Use of dipsticks for routine analysis of urine from children with acute abdominal pain

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Urinary tract infections are common in infancy and childhood and may indicate an underlying urological problem requiring treatment. The standard method for the diagnosis of urinary tract infection remains the microscopic examination and quantitative culture of a clean catch specimen of urine, but recently a dipstick has become available that tests for two markers of infection—leucocyte esterase and nitrites. Leucocyte esterase is an enzyme from neutrophils not normally found in urine and is a marker of pyuria. Nitrites are produced in urine by the bacterial breakdown of dietary nitrates. Almost all urinary pathogens reduce nitrates to nitrites except for certain pseudomonads and group B streptococci.[1]

The dipsticks have been tested extensively in adults[2] but there are few reports of their use in children. Wiggelinkhuizen *et al* compared dipstick testing with formal urine analysis of 1137 children and concluded that the dipsticks were a reliable screening technique.[3] Other groups have also recommended that dipsticks be used instead of urine analysis for rapid screening of children for urinary tract infection since negative results for leucocyte esterase and nitrites indicated the absence of infection.[4,5] The routine use of dipsticks for screening children's urine is not widespread in the United Kingdom, and so we have retested them to determine whether they should be adopted for primary screening.

Patients, methods, and results

Between November 1992 and January 1993 we tested 133 urine samples with the dipsticks (Multistix 10SG, Bayer, Newbury) in our paediatric surgical department. We did not alter our pre-existing criteria for the selection of patients for urine testing: most were children with acute abdominal pain, whose urine was routinely tested. Their mean age was 8·1 years (range 1 month to 15 years), and 71 (53%) were girls. About 86% of the urine samples were taken mid-stream with the rest from a bag or catheter. A positive result was recorded if more than a trace of leucocyte esterase was detected or if any colour change for nitrites occurred.

Comparison of using dipstick to test urine samples for markers (leucocyte esterase and nitrites) with urine analysis. Values are numbers

	Urine analysis		
Screening with dipstick	Infected	Not infected	Total
Both markers positive	10	0	10
One marker positive	2	14	16
Both markers negative	0	107	107
Total	12	121	133

We detected 12 urinary tract infections based on criteria of >20 white blood cells per μl and $>10^8$ organisms per litre of a pure culture. Ten of these were positive for both leucocyte esterase and nitrites, and two were positive for just leucocyte esterase. Eight samples gave inconclusive bacteriological results, and none of these registered positive for leucocyte esterase or nitrites. The table shows that the positive predictive value of the dipstick for an infection of the urinary tract was 100% if both leucocyte esterase and nitrites were detected. The dipstick's predictive value for infection was 12·5% (2/16) if only one of the markers was positive. The dipstick's negative predictive value was also 100%—absence of leucocyte esterase and nitrites excluded infection of the urinary tract.

Comment

Our study has confirmed previous reports that testing of urine with the dipstick is an effective method of screening urine samples for infection. The absence of both leucocyte esterase and nitrites in a urine sample confirms its sterility; the presence of one of the markers indicates a possible infection of the urinary tract; and the presence of both confirms infected urine. We advocate the use of dipsticks, particularly for children with acute abdominal pain, as a quick and reliable means of excluding infection of the urinary tract as a cause of the symptoms. A urine sample should be sent for formal urine analysis only if one or both markers are positive. We would not, however, advise the use of dipsticks as the sole means of diagnosing infection in children with more complex renal problems, when infection with non-nitrite producing organisms, such as pseudomonads and group B streptococci, is a real possibility.

A final factor for consideration is cost. Routine processing of a midstream urine specimen costs over £5, a dipstick about 15p. If routine use of dipsticks for screening urine became widespread the financial savings would be considerable.

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Invasive procedures in children receiving intensive care

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Infants and children receiving intensive care are inevitably subjected to invasive procedures. The youngest of these children—the largest group receiving intensive care—may be less able than adults to limit the number of procedures performed or ensure adequate analgesia. With unresolving illness, parents may be unable to make objective decisions about continuing intensive care and carers may focus on system failure and lose sight of the child as a whole person. It is our impression that children having prolonged intensive care are more likely to die, survive with serious neurological problems, or behave as if they have suffered non-accidental injury.

This pilot study attempted to audit invasive procedures and their management in a sample of children receiving intensive care.

Patients, methods, and results

During six months nurses were asked to record on special forms every invasive procedure performed on the 96 patients who spent three days or more in the