Treatment of Severe Pertussis with Hyperleucocytosis in an Infant Using Exchange Transfusion: Is It the Optimal Time?

Sir,

Pertussis remains a highly contagious respiratory disease, posing a significant threat to infants, especially those unvaccinated, despite global immunisation efforts.[1] Severe cases complicated by hyperleucocytosis and pulmonary hypertension demand prompt intervention.[2] Exchange transfusion (ET) has been utilised in selected cases,[3] with survival rates ranging from 54 to 92%, and has shown positive effects in both local and international studies. However, the indications and optimal timing for ET remain unclear.

This study reports a 13-month male infant who presented with a one-week history of worsening cough, fever, and cyanotic episodes during severe coughing paroxysms. The cough had been persistent for the past two weeks. The child, born prematurely at 35 weeks' gestation (birth weight: 2500 g), had no history of recurrent coughs, and denied any history of congenital heart disease. He had not received the diphtheria, pertussis, and tetanus (DPT) vaccine. Apart from the DPT vaccine, the child had received all other vaccinations in accordance with the standard vaccination schedule for his age.

On admission, the patient was alert but exhibited respiratory distress (temperature: 38.3°C). Coarse breath sounds, wheezing, and crackles were noted on auscultation. The respiratory rate was 49 breaths per minute, indicating significant respiratory distress. Laboratory tests revealed marked hyperleucocytosis (WBCs: 70.5×10^9/L; 76% lymphocytes). Chest x-ray showed bilateral patchy consolidation, consistent with pneumonia. Bordetella pertussis DNA was detected *via* polymerase chain reaction (PCR), confirming pertussis.

Despite seven days of broad-spectrum antibiotics (cefoperazone-sulbactam, azithromycin, and trimethoprim-sulfamethoxazole), hyperleucocytosis persisted (WBCs $>50\times10^9$/L), and pulmonary hypertension worsened (45 mmHg on echocardiography). On day 8, ET was initiated, exchanging 900 ml of blood *via* peripheral catheters with a red cell-to-plasma ratio of 2:1. Post-ET, the WBC count normalised rapidly, pulmonary hypertension improved, and the patient was discharged on day 15 without complications (Figure 1).

ET can promote a rapid decrease in white blood cell numbers and may help clear circulating pertussis toxin, thereby producing favourable clinical effects.[4] This case highlights the potential role of ET in managing severe pertussis complicated by hyperleucocytosis and pulmonary hypertension. Although the procedure appeared beneficial in this instance, standardised protocols for ET in pertussis are lacking. Further multicentre studies are essential to establish evidence-based guidelines for ET in pertussis management.

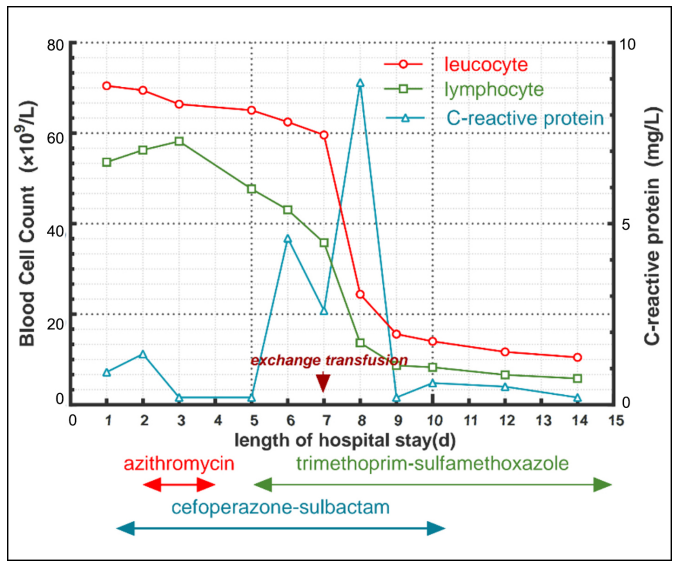

Figure 1: Trends in leucocyte, lymphocyte, and C-reactive protein levels before and after exchange transfusion, and antibiotic treatment timeline in an infant with severe pertussis and hyperleucocytosis.

FUNDING:
This work was supported by the Ningbo Medical and Health Brand Discipline (PPXK2024-06), the Ningbo Health Technology Plan Project (2024Y23), and the Zhejiang Medical Health Science and Technology Project (2023RC085).

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
YZ: Designed the study, analysed the data, and drafting of the manuscript.
PR: Provided critical revisions, data collection, and analysis.
HC: Supervised the study.
All authors approved the final version of the manuscript to be published.

REFERENCES

1. Liu Y, Yu D, Wang K, Ye Q. Global resurgence of pertussis: A perspective from China. *J Infect* 2024; **89(5)**:106289. doi: 10.1016/j.jinf.2024.106289.
2. Shi T, Du S, Fan H, Yu M, Jiang W, Zhang D, *et al*. Risk factors of exchange blood transfusion in infants with severe pertussis. *Clin Pediatr (Phila)* 2023; **62(10)**:1245-53. doi: 10.1177/00099228231154949.
3. Tian SF, Wang HM, Deng JK. Fatal malignant pertussis with hyperleucocytosis in a Chinese infant: A case report and literature review. *Medicine (Baltimore)* 2018; **97(17)**: e0549. doi: 10.1097/MD.0000000000010549.

4. Scanlon K, Skerry C, Carbonetti N. Association of pertussis toxin with severe pertussis disease. *Toxins (Basel)* 2019; **11(7)**:373. doi: 10.3390/toxins11070373.

Yao Zheng, Peisen Ruan and Hehe Chen

Paediatric Intensive Care Unit, Women and Children's Hospital of Ningbo University, Ningbo, China

Correspondence to: Dr. Hehe Chen, Paediatric Intensive Care Unit, Women and Children's Hospital of Ningbo University, Ningbo, Zhejiang, China
E-mail: yhy20210418@163.com

Received: December 03, 2024; Revised: January 15, 2025; Accepted: January 17, 2025
DOI: https://doi.org/10.29271/jcpsp.2025.05.677