International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 25-01-2021; Accepted: 10-02-2021; Published: 14-03-2021
www.medicalsciencejournal.com
Volume 7; Issue 3; 2021; Page No. 28-30

Management and outcomes of bacteraemic urinary tract infection in infants

Suprabhat Ranjan[1*], Sheela Sinha[2]
[1] Junior Resident (PG), Upgraded Department of Paediatrics, Patna Medical College and Hospital, Patna, Bihar, India
[2] Professor, Upgraded Department of Paediatrics, Patna Medical College and Hospital, Patna, Bihar, India

Abstract
Bacteraemic UTI is a common source of bacteraemia in young infants. This study was done to determine predictors of parenteral antibiotic duration and the association between parenteral treatment duration and relapses in infants <3 months with bacteraemic urinary tract infection (UTI). Infants <3 months of age with bacteraemic UTI, defined as the same pathogenic organism isolated from blood and urine was included in stydy. The mean (±SD) duration of parenteral antibiotics for the 251 included infants was 7.8 days (±4 days). No infants had a relapsed bacteraemic UTI. Six infants (2.4%) had a relapsed UTI (without bacteraemia). The duration of parenteral antibiotics did not differ between infants with and without a relapse (8.2 vs 7.8 days, p=0.81).

Keywords: bacteraemic, antibiotics, UTI, Infants

Introduction
Bacteraemia is detected in 3–17% of infants with urinary tract infections (UTI), and bacteraemic UTI now represents the most common source of bacteraemia in young infants. The clinical significance of bacteraemia with UTI is uncertain. Although no published guidelines exist on the management of bacteraemic UTI, the available literature suggests that detection of bacteraemia leads to longer hospitalisations and durations of parenteral antibiotics use.

Methods
This retrospective study was done in department of pediatrics of Patna Medical College Hospital between July 2012 to Jan 2013. This study was done using pre-existing databases from prior and/or ongoing investigations that included data on infants<3 months with bacteraemic UTI. All infants <3 months of age with bacteraemic UTI identified from these initial databases underwent a second chart review using a protocol specifically designed for this study. Infants were included if they were <3 months of age and had the same pathogenic organism isolated from the blood and urine, regardless of the urine culture colony count, urinalysis findings or indication for the cultures. Infants were excluded after data submission if they received prolonged parenteral treatment for other reasons (meningitis, osteomyelitis), if data on parenteral treatment were missing or if transfer out of the study site occurred during the hospitalization.

Statistical Analysis
To determine the predictors of the duration of parenteral antibiotic therapy, all potential predictor variables were included in a linear fixed-effects regression model. Fixed-effects regression adjusts for clustering by institution with indicator variables and is most appropriate when the research focus is the pooled within-cluster effects of relatively few clusters. To estimate this clustering effect and how it was affected by the predictors in our model, we calculated the intraclass coefficient (ICC) of both the empty model with no predictors and the full model with all predictors. This ICC reflects the proportion of variance in duration of parental antibiotic therapy due to institutions. Parenteral antibiotic duration was analysed both as an outcome variable and as a predictor variable (of relapse). For bivariate analysis, Fisher's exact test or $\chi 2$ test was used, as appropriate, for categorical variables, and the Wilcoxon rank sum test or Students't test was used, as appropriate, for continuous variables.

Results
A total of 276 infants with bacteraemic UTI were identified, from which 25 infants were excluded: 5 had missing data or were transferred out, 19 were treated for meningitis and one was diagnosed with osteomyelitis. Escherichia coli was the most common organism (89.6% of cases). The mean±SD duration of parenteral antibiotics was 7.8±4 days. There was substantial variability in the duration of parenteral antibiotics, with the clustering effect of institutions accounting for a third of it (ICC 0.33, 95% CI 0.18 to 0.43) in the empty model. In the full model, the ICC dropped minimally (0.31, 95% CI 0.17 to 0.37), suggesting that clustering was not due to the included patient-level predictors. Only six infants (2.4%, 95% CI 0.8% to 5.1%) had relapsed UTI caused by the same organism, four of whom were readmitted to the hospital. No infants had a relapsed bacteraemic UTI, four infants (1.6%) had a recurrent UTI within 30 days caused by a different organism (all Enterococcus spp.).

Discussion
This investigation is one of the largest study to analyse parenteral antibiotic duration and outcomes of young infants with bacteraemic UTI. Infants with this condition were provided durations of parenteral antibiotic that were quite variable, and this variability was only partially explained by factors relating to the infant and his or her clinical course. None of the 251 infants had a relapsed bacteraemic UTI. Few infants had relapsed UTIs, and no babies deteriorated

during treatment. We chose to analyse the association between parenteral antibiotic duration and relapsed UTI because we anticipated that other outcomes such as relapsed bacteraemic UTI and/or clinical deterioration would be extremely rare events (indeed, none of these outcomes occurred in any of the included infants), and that relapsed UTI would represent the best available indicator of possible undertreatment of the index infection. However, multiple prior trials have demonstrated no association between the route or duration of antibiotic therapy and future scarring in paediatric patients with UTI. Although these trials did not focus specifically on young infants or bacteraemic UTI, there is no published evidence demonstrating that young age or bacteraemia increase the risk of renal scarring in children with UTI. There are no available published recommendations on the duration of parenteral treatment for bacteraemic UTI. Data on parenteral antibiotic use can be gleaned from existing studies and suggest that prolonged parenteral antibiotic courses offer no clear benefit. However, these studies are limited by small numbers, lack of inclusion in some cases of infants <1 month or lack of focus on clinical outcomes. The largest investigation, by Honkinen *et al*, involved 134 children with bacteraemic UTI (66% of whom were <3 months) and reported a mean duration of intravenous antibiotics of 6.3 days which is 2.5 days longer on average than the duration provided to age-matched and gender-matched children with non-bacteraemic UTI. A non-E. Coli organism and a positive repeat blood culture during acute treatment had a larger impact on duration (average of an additional 2.2 and 3.5 days, respectively), but only 34 infants (13.5%) had one or both of these risk factors. Some variability can also be explained by different institutional practices, as evidenced by the ICC remaining above 0.3 even after addition of patient-level predictors. The average duration of parenteral antibiotic in the institution with the longest mean was over twice as long as the institution with the shortest mean.

This study has several limitations. First, it is possible that infants may have been treated for relapses elsewhere, which would lead to an underestimation of the risk of relapse. Second, severity of illness can be difficult to capture in a retrospective chart review, and unmeasured variables such as time to defervescence, socio-economic factors or concerns surrounding parental reliability or medication compliance may have affected the duration of parenteral therapy.

Conclusion

In infants <3 months with bacteraemic UTI, the duration of parenteral antibiotic therapy is variable and only partially explained by clinical characteristics. Relapse is rare and is not associated with the duration of parenteral antibiotic therapy, suggesting that shorter courses may be safe and appropriate for generally healthy infants with bacteraemic UTI who have recovered clinically.

References

1. Bachur R, Caputo GL. Bacteremia and meningitis among infants with urinary tract infections. Pediatr Emerg Care. 1995; 11:280-4.
2. Hoberman A, Wald ER, Hickey RW. *et al*. Oral versus initial intravenous therapy for urinary tract infections in young febrile children. Pediatrics. 1999; 104(1Pt 1):79-86.
3. Newman TB, Bernzweig JA, Takayama JI, *et al*. Urine testing and urinary tract infections in febrile infants seen in office settings: the Pediatric Research in Office Settings' Febrile Infant Study. Arch Pediatr Adolesc Med. 2002; 156:44-54.
4. Pitetti RD, Choi S. Utility of blood cultures in febrile children with UTI. Am J Emer Med. 2002; 20:271-4.
5. Schnadower D, Kuppermann N, Macias CG. *et al*. Febrile infants with urinary tract infections at very low risk for adverse events and bacteremia. Pediatrics. 2010; 126:1074-83.
6. Magin EC, Garcia-Garcia JJ, Sert SZ. *et al*. Efficacy of short-term intravenous antibiotic in neonates with urinary tract infection. Pediatr Emerg Care. 2007; 23:83-6.
7. Greenhow TL, Hung YY, Herz AM. *et al*. The changing epidemiology of serious bacterial infections in young infants. Pediatr Infect Dis J. 2014; 33:595-9.
8. Averbuch D, Nir-Paz R, Tenenbaum A. *et al*. Factors associated with bacteremia in young infants with urinary tract infection. Pediatr Infect Dis J. 2014; 33:571-5.
9. Biondi E, Evans R, Mischler M. *et al*. Epidemiology of bacteremia in febrile infants in the United States. Pediatrics. 2013; 132:990-6.
10. Greenhow TL, Hung YY, Herz AM. Changing epidemiology of bacteremia in infants aged 1 week to 3 months. Pediatrics. 2012; 129:e590-6.
11. Honkinen O, Jahnukainen T, Mertsola J. *et al*. Bacteremic urinary tract infection in children. Pediatr Infect Dis J. 2000; 19:630-4.
12. Roman HK, Chang PW, Schroeder AR. Treatment variability of bacteremic urinary tract infections in infants. Hospital Pediatr. 2015; 5:1-8.
13. Brady PW, Conway PH, Goudie A. Length of intravenous antibiotic therapy and treatment failure in infants with urinary tract infections. Pediatrics. 2010; 126:196-203.
14. Medi S, Shen M. Short term parenteral antibiotic therapy for E coli bacteremia and UTI in infants under one year of age. Abstract presented at Pediatric Hospital Medicine National Conference; Cincinnati, OH, 2012.
15. Snijders T, Bosker R. Multilevel analysis. 2nd edn. Sag Publishers, London, 2012.
16. Carpenter J, Bithell J. Bootstrap confidence intervals: when, which, what? A practical guide for medical statisticians. Stat Med. 2000; 19:1141-64.
17. Peduzzi P, Concato J, Kemper E. *et al*. A simulation study of the number of events per variable in logistic regression analysis. J Clin Epidemiol. 1996; 49:1373-9.
18. Benador D, Neuhaus TJ, Papazyan JP. *et al*. Randomised controlled trial of three day versus 10 day intravenous antibiotics in acute pyelonephritis: effect on renal scarring. Arch Dis Child. 2001; 84:241-6.
19. Bocquet N, Sergent Alaoui A, Jais JP. *et al*. Randomized trial of oral versus sequential IV/oral antibiotic for acute pyelonephritis in children. Pediatrics. 2012; 129:e269-75.
20. Bouissou F, Munzer C, Decramer S, *et al*. Prospective, randomized trial comparing short and long intravenous antibiotic treatment of acute pyelonephritis in children: dimercaptosuccinic acid scintigraphic evaluation at 9 months. Pediatrics. 2008; 121:e553-60.

21. Strohmeier Y, Hodson EM, Willis NS. *et al*. Antibiotics for acute pyelonephritis in children. Cochrane Database Syst Rev. 2014; 7:CD003772.
22. Schroeder AR, Ralston SL. Intravenous antibiotic durations for common bacterial infections in children: when is enough enough? J Hosp Med. 2014; 9:604-9.
23. Zaoutis T, Localio AR, Leckerman K. *et al*. Prolonged intravenous therapy versus early transition to oral antimicrobial therapy for acute osteomyelitis in children. Pediatrics. 2009; 123:636-42.
24. Cummings EA, Reid GJ, Finley GA. *et al*. Prevalence and source of pain in pediatric inpatients. Pain. 1996; 68:25-31.