



Contrast-enhanced Ultrasound (CEUS) in the Diagnosis of Acute Pyelonephritis – an Interim-Analysis

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Introduction:

Urinary tract infections (UTIs) are among the most common infectious diseases and drivers of antibiotic use and in-hospital days. An early and adequate risk assessment has the potential to optimize site-of-care decisions and thus allocation of limited health-care resources. Contrast-enhanced ultrasound (CEUS) has been described as a promising method for detecting acute pyelonephritis and its complications. Its sensitivity and specificity has been claimed to approach that of contrast CT, but the available data are very limited.

Methods:

The „Triple P in UTI“ study (Procalcitonin, pyuria and proadrenomedullin in the management of urinary tract infections, Drozdov et al. *Trials* 2013) is a randomized controlled trial with a factorial (2x2) design.

It compares two strategies regarding initiation and duration of antibiotic therapy (pyuria/PCT guided versus guideline based) and two algorithms for triage decisions (ProADM plus clinical criteria versus standard clinical criteria alone) in patients with UTI (Fig 1).

In a substudy, all hospitalized patients with fever and/or flank pain undergo gray-scale, Doppler and contrast enhanced ultrasound (Contrast agent: Sonovue®, Bracco) of both kidneys within 72h of admission. We report interim results of this substudy.

Results:

59 of 114 study patients were eligible for the substudy. 33 patients (56%) underwent study ultrasound, 8 (14%) refused to participate, and 18 (31%) missed the examination for various reasons. 3 of 33 patients (9%) showed signs of pyelonephritis by gray-scale and Doppler US, 2 patients (6%) exhibited underperfused areas that were only visible by CEUS (e.g. Fig.3). 28 patients (85%) showed no signs of pyelonephritis whatsoever. All findings of pyelonephritis were only recorded in the 24 patients with fever. In the 8 patients with fever and flank pain 3/8 studies were suggestive of pyelonephritis.

Conclusion:

1. In patients hospitalized for UTI with fever and/or flank pain early ultrasound examination has a low yield of detecting abnormalities suggestive of pyelonephritis.
2. Findings are entirely restricted to patients with fever.
3. If only patients with fever and flank pain are considered a substantial proportion of patients will have abnormal ultrasound examinations.
4. The addition of CEUS to standard ultrasound technique markedly increases the detection rate.
5. Whether abnormalities detected by ultrasound correlate with clinical outcomes in our study and might be useful in risk stratification remains to be determined.

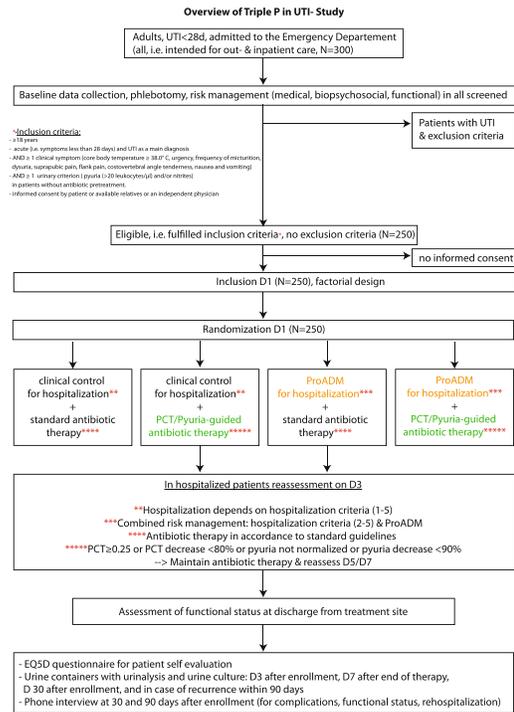


Fig.1: Overview of the „Triple P in UTI study“

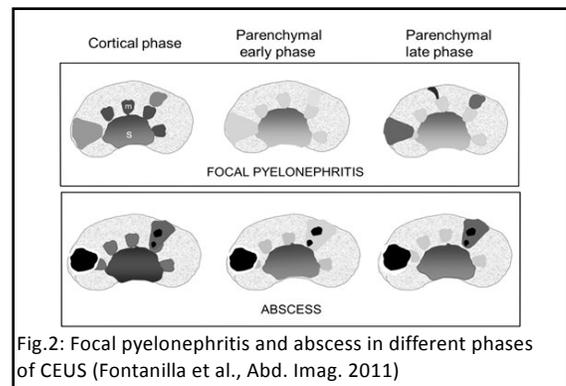


Fig.2: Focal pyelonephritis and abscess in different phases of CEUS (Fontanilla et al., Abd. Imag. 2011)

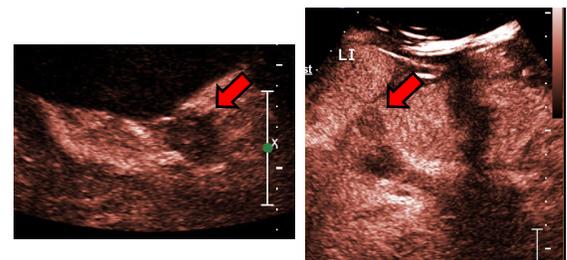


Fig.3: Two examples of focal pyelonephritis detected by CEUS