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URINE ANALYSIS IN URINARY TRACT INFECTIONS IN CHILDREN

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Annotation

In infants and children, the urinary tract is a relatively common site of infection. Urinary tract infections (UTIs) result in significant acute morbidity as well as long-term medical problems including delayed hypertension and progressive renal dysfunction. Accurate diagnosis and timely treatment are vital in limiting these long-term sequelae, because the pediatric kidney is particularly susceptible to scarring and permanent renal damage.

Key words:

The diagnosis of UTI is predicated on obtaining a good urinary specimen, which can be difficult in children. Routinely, there are four ways that urinary specimens are obtained in children. In order of least to most reliable for UTI diagnosis, they are plastic bag attached to the perineum ("bagged specimen"), midstream void, catheter specimen, or a suprapubic bladder aspirate. A plastic bag specimen, despite thorough skin cleansing, usually reflects the perineal and rectal flora and can yield false-positive results. Although a midstream voided specimen in a circumcised boy, older girl, or older uncircumcised boy who can retract his foreskin may reliably represent the urine, such specimens obtained in young girls and uncircumcised boys usually reflect periurethral and preputial organisms and cells. A catheterized specimen is reliable if the first portion of urine, which may contain urethral organisms, is discarded and the specimen is taken from later flow through the catheter; however, catheterization can be traumatic and can potentially introduce urethral organisms into the sterile urinary tract. The most reliable urinary specimen for culture is obtained by suprapubic bladder aspiration. This can be performed safely in children and even in premature infants with a full bladder by cleansing the skin and percutaneously introducing a 21- or 22-gauge needle 1 to 2 cm above the pubic symphysis until urine is obtained by aspiration into a sterile syringe. Because

the urine does not cross the urethra, urethral and periurethral organisms are absent, and skin contamination should be nil. Organisms present in a suprapubic aspirate are pathognomonic of bacteriuria. The main drawback of suprapubic aspiration is that needle aspiration may be distasteful or inconvenient to the older child, parent, or even physician, and these considerations may be important. The application of a local anesthetic cream, such as topical lidocaine and prilocaine, provides excellent analgesia prior to suprapubic aspiration in young children. In a child who is not yet toilet trained, only a catheterized or needle-aspirated specimen is acceptable for diagnosis. Assuming that the prevalence of UTI is 2%, the false-positive rate for bagged specimens is approximately 93%, based on a summary of the literature. Under special collection circumstances, when the perineum is cleaned well and the bag is removed and processed promptly after voiding, a “bagged” specimen or even a diaper specimen showing no growth may be useful in eliminating bacteriuria as a possibility. Plastic bag specimens are unacceptable for diagnosis of UTI in high risk populations and in infants younger than 2 months old.

Urinalysis The gold standard for the diagnosis of UTI is quantitative urinary culture. Yet, controversy exists regarding the interpretation of urinalysis and culture results. Four determinations from the urinalysis may be useful in supporting a diagnosis of UTI: (1) microscopic urinary examination for white blood cells (WBCs), called “pyuria”; (2) microscopic urinary examination for bacteria; (3) urinary leukocyte esterase; and (4) urinary nitrite. The microscopic identification of bacteria in the urine is more sensitive and more specific for diagnosing UTI than is identification of pyuria. The finding of urinary sediment red cells and WBC casts is even less reliable. Hoberman and associates proposed the use of an “enhanced urinalysis,” in which an uncentrifuged specimen is examined for WBCs and a Gram stain is performed for bacteria, with pyuria defined as the presence of greater than 10 WBCs/mm3. For identifying positive urine cultures, those with greater than 50,000 colonyforming units (CFU) per milliliter, this method produced a sensitivity of 84%, compared with 66% for standard urinalysis. Urinary leukocyte esterase detects urinary esterases produced by the breakdown of WBCs in the urine, yet WBCs may not be present with the infection. The test may be less reliable in infants. The urinary nitrite test measures dietary nitrates that are reduced to nitrite by many gram-

negative urinary bacteria and has a high specificity. (Most gram-positive bacteria do not perform this reduction.) A serious drawback of this test is that the bacterial reduction to nitrite may take several hours; therefore, this test is most useful on first morning voided specimens. Although both tests may be performed by dipstick in the urine, the tests are more unreliable when the bacterial count is lower than 100,000 CFU/mL. No combination of urinary tests meets the gold standard of culture, but several tests may help predict patients in whom culture will be positive.

All I all, in a more general child population, others have shown that, when urinary specimens are properly collected and promptly processed, positive leukocyte esterase and nitrite tests, in combination with microscopic confirmation of bacteria, have 100% sensitivity for detection of UTI. When all tests (or leukocyte esterase and nitrite tests) are negative, the negative predictive value approaches 100%. In febrile children 3 to 24 months old, a risk-benefit analysis based on the current literature, which had the goal of preventing the majority of cases of UTI-related ESRD and hypertension, concluded that both urinalysis and culture are needed to optimize prevention.

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