

Urinary tract infections in children

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Abstract

Urinary tract infections (UTI) are a common problem in childhood. The clinical presentation is variable depending on age and whether there is pyelonephritis or cystitis. UTI are diagnosed by culturing an appropriately collected urine sample. Most children with UTI can be managed safely with oral antibiotics irrespective of whether they have cystitis or pyelonephritis. Following a single UTI a significant proportion of children will develop recurrent UTI and many of these children will have identifiable risk factors. Treating children with recurrent UTI with repeated courses of antibiotics or long term prophylactic antibiotics puts patients at risk of infections with multi-resistant organisms. Furthermore recurrent UTI are also associated with the risk of renal parenchymal damage with long term health implications. It is therefore essential that management of children with UTI focuses not only on early diagnosis and treatment but also on UTI prevention.

Keywords antibiotics; children; cystitis; pyelonephritis; urinary tract infection

Introduction

Urinary tract infections (UTI) are a common problem in childhood. The clinical presentation is variable depending on age and whether there is pyelonephritis (upper UTI) or cystitis (lower UTI). Children and young people can become significantly unwell with UTI especially infants and those with pyelonephritis. An important complication of UTI is renal parenchymal damage or renal scarring. A significant proportion of children that have suffered with a single UTI will develop recurrent UTI. This is often, but not always, related to underlying urinary tract abnormalities. Children with recurrent UTI are at greater risk of developing renal scars. Furthermore the current conservative management strategies used in recurrent UTI including repeated treatment courses of antibiotics or daily prophylactic antibiotics can lead to antimicrobial resistance. It is therefore essential that the management of children with UTI focuses not only on early diagnosis and treatment but also on UTI prevention.

Epidemiology

Studies have suggested a pooled prevalence of UTI of 7% in infants and children under 2 years of age presenting with fever. The prevalence appears to be greater in males under 3 months of age particularly if they are uncircumcised. As children get older,

there is an increasing female preponderance for UTI although the overall frequency reduces.

Definition

UTI are defined as a pure growth of bacteria (10^4 – 10^5 colony forming units/ml) in an appropriately collected urine sample from a child or young person with clinical symptoms consistent with a UTI.

Pathogenesis

Escherichia coli (*E. coli*) is the most common uropathogenic organism accounting for approximately 80% of UTI. Other Gram negative organisms causing UTI in children include *Proteus* spp, *Klebsiella* spp and *Enterobacter* spp. UTI with Gram positive organisms are less common and often associated with catheterisation.

The pathological organisms seen in UTI are commonly found in the gastrointestinal tract and this supports the hypothesis that UTI result from these bacteria ascending into the bladder and urinary tract. Once bacteria are within the bladder they appear to be able to adhere to the bladder epithelium (urothelium) ultimately causing an inflammatory response and infection. The infection can spread to the kidneys especially if there is underlying vesicoureteric reflux.

Between 12 and 30% of children that have suffered with a single UTI will develop recurrent infections. Whilst bacteria ascending into the bladder and causing UTI seems plausible for a single UTI, this mechanism seems a less convincing pathological process in those suffering from recurrent infections. There are recognised risk factors for recurrent UTI (Table 1) including structural abnormalities like vesicoureteric reflux. Interestingly, children with similar structural abnormalities have a variable propensity to developing recurrent UTI and there are some children with an apparently normal urinary tract and no identifiable risk factors that suffer with recurrent infections. These observations would suggest that there are additional factors that predispose some children to recurrent UTI. There is increasing interest into the role of urothelium and the possibility that it has an innate immune function in addition to its barrier function. The molecular level interaction between urothelium and bacterial pathogens may well be a contributing factor to the recurrent infections seen in some children and young people.

Presentation

A thorough clinical assessment is required to identify the clinical signs and symptoms of UTI (Table 2) as well as any potential risk factors (Table 1). Diagnosis in infants can be particularly difficult as the signs and symptoms are non-specific. Making a diagnosis of UTI in this age group requires a high index of clinical suspicion.

In older children symptoms and signs may help localise the infection. Children with cystitis are usually afebrile, have suprapubic pain/discomfort, dysuria, frequency and incontinence, whereas those with pyelonephritis tend to have fever, loin pain/tenderness, rigors and generalised systemic upset.

Diagnosis

Diagnosis of UTI is made by culture of an appropriately collected urine sample. Whilst obtaining a urine sample for culture is

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Risk factors for UTI in children

Age less than 1 year
 Uncircumcised males
 Constipation
 Poor fluid intake
 Structural abnormalities e.g. vesicoureteric reflux, obstructive uropathy
 Dysfunctional voiding pattern
 Poor toilet hygiene
 History of UTI

Table 1

essential to making the diagnosis and guiding antibiotic therapy, obtaining a sample should not delay treatment in those children that are clinically unwell or septic. In older children that are toilet trained, a clean catch urine is the preferred method for obtaining a urine sample. Obtaining a clean catch urine in infants and younger children in a busy emergency department or paediatric assessment unit can be stressful for parents, time consuming and lead to delays in administration of appropriate treatment. In many paediatric centres urine samples in infants are obtained by urethral catheterisation. Catheterisation requires trained staff and sterile equipment. The procedure can introduce infection or cause urethral trauma so its routine use requires careful consideration.

Clinical signs and symptoms in children with a UTI

Signs and symptoms					
< 3 months					Poor feeding Faltering growth Irritability Jaundice
3 months – 3 years	Fever	Haematuria	Vomiting	Lethargy and malaise	Irritability Abdominal pain Incontinence
>3 years					Abdominal pain Loin tenderness Incontinence Frequency Dysuria

Table 2

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