

# Overuse of Diagnostic Testing in the Management of Korean Patients with Acute Pyelonephritis

Seong Yeon Park

Department of Internal Medicine, Dongguk University Ilsan Hospital, Goyang, Korea

Acute pyelonephritis (APN) is an infection of the renal pelvis and kidney that usually results from a bacterial pathogen ascending the ureter from the bladder into the kidney [1]. It is one of the most common bacterial infections in the community setting. It is estimated that the annual incidence of APN is 35.7 per 10,000 people, with the APN hospitalization rate being 9.96 per 10,000 in women and 1.18 per 10,000 in men in South Korea [2]. The diagnosis of APN is primarily based on a combination of symptoms and evaluation of the urine for bacteria and white blood cells. The combination of fever, flank pain, frequency and dysuria is typical of APN in adults. Thus, history and physical examinations are the most useful tools for diagnosis. However, sometimes an additional work up is needed to manage APN.

First, to identify the pathogen of APN, all patients with APN should have a urine culture with antimicrobial susceptibilities tested to confirm the appropriate choice of therapy [1]. The detection of the implicated pathogen in a urine culture facilitates a high diagnostic yield. Generally, blood cultures are considered to be an important tool for the evaluation and management of patients with bacterial infections. However, the diagnostic usefulness of blood cultures is controversial in

patients with complicated and uncomplicated APN. Blood culture may only give information confirming whether bacteremia exists or not and does not change the antibiotic therapy in most cases [3, 4]. Velasco et al. reported that the pathogens isolated from urine and from blood were different in only 2.3% of uncomplicated cases of APN. In addition, no changes to antibiotic therapy were required on the basis of blood culture results [4]. Nevertheless, blood cultures are still part of the routine work up for APN. For the purposes of this study, we are examining the current management of APN in the light of recent studies [5]. Kim et al. prospectively enrolled community-acquired APN patients who visited 11 Korean hospitals over a period of 1 year. According to their study, blood culture analysis was performed in 78.3% (648/827) of APN patients and in 42.7% (277/648) of these patients bacteremia was detected. Blood culture identified the urinary pathogen in 60 of 645 (9.3%) patients, and 15 of 645 patients (2.3%) changed the antibiotic regimen after confirmation of blood culture results. The incidence of bacteremia (42.7%) in the current study [5] is slightly higher than that in other studies (19-23%) [3, 4, 6, 7]. The positive pathogen detection rate (69.3%) in urine culture was lower than that of other studies (74-98%) [3, 4, 6]. Although

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**Corresponding Author :** Seong Yeon Park, MD

Division of Infectious Diseases, Department of Internal Medicine, Dongguk University

Ilsan Hospital, 27 Dongguk-ro, Ilsandong-gu, Goyang 10326, Korea

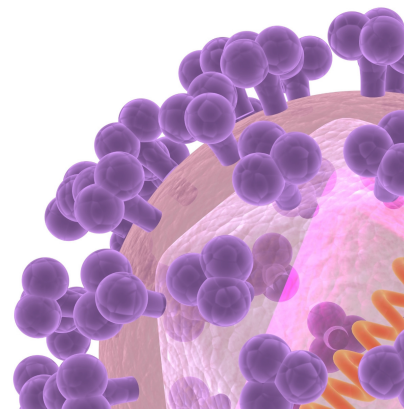
Tel: +82-31-961-7140, Fax: +82-31-961-8331

E-mail: psy99ch@hanmail.net

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the number of patients who were already taking antibiotics was not shown in the study, the authors explained that this was because patients referred to tertiary hospitals were already taking antibiotics to sterilize their urine and not their blood. Antimicrobial pretreatment was an independent predictor for bacteremia with a uropathogen not detected in urine culture [6]. In the present study, blood cultures have influenced the clinical management of only 2.3% cases of APN; however, it might be useful to identify the pathogen of APN in patients already taking antibiotics.

Although some authors questioned the role of blood cultures in the therapeutic decision and clinical management in APN [3, 4], bacteremia was a marker of more severe disease including final clinical failure, longer hospital duration, and deaths [5]. These findings are in line with previous studies [6, 8]. Therefore, it is important to differentiate bacteremic cases from non-bacteremic cases. Bacteremia was more common in older persons and those with comorbidity, such as high Charlson comorbidity index, diabetes mellitus and chronic renal disease [5]. In conclusion, it is reasonable to perform a blood culture in patients with a high risk of bacteremia for prognostic reasons.

Secondly, radiologic studies are considered useful in identifying urologic abnormalities. Performing radiologic imaging has been advocated for those who remain febrile despite having undergone 3 days of active antimicrobial treatment [1]. Imaging should be considered in men, diabetic persons, and patients with relapsing APN or in those symptomatic of urolithiasis. However, these recommendations are not followed in real practice. Surprisingly, radiologic studies such as computed tomography and ultrasonography were carried out in more than 80% of study patients regardless of their response to treatment [5]. In addition, the demographic and clinical characteristics of the groups that either underwent radiologic testing or not were no different, suggesting that clinicians did not follow any consistent principle in ordering radiologic tests. Routine performance of imaging studies in APN are reported to be of little value, because the incidence of underlying abnormalities is low [9]. Indiscriminate radiologic testing did not detect any abnormalities in 10% of patients who underwent computed tomography. Radiologic imaging detected 81 patients (11.9%) with structural abnormalities, which could potentially impact on clinical management. In other words, the remaining 82% of cases might not have needed radiological testing. Patients with a Pitt score  $\geq 1$ , flank pain and azotemia were significantly more likely to have structural abnormalities in the Kim et al. study [5]. Therefore, it would appear helpful to

perform radiologic imaging in that particular patient group.

This prospective study provides important information on the current status of diagnostic testing in Korean patients with APN [5]. Blood cultures and imaging studies were routinely performed in most of the study patients. There were no consistent principles in ordering blood cultures or radiologic tests. The diagnostic usefulness of blood cultures for patients with APN was limited, except in those with an antibiotic pretreatment. However, bacteremia was a useful clinical indicator of severe disease. Therefore, it is reasonable to perform blood cultures selectively in patients with a high risk of bacteremia and in patients already taking antibiotics. Radiologic imaging also should be selectively applied to those with structural abnormalities or in those without a response to treatment. In conclusion, it is important to clarify who will benefit from blood cultures and radiologic imaging to promote more efficient diagnostic testing. Further studies are needed to address this issue.

## Conflicts of Interest

No conflicts of interest.

## ORCID

Seong Yeon Park

<http://orcid.org/0000-0001-8762-7006>

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