Emergency Cesarean Section as a Result of Acute Eosinophilic Pneumonia during Pregnancy

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Acute eosinophilic pneumonia is a disease of unknown etiology characterized by peripheral blood eosinophilia and pulmonary infiltrative shadows on radiography. Acute eosinophilic pneumonia follows an acute course within 1 week and the symptoms include fever, dyspnea, and cough. Acute eosinophilic pneumonia has a good prognosis and responds promptly to steroid treatments. Here we present a critical case of acute eosinophilic pneumonia during pregnancy, which led to emergency cesarean section because of fetal distress. The patient was a 24-year-old gravida at 34 + 6 weeks gestation, with fever, and an elevated CRP; thus antibiotics were started. At 35 + 1 weeks gestation, cardiotocography (CTG) revealed late decelerations, fetal distress was diagnosed, and an emergency cesarean section was performed. The pre-operative maternal blood gas analysis showed a low PaO2 of 55.7 mmHg and a chest X-ray revealed ground-glass opacities and pleural effusions in the middle lower lung fields bilaterally. A male of 2.336 g in weight was delivered with Apgar scores of 8 and 8 at 1 and 5 min, respectively. Due to the clinical progress and the elevated eosinophil count (532/µl) in the peripheral blood differential leukocyte count, the diagnosis of acute eosinophilic pneumonia was made. With the administration of oxygen and steroid treatment, the patient’s general condition recovered. Both the mother and the baby were discharged on the 10th post-operative day and the patient has been leading a normal life with no recurrence for > 3 years since delivery.

History of the patient
Patient: a 24-year-old female
Reproductive history: G0P0
Family history: Nothing noteworthy
Previous history: Nothing noteworthy
Smoking history: None
Allergic history: raw eggs, dog hair
Menstrual history: regular 28-day cycle

Acute eosinophilic pneumonia is a disease of unknown etiology, which is characterized by peripheral blood eosinophilia and pulmonary infiltrative shadows on radiography. The clinical concept of eosinophilic pneumonia was proposed by Liebow and Carrington (1969) to categorize the pulmonary infiltration with eosinophilia (PIE) syndrome described by Crofton et al. (1952). Eosinophilic pneumonia encompasses the conditions with histologically remarkable eosinophil infiltration into lung with or without an increased peripheral eosinophil count (Crofton et al. 1952; Liebow and Carrington 1969). Furthermore, Carrington et al. (1969) reported prolonged eosinophilic pneumonia of unknown etiology typically with shadows in the lung margins on x-ray that responds promptly to steroid treatment, which they termed chronic eosinophilic pneumonia. On the other hand, acute eosinophilic pneumonia is a relatively new disease concept, which was advocated by Badesch et al. (1989) and Allen et al. (1989) as a group of eosinophilic pneumonias. Acute eosinophilic pneumonia follows an acute course within 1 week and the symptoms include fever, dyspnea, and cough. Acute eosinophilic pneumonia has a good prognosis and responds promptly to steroid treatment, resulting in improvement of the condition.

In our literature investigation, we found no reports of patients who developed acute eosinophilic pneumonia during pregnancy. In this article we report an extremely rare case, in which a patient developed acute eosinophilic pneumonia during pregnancy and underwent emergency cesarean section due to fetal distress, which resulted from a low maternal PaO2.


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History of present illness

The patient received perinatal care at a nearby hospital. On a routine pregnancy examination at 31 weeks gestation, she was noted to have uterine contractions, with 50% effacement, but no cervical dilatation. A diagnosis of threatened premature delivery was made, and oral ritodrine hydrochloride at a dose of 15 mg/day was started. At 32 + 5 weeks gestation, her uterine contractions had not ceased and she was admitted to the hospital. An infusion of ritodrine hydrochloride was started at a dose of 3 mg/hr. A culture of the vaginal secretions showed no abnormal findings. At 33 + 2 weeks gestation, her uterine contractions had not ceased and she was admitted to the hospital. An infusion of ritodrine hydrochloride was started at a dose of 3 mg/hr. A culture of the vaginal secretions showed no abnormal findings. At 33 + 2 weeks gestation, an infusion of magnesium sulfate was added at a dose of 1 g/hr since the uterine contractions continued without cessation, despite an increased dose of the ritodrine hydrochloride infusion to 6.4 mg/hr. At 34 + week gestation, a fever of 40.1ºC developed and the CRP level rose to 16.9 mg/dl. On auscultation, the CRP level increased further to 20.3 mg/dl without any improvement in her symptoms.

Preoperative CRP level showed elevation to 20.3 mg/dl but the leukocyte count was normal until this time. On POD2, the peripheral blood eosinophil count was elevated to 532/ul. POD, postoperative day.

Table 1. Blood data.

<table>
<thead>
<tr>
<th>Week</th>
<th>34w6d</th>
<th>35w0d</th>
<th>35w1d (operation day)</th>
<th>POD 1</th>
<th>POD 2</th>
<th>POD 5</th>
<th>POD 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP (mg/dl)</td>
<td>7.5</td>
<td>16.9</td>
<td>21.2</td>
<td>16.6</td>
<td>17.2</td>
<td>2.4</td>
<td>0.5</td>
</tr>
<tr>
<td>WBC (/ul)</td>
<td>4,800</td>
<td>3,500</td>
<td>5,500</td>
<td>4,600</td>
<td>7,100</td>
<td>8,000</td>
<td>6,600</td>
</tr>
<tr>
<td>Eosino (/ul)</td>
<td></td>
<td></td>
<td></td>
<td>532</td>
<td>88</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>Hb (g/dl)</td>
<td>10.1</td>
<td>10.5</td>
<td>10.2</td>
<td>7.9</td>
<td>9.5</td>
<td>8.8</td>
<td>12.0</td>
</tr>
<tr>
<td>PLT (× 10/ul)</td>
<td>13.0</td>
<td>10.7</td>
<td>8.6</td>
<td>7.0</td>
<td>12.8</td>
<td>22.5</td>
<td>47.6</td>
</tr>
</tbody>
</table>

Findings upon admission

Upon admission to our hospital, the patient was lucid without dyspnea or cough. A slight decrease in the breath sounds was heard over the lung fields bilaterally. The blood pressure, pulse rate, and body temperature were 116/66 mmHg, 126/min, and 37.1ºC, respectively. A blood test revealed an elevated CRP level of 21.2 mg/dl, and an arterial blood gas analysis revealed a lowered PaO₂ at 55.7 mmHg. A chest X-ray taken as a preoperative test showed no finding suggestive of pulmonary edema, but ground-glass opacities and pleural effusion in the bilateral middle lower lung fields were depicted (Fig. 2). On the CTG, a baseline of 140 bpm with minimal variability was observed; no accelerations, but late decelerations were noted (Fig. 3).
Clinical course after admission

At 35 + 1 weeks gestation, an abdominal cesarean section was performed due to fetal distress. A 2,336-g male was delivered. The Apgar score was 8 at 1 minute after birth with 0 points for skin color; the Apgar score was 8 at 5 minutes, and the newborn did not require resuscitation. The placenta, with the umbilical cord attached at the center, weighed 500 g. No abnormal findings were found in the appearance or position of the placenta and the umbilical cord.

A chest computed tomography (CT) obtained immediately after surgery revealed ground-glass opacities, shadows along the bronchi, and pleural effusions in the middle lower lung fields (Fig. 4). Based on these findings, atypical pneumonia, viral pneumonia, eosinophilic pneumonia, or malignant lymphoma was suspected. In addition, since heart failure and thrombosis were suspected due to the elevated CPK level at 1,295 IU/l, electrocardiogram, echocardiogram, and peripheral vascular sonogram were recorded, none of which showed significant abnormalities.

In addition, further blood tests and a urinalysis were performed. Negative results were obtained for β-D-glucan, Candida antigen, urinary Streptococcus pneumoniae capsular antigen, urinary Legionella antibody, and anti-Chlamydia pneumoniae antibody. The Mycoplasma antibody titer by complement fixation (CF) was low at ≤ 4, the KL-6 level was 268 U/ml, and the cold agglutinin titer was 64, all of which were within the normal range. The IgE level was elevated at 3,371 U/ml. Various allergy tests revealed a positive reaction to cedar, mite, house dust, and the dander of dogs and cats. Based on the pulmonary infiltrative shadows and the elevated peripheral blood eosinophil count of 532/µl, the diagnosis of acute eosinophilic pneumonia was made. Carbapenem and new quinolone antibiotics and methylprednisolone sodium succinate were started at a dose of 250 mg/day each, as well as oxygen at 6 l/min (80%).

On post-operative day 2, the shadows in the middle lung fields started to resolve on the chest X-ray (Fig. 5). On post-operative day 4, the radiolucency in both of the lung fields was increased on chest x-ray, and oxygen administration was discontinued (Fig. 6). After discontinuation of oxygen, there were no respiratory problems or a decrease in PaO₂. On post-operative day 5, the CRP level decreased to 2.4 mg/dl, and the administration of antibiotics was discontinued. On post-operative day 10, corticosteroid administration was discontinued. On post-operative day 13, the general condition improved and the mother and her baby were discharged to home. The patient has been leading a normal life with no recurrence for > 3 years since delivery.
Acute eosinophilic pneumonia is a relatively new disease concept which was advocated by Allen et al. (1989) and Badesch et al. (1989) as a group of eosinophilic pneumonias of unknown etiology. In their initial report, Allen et al. (1989) presented the characteristics of acute eosinophilic pneumonia as follows: i) acute fever of < 7 days duration, ii) hypoxemia with a PaO$_2$ < 60 mmHg, iii) diffuse pulmonary shades on chest x-ray, iv) an increased eosinophil count in the bronchoalveolar lavage fluid (BALF) >25%, v) exclusion of clear infection, including those from parasites or fungi, vi) absence of a history of bronchial asthma and other allergic disease, vii) prompt response to treatment with steroids, and viii) no recurrence after discontinuation of treatment. While these characteristics are currently often used as the diagnostic criteria, later reports have expressed the opinion that even if some of these criteria are not met, those cases with many of these characteristics may be considered to be acute eosinophilic pneumonia (Umeki 1992; Hayakawa et al. 1994).

Discussion

Acute eosinophilic pneumonia is a relatively new disease concept which was advocated by Allen et al. (1989) and Badesch et al. (1989) as a group of eosinophilic pneumonias of unknown etiology. In their initial report, Allen et al. (1989) presented the characteristics of acute eosinophilic pneumonia as follows: i) acute fever of < 7 days duration, ii) hypoxemia with a PaO$_2$ < 60 mmHg, iii) diffuse pulmonary shades on chest x-ray, iv) an increased eosinophil count in the bronchoalveolar lavage fluid (BALF) >25%, v) exclusion of clear infection, including those from parasites or fungi, vi) absence of a history of bronchial asthma and other allergic disease, vii) prompt response to treatment with steroids, and viii) no recurrence after discontinuation of treatment. While these characteristics are currently often used as the diagnostic criteria, later reports have expressed the opinion that even if some of these criteria are not met, those cases with many of these characteristics may be considered to be acute eosinophilic pneumonia (Umeki 1992; Hayakawa et al. 1994).

Regarding the etiology of acute eosinophilic pneumonia, Allen et al. (1989) stated that the etiology of this disease is unknown. But some reports have attributed acute eosino-
philic pneumonia to an initiation of smoking, increased consumption of tobacco, or a change in smoking habits (Nakajima et al. 1998; Shintani et al. 2000). Also, there are reports of similar pathology caused by drugs, including aspirin and minocycline or environmental fungi (Toyoshima et al. 1996; Imokawa et al. 1996). The patient in the present case had no history of tobacco use, thus the etiology is considered unknown.

There have been no other reports on a case of acute eosinophilic pneumonia during pregnancy, although a case of acute eosinophilic pneumonia was reported that developed following an intramuscular injection of progesterone in an in vivo fertilization cycle (Bouckaert et al. 2004).

In the present patient, a rapidly progressing fever and deterioration in respiratory status were observed during pregnancy. The presence of diffuse ground-glass opacities on chest x-ray and chest CT, and a mildly elevated eosinophil count in the peripheral differential leukocyte count were also confirmed. The symptoms showed a good response to steroids without signs of recurrence. BALF could not be obtained because the patient had been receiving a high concentration of oxygen after the cesarean delivery. The diagnosis of acute eosinophilic pneumonia was therefore based on the clinical course and examination results. Other differential diagnoses were ruled out as follows. Various bacterial and fungal pneumonias were eliminated as etiologic pathogens by the negative results for β-D-glucan and Candida antigen, and low titers for Chlamydia pneumoniae and Mycoplasma antibodies. Interstitial pneumonia was ruled out with the normal KL-6 level. Hypersensitivity pneumonitis and other pneumonias were also dismissed by the normal cold agglutinin titer.

Concerning the effect of the respiratory disease on the relationship between the mother and fetus, it is reported that a maternal PaO₂ < 60 mmHg is hazardous for the fetus (Hernandez et al. 1980). Based on the oxygen-human hemoglobin dissociation curve, a maternal PaO₂ of at least 60 mmHg is required to maintain the oxygen saturation level of the fetus > 90% and ensure the transfer of a sufficient amount of oxygen to the periphery. Of note, the patient in the present case had a PaO₂ as low as 55.7 mmHg on admission. It is thought that the low PaO₂ of the mother caused an insufficient oxygen supply to the fetus, which was shown as the absence of accelerations and the presence of late decelerations on the CTG. This rare case of acute eosinophilic pneumonia during pregnancy caused a low partial pressure of oxygen on the maternal side, which caused an insufficient oxygen supply on the fetal side, leading to fetal distress, and necessitating an emergency cesarean section.

For this type of unexplained disease, diagnosis in the early stage is extremely difficult. The pre-operative chest X-ray for cesarean section allowed us to make the diagnosis. However, an earlier diagnosis might have been possible if the patient had been examined by a chest X-ray examination at 35 + 0 weeks gestation when the patient experienced worsening chills and cough. With an earlier diagnosis, steroid administration might have been effective, and the fetal distress due to insufficient oxygen supply and the resulting emergent cesarean section may have been avoided.

References