongly that the dose of streptomycin is graduated according to the glomerular filtration rate (Kunin and Finland, 1959), otherwise the risk of otological complications will be considerable.

Even if prophylactic antibiotics are administered to a patient with known valvular heart disease undergoing any urethral manoeuvre a blood culture should be performed as a routine follow-up at about four weeks after the operation. This may be the only way of making an early diagnosis.

Conclusion

In spite of repeated emphasis bacterial endocarditis following genito-urinary surgery or manipulation is not readily thought of as a cause of unexplained fever. In finding the cause of these fevers blood culture should be deemed as valuable as a blood count or urine culture.

With enterococcal endocarditis the only hope of cure is by treatment with massive doses of bactericidal antibiotics controlled by blood levels.

Antibiotic prophylaxis against enterococcal endocarditis presents a different problem from that of prophylaxis against endocarditis caused by *Str. viridans*, where one is dealing with a highly sensitive organism. A controlled trial to assess the value of prophylactic antibiotics in preventing the development of endocarditis after urological procedures is urgently needed.

Summary

Three cases of bacterial endocarditis caused by *Streptococcus faecalis* are described; all three cases occurred after urological manipulations.

The causal relation between urological surgery and bacterial endocarditis is reviewed. The main dangers are transurethral resection of the prostate and cystoscopy in the presence of an established urinary infection.

The importance of early diagnosis and intensive treatment is stressed.

The value of prophylactic treatment is discussed. It is suggested that routine blood cultures may be necessary post-operatively for periods of up to a month in order to establish a diagnosis and enable effective treatment to be undertaken.

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