

URINARY TRACT INFECTION FOLLOWING ABDOMINAL DELIVERY — SECOND THOUGHT ON INDWELLING CATHETER

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SYNOPSIS

One hundred and forty one cases of caesarian section were studied for catheter-associated urinary tract infection. The operations were performed electively as well as on emergency basis. All patients received a Foley's catheter immediately prior to operation which was removed after a mean period of about 22 hours. The incidence of urinary tract infection in these cases was compared with that of a smaller group of similar cases but without any indwelling catheter. Urinary tract infection was twice as common in the former as in the latter group but the difference was not statistically significant. Further research in this field is emphasised.

INTRODUCTION

"Those who look for trouble will surely find it" — this was the opening remark of an international paper concerning urinary tract infection in women(1). Catheter-associated urinary tract infection in obstetrics certainly goes a long way to substantiate this treatment.

It is reckoned that in about five per cent of all necropsies in women, pyelonephritis is a major contributory cause of death and there is at least some evidence of infection of the kidneys in 20 per cent of female postmortem studies(2).

Women are prone to develop urinary tract infection than men because the female urethra is short and lies in the close proximity of the vagina which harbours a variety of organisms. This is particularly so in pregnancy, labour and puerperium, because of:

- 1 hormonal changes affecting the urinary tract.
- 2 stasis of urine due to the controversial element of obstruction, particularly affecting the urinary tract on the right side, due to the dextrorotation of the uterus(3).
- 3 interference of and minor injury to the vulvo-vaginal-urethral anatomy during labour.
- 4 urethral catheterisation in the late stage of labour or as a part of an obstetric procedure.

While the first three factors bring the female urinary tract to the brink of bacteriological invasion, the last one usually tips the scale.

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The single passage of a catheter into a healthy bladder has been known to cause infection to the extent of about three per cent (4). At the other extreme, with an indwelling catheter and an open drainage, the incidence of infection approaching 100 per cent has been documented (5).

However, the last couple of decades had witnessed a tremendous output of work in the frontiers of medicine aimed at reducing iatrogenic urinary tract infection. It is comforting to note that it has been possible to reduce catheter-associated urinary tract infection from an appalling almost 100 per cent to an acceptable five per cent (6, 7). Unfortunately, the result is not uniform and nosocomial urinary tract infection still remains a nightmare amongst some.

The morbidity associated with urinary tract infection in the puerperium is well recognised. It has been shown that this prolongs the period of convalescence for an average of at least two days (8).

It is reckoned that some of the women contracting urinary tract infection during puerperium may develop asymptomatic bacteriuria during a subsequent pregnancy. As much as one-fifth of these cases may develop overt pyelonephritis in pregnancy. This is a serious state of affair and more difficult to treat than in the non-pregnant state because of reduced hydrodynamic clearance of bacteria from the urinary tract during pregnancy. Some also believe that asymptomatic bacteriuria contributes to pre-eclampsia, prematurity and perinatal mortality. In many of these women, complications such as these were needless, if an episode of iatrogenic urinary tract infection during a previous labour or puerperium had been avoided.

The present paper is the direct consequence of a rather uncanny feeling shared by one of the authors (Dr P.C.) to whom the routine use of an indwelling catheter during and after caesarian section, a commonly practised procedure in Singapore, was a new one. The aim of the study was to obtain a preliminary but first hand information about the magnitude of the problem of catheter-associated urinary tract infection by evaluating a randomised consecutive series of cases in their natural course of events over a defined period of time.

MATERIAL AND METHOD

All patients who had caesarian sections and returned from the operating theatre with an indwelling urethral catheter during the period 24 Aug 82 to 6 Nov 82 were studied. This group was designated as "Catheter-associated" group.

The operations were performed by a variety of surgeons with good experience and included elective as well as emergency operations. Patients who were already on antibiotics were not included in the series.

The catheter used was that of Foley and introduced aseptically into the bladder on the operating table. The balloon was inflated and the catheter connected via a closed system to a plastic bag.

A continuous drainage was maintained. All cases were reviewed on the following morning and the catheter was removed unless there was some special indication to maintain the catheter for a longer period of time.

A "clean-catch" midstream sample of urine was collected on the third postoperative day in a sterile test tube and transported to the laboratory shortly afterwards.

The urine samples were immediately inoculated with a standard loop into a blood agar and eosine — methylene blue agar media. The colony count was performed after a incubation period of 24 hours at 37°C. The number of organisms per millilitre of urine was calculated from the colony count. The offending organisms with a viable count of more than 100,000 per ml of urine were identified and their sensitivity to a variety of antibiotics was determined.

The foregoing procedure of collection of urine and

bacteriological study were also followed in another group of cases of caesarian section but without any indwelling catheter. In these cases the bladder was emptied by a firm rubber catheter prior to caesarian section and the catheter was either removed after emptying the bladder or at the end of the operation. Postoperatively, the patients were encouraged and helped to pass urine without the aid of a catheter. This was designated as "catheter-free" group.

"Significant bacteriuria" was deemed to have been present when the viable count was in excess of 100,000 organisms per millilitre of urine. This was regarded as the sole evidence of urinary tract infection despite the clinical picture. Any specimen which was found to be contaminated or yielded ambiguous result was excluded from the analysis.

Both groups were analysed separately for the frequency of significant bacteriuria. Null hypothesis was erected and challenged by chi-square test to evaluate the statistical significance of the differences. Yates "correction for continuity" was also applied.

RESULT

In the catheter-associated group, the mean duration of catheter was 22.90 hours. The standard deviation was 3.10. The incidence of infection in this group is compared with the catheter-free group in the following table:

TABLE 1
INCIDENCE OF URINARY TRACT INFECTION
IN ALL CASES STUDIED
(n = Total number of cases)

	No growth	Infection
Catheter-associated group (n = 141)	111	30 (21.28%)
Catheter-free group (n = 32)	29	3 (9.38%)

DF = 1
Chi-Square = 2.39
Probability 0.50 > P > 0.01

Since it was a fourfold table, it was thought appropriate to incorporate Yates "correction for continuity" into the chi-square calculation. It was done but the same range of P values was obtained. Therefore, null hypothesis could not be disproved meaning thereby that there was no significant statistical difference between the two sets of observations.

Assuming that there was some difference in the aseptic care taken during catheterisation amongst different surgeons and since only one surgeon had cases in both groups, his cases were analysed separately as a "special group". The idea is to remove this variable element of the quality of aseptic care taken so that better comparison can be made between the two groups. The result of this group is summarised in Table 2.

Emergency caesarian section accounted for 60.61 per cent of cases. Escherichi Coli was the commonest offending organism and was found in 28 per cent of cases, followed by proteus (25 per cent). Acinetobacter calcoaceticus accounted for nine per cent of infections and the rest was caused by a variety of organisms which include Staphylococci, Streptococcus Gr D, Enterobacter and Klebsiella. The sensitivity of the organisms varied widely and no consistent pattern was observed.

Table 2
Incidence of UTI in the special group
 (n = Total number of cases)

	No growth	Infection
Catheter-associated group (n = 6)	4	2 (33.33%)
Catheter-free group (n = 32)	29	3 (9.38%)

DF = 1
 Chi-Square = 2.47
 Probability 0.50 > P > 0.10

DISCUSSION

It is apparent from the foregoing observation that the incidence of urinary tract infection following the use of indwelling catheter during and after caesarian section is at least twice as much when such catheter is not used. When the element of individual variability in the aseptic care taken during catheterisation is removed, the analysis shows that the incidence of catheter-associated infection is 3.5 times more than the catheter-free group in the hands of the same surgeon. Although this difference is striking, no significant difference is observed when the numericals are treated statistically. One must, nevertheless, note that the two groups differ considerably as to the total number of cases belonging to each group which means that a proper comparison is rather difficult.

In this context, it is worthwhile bearing in mind that "statistical significance does not necessarily imply clinical significance" (9). The reverse is also true.

E Coli has been found to be responsible for the infection in only 28 per cent of cases. Whether this less than usual cases of E Coli infection in our series reflects a changing trend of bacteriological invasion of urine or indirectly indicates more cases of acute — on — chronic infections by other organisms triggered off by the indwelling catheter requires further study.

Urinary tract infection is the most common nosocomial infection and the majority have been known to be associated with urethral catheterisation or other types of urethral instrumentation (10, 11). Catheterised patients are at increased risk of developing bacteriuria, cystitis, pyelonephritis and gram-negative septicaemia.

The arduous work of a multitude of researchers in this field has brought about a steady decline in the occurrence and morbidity of catheter-associated urinary tract infection. But a sustained improvement will be observed if each and every physician asks himself, prior to every

catheterisation, whether the benefit of catheterisation in the particular case truly outweighs its formidable disadvantages. In our less than ideal world, where the perpetual race between progressive development of bacterial resistance and discovery of the newer and stronger antibiotics continue at a terrifying speed, even the most unyielding will perhaps agree that prevention is better than cure.

At any rate, it may be beneficial to have a second thought on the use of indwelling catheter in obstetrics and generate a more extensive carefully controlled study with comparable number of cases. Research in this field is surely worth the investment as it promises a good return of dividends in the way of reducing patient morbidity, saving hospital beds and easing the staggering cost of a highly subsidised health service.

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