

Urinary tract infection in small children: aspects of bacteriology, vesicoureteral reflux and renal damage

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- I. Swerkersson S, Jodal U, Sixt R, Stokland E, Hansson S. Relationship among vesicoureteral reflux, urinary tract infection and renal damage in children. *J Urol*. 2007;178: 647-51.
- II. Swerkersson S, Jodal U, Åhrén C, Hansson S. Urinary tract infection in small outpatient children: the influence of age and gender on resistance to oral antimicrobials. *Eur J Pediatr*. 2014;173: 1075-81.
- III. Swerkersson S, Jodal U, Åhrén C, Sixt R, Stokland E, Hansson S. Urinary tract infection in infants: the significance of low bacterial count. *Pediatr Nephrol*. 2016;31: 239-45.
- IV. Swerkersson S, Jodal U, Sixt R, Stokland E, Hansson S. Urinary tract infection in small children: the development of renal scarring over time. Submitted



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Background: Urinary tract infection (UTI) is a prevalent bacterial infection in children. The diagnosis is based on growth of bacteria in urine specimen and treatment is chosen out of knowledge of the present antimicrobial resistance situation. Vesicoureteral reflux (VUR) is a well-known risk factor for UTI in children. Besides acute discomfort of UTI, long-term consequences associated with renal damage may occur.

Research questions: What is the relation between UTI, VUR and renal damage? How has bacterial resistance to oral antimicrobials changed over time? What is the significance of a low bacterial count? How does renal damage develop over time?

Methods: The study was retrospective, population-based and included children below 2 years of age with first time symptomatic UTI. The data files were analyzed. Recorded were clinical and laboratory parameters at index UTI including symptoms, duration of fever, highest measured temperature, highest C-reactive protein, sampling method, bacterial count, bacterial findings, antibacterial resistance, treatment and occurrence of recurrent UTI. All radiological and scintigraphic investigations were reexamined. The grade of VUR and renal damage was classified.

Results: A significant relationship between renal damage and severity of VUR was found. During a 10-year period the *E.coli* resistance to trimethoprim increased from 5 to 17%, while it remained unchanged low to nitrofurantoin and cefadroxil. Bacterial count below the significant level of 100.000 CFU/mL was found in 19% of the children and these children had similar rate of high grade VUR and renal damage as those with higher bacterial number. In children with renal damage 19% had regressed and 19% progressed at a median follow-up time of 8 years. Those who progressed had more severe renal damage at the index DMSA scan, a higher rate of VUR grade III-V and more often recurrent UTI.

Conclusions: Children with high grade VUR are risk subjects for permanent renal damage. The *E.coli* resistance to trimethoprim has increased significantly and trimethoprim is no longer appropriate as a first-line drug for empirical treatment. The possibility of UTI should be considered also with low bacterial count. This information should also be considered in the development of new guidelines. Children with severe renal damage, high grade VUR and recurrent UTI are at risk for progression of renal damage.

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