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Unusual clinical course of preeclampsia heralded by generalized edema

Takahshi Kojima¹, Takahiro Yamada², Takashi Yamada¹, Mamoru Morikawa²,
Kazutoshi Cho², Hisanori Minakami¹

1, Department of Obstetrics, Hokkaido University Graduate School of Medicine
2, Hokkaido University Hospital

Running foot: Unusual preeclampsia heralded by edema

*Corresponding author: Takahiro Yamada

Department of Obstetrics, Hokkaido University Graduate School of Medicine, Kita-ku
N14 W6, Sapporo 060-8638, Japan
Email: taka0197@med.hokudai.ac.jp
Abstract

Background: Preeclampsia monitored by the amount of proteinuria usually does not show amelioration during pregnancy.

Case: A 37-year-old nulliparous woman was admitted to our hospital at gestational week (GW) 24\(^{-1/7}\) due to rapid weight gain (6.2 kg/4 weeks) and oligohydramnios. Hypertension (151/91 mmHg) appeared at GW 25\(^{-0/7}\) and proteinuria not detected at GW 24\(^{-0/7}\), became significant (0.55 g/day) at GW 25\(^{-2/7}\). During the two successive weeks after administration of betamethasone at 12 mg twice and transabdominal amnioinfusion with 250 mL of Ringer’s acetate solution at GW 25\(^{-3/7}\), generalized edema, proteinuria, and thrombocytopenia markedly improved: body weight, 78.0 – 69.0 kg; proteinuria (g/day), 7.1 – 1.3; and platelet count (×10\(^9\)/L), 111 – 230. However, intrauterine infection accompanied by non-reassuring fetal status necessitated emergency cesarean section at GW 28\(^{-3/7}\).

Conclusion: Extraordinary body weight gain can herald the occurrence of preeclampsia and this weight gain together with signs of preeclampsia can ameliorate even during pregnancy, although its mechanism is unclear.

Keywords: gestational edema, preeclampsia, thrombocytopenia, vascular permeability
Introduction

Women with preeclampsia are likely to show excessive water retention [1]. Although generalized edema can precede the development of preeclampsia [2], there is as yet no technical term applicable to the condition of edema alone. Preeclampsia usually does not show amelioration during pregnancy. Here, we present a pregnant woman in whom preeclampsia was heralded by generalized edema and clinical signs of preeclampsia acutely ameliorated during pregnancy.

Presentation of the case

This study was approved by the institutional review board of the Hokkaido University Hospital and was undertaken following the provisions of the Declaration of Helsinki. A 37-year-old nulliparous Japanese woman presented with marked edema (weight gain of 6.2 kg/4 weeks) (Fig. 1) and oligohydramnios (amniotic fluid index [AFI] of 4.8 cm) in the absence of hypertension, proteinuria, or placental edema and was admitted to our hospital at gestational week (GW) 24-1/7. Hypertension (151/91 mmHg) and proteinuria (0.55 g/day) appeared at GW 25-0/7 and GW 25-2/7, respectively. Primary aldosteronism, autoimmune diseases, or thyroid diseases were considered unlikely by endocrinologists and immunologists (Table 1). Administration of betamethasone for fetal lung maturation (intramuscular 12 mg twice) and amnioinfusion with 250 mL of Ringer’s acetate solution for oligohydramnios (AFI of 0.4 cm) were performed at GW 25-3/7 (Fig. 1). An AFI of 11.5 cm at GW 25-4/7 gradually decreased to 3.8 cm at GW 27-6/7. Treatment with oral nifedipine (20 mg/day) was initiated at GW 26-0/7. The maternal body weight began to decrease after showing a peak value at GW 25-5/7 and platelet counts began to increase after showing a nadir value at GW 26-6/7, while
hematocrit values were stable (Fig. 1). Proteinuria (g/day) also began to decrease after showing a peak value of 7.1 at GW 26\(^{6/7}\) to 1.3 at GW 27\(^{3/7}\), respectively, while blood pressure remained high (140 – 170/75 – 95 mmHg).

Four days after the second amnioinfusion (250 mL of Ringer’s acetate solution) at GW 27\(^{6/7}\) for oligohydramnios (AFI of 3.8 cm), the patient exhibited fever of 38.6°C with elevated C-reactive protein level (5.7 mg/dL) and WBC count (20200/μL), as well as non-reassuring fetal status at GW 28\(^{3/7}\). A growth restricted (-1.45 SD) female infant weighing 820 g was born by emergency cesarean section. Pathological examination of the placenta revealed chorioamnionitis (stage III). The infant survived septicemia with *Abiotrophia defectiva* and left our hospital on hospital day 85. Magnetic resonance imaging (MRI) of the infant’s brain performed on hospital day 82 was unremarkable.

The mother leaving our hospital on postpartum day 8 showed normal blood pressure (127/69 mmHg) and non-significant proteinuria (negative on dip stick test) at 1 month postpartum.

**Discussion**

This patient exhibited two unusual features of pregnancy. First, her preeclampsia was heralded by extraordinary weight gain between GW 20 and 24. Second, her preeclampsia monitored by changes in body weight (degree of edema), proteinuria, and platelet counts showed amelioration during pregnancy.

We previously encountered a woman who exhibited rapid weight gain (6.0 kg in the last 7 days of pregnancy) with gradual declines in antithrombin activity and platelet count until delivery [2]. In this previous case, the risk of pulmonary edema necessitated cesarean section at GW 37 in the absence of hypertension and proteinuria, and
pulmonary edema actually developed postpartum followed by hypertension, but the
diagnosis of preeclampsia had to wait until 5 days after delivery at which time
proteinuria developed [2]. Thus, a type of preeclampsia with edema as its initial sign
indeed exists. The present case also showed a gradual decline in platelet count (Fig. 1)
and modestly reduced antithrombin activity (72% of normal activity level). Pregnant
women with reduced antithrombin activity and/or platelet counts are suggested to be
suffering from increased blood vessel permeability [3, 4]. The appearance of edema is
likely a consequence of endothelial leakage of plasma into the interstitial space.
Consequently, plasma volume is reduced by approximately 20% in women with
preeclampsia [5] and more in women with eclampsia [6]. The rapid and extraordinary
weight gain in our patient may be explained by the same mechanism as that in women
with preeclampsia.

Amounts of protein in the urine increase with advancing gestation irrespective of the
presence or absence of hypertension [7]. In the presence of increased blood vessel
permeability, adequate water intake results in edema formation with stable hematocrit
value, but insufficient water intake results in increased hematocrit value, and finally a
decrease in body weight designated as “dehydration.” Thus, in the presence of increased
blood vessel permeability, maternal body weight is unlikely to decrease in the absence
of changes in hematocrit value. However, the present case exhibited marked weight
reduction with stable hematocrit value and a decrease in proteinuria. As the period until
delivery after the diagnosis of preeclampsia is approximately 2 weeks [7], this patient
received steroid administration and amnioinfusion, resulting in an increase of AFI from
0.4 to 11.5 cm. It remains unclear whether these treatments contributed to the favorable
changes in various parameters seen in this patient.

**Disclosure**

All authors declare that they have no financial relationship with a biotechnology manufacturer, a pharmaceutical company, or other commercial entity that has an interest in the subject matter or materials discussed in the manuscript.


Figure Legend

Figure 1: Changes in maternal body weight (○), platelet counts (●), and hematocrit value (×)

PPD, postpartum day
### Table 1. Results of laboratory work-up and Doppler study

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antithrombin activity (% of normal activity level)</td>
<td>78 (24(^{67})), 72 (25(^{27})), 86 (27(^{67}))</td>
</tr>
<tr>
<td>AST [IU/L]</td>
<td>12 (24(^{67})), 13 (28(^{37})), 16 (PPD 3)</td>
</tr>
<tr>
<td>LDH (IU/L)</td>
<td>161 (24(^{67})), 137 (28(^{37})), 190 (PPD 3)</td>
</tr>
<tr>
<td>PAC [ng/L]</td>
<td>124 (24(^{67})), 115 (26(^{67}))</td>
</tr>
<tr>
<td>PRA [ng/mL/hour]</td>
<td>2.8 (24(^{67})), 2.7 (26(^{67}))</td>
</tr>
<tr>
<td>TSH</td>
<td>2.16 μIU/mL (24(^{67}))</td>
</tr>
<tr>
<td>Free T4</td>
<td>1.1 ng/dL (24(^{67}))</td>
</tr>
<tr>
<td>NT-proBNP [ng/mL]</td>
<td>992 (26(^{67})), 79 (27(^{67}))</td>
</tr>
<tr>
<td>IgA</td>
<td>147 mg/dL (24(^{67}))</td>
</tr>
<tr>
<td>IgM</td>
<td>186 mg/dL (24(^{67}))</td>
</tr>
<tr>
<td>IgE</td>
<td>107 mg/dL (24(^{67}))</td>
</tr>
<tr>
<td>C3 *</td>
<td>95 mg/dL (24(^{67}))</td>
</tr>
<tr>
<td>C4*</td>
<td>7 mg/dL (24(^{67}))</td>
</tr>
<tr>
<td>CH50*</td>
<td>31 U/mL (24(^{67}))</td>
</tr>
<tr>
<td>Rheumatoid factor</td>
<td>0.9 IU/mL (24(^{67}))</td>
</tr>
<tr>
<td>Antinuclear antibody</td>
<td>negative (24(^{67}))</td>
</tr>
<tr>
<td>Lupus anticoagulant</td>
<td>ND (25(^{27}))</td>
</tr>
<tr>
<td>IgM</td>
<td>735 mg/dL (24(^{27}))</td>
</tr>
<tr>
<td>IgG</td>
<td>186 mg/dL (24(^{27}))</td>
</tr>
<tr>
<td>IgE</td>
<td>107 mg/dL (24(^{27}))</td>
</tr>
<tr>
<td>Rheumatoid factor</td>
<td>0.9 IU/mL (24(^{27}))</td>
</tr>
<tr>
<td>Anti-cardiolipin antibody</td>
<td>ND (25(^{27}))</td>
</tr>
<tr>
<td>Lupus anticoagulant</td>
<td>ND (25(^{27}))</td>
</tr>
<tr>
<td>Anticardiolipin-β2 glycoprotein I complex antibody</td>
<td>ND (26(^{17}))</td>
</tr>
<tr>
<td>Umbilical artery pulsatility index</td>
<td>1.52 (25(^{27})), 0.99 (28(^{27}))</td>
</tr>
<tr>
<td>Umbilical artery resistance index</td>
<td>0.76 (25(^{27})), 0.65 (28(^{27}))</td>
</tr>
<tr>
<td>Fetal middle cerebral artery pulsatility index</td>
<td>1.27 (25(^{27})), 1.30 (28(^{27}))</td>
</tr>
<tr>
<td>Fetal middle cerebral artery resistance index</td>
<td>0.73 (25(^{27})), 0.74 (28(^{27}))</td>
</tr>
</tbody>
</table>

Gestational week at examination is indicated in parenthesis.

PPD 3, postpartum day 3; AST, Aspartate aminotransferase; LDH, Lactate dehydrogenase;
PAC, plasma aldosterone concentration; PRA, plasma renin activity; TSH, thyroid stimulating hormone;
NT-proBNP, N-terminal fragment of precursor protein brain-type natriuretic peptide;
Ig, Immunoglobulin; *, Complement; ND, not detected