Catheter-Associated Urinary Tract Infections: A Syllogism Compounded by a Questionable Dichotomy

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(See the article by Cope et al. on pages 1182–8)

Urinary tract infections (UTIs) account for ∼40% of all nosocomial infections [1] and ∼18%–25% of all nosocomial bacteremias [2]. Most UTIs (80%) are associated with indwelling urinary catheters. Numerous studies have shown that nosocomial UTIs are usually asymptomatic and are exceedingly difficult to eradicate as long as the catheter remains in place. Catheter-associated UTIs (CAUTIs) are considered to be complicated infections, because normal host defense mechanisms are compromised by the presence of a foreign body. Antimicrobial therapy is only transiently effective if the catheter remains in place. Superinfection is usually caused by multiresistant microorganisms. Catheters should be removed from patients suspected of having urosepsis and should be replaced only when needed to relieve obstruction or to measure urine output. Bacteriuria will often clear spontaneously after short-term catheterization. Antimicrobial therapy is most effective after the catheters are removed [2].

As reported in this issue of Clinical Infectious Diseases, Cope et al. [3] conducted a retrospective study of veterans who had a positive urine culture and an indwelling urinary catheter or a condom collection system. They concluded that antibiotics were used inappropriately in approximately three-fourths of asymptomatic catheterized patients and were used appropriately in almost two-thirds of symptomatic catheterized patients. Their conclusions are based on a syllogism and a questionable dichotomy.

The Centers for Disease Control and Prevention (CDC) uses the code UTI-SUTI for symptomatic UTIs and the code UTI-ASB for asymptomatic bacteriuria in patients with indwelling catheters [4]. Cope et al. [3] elected to use the terms symptomatic CAUTI and catheter-associated asymptomatic bacteriuria (CAABU). They assumed that antimicrobial therapy was appropriate for CAUTI but not for CAABU. Their argument is based on the following syllogism:

1. Asymptomatic bacteriuria in children and adults should not be treated.
2. Symptomatic UTIs respond well to appropriate antimicrobial therapy.
3. Patients with indwelling urinary catheters may have asymptomatic bacteriuria (i.e., CAABU) or symptomatic UTI (i.e., CAUTI).
4. Therefore, it is appropriate to treat CAUTI and inappropriate to treat CAABU.

This syllogism mistakenly extrapolates the first 2 statements from long-term studies involving patients with uncomplicated UTI [5] to the last 2 statements for catheter-associated infections. It is not logical to apply observations made in patients with uncomplicated infections to those with complicated infections. There is no reason to assume that the long-term outcomes of patients with CAABU and those with CAUTI would be different or that treatment would alter the natural history of catheter-associated infections—so long as the instrument remains in place.

The study was based on positive cultures of urine specimens obtained from patients with CAABU or CAUTI. This is a questionable dichotomy. The population should have consisted of a group of patients with a urinary drainage device, divided into those with CAABU and those with CAUTI; subdivided into culture negative, culture positive, and culture not done; and analyzed according to the use of antibiotics. Symptomatic patients were overrepresented in this study because they had a greater likelihood of having a positive urine culture. Patients with condom collection systems should have been excluded, because the pathogenesis of UTIs with these systems differs from that in indwelling urinary catheters.
Acutely ill patients are often treated with antibiotics for a variety of reasons other than symptomatic UTI. It is difficult to determine, from the lenient criteria used in this study, whether fever, leukocytosis, or altered mental status was caused by the indwelling catheter or by an infection at a distant site. Information is not provided on indications, choice of drug, dose, duration of therapy, use of antibiotics for treatment of other conditions, the presence of underlying diseases, and most importantly, whether the catheter was removed. Accordingly, we cannot determine from their data whether the use of antibiotics was appropriate in symptomatic, bacteriuric patients with a urinary drainage device. A better term would be “indeterminate.”

I prefer the term catheter-associated urosepsis rather than symptomatic CAUTI. The first steps to evaluate urosepsis are to remove the catheter, to determine whether it is obstructed by encrustations, and to ensure that the drainage system is working properly. Male patients should be carefully examined for epididymitis, orchitis, and prostatitis. The perineal areas of chronically ill patients, particularly diabetic patients, should be evaluated for cellulitis and necrotizing fasciitis. Blood and urine cultures should be performed. Urease-producing bacteria—Proteus, Providencia, and Morganella species—should be considered as potential pathogens in patients with alkaline urine and blocked catheters. Gram staining of the urine for detection of bacteria and yeasts may provide additional information. Fluids, electrolytes, and pressor drugs should be given as needed.

The role of antimicrobial therapy is more problematic. Although it seems reasonable to administer antimicrobial drugs to patients suspected of having urosepsis, it is doubtful that they would be effective as long as the catheter remains in place. Removal of the catheter may be all that is needed for clearance of transient gram-negative bacteremia in patients with mild or moderate urosepsis.

The study by Cope et al. [3], despite its defects, is helpful because it reminds us that antibiotics continue to be used inappropriately for patients with urinary collection devices. More importantly, it compels us to reconsider how best to evaluate and manage urosepsis in patients with indwelling catheters. Well-designed studies are needed to determine the conditions under which removal of catheters may be sufficient for male and female patients, when antimicrobial therapy is warranted, and how long to treat urosepsis. The mission of hospital infection control units is to decrease unnecessary and prolonged use of indwelling urinary catheters and to discourage inappropriate use of antibiotics. The research needs are to design and evaluate urinary drainage systems that do not obstruct the bladder and urethra and that block the passage of microorganisms around the drainage device [6].

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References