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Hutchings F, Jadresić L. GPs should evaluate all children following UTI.
Practitioner 2010; 254 (1731): 17–21

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Medical Publishing Ltd

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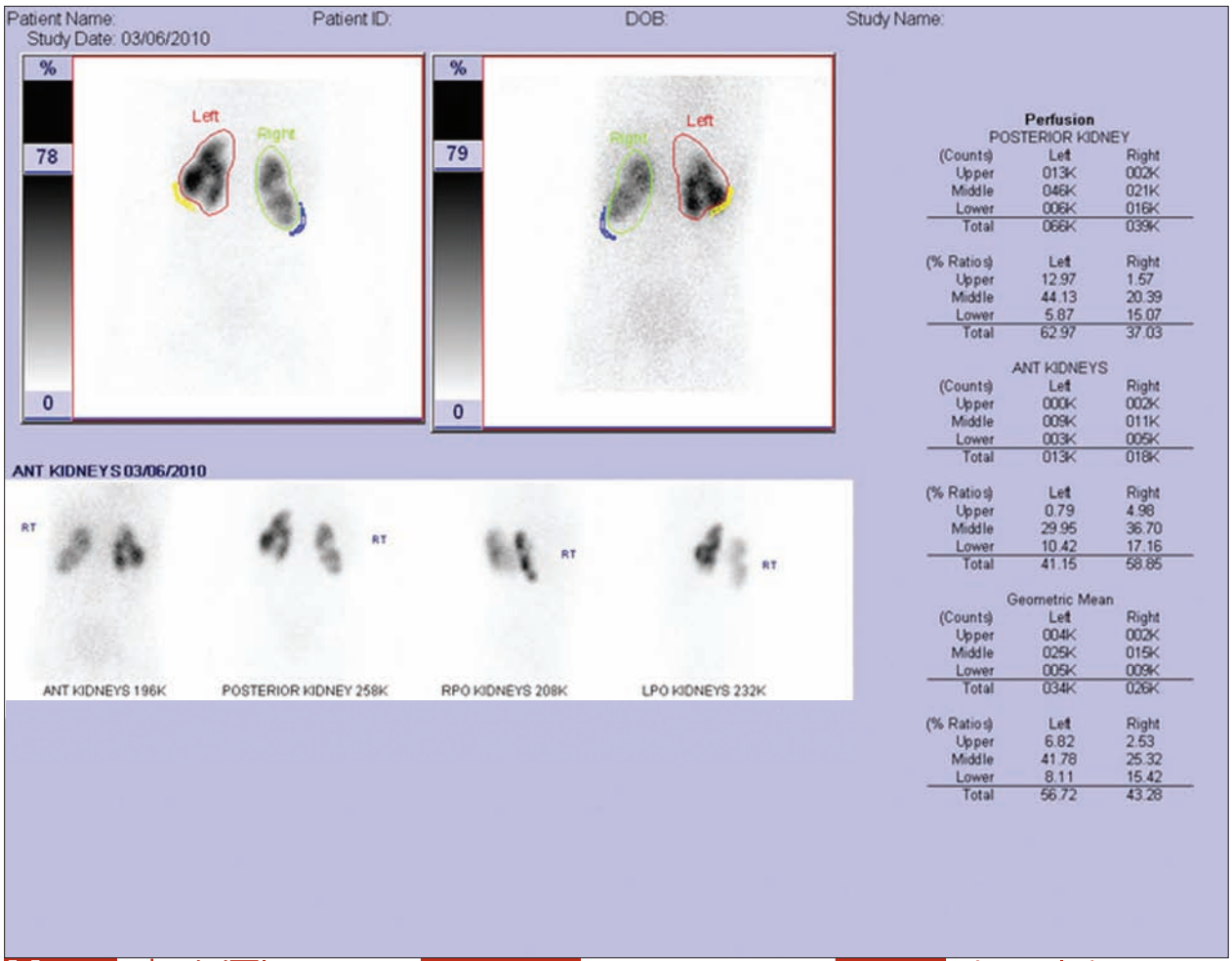


FIGURE 1
DMSA scan showing bilateral scarring in a child with recurrent UTIs

How do UTIs present in children?

URINARY TRACT INFECTIONS (UTIs) ARE COMMON IN CHILDREN IN THE COMMUNITY. Epidemiological data from the UK and Sweden suggest that 10% of girls and 3% of boys will have had an infection by 16 years of age.[1,2] The majority are acute, isolated illnesses that resolve quickly, with no long-term implications for the patient. However, UTIs may be associated with underlying congenital abnormalities, and recurrent infections can lead to renal scarring. Failure to consider the diagnosis, or investigate appropriately following a diagnosis, may therefore result in long-term damage.

Which patients should be referred?

PATHOPHYSIOLOGY

UTI is defined as bacteriuria in the presence of symptoms.[2] The threshold for significant bacterial growth is generally regarded as > 10^5 colony forming units/ml. It is important to note that asymptomatic bacteriuria (the presence of significant bacterial growth, with or without pyuria, in a child who is entirely well with a normal clinical examination) does not require treatment or investigation.[3] »

How should cases be followed up?

Table 1

Clinical evaluation following UTI

How old is the child?
All children under 6 months need imaging and we would recommend that they are referred to the paediatric clinic.

Has the child had previous UTIs and if this is the case have they been cystitis/lower or pyelonephritis/upper UTI (e.g. febrile UTI)?
A child warrants renal imaging after three UTIs if they have all been lower tract episodes or after two UTIs if at least one has been an upper tract episode.
The investigations consist of both a renal ultrasound and a DMSA scan and possibly a micturating cystourethrogram (MCUG) in selected cases.
NICE recommends that children with recurrent UTIs should be referred in any case to a paediatric specialist.

Is there a history of antenatal abnormality or family history of vesicoureteric reflux or renal disease?
If this is the case the child should be referred to the paediatric clinic.

Does the child have a poor urine flow?*
If so an urgent referral should be made to the paediatric clinic.

Examination*
- Is there an abdominal mass or a palpable bladder?
- Is the examination of the spine and the lower limbs abnormal suggestive of a spinal lesion?
- Is the child's growth abnormal?
- Is the blood pressure abnormal?

If the answer to any of these questions is Yes, the child needs to be referred to the paediatric clinic.

Did the child take longer than 48 hours to respond to the appropriate antibiotics (i.e. to the antibiotic to which the bacteria were reported as sensitive)?*
Discuss this child on an urgent basis with the paediatricians as an obstructive uropathy needs to be ruled out.

Was the child seriously ill with the UTI (e.g. in shock), has the child had an elevated creatinine?*
These children would have been admitted to hospital and renal investigations would have been started during the acute admission.

Was the UTI caused by an organism other than *E. coli*?*
UTIs caused by organisms other than *E. coli* are more likely to be associated with obstructive uropathy, hence the need for imaging.

*= 'atypical UTI'[2]

Uropathogenic *E. coli* (UPEC) account for 70-90% of community-acquired UTIs. These bacteria possess virulence factors that attack the uroepithelium.[4] Causative organisms other than *E. coli* rely more heavily on host factors (such as structural renal tract abnormalities or renal calculi) and are regarded as atypical infections. Further investigation is required and is outlined below.[5]

PRESENTATION

Presentation is extremely variable and this may be a factor in the underdiagnosis of UTIs. In infancy, non-specific fever is by far the most common way for UTIs to present.[1] The only way to differentiate a UTI from a viral infection is by testing the urine and a key recommendation from NICE is that this should be carried out within 24 hours in children with non-specific fever.[2]

Children may also present with a vomiting illness, failure to thrive or persistent irritability. Older children may present with other systemic symptoms such as loin pain. It is also important to consider the diagnosis of UTI in a febrile child with an alternative focus who remains unwell. A urine infection in the presence of any of the above symptoms is a pyelonephritis (upper UTI).

Children may present with the classical symptoms of cystitis (lower UTI) such as urinary frequency, dysuria and abdominal pain.[2]

Most children with UTI, even if febrile, can be managed in the community. However, if the initial clinical assessment shows the child to be at high risk of serious illness,[6] there should be an urgent referral to the local paediatric service. The same applies to any infant under the age of three months with suspected UTI.[2]

'When oral therapy has been started, parents should be advised that the child needs reassessment if he or she remains unwell after 48 hours'

COLLECTION OF URINE SAMPLES

It is far better to obtain a urine sample by catching it in a sterile container (the clean catch method), after the perineum has been washed normally. If the child is still in nappies, ideally the sample should be obtained 20 minutes or so after a drink. It may be possible to stimulate micturition by tapping with a finger over the abdominal area overlying the bladder.

The contamination rate is significantly lower with the clean catch method than using either urine pads or bags. NICE could not make a definitive recommendation regarding either of these latter two collection methods given the lack of adequate studies.[2] However, urine pads are more user friendly and the contamination rate has been shown to decrease if they are changed every 30 minutes.[7]

The urine specimen can be refrigerated at 5°C if it cannot be set up for culture within four hours. Boric acid can be used as a preservative but for no longer than 24 hours.[2]

Table 2

Summary of indications for renal imaging[2]

- Infants under 6 months of age: ultrasound (US) followed by MCUG in some cases
- Atypical infection (see table 1, p18): US and DMSA ±MCUG, unless the child is older than 3 years when initially only US
- Recurrent infections (see table 1, p18): US and DMSA in all ages

Table 3

Preventing recurrence of infection

- Dysfunctional elimination syndromes and constipation[10,11] should be identified through the history and examination and should be addressed
- Advice should include encouraging the child to drink plenty of fluids and not to delay voiding
- Parents should be advised on the symptoms of UTI and on the importance of prompt medical assessment if they feel that the child has developed a further infection

DIPSTICKS

Leucocyte esterase and nitrite dipsticks are widely used as a rapid test for UTI. After assessing the evidence, NICE came to the view that when used in combination, their use was reliable in children aged three years and older. In this age group, a negative leucocyte esterase result with a negative nitrite confidently rules out UTI. If both are positive UTI can be ruled in. Dipsticks are not reliable in children under three years of age, so a negative dipstick result does not rule out UTI. Therefore, in this age group all urine specimens should be sent to the laboratory for microscopy and culture regardless of the dipstick result.

TREATMENT

Cystitis can be treated with a three-day course of antibiotics such as trimethoprim or nitrofurantoin. Pyelonephritis should be treated with a 7-10 day course of antibiotics. Trimethoprim, but not nitrofurantoin, is often suitable. *E. coli* resistance to amoxicillin is now too high to recommend it as a first-line antibiotic in either lower or upper UTI. In either instance we would strongly recommend close liaison with the local microbiology laboratory and locally agreed antibiotic guidelines should be followed.

Children with persistent vomiting, those with circulatory shock and those with known potential obstruction, such as hydronephrosis, require urgent referral to paediatric services for initiation of intravenous therapy.

When oral therapy has been started, parents should be advised that the child needs reassessment if he or she remains unwell after 48 hours. Urine culture should be repeated at this point and the child should be referred to paediatric services for clinical assessment and renal ultrasound (US) to exclude urinary tract obstruction.[8,9]

REFERRAL AND FOLLOW UP

The single most important difference between the guidelines published by NICE in 2007[2] and those published in 1991 by the Royal College of Physicians is that it is no longer deemed necessary for every child to be automatically referred to the paediatric clinic after a first UTI. The NICE criteria for renal imaging are selective and the onus falls mainly on general practice to determine which children need further investigation.

NICE recommends that every child should be evaluated after a UTI, see table 1, p18. This will help determine which children require renal imaging, see table 2, above, as well as identifying triggers for recurrent UTIs. Table 3, above, summarises information on prevention and gives advice for parents.[2]

The implementation of the NICE guidance represents a major challenge for GPs who are central to the identification of children at risk of renal pathology. It is important to ensure that all children who are appropriately diagnosed and treated for a UTI are also assessed for risk of renal abnormalities and/or recurrence, as outlined in tables 1, p18, and 2, left. If this key recommendation is not implemented, children who are not only at risk of recurrence but who should also undergo renal imaging may fail to be identified.

‘All children who are appropriately diagnosed and treated for a UTI must also be assessed for risk of renal abnormalities and/or recurrence’

This clinical evaluation may involve a significant change in practice, namely the need in many cases for a further clinical consultation once the acute episode has passed. Ideally, there should be dialogue between primary and secondary care, with input from the local microbiology and radiology departments, to find efficient and cost-effective ways for the implementation of this guidance. »

key points

SELECTED BY

Dr Peter Saul
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Ten per cent of girls and 3% of boys will have had a UTI by 16 years of age. The majority are acute, isolated illnesses that resolve quickly, with no long-term implications for the patient. However, UTIs may be associated with underlying congenital abnormalities, and recurrent infections can lead to renal scarring. UTI is defined as bacteriuria in the presence of symptoms. Asymptomatic bacteriuria does not require treatment or investigation.

The presentation of UTI is extremely variable. The only way to differentiate a UTI from a viral infection is by testing the urine and this should be carried out within 24 hours in children with non-specific fever. UTIs can also present with vomiting, failure to thrive or persistent irritability. A urine infection in the presence of any of the above symptoms is a pyelonephritis (upper UTI). Children may also present with classical symptoms of cystitis (lower UTI) such as urinary frequency, dysuria and abdominal pain.

Most children with UTI, even if febrile, can be managed in the community. However, if the initial assessment shows the child is at high risk of serious illness, there should be an urgent referral to the local paediatric service. The same applies to any infant under three months of age with suspected UTI.

It is better to obtain a urine sample by catching it in a sterile container, rather than using urine pads or bags. Leucocyte esterase and nitrite dipsticks are not reliable in children under three years, so a negative dipstick does not rule out UTI in this age group.

Not every child needs to be referred after a first UTI. However, they should all be evaluated to help determine which require renal imaging as well as identifying triggers for recurrent UTIs. GPs are central to the identification of children at risk of renal pathology. All children who are appropriately diagnosed and treated for a UTI must be assessed for risk of renal abnormalities and/or recurrence.

CONCLUSION

The diagnosis of UTI is challenging particularly in infants and young children. A non-specific fever is the most ubiquitous symptom and a diagnosis of UTI should be sought by testing the urine. All children who have had a diagnosis of UTI need to be individually assessed so that risk of recurrence and/or significant underlying pathology is identified.

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