Imaging in Febrile Urinary Tract Infections – Area of Debate

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Vesico-ureteric reflux (VUR) is an abnormal flow of urine from bladder to one or both ureters and sometimes to kidneys at the time of micturition. VUR is most common in infants and young children. Primary VUR, is most common in children due to developmental defect in the valve which prevents urine from flowing backward from the bladder into the ureters. Secondary VUR is due to anatomical or functional obstruction in the bladder or urethra which causes urine to flow backward into the kidneys.

Urinary tract infection (UTI) is a common manifestation of vesico-ureteric reflux. In a large retrospective study, the prevalence of VUR was estimated at 37% in children with UTI and 34% without UTI [1]. Presence of moderate-to-severe reflux is associated with pyelonephritis, reflux nephropathy, long term complications of hypertension and end stage renal disease. As VUR is detected on investigations that are carried out after an episode of febrile UTI (fUTI), there is a need of detailed evaluation protocols and risk stratification for VUR to prevent morbidity.

According to the current guidelines, further imaging is indicated after fUTI, depending on findings of sonography, sex of the child and clinical course of the infection [2]. Top-down approach (TDA) or bottom-up approach [Voiding-cystourethrography (VCUG)] are recommended for diagnosis but a uniform approach is still the area of search.

Study published in this issue of the journal by Roesch et al. [3] advocates the use of multi-parametric tool, as imaging approach for detection of VUR after fUTI.

VCUG remains the modality of choice, for defining the presence, grade, and possible impact of VUR. Ongoing attempts to standardize this modality for usage are underway [4]. The primary techniques in evaluation remain as Dimercaptosuccinic acid (DMSA) scanning and renal ultrasound as they lack need for sedation or catheterization.

In TDA, sensitivity of DMSA alone to detect high grade VUR performed within 5 d of admission was only 65.5% whereas by combination of both RBUS (renal and bladder ultrasound) and DMSA it was 83.2% [5]. In this study, a combination of sonography and DMSA yielded a detection rate of 78.7% especially of high grade VUR. Therefore, sonography or DMSA alone are not useful to screen for renal damage. VUR detection rate (85.2%) in the study of Roesch et al. [3] with the use of comparative tool was comparable with detection rate by combination of sonography and DMSA scan.

Cochrane Review conducted by Shaikh et al. [6], concluded that DMSA lacks the accuracy to detect VUR of any grade and should be challenged as a screening test because of the high proportion of children labelled at-risk for high-grade VUR. Performing DMSA scans alone, as TDA will lead to missing VURs. However, an abnormal DMSA scan comprises a risk factor for VUR identification after UTI, for recurrent UTIs, renal damage/scarring, renal function deterioration, and a negative predictive risk factor for VUR improvement and/or spontaneous resolution.

A systemic review found that the presence of both bladder bowel dysfunction (BBD) and VUR doubles the risk of recurrence of UTI; hence, all children presenting with UTI should be carefully evaluated for presence of BBD and managed accordingly [7]. As BBD is an important risk factor for UTI recurrence in future, intervention trials for patients with primary VUR should be stratified as per presence of BBD. In this study, BBD was low risk factor in having VUR after VCUG. The study, though, had devised an excellent tool which will guide risk stratification and further appropriate choice of imaging by avoiding unnecessary investigation in selected patients, but in high risk patients collaborative use of approaches is required for detection and decision making for treatment. All investigations for detection of VUR require appropriate diagnosis of UTI.

New modalities like use of procalcitonin [8], urinary UGAL levels and others can be considered as parameters in further studies for development of a universal tool.

To conclude, various guidelines for imaging following first UTI are postulated. The diagnostic yield of imaging protocols is higher with stringent guidelines, but with questionable

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benefits. There is a need for uniform guidelines and development of non-invasive, effective and validated protocols for detection of VUR following febrile UTI. It is interesting to note that tool developed in this retrospective prospective study [3], is a promising ray of hope but more multi-centric large studies are required to implement the findings. New modalities like use of procalcitonin [8], urinary UGAL levels and others can be considered as parameters in further studies for development of a universal tool.

Compliance with Ethical Standards

Conflict of Interest None.

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