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Pediatric urinary tract infections caused by extended-spectrum beta-lactamase-producing bacteria

Hye sun HYUN, Hye sun HYUN, Ji hye KIM, Myung hyun CHO, Eu jin PARK, Il soo HA, Hae il CHEONG, *Hee gyung KANG

Pediatrics, Seoul National University Children's Hospital, Korea,South

Objectives : Urinary tract infection (UTI) is one of the most frequent bacterial infections in children. Since UTI in young children younger than 2 years should be treated immediately to prevent renal damage, 3rd generation cephalosporin is recommended as empirical antibiotics. However recently, extended-spectrum beta-lactamase (EBSL)-producing bacteria has become increasingly important cause of UTI worldwide. Then, is 3rd generation cephalosporin still effective for UTI in young children? Are these antibiotics increasing the prevalence of antibiotics-resistant pathogens, ESBL producing bacteria? To answer these questions, we reviewed the clinical courses of young patients UTI retrospectively.

Methods : All the urinary culture results in patients younger than 2 years from January 2010 to December 2016 at Seoul National University Children's Hospital were assessed, and only those with Gram (-) bacteria were reviewed.

Results : Total of 1208 episodes were accompanied by pyuria and treated as UTI in 1044 patients. Escherichia coli was cultured in 947 episodes, followed by Klebsiella pneumoniae (n=223) and Klebsiella oxytoca (n=38). ESPL producers comprised 18%, 44% and 21% of the pathogens, resulting in 281 (23.2%) episodes of UTI by EBSL positive bacteria.
Epidemiologically, there was no significant difference in the gender (male 66%) and age (mean 6 months) between those with ESBL (+) UTI and ESBL (-) UTI. As expected, children with ESBL (+) UTI had higher rate of previous history of UTI (7.8% vs. 3.1%, $p<0.001$) than those with ESBL (-). However rates of abnormal results in imaging studies of 99m-Tc dimercaptosuccinic acid (DMSA) and voiding cystourethrogram (VCUG) were not different between the groups, indicating that ESBL (+) UTI was not more damaging than ESBL (-), and VUR is not a risk factor of ESBL (+) UTI. Empirical antibiotics were appropriate in all episodes for the non-ESBL group and 37.4% for the ESBL group ($p<0.001$). Recurrence of UTI was observed in 7.5% of ESBL (+) and 2.9% of ESBL (-) UTI, after completion of treatment of two weeks. Among ESBL (+) UTI episodes, 65% had chosen ESBL-resistant antibiotics, while the others was managed with initial empirical antibiotics, 3rd generation

cephalosporin once clinical improvement was observed; recurrence rate was 6.7% and 8.9%, respectively.

Conclusions : While recurrence of UTI was more frequent in ESBL (+) UTI, modification of antibiotics according to the antibiotics-sensitivity of the pathogens did not significantly reduced the recurrence. Nonetheless, since ESBL (+) UTI is more than 20% of UTI with young children, empirical antibiotics should be carefully chosen, and revision of the recommendation should be considered in our society

Keywords : Urinary tract infections, extended-spectrum beta-lactamase-producing bacteria, child