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SCIENTIFIC LETTER
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A Case of Malignant Pertussis Treated by Double Volume Blood Exchange

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Malignant pertussis is a severe form of pertussis that usually affects infants younger than 4 months. It is characterized by respiratory distress, tachycardia, and hyperleukocytosis ($\geq$ 50.000 × 10^9/L). This lethal phenomenon can cause pulmonary hypertension, multiorgan failure, and death (up to 80%) in young infants.[1-3] This letter highlights the experience and aims to raise awareness about malignant pertussis.

A 26-day-old baby was brought to the emergency room with a cough and wheezing. Written informed consent was obtained from the parent of the patient. During the physical examination, tachypnea, retractions, secretory rales, and prolonged expiration were observed; other systems were normal. Laboratory tests revealed a leukocyte count of 22.42 × 10^9/L, lymphocyte count of 16.15 × 10^9/L, hemoglobin level of 12 g/dL, platelet count of 500 × 10^9/L, and C-reactive protein level of 2.1 mg/L. A rapid influenza test yielded negative results. Chest radiography indicated interstitial involvement, and the patient was admitted to the pediatric intensive care unit (PICU).

Initial treatments included intravenous hydration, nebulized salbutamol, and respiratory support with continuous positive airway pressure. During follow-up, the patient developed apnea and bradycardia, which necessitated intubation. On the second day, azithromycin was initiated after the respiratory multiplex polymerase chain reaction (PCR) panel confirmation of *Bordetella pertussis* infection.

After the third day of PICU admission, the patient developed leukocytosis (Figure 1). Intravenous hydration was increased, and dexamethasone was initiated as an anti-inflammatory agent. Despite these interventions, persistent tachycardia, respiratory distress (indicating a need for increased pressure support), and hyperleukocytosis (63.17 × 10^9/L on the eighth day) were observed. Echocardiography was performed to evaluate for secondary pulmonary hypertension, which did not reveal any pathological findings. Double-volume therapeutic blood exchange (DV-TBE) was administered as the patient's clinical condition deteriorated despite ongoing treatments. Following DV-TBE, the leukocyte count decreased to 16.03 × 10^9/L, and the lymphocyte count dropped to 6.29 × 10^9/L. The patient was extubated 3 days after DV-TBE, during which the pressure requirement decreased, and tachycardia was resolved immediately afterward. However, the patient was re-intubated because of ventilator-associated pneumonia (VAP). Piperacillin-tazobactam was initiated for VAP, and the tracheal aspirate culture tested positive for *Serratia liquefaciens*. The patient was extubated on the 27th day. After 27 days of invasive mechanical ventilation, 10 days of non-invasive mechanical ventilation, a one-time DV-TBE, and VAP due to Serratia, along with 39 days in the PICU and 6 days of inpatient follow-up, he was discharged with a full recovery.

Pertussis toxin (PT) inhibits chemokine receptors, leading to decreased leukocyte retention in the bone marrow and lymphoid organs. Additionally, PT prevents the extravasation of leukocytes, contributing to hyperleukocytosis. This hyperleukocytosis leads to stasis in pulmonary vessels and consequently affects pulmonary function and hypoperfusion. PT also causes direct cardiac and pulmonary dysfunction through the Gi protein pathway.[4] Young infants

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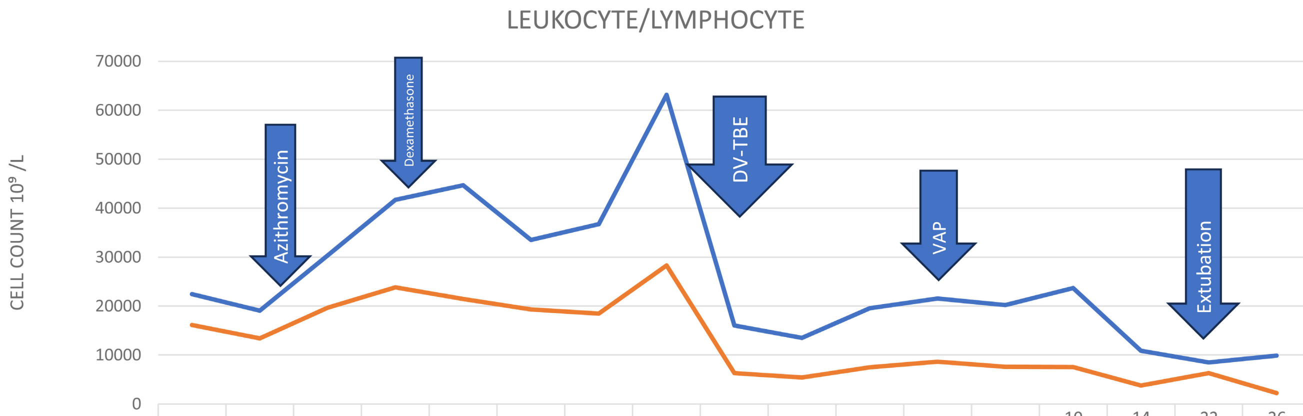

	25 Feb	26 Feb	27 Feb	28 Feb	29 Feb	1 March	2 March	3 March	3 March	4 March	5 March	6 March	8 March	10 March	14 March	22 March	26 March
Leukocyte	22420	19040	30320	41680	44700	33510	36710	63170	16030	13480	19530	21540	20220	23690	10870	8490	9850
Lymphocyte	16150	13420	19630	23830	21420	19300	18480	28310	6290	5380	7470	8640	7600	7550	3770	6280	2220

Figure 1. Leukocyte and lymphocyte counts and interventions during PICU stay. DV-TBE: double-volume therapeutic blood Exchange, VAP: ventilator-associated pneumonia.

are at a higher risk for complications from PT. Infants experiencing apnea, seizures, and pneumonia with refractory hypoxemia and/or pulmonary hypertension and/or cardiac failure must be hospitalized in PICUs. If feasible, they should be transferred to facilities capable of providing exchange transfusions, leukapheresis, or extracorporeal membrane oxygenation.[5]

The Centers for Disease Control and Prevention (CDC) and the Health Ministry of Türkiye state that if a more likely diagnosis is not present, an illness marked by any duration of coughing, a history of exposure to a laboratory-confirmed case, and at least 1 of the following signs or symptoms: paroxysms of coughing, an inspiratory whoop, vomiting after coughing, or apnea, indicates "possible pertussis." Meanwhile, a cough illness of any duration where B. pertussis is isolated from a clinical specimen or shows a positive PCR result for B. pertussis is classified as "confirmed pertussis."[6,7] Recently, the incidence of whooping cough has increased in Türkiye. Besides common complications like apnea and seizures, malignant pertussis is a clinical condition that requires careful evaluation and urgent treatment. Malignant pertussis refers to a clinical situation characterized by tachycardia, respiratory failure, and hyperleukocytosis.[8] When the patient's condition begins to deteriorate, extracorporeal treatments such as therapeutic blood exchange, leukapheresis, or extracorporeal membrane oxygenation must be performed immediately. Vaccinating adolescents and pregnant women with the diphtheria, tetanus, and acellular pertussis (Tdap) booster vaccine is crucial for controlling pertussis in Türkiye.

Data Availability Statement: The data that support the findings of this study are available upon request from the corresponding author.

Informed Consent: Written i consent was obtained from the parent of the patient who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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Declaration of Interests: The authors have no conflicts of interest to declare.

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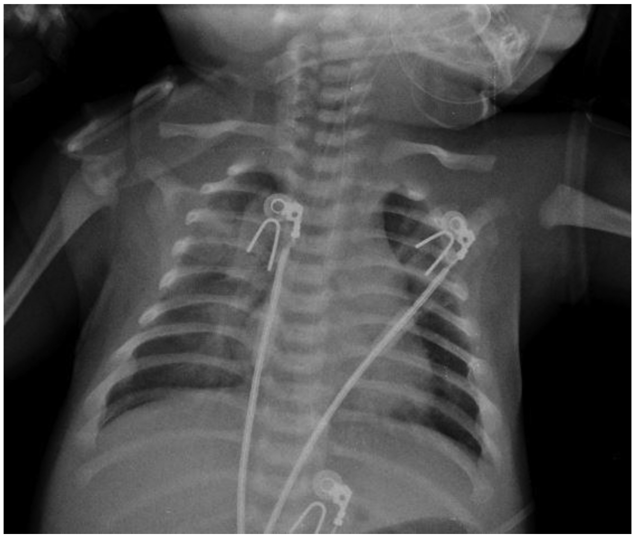
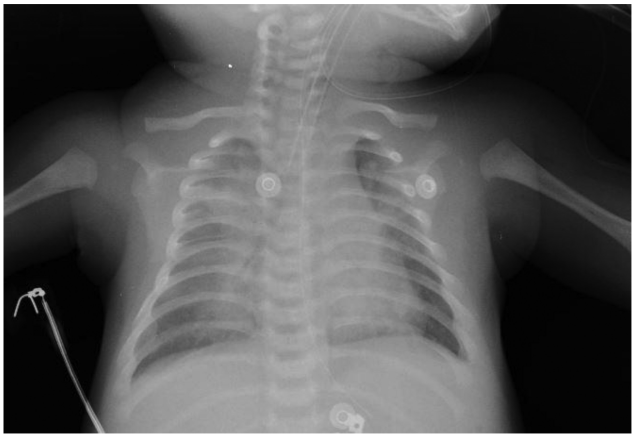
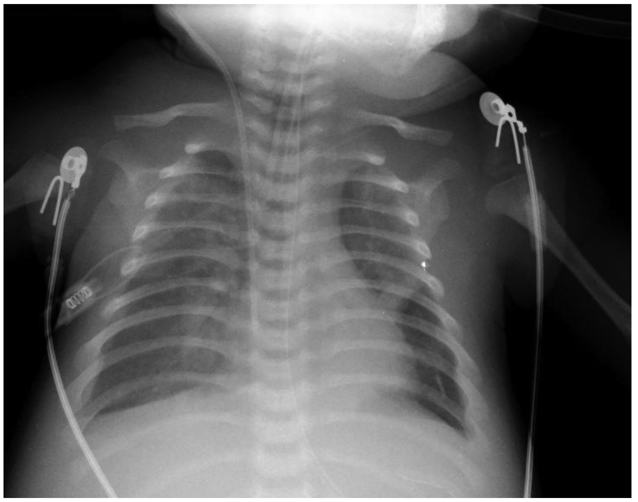


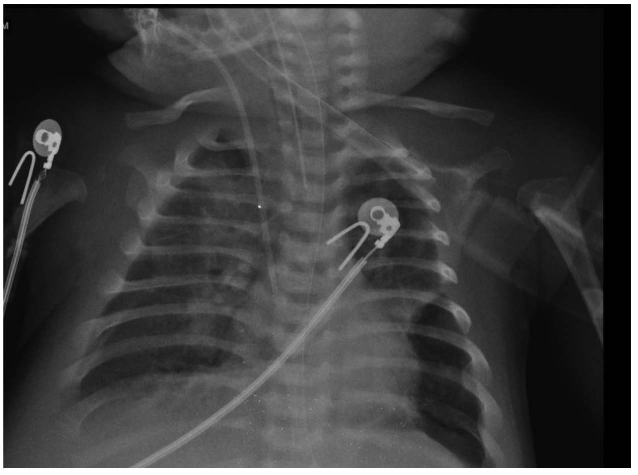
Supplementary Figure 1. Chest X-Ray at PICU Admission.



Supplementary Figure 2. Chest X-Ray After First Intubation.



Supplementary Figure 3. Chest X-Ray Before DV-TBE.



Supplementary Figure 4. Chest X-Ray after DV-TBE.