EDITORIAL COMMENTARY

Prosthetic Joint Replacement: Should Orthopedists Check Urine Because It's There?

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(See the Major Article by Sousa et al on pages 41–7.)

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Remote infection has long been considered a risk factor for prosthetic joint infection (PJI), a dreaded complication for orthopedic surgeons and patients who require joint replacement. Symptomatic urinary tract infection has been suspected as a cause of PJI in such patients, with little supportive evidence. There is concern that asymptomatic bacteriuria (ASB) could be another cause and that frail, elderly patients needing joint replacement might not express or manifest symptoms of urinary tract infection, placing them at untoward risk of PJI. Such concerns often lead surgeons to more vigilant screening.

Despite scant supporting evidence, preoperative screening with urinalysis and/or urine culture has been advocated to prevent ASB from causing PJI [1]. Noting lack of clarity on the issue, David and Vrahas [2] advocated 8–10 days of perioperative treatment of ASB. Preoperative treatment of ASB is common in some quarters, and is often considered a standard of care. Should it be?

To answer this question, several issues need to be addressed. First, does ASB itself constitute a risk for morbidity or mortality, or is it just a marker of vulnerability? In a seminal multicenter, observational study of ambulatory, elderly women, Abrutyn et al [3] found that 318 women with ASB were older, sicker, and had greater mortality than 1173 women without ASB. Multivariate analysis, however, showed that ASB was unrelated to mortality; in addition, treatment of ASB had no effect on mortality—early evidence that ASB is a marker of risk, rather than a risk factor itself.

Second, how reliable is a finding of ASB? The accuracy, reproducibility, and value of urinalysis [1, 4] and urine culture [4–6] have all been called into question. Trautner [6] notes that ASB represents differing conditions among patient groups differing in age, sex, and genetic and mechanical risks, and is caused by organisms of variable relevance. In the setting of acute cystitis in women, isolating *Escherichia coli* from a voided specimen is highly predictive of *E. coli* in a concurrent catheterized specimen, whereas enterococci and group B streptococci are unreliable predictors and rarely cause cystitis by themselves [5].

Treatment of ASB is commonplace, but indications for treatment of ASB are few [4]. With the exception of pregnant women and patients about to undergo invasive bladder procedures, ASB should not be treated. Lacking sufficient data, Infectious Diseases Society of America guidelines do not address management of ASB preceding joint replacement surgery.

So, does ASB affect risk of PJI? Ritter and Fechtman [7] cast doubt on this concept in 1987, prospectively studying pre- or perioperative ASB or urinary tract infection (UTI) in 277 patients undergoing hip or knee replacement. They found no correlation between PJI and any urinary tract complications. They buttressed their conclusions by retrospectively examining another 16 years of practice and found only a single episode of PJI occurring 20 months after ASB and concluded that ASB should not be a contraindication for total joint replacement. More recently, Cordero-Ampuero et al [8] surveyed urinalyses in 471 patients without urinary symptoms prior to hip arthroplasty. If urinalysis was abnormal, they obtained urine cultures and if ASB was detected, they randomized subjects to treatment or placebo. They determined that organisms found in the urine were dissimilar to organisms causing PJI and that no episodes of PJI could be linked to ASB. Furthermore, treatment of ASB had no effect on outcomes. Bouvet et al [9] found a similar

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lack of effect of ASB on PJI in 510 patients undergoing joint replacement and noted little bearing on symptomatic postoperative urinary tract infection.

In this issue, Sousa and coauthors [10] address several subsequent questions. In a prospective, observational study of almost 2500 patients undergoing hip or knee replacement in 3 large institutions in Spain, Portugal, and the United Kingdom, these authors confirmed a high prevalence of ASB (16.3% in women and 5.0% in men). Adjusting for known risk factors in a multivariate model (age, female sex, duration of surgery, obesity, diabetes, and American Society of Anesthesiologists score ≥3), ASB independently raised the risk of PJI >3-fold. As in prior studies, treatment of ASB did not affect that risk. Most importantly, in the 13 patients who had both ASB and PJI, the causative organisms did not match at all. This suggests that preoperative testing for ASB identifies a marker for increased risk of infection, but does not predict a causative organism. Furthermore, prophylaxis intended to mitigate that risk has no clinical utility. These results reaffirm, in more robust fashion, the conclusions of smaller preceding studies [8, 9].

This report has several limitations. Although it is not a randomized, controlled trial, it is the largest prospective survey of its kind. The multicenter design enhances generalizability, although it is unclear how well each institution represents practice within its native country and how much the variation in practice observed between sites affects outcomes. Less rigorous data collection at some sites limits the capacity of their multivariate analysis to adjust for comorbidities. Nonetheless, it provides a significant basis for countering a common practice with no apparent utility.

Future studies should carefully assess adverse effects of ASB screening. Inappropriate treatment of ASB is rightfully garnering attention as a major contributor to antimicrobial resistance. Treatment of any positive culture remains a dominant practice in medicine despite advice to the contrary, as is certainly the case for ASB [4]. This practice risks adverse drug reactions and alters native flora, thereby increasing risks of *Clostridium difficile* infection and antibiotic resistance [11, 12], with widespread ecologic effects [6]. Candidates for joint replacement, by virtue of their demographics and comorbid illnesses, are already at increased risk of carrying methicillin-resistant *Staphylococcus aureus*, extended-spectrum β-lactamase–containing organisms, or carbapenem-resistant Enterobacteriaceae. Unnecessary antibiotic use only exacerbates this risk, whereas reduction of excessive antibiotic use can produce both direct and indirect effects leading to reductions in *C. difficile* infection [13]. There is emerging evidence that treating postmenopausal women with ASB not only fails to change the frequency of symptomatic UTI, but may in fact predispose to recurrent UTI and greater resistance in women [14] and in men [12], negating a potential protective effect of ASB [14].

Finally, unwarranted cost cannot be ignored. Lawrence et al [15] estimated 25 years ago that United States orthopedists spent $7 000 000 on screening urinalyses alone, while avoiding <5 PJIs, at a cost of >$1 500 000 for each infection prevented. A modern study incorporating calculation of wasted culture, antibiotic, and labor costs could only dwarf Lawrence et al's figures.

In summary, the balance of evidence favors eliminating preoperative treatment of ASB as potentially hazardous and devoid of benefit. Several interventions have been proposed promoting the "less is more" ideal [12], ranging from simple elimination of orders for preoperative ASB screening to incorporating behavioral economics and implementation science to promote change [16]. In a proof-of-concept study, Leis et al [11] reduced treatment of ASB 36% by no longer routinely reporting urine culture results in low-risk, noncatheterized patients. Gross and Patel [17] suggest creating a performance measure for not treating ASB, arguing that lengthy and detailed published guidelines often have little immediate impact on clinical practice. This would require a convincing evidence base, perhaps requiring randomized, controlled trials. The study by Sousa et al [10] lends substantial weight in that direction. Until such trials can be completed, preoperative screening for ASB is difficult to justify and should be avoided, apart from careful research protocols.

Note

Potential conflicts of interest. Author certifies no potential conflicts of interest.

The author has submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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