

Prediction of Vesicoureteral Reflux by Ultrasonography and Renal Scan in Children

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Abstract

Background. In recent studies, renal ultrasonography and dimercapto-succinic acid (DMSA) scan have a role in predicting vesicoureteral reflux in children with febrile urinary tract infection (UTI). **Materials and Methods.** Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), and negative likelihood ratio (NLR) were defined for ultrasonography and DMSA scan to predict vesicoureteral reflux in 70 children with febrile UTI. **Results.** Renal ultrasonography sensitivity, specificity, PPV, NPV, PLR, and NLR for vesicourethral reflux prediction was 0.57, 0, 1, 0, 0.57, and 0.47 and sensitivity, specificity, PPV, NPV, PLR, and NLR of DMSA scan for predicting vesicourethral reflux was 0.75, 0.9, 0.33, 0.98, 7.5, and 0.27, respectively. **Conclusions.** Ultrasonography cannot predict the presence of VUR, but DMSA scan has a good sensitivity in this context. Therefore, by observation of DMSA scan results, it can be decided whether to perform VCUG or not.

Keywords

urinary tract infection, diagnostic imaging, vesicoureteral reflux, ultrasonography, 99m Tc DMSA

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Introduction

Urinary tract infection (UTI) is one of the most common bacterial infections in children, accounts for 4% to 8% of childhood febrile illnesses.¹ By the age of 7, 8.4% of girls and 1.7% of boys have symptomatic UTI once or more.² Late diagnosis and inadequate treatment of UTI may lead to renal scarring, chronic renal failure and hypertension.³ The prevalence of renal scarring following acute pyelonephritis is between 15% and 38.2%.^{4,5} The most common risk factor for pyelonephritis in children is vesicoureteral reflux (VUR).⁶ Nearly half of the children with renal scars have VUR,⁵ also renal scar progression is more prevalent in VUR grade III-V.⁷ Voiding cystourethrogram (VCUG) is performed for VUR diagnosis,⁶ but it accompanied radiation exposure.⁴ VCUG is an invasive procedure and less than half of the children with UTIs have VUR,^{5,8,9} so researchers are looking for other ways to avoid unnecessary VCUG. One of these strategies is to use ultrasound and dimercapto-succinic acid (DMSA) renal scan for predicting of renal scars.¹⁰ This study was performed to determine the value of renal ultrasound and DMSA renal scan in predicting VUR in children with the first Febrile UTI.

Methods

In this cross-sectional study, we studied infants and children with febrile UTI hospitalized in Qazvin Children's Hospital affiliated to Qazvin University of Medical Sciences (Qazvin-Iran) in 2018 to 2019. Sample size was calculated 70 febrile UTI children based on two-sided confidence level (1- α) equal to 0.95 and at 80% power.¹¹ Sampling was performed sequentially until the required sample size was completed.

Infants and children aged over 1 month and less than 12 years with the following conditions were included in the study. Clinical and laboratory diagnosis of febrile UTI based on fever with axillary temperature greater than 38°C, symptoms of urinary irritation, abdominal and flank pain. In addition, with urine analysis including:

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