A STUDY OF URINARY TRACT INFECTIONS IN A KANPUR HOSPITAL

by

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Background

It was Pasteur who first directed attention to the fact that urine was an excellent culture medium for bacteria. Thus began systematic studies on the pathogenesis of these infections and the various factors, mechanical, anatomical and biological that promote infection, reinfection, chronicity and resistance to treatment.

Paul A. Bunn et al, State University of New York, studied 54 patients with acute or recent urinary tract infection manifested by pyuria and a positive urine culture. In order of frequency the causative organisms were;

E. Coli, aerobacter aerogenes, streptococcus faecalis (alpha type), staphylococcus aureus, a. cloacae, a species of proteus, beta, haemolytic streptococci, para-colon bacteria, and species of pseudomonas.

Toland and Schwartz studied 86 women who had infection of the urinary tract associted with pain and discomfort. E. Coli was the organism most frequently found.

Kirby, Tanner et al in a survey of urine cultures of 85 patients with infections of the urinary tract found coliform bacilli to be predominant. In 41 patients the organisms were sensitive, and in 44 resistant to antibiotics.

Keefer C. S. (1957) studied 477 cases of urinary tract infections. E. Coli was isolated in 188 cases. His observations, agreeing with the general experience, showed that between 75 and 80% of urinary tract infections are bacillary in origin and 20 to 25% are coccal in origin.

J. Simons (1950) considered Mandelamine the most effective chemotherapeutic agent for sterilizing the neurogenic bladder, administered by mouth in divided daily doses of 3 to 4 gms.

Thompson H. T. (1949) found Gantrisin, a sulphonamide of high solubility and low toxicity, an effective therapeutic agent in some urinary infections caused by e. coli, b. pyocyaneus and proteus bacilli.

Wells C. A. and Marcus (1949) succeeded in controlling and in eliminating from most cases, the infections due to b. proteus, ps. pyocyaneus, Friedlander's bacillus and e. coli resistant to the sulpha drugs. They used streptomycin by intramuscular injection.

Riches E. W. (1949) treated urinary tract infection with streptomycin. B.

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Received for publication on 28-10-63.

coli and b. proteus disappeared with more regularity than any of the other common bacteria invading the urinary tract.

Chittenden G. E. and his colleagues (1949) found chloromycetin of great assistance in the treatment of bacillary infections of the urinary tract. He administered it orally and found it singularly devoid of gastrointestinal neurotoxic, cutaneous or allergic reactions.

Matheson N. M. (1950) considered chloromycetin very promising in the management of urinary infections due to proteus vulgaris.

According to Ian Aird (1958) urinary infections are particularly susceptible to aureomycin, especially if the urine is acid.

Clifford Wilson (1951) found aureomycin and chloromycetin highly active in vitro against most strains of b. coli, aerobacter aerogenes, paracolon bacillus, streptococcus faecalis and staphylococci, only moderately active against ps. pyocyaneus and usually inactive against proteus vulgaris. The in vitro observations are reproduced in vivo, and the majority of infections due to the sensitive organisms mentioned above are at least temporarily controlled by aureomycin and chloromycetin.

Matheson N. M. counselled that before undertaking therapy of urinary infections, it is desirable not only to ascertain the offending organism and to determine its drug sensitivity, but to proceed further, in an endeavour to seek a cause for bacterial invasion.

A. Dickson Wright (1950) remarks that of all systems the urinary system benefits most from this anti-biotic; not only does it receive benefit from all the streptomycin as it circulates in the blood but also it excretes 75% of the drug unchanged and concentrated in the urine.

Dutton and Ralston have shown that the ward dust and air are a permanent reservoir of bacterial species which infect the urinary tract and that some degree of contamination by the nurses' hands is more or less inevitable. These workers failed to isolate anti-biotic resistant coliform bacilli from the faeces of patients in whom they caused urinary infection.

Beeson however, believes that acute non-obstructive pyelonephritis is almost exclusively a disease of the female sex, because in them the urethra is shorter and more liable to contamination by enteric bacteria.

Dutton and Ralston showed experimentally that bacteria could ascend to the bladder via the drainage tube and indwelling catheter. Miller et al have shown that air bubbles can readily carry organisms up the tube.

According to Beeson P. B. the real problem is the ascent of the bacteria along the outside of the catheter, as shown by Kass et al (1957).

Cross infection has been shown to occur in wards, so that in patients being treated by catheterisation there is a tendency for infections with the same bacterial strains to develop. Dutton and Ralston have conclusively shown that bacteria are transferred from the catheter of one patient to that of another by the hands of the attending personnel. The observations of Kass et al support the findings of Dutton and Ralston.

Shackman believes that the risks of cross infection are significant during catheterization, reconnection of a drainage tube after detachment from a catheter or bottle or when sterilization and handling of the drainage bottles or urinals are imperfect. Bladder irrigations are particularly dangerous and he advised to avoid them both before and after operation.

Clinical studies by Macdonald, Levitin et al have indicated that the approximate demarcation line between true bacteriuria and contamination was at 100,000 bacteria per ml.

The Present Study

The findings in 64 female patients suffering from urinary tract infections are presented. These patients were picked for study from the outpatient department and the wards of the Medical College Hospital, Kanpur. The patients were examined in detail at their first appearance and as far as possible before any urethral instrumentation had been carried out on them. They were re-examined after urethral instrumentation and/or catheterization. For culture purposes a catheter specimen was employed. Sterile metal catheter was inserted through the urethra into the bladder until the tip of the catheter was just inside the internal sphincter. Most of the urine was allowed to run out as waste and the latter part of the specimen collected for culture. This approximates the mid-stream specimen obtained in the males.

The clinical diagnoses of the studied patients were as follow:—

	No. of cases
1—Carcinoma cervix—advanced type	13
2—Carcinoma vulva—advanced type	4
3—Prolapse uteri with cystoceles	9
4—Urethral carbuncle	1
5—Pregnancy complicated with pyelitis and hydronephrosis ..	1
6—Post-operative urinary retention, treated by catheterization	17
7—Post-operative indwelling catheterization as after exenteration and Fothergill's operations, etc.	19
Total	64

The organisms isolated from these patients were as follow:—

1—B. Coli	
Typical type	31 times
Atypical type	9 times
2—Pseudomonas Pyocyaneus	14 times
3—Proteus Vulgaris	9 times
„ Morganii	1 time
4—Staphylococci	9 times
5—Streptococcus faecalis	8 times

The pure bacillary infection was encountered in 47 cases. Pure coccal infection in 3 cases. Mixed coccobacillary or mixed bacillary infection was found in 14 cases.

The mixed cultures were obtained almost invariably from those patients who had been catheterized several times before this study or those who were wearing indwelling catheter.

Anti-biotic Sensitivity

TABLE I—B. Coli

Sensitivity of B. Coli isolated from Urine Culture

1—Penicillin	—	—	—	—	—
2—Streptomycin	+++	—	—	+	—
3—Chloromycetin ..	+++	—	++	+++	—
4—Aureomycin	+++	—	+++	+++	+++
5—Terramycin	+++	—	++	++	++
6—Achromycin	+++	—	++	++	+
7—Furadantin		++			
Total	5	2	17	13	3

TABLE II—Pyocyaneus

Showing the sensitivity of Pyocyanea, isolated

1—Penicillin	—	—	—	—
2—Streptomycin	++	+	—	+
3—Chloromycetin ..	+++	++	+	+
4—Aureomycin	++	+	—	—
5—Terramycin	+++	++	—	—
6—Achromycin	+	+	—	—
Total	9	3	1	1

From the above tables it will be seen that chloromycetin was effective against most strains of pyocyanea and streptomycin and terramycin were the next best drugs.

TABLE III—Proteus

Shows the antibiotic sensitivity of staph. and streptococcus isolated

1—Penicillin	—	—	—
2—Streptomycin	++	—	+
3—Chloromycetin ..	++	++	++
4—Aureomycin	++	+	—
5—Terramycin	+++	+++	++
6—Achromycin	+++	—	—
Total	4	2	3

The above table reveals that terramycin was the one generally effective anti-biotic. Then followed chloromycetin and streptomycin.

TABLE IV

Shows the antibiotic sensitivity of staph; and streptococcus isolated

1—Penicillin	+	—	—	—
2—Streptomycin	++	+	+	—
3—Chloromycetin ..	+++	+++	++	+
4—Aureomycin	+++	++	+++	++
5—Terramycin	+++	++	++	+
6—Achromycin	+++	++	++	+
Total	4	5	3	5

Chloromycetin was most active against staphylococci and aureomycin against streptococci faecalis. The rest of the sensitivity pattern was more or less the same for both organisms. Terramycin was the next drug of choice.

The patients from whom these various organisms were isolated were classed into four categories;

Group A. Included those patients with maximal clinical symptoms. Out of 5 cases belonging to this group three were due to pyocyaneus, and urine showed pus cells more than 30 per low power field.

Group B. This comprised patients with moderate symptoms i.e. pyrexia, dysuria etc. Pus cells less than 30 per field.

Group C. This included patients with only slight symptoms e.g. burning during micturition, frequency, pus cells more than 8 per field.

Group D. Patients with no symptoms but a positive urine culture were included in this group.

Whereas pyocyaneus was the predominant organism in group A cases, b. coli was the dominant organism in groups B, C and D.

Burning during micturition appeared to be the predominant complaint in groups A, B and C. It was complained of by 90% patients. The remaining patients also admitted having experienced it, but were occupied presently with their more troublesome complaints. High temperature, rigors and sweating, were observed in group A patients and to a lesser extent in group B cases. In group C and D patients these were absent or only slight.

Pus in urine was the one chief finding in centrifuged urinary sediment in all cases of urinary tract infections. The number of pus cells per microscopic field was the true and reliable index of the severity of infection. Thirty pus cells per low power field were found by comparative study to be a true guide to the severity of urinary infection. More than 30 pus cells per field always indicated a severe infection and the culture in these cases yielded a heavy growth of bacteria.

After the isolation of the infecting organism and determination of its sensitivity to various anti-biotics, treatment with the appropriate antibiotic was started.

TABLE V

Shows the results of one week of intensive and appropriate antibiotic treatment

Completely cured	Markedly relieved	Slightly relieved	Not relieved
13	29	19	3

Summary

The findings in 64 female patients suffering from urinary tract infections are presented. The organisms isolated from the urine of these patients were as follows: in order of

frequency, B. Coli, Pseudomones Pyocyaneus, Proteus vulgaris, Proteu Morganii, Staphylococcus, Streptococcus faecalis; 47 cases yielded pure bacillary cultures; 3 cases yielded pure coccal cultures and 14 cases mixed cultures. B. Coli was most suceptible to Aureomycin, Pyocyaneus and staphylococci responded best to chloromycetin, followed by streptomycin and Terramycin. The latter was most active against the isolated strains of proteus.

Burning during micturition was complained of by 90% of patients.

Pus in urine was the chief finding in all cases of urinary tract infections. The number of pus cells per low power field was found to be a reliable index of the severity of infection. More than 30 pus cells per low power field always indicated a severe infection.

Forty-two cases were markedly benefitted after 1 week of intensive therapy with the appropriate antibiotic; 22 cases were only slightly relieved or not at all.

Acknowledgement

I am in-debted to Professor G. K. Tiagi, Head of the Department of Pathology, Medical College, Kanpur for much help in the fulfillment of this study.

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