URINARY INFECTIONS IN GYNAECOLOGY

by

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In certain gynecological conditions like genital prolapse, urinary infection may be caused by urinary stasis. Operations on the bladder (repair of cystocele, urinary stress incontinence or fistulae) are followed by continuous drainage for several days and are likely to produce infection of the lower urinary tract. A single catheterisation to empty the bladder before gynecological examination, before an operation or to measure residual urine, may also lead to this infection.

A study of urinary infections in gynaecological patients was made in the departments of Obstetrics and Gynaecology and Bacteriology, Madurai Medical College, from June 1967 to March 1968. As shown in Tables I and II 155 gynaecological cases were studied. Genital prolapse and genito-urinary fistulae formed about 50% of the material. Each case was examined in detail after history taking and the following investigations were done: (1) urine for number of pus cells per high power field; (ii) urine culture and colony counts; (iii) the organisms isolated were subjected to sensitivity tests against certain antibiotics; (iv) white blood cell count and blood urea estimation; (v) intravenous pyelography, whenever necessary.

TABLE I

Type of gynaecological cases studied

	Type of cases	Number of patients
1.	Prolapse uterus	49
2.	Vesico-vaginal fistula	27
3.	Dysfunctional uterine bleeding	31
4.	Fibroid uterus	19
5.	Others	29
	Total	155

TABLE II

Incidence of urinary infections in different gynaecological conditions

	Type of cases	No. of cases	No. infected (Percent in brackets)
1.	Prolapse uterus	49	21. (42.8)
2.	Vesico-vaginal fistula	27	24. (88.8)
3.	Chr. cervicitis, pelvic infections etc.	14	5. (35.6)
4.	Sterility, dysfunctional uterine bleeding, myomas.	65	14 (21.5)
	Total	155	64 (41.2)

Except in cases of urinary fistulae, a midstream specimen of urine was collected after preliminary vulval toilet. In patients with fistulae, either a catheter specimen or, if its size

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permitted, a direct collection was made. Soon after the collection, urine was put up for culture on MacConkey's medium and nutrient agar by surface inocculation method, using a platinum loop (calibrated to deliver 0.01 and 0.001 ml. of urine). Twenty-four hours later the total surface colony count was made by a colony counter and the number of colonies per ml. was recorded. When more than one type of colony was grown, subcultures were made with peptone agar. Sugar and biochemical tests were carried out for identification of these organisms. All the organisms grown were tested for their sensitivity with the disc method against the following antibiotics in different concentrations:—oxytetracycline 20 ug per disc; urobiotic-20 ug. per disc; strepotmycin-200 ug. per disc and chloramphenicol 100 ug. per dic. Whenever the first specimen of urine showed pathogens, the patient was treated with a course of urobiotic (composed of oxytetracycline 125 mg., sulphamethizole 250 mg. and phenazopyridine 50 mg. per capsule), one capsule every 4 hours for 5 days. Postoperatively, the bladder drainage was maintained for 48 hours following operations for genital prolapse and for 14 days after repair of vesico-vaginal fistulae. The urine was collected for culture at the end of 2 and 4 days in prolapse cases, and 2, 4, 7 and 14 days in fistulae cases. Urobiotic was given prophylactically in the postoperative period in the dose stated earlier for 5 days. The urine culture was done on the day of discharge and the patients were followed 3 months later. A study was also made to determine the effect of single catheterisation in 50 patients. For this purpose 3 specimens of urine were collected from each of them—(i) one midstream specimen on admission, (ii) a catheter specimen with an autoclaved catheter before a minor operation the following day, ond (iii) one more midstream sample 48 hours after catheterisation.

Results

Out of 155 cases, in 41.2% pathogenic organisms were isolated from urine culture. In 58.9% of these samples the infection was mono-bacterial and in 41.1% it was polybacterial in origin. It may be noted from Table II that the incidence of urinary infection was high in cases of genital prolapse and genito-urinary fistulae, 42.8% and 88.8% respectively, though most of them were asymptomatic. In other cases where there was no bladder pathology, as in cases of dysfunctional uterine bleeding, sterility etc., the incidence of this infection was only 21.5%.

For 155 cases, 421 urine samples were collected for culture. Among the pathogenic organisms grown the commonest was the coliform group forming 51.6% of patients and 29.6% of samples (Table III). Next in order of frequency were the proteus, pyocyaneus (24% and 15% of cases respectively); Klebsiella, strep. faecalis, streptococci (non-haemolytic and haemolytic), staph. aureus. Amongst the organisms ordinarily non-pathogenic B. faecalis alkaligenes were seen in 34.6% of patients and 16.6% of samples.

TABLE III

Type of organisms grown on urine culture
(No. of patients 155; No. of samples 421)

Organisms	Patients		Samples	
	Number	Per cent	Number	Per cent
1. Coliforms	80	51.6	125	29.6
2. Proteus	38	24.5	58	14.0
3. Klebsiella	34	21.9	47	11.1
4. B. pyocyaneus	24	15.5	34	8.07
5. Strep. faecalis	13	8 .3	13	3.1
6. Non-haem. streptococcus	7	4.5	20	4.7
7. Haem. streptococcus	4	2.6	4	0.95
8. Staph. aureus	1	0.06	1	0.23
9. B. faecalis alkaligenes	54	34.6	70	16.6

TABLE IV

Organisms grown on urine culture and their sensitivity to antibiotics

No.	Organisms	No. isolated.	Number tested	Urobiotic	Oxytetracycline	Chloramphenicol	Streptomycin
				(All figures in per cent)			
1	Coliforms	125	121	14.05%	9%	43%	45.8%
2	B. proteus	58	56	1.78	1.9	66	38.6
3	Klebsiella	47	46	8.69	6.8	30	45
4	Ps. pyocyaneus	34	33	6.06	3	17	10.3
5	Nonhaem streptococcus	20	13	61.53	57	50	50
6	Strep. faecalis	13	12	16.6	25	57	20
7	Haem. streptococcus	4	4	50	50	50	75
8	B. faecalis alkaligenes	70	46	28.26	20.4	66	33
9	Staph. albus	39	27	37.03	28	75	Nil

The results of sensitivity studies are shown in Table IV. It may be noted that B. coli was more sensitive to streptomycin and chloramphenicol than to other antibiotics. The proteus group was sensitive to chloramphenicol in 66% of cases and to streptomycin in 38.6% and to oxytetracycline and urobiotic in less than 2 per cent. Against B. pyocyaneus, the order of preference was chloramphenicol, streptomycin, urobiotic and oxytetracycline. Against non-haemolytic streptococci, urobiotic was the drug of choice. In almost all cases, urobiotic was found to be superior to oxytetracycline.

With closed drainage, the incidence of urinary infection was 71.4% at end of 48 hours, 75% at end of 4 days and 90% at the end of a week; whereas with the open drainage it was 90% after 48 hours and 100% at end of 4 days. (Table V).

TABLE V

The incidence of urinary infections in postoperative gynaecological cases

Type of drainage	No. of cases	No. of days of bladder drainage			
		2 days	4 days	7 days	14 days
		Number infected (% in brackets)			
Open	20	18 (90%)	20 (100%)	..	..
Closed	28	20 (71%)	21 (75%)	25 (90%)	25 (90%)

In a series of 50 women who had no urological complaints, midstream urine showed evidence of infection in 11, in all of whom the infection persisted after the catheterisation. In 39 cases where there was no infection initially, single catheterisation produced infection in 47.0%

Discussion

It is well known that any condition causing obstruction to free flow of urine favours bacterial growth. In genital prolapse difficulty in emptying the bladder is often present due to cystocele. Fibroids may occasionally give rise to dysuria. Depending on the size of the bladder fistula, its mucosa may be exposed or prolapsed into the vagina or there may be bladder neck obstruction due to scarring. Upadhyay and Verma (1968) reported positive urine culture in 66% of genital prolapse, 77.6% of vesico-vaginal fistulae, 36.4% myomas and 22.2% of dysfunctional uterine bleeding. In our series, pathogenic organisms were grown on urine culture in 88.8% of fistulae and 42.8% of prolapse cases as compared to 21.5% of dysfunctional uterine bleeding and sterility cases.

Catheterisation is a potent cause of urinary infection. Infection is less with single catheterisation—3% (Kass, 1957) to 9% (Slade and Linton 1960), though in the presence of complications it may be as high as 23% (Linton and Gillespie 1962). On the other hand, with continuous drainage of the bladder the infection rate may vary from 85% to 38% depending on the type of bladder drainage—open or closed (Linton and Gillespie 1962). Kass 1957 stated that half the patients with in-dwelling catheters for 24 hours have bacteriuria and almost all with those for 96 hours have such infections. Donald *et al* (1962) reported an infection rate of 71% when the catheter was removed after 48 hours of continuous drainage. According to them, even without catheterisation the infection rate was 40% following operations on the bladder. We noticed infection in all the cases 4 days after open drainage, whereas with the closed drainage, with no formalin, the incidence was as high as 90% at the end of a week. Even with single catheterisation there was a considerable risk of causing urinary infection.

Causes of urinary infection following catheterisation in female patients have been discussed by Linton and Gillespie (1962). Infection may be introduced from the introitus or may travel from the lower end of the drainage tube. The movement of the catheter in the urethra facilitates spread of infection and air bubbles in the tubing may also cause regurgitation when the tube is lifted to change the drainage bottle. Kass and Schneidermann (1957) have demonstrated that within 3 days of applying a sample of test culture of bacteria to the periurethral epithelium of patients having an indwelling catheter, these organisms could be recovered in large numbers from the urine. They believe that these organisms enter the bladder via the exudate (or mucopus) that often forms around the catheter. The catheter itself may not be sterile. Out of 12 'wet sterile' catheters tested from

the wards, we found 8 were infected. As far as possible, autoclaved catheters should be used.

Amongst the organisms responsible for urinary infection B. coli is the commonest—42% to 84% in the series reported by Madsen *et al* (1967), Samuel *et al* (1968), Upadhyay and Verma (1968) and Pathak *et al* (1968). In our series it was noted in 51.6% of patients and 30% of samples. Other pathogenic organisms noted were the proteus, Klebsiella, pyocyaneus, strep. faecalis, etc. as stated earlier. The sensitivity of these organisms to different antibiotics and chemotherapeutic substances have been reported by several workers. Samuel *et al* (1968) found B. coli sensitive to streptomycin and chloramphenicol in 43.4% and 83.3% respectively. The corresponding figures reported by Upadhyay and Verma (1968) were 48.3 and 42%, which are comparable with 45.8% and 43.4% in our series. Sensitivity of B. coli to nitrofurantoin varied from 96.7% (Upadhyay and Verma, 1968) to 30% (Samuel *et al*, 1968). Upadhyay found the proteus sensitive to both streptomycin and chloramphenicol in 51.7% compared to 25% and 50% respectively as reported by Samuel *et al*. For strep. faecalis, chloramphenicol was the best.

It is worth observing here that over half the strains of B. coli—the commonest pathogen in urinary infections—were resistant to the commonly employed antibiotics. It is essential, therefore, that these infections should be minimised amongst gynaecological cases. Catheterisation should not be done unless it is unavoidable. Midstream samples, properly collected, are adequate for microscopic and bacteriological studies. Whenever indicated, it should be done with an autoclaved catheter, taking the same aseptic precautions as for a surgical procedure—reinforced, preferably, with chlorhexidine cream. In certain cases, like fistula repair, when the continuous bladder drainage cannot be avoided—closed drainage of fixed type should be used with 10% formalin solution in the bottle. The bottle should not be changed frequently. Gillespie *et al* (1967) have devised a closed system of bladder drainage into a plastic bag with an immobilised in-dwelling catheter and advocate disinfection of the bladder during subsequent intermittent catheterisations, if indicated, for the residual urine. It is doubtful whether prophylactic antibiotics are useful in these patients. Donald *et al* (1962) stated that in spite of antibiotics urinary infection was persisting in a considerable number (46%) of cases following surgery for prolapse. Kass (1957) was of the opinion that prophylactic and therapeutic value of antibacterial agents is diminished in patients with in-dwelling catheters. This may explain the fairly high rate of infection even after prophylactic antibiotics in the postoperative period in our cases. Fortunately, the long range follow up of such cases by Cox and Hinman (1961), Tyler and Oseasoha (1963) and Madsen *et al* (1967) show that the infection following catheterisation completely clears up in almost all cases in the absence of a pre-existing renal lesion of any obstructive lesion in the urinary tract.

Summary

1. A study of urinary infection in 155 gynaecological cases was made. The incidence was high in urinary fistulae and genital prolapse as compared to cases of sterility, dysfunctional uterine bleeding, etc.

2. B. coli was the commonest organism grown in this series—51.6% of cases and 29.6% of urinary samples. In order of frequency other pathogenic organisms were proteus Klebesiella, pyocyaneus and strep. faecalis.

3. The sensitivity of organisms isolated was tested against streptomycin, chloramphenicol, oxytetracycline and urobiotic.

4. With closed drainage, 75% of cases showed urinary infection after 96 hours as compared to 100% following the open method.

5. Prophylaxis of urinary infection in gynaecological surgery is discussed.

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