



ORIGINAL ARTICLE

# Comparison of Acute Lobar Nephronia and Acute Pyelonephritis in Children: A Single-Center Clinical Analysis in Southern Taiwan



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## Key Words

acute lobar nephronia;  
acute pyelonephritis;  
children;  
*Escherichia coli*;  
urinary tract infection

**Background:** Patients with acute lobar nephronia (ALN) require a longer duration of antimicrobial treatment than those with acute pyelonephritis (APN), and ALN is associated with renal scarring. The aim of this study was to provide an understanding of ALN by comparing the clinical features of pediatric patients with ALN and APN.

**Methods:** We enrolled all of the patients with ALN (confirmed by computed tomography) admitted to our hospital from 1999 to 2012 in the ALN group. In addition, each patient diagnosed with APN who was matched for sex, age, and admission date to each ALN patient was enrolled in the APN group. The medical charts of patients in these two groups were retrospectively reviewed and analyzed for comparison.

**Results:** The fever duration after hospitalization in the ALN group and the APN group were  $4.85 \pm 2.33$  days and  $2.30 \pm 1.47$  days respectively. The microbiological distributions and

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the majority of susceptibilities were similar in the ALN and APN groups. The majority of clinical manifestations are nonspecific and unreliable for the differentiation of ALN and APN. The patients with ALN were febrile for longer after antimicrobial treatment, had more nausea/vomiting symptoms, higher neutrophil count, bacteremia, and C-reactive protein (CRP) levels, and lower platelet count (all  $p < 0.05$ ). In multivariate analysis, initial CRP levels, nausea/vomiting symptoms, and fever duration after admission were independent variables with statistical significance to predict ALN. Severe nephromegaly occurred significantly more in the ALN group than in the APN group ( $p = 0.022$ ).

*Conclusion:* The majority of clinical manifestations, laboratory findings, and microbiological features are similar between patients with ALN and APN. Clinicians should keep a high index of suspicion regarding ALN, particularly for those with ultrasonographic nephromegaly, initial higher CRP, nausea/vomiting, and fever for  $> 5$  days after antimicrobial treatment.

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## 1. Introduction

The clinical severity of acute renal bacterial infections range from uncomplicated lower urinary tract infections (UTI) to frank abscess formation.<sup>1</sup> Among these renal inflammatory diseases, acute lobar nephronia (ALN), also known as acute focal bacterial nephritis, is a non-suppurative focal form of acute bacterial infection, generally affecting one or more renal lobules. The reported incidence of ALN has increased as a result of advancements in noninvasive imaging techniques,<sup>2–5</sup> of which renal ultrasonography is considered to be the best and most effective screening method. Computed tomography (CT) is currently recognized as the most sensitive and specific imaging modality to diagnose ALN,<sup>1,3,4,6–9</sup> which typically appears as wedge-shaped, poorly defined regions of decreased nephrogenic density after contrast medium administration and as mass-like hypodense lesions in the more severe form.<sup>1,7,8,10</sup>

The clinical presentations and laboratory findings are similar between patients with ALN and acute pyelonephritis (APN), and differentiation of ALN and APN is not easy in the early stage of illness.<sup>5</sup> However, effective antimicrobial therapy for the treatment of ALN generally requires a longer duration than treatment for uncomplicated APN, indicating the importance of an adequate diagnosis.<sup>6,8,11</sup> In addition, ALN may also represent a relatively early stage of the development of a renal abscess, and ALN is associated with a very high incidence of renal scarring.<sup>6,12,13</sup> Clinicians should therefore have a high index of suspicion of ALN in patients with UTI. In this study, we reviewed and compared the clinical presentations, microbiological findings, and imaging results of patients with ALN and APN in our hospital from 1999 to 2012. The aim of this study was to provide an understanding of ALN in children by comparing the clinical manifestations, laboratory findings, imaging results, common pathogens, and their antimicrobial susceptibilities, treatments, and outcomes of pediatric patients with ALN and APN.

## 2. Methods

We retrospectively evaluated the medical records of 1039 pediatric patients (age  $\leq 18$  years) hospitalized for UTI

from January 1999 to December 2012 at our hospital, a 1700-bed medical center in southern Taiwan providing both primary and tertiary medical care. The majority of patients received renal ultrasound or technetium-99m-labeled dimercaptosuccinic acid (DMSA) renal scanning within 3 days of admission. CT was performed when the patients had a focal renal mass on renal ultrasound, or remained febrile for 72 hours after susceptible antimicrobial treatment for upper UTI as localized by DMSA or renal ultrasound. Renal size was recorded by renal ultrasound, and the normal sonographic values of kidney sizes among Taiwanese children were adapted from the study by Chu et al.<sup>5,14</sup> Severe nephromegaly was defined as a kidney size 3 standard deviations larger than the mean.

The definition of ALN was based on positive CT findings after contrast medium administration. Patients with trauma, previous renal surgery, malignancy, and other concomitant diagnoses that may have caused a fever, such as acute gastroenteritis and balanoposthitis, were excluded. In total, 80 patients fulfilled the enrollment criteria of ALN, and all of them were enrolled in the ALN group. In addition, each patient diagnosed with APN who was matched for sex, age, and admission date to each ALN patient was enrolled in the APN group. The definition of APN was based on the admission diagnosis of UTI combined with pelvic wall thickening and renal enlargement seen in renal ultrasound, or the presence of focal or diffuse areas of decreased uptake of DMSA without evidence of cortical loss, or by the presence of diffusely decreased uptake in an enlarged kidney. The medical records of all patients in both groups were retrospectively reviewed with regard to their demographic characteristics, clinical presentations, laboratory findings, microbiological features, imaging results, treatment, and outcomes.

The attending physicians made all decisions regarding antimicrobial therapy, either prior to or after the results of susceptibility tests. Renal sonography and DMSA renal scans were performed as soon as possible after hospitalization, usually within 3 days of admission. After complete treatment, radionuclide cystography or voiding cystourethrography was arranged for vesicoureteral reflux (VUR) studies. Radiologists and nuclear medicine physicians reviewed the imaging results.

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