

The Termination of Gestational Weeks and Methods of Delivery of Severe Pneumonia in Pregnancy

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Abstract

Objective: Pregnant women were at increased risk for serious outcomes of severe pneumonia, we concentrate on the termination weeks and methods to bring improvement to the clinical outcomes.

Methods: We identified 30 singleton pregnancies with a diagnosis of severe pneumonia during their pregnancy and used 37 matched women without infection as a comparison group. We analyze the termination weeks, methods and adverse pregnancy outcomes, including maternal age, body mass index, and the laboratory indexes, birth weight.

Results: The terminal weeks and methods were significantly different between the two groups ($p < 0.05$). The experiment group had bigger body mass index, worse blood biochemical examination and lower birth weight ($p < 0.05$). There is no difference in maternal age. They all needed assisted mechanical ventilation to improve respiration.

Conclusion: The biggest of body mass index, the more easily to come down with severe pneumonia, low birth weight and adverse blood biochemistry examination. If admitted severe pneumonia, they should be treated timely, seek out the appropriate time of termination of pregnancy to reduce the mortality of mother and the fetuses.

Keywords: Pregnancy, Severe pneumonia, Terminal weeks, Methods

Introduction

Pregnant women were at increased risk for serious outcomes of severe pneumonia, especially viral pneumonia. During the last decade humankind has experienced the emergence of four severe acute respiratory infections: severe acute respiratory syndrome (SARS) caused by coronavirus, avian influenza A due to (H5N1) virus, pandemic influenza A caused by (H1N1)2009 virus, and avian influenza A caused by H7N9 virus, which lead to fatal outcomes with pregnant women. However, few researches concentrate on the termination weeks and methods. We focus on the termination weeks and methods of severe pneumonia in pregnancy to bring improvement to the clinical outcomes.

Materials and Methods

Data Source

A retrospective study comparing pregnancies of women with and without severe pneumonia was conducted. As for the selection of the study group, we identified 30 women with singleton births who had been hospitalized with a diagnosis of severe pneumonia (Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults Clinical Infectious Diseases 2007) during their pregnancies between Nov. 1, 2009, and Feb. 25, 2010. In addition, we randomly retrieved 37 matched women without pneumonia as a comparison group.

Diagnostic Criteria

Criteria for severe community-acquired pneumonia [1]

Minor criteria^a

1. Respiratory rate ≥ 30 breaths/min
2. PaO_2/FiO_2 (arterial oxygen pressure/fraction of inspired oxygen ratio) ≤ 250

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3. Multilobar infiltrates
4. Confusion/disorientation
5. Uremia (blood urea nitrogen level, ≥ 20 mg/dL)
6. Leukopenia^c (white blood cell count, < 4000 cells/mm³)
7. Thrombocytopenia (platelet count, $< 100,000$ cells/mm³)
8. Hypothermia (core temperature, $< 36^{\circ}\text{C}$)
9. Hypotension requiring aggressive fluid resuscitation

Major criteria

1. Invasive mechanical ventilation
2. Septic shock with the need for vasopressors
 - a. Other criteria to consider include hypoglycemia (in non-diabetic patients), acute alcoholism/alcoholic withdrawal, hyponatremia, unexplained metabolic acidosis or elevated lactate level, cirrhosis, and asplenia.
 - b. A need for noninvasive ventilation can substitute for a respiratory rate > 30 breaths/min or a PaO₂/FiO₂ ratio < 250 .
 - c. As a result of infection alone.

Patients were included in the study if they met one of the major criteria or three of the minor criteria above. Patients were excluded from the study if they had a history of asthma, infections, chronic obstructive pulmonary disease, diabetes, renal disease, hepatic disease, hypertension, cardiovascular illness, multiple pregnancies, HELLP syndrome (hemolysis, elevated liver function, low platelets) and autoimmune diseases.

Statistic method

Applying SPSS 13.0 to analyze the data. T test for body mass index (BMI), terminal weeks and maternal age, birth weight, which presented as mean \pm standard deviation, while χ^2 test for terminal methods and blood biochemical examinations including myocardial enzyme, hepatic enzyme, renal enzyme and electrolyte. It is statistically significant different when $p < 0.05$. All pregnant women understood and agreed the clinical trial.

Results

Blood biochemical examination consisting of myocardial enzyme, hepatic enzyme, renal enzyme and electrolyte of the experimental group and control group (Table 1). The prevalence of adverse maternal blood biochemical examination is presented in Table 1. It shows that women with pneumonia had a worse blood biochemical examination of myocardial enzyme (90.00% vs 24.32%, $P < 0.01$), hepatic enzyme (33.33% vs 10.81%, $P < 0.01$), renal enzyme (83.33% vs 24.32%, $P < 0.01$), electrolyte (86.67% vs 13.51%, $P < 0.01$) than women without pneumonia.

Other indications consisting of BMI, terminal week and maternal age, birth weight of the experimental group and control group (Table 2). It shows that women with pneumonia had bigger BMI than women without pneumonia (31.4 ± 4.37 vs 28.41 ± 4.98 , $P < 0.05$), and terminal week is different between two groups (34.31 ± 5.75 vs 37.20 ± 3.39 , $P < 0.05$). Women with pneumonia had a lower birth weight than women without pneumonia (2328.33 ± 592.73 g vs 2779.19 ± 634.18 g, $P < 0.01$). There were no significant differences in the maternal age (28.87 ± 4.24 vs 27.62 ± 3.91 , $P > 0.05$) between women with and without pneumonia.

	Experimental group n	Experimental group %	Control group n	Control group %	χ^2	p
Myocardial enzyme	27	90.00	9	24.32	28.74	0.000
Hepatic dysfunction	10	33.33	4	10.81	5.08	0.024
Renal dysfunction	25	83.33	9	24.32	23.08	0.000
Electrolyte disorder	26	86.67	5	13.51	35.66	0.000

Laboratory examinations consisting of myocardial enzyme, hepatic enzyme, renal enzyme and electrolyte of the experimental group and control group.

Table 1: Blood biochemical examination of the two groups

	BMI* (kg/m ²)	Terminal week	Maternal age (year)	Birth weight
experimental group	31.40 ± 4.37	34.32 ± 5.76	28.87 ± 4.24	2328.33 ± 592.73
control group	28.41 ± 4.98	37.20 ± 3.39	27.62 ± 3.91	2779.19 ± 634.18
t	2.58	-2.56	1.248	-2.98
P	$< 0.05^*$	$< 0.05^*$	> 0.05	$< 0.05^*$

Other indications consisting of BMI, terminal week of the experimental group and control group. Body mass index (BMI) was significantly different between the two groups, and the experimental group had bigger BMI.

Table 2: BMI, Terminal week of the two groups

Discussion

The predisposing factors

During pregnancy both mother and baby are at increased risk when infected with pneumonia. The mechanical, immunological, and hormonal changes of pregnancy contribute to this heightened risk [2]. There are some predisposing factors, for example, BMI, gestation week and maternal age, and vaccination.

Body Mass Index (BMI): Sullivan observed obese patients ($\text{BMI} \geq 30$ kg/m²) accounting for approximately one-third of the cases required intensive care [3]. There are 20 patients whose BMI indexes are greater than 30 accounting for 66.67% of the experimental group. Comparing the two groups, the difference of statistic was significant ($p < 0.05$). That is the same with the recommendation of severe pneumonia. Pregnant women ought to control their weight to descend the risks of developing a disease, such as severe pneumonia, pre-eclampsia.

Gestation Weeks and Maternal Age: Liu put forward the idea that gestational week is associated with the risk of developing critical infection. The risk increases with increasing weeks of gestation, while the maternal age was not found to be risk factors for critical cases [4]. In our study, there is no difference in maternal age ($P > 0.05$). However, it seems that pregnancy, particularly during the third trimester, increases the risk of severe pneumonia. As following infected with severe pneumonia 27 cases (90% of the 30 cases) were in the third trimester; three cases (10% of the 30 cases) were in the second trimester; none of them was in the first trimester. Seemly, pregnancies during the third trimester were easier than other pregnancies to suffer from infection with severe pneumonia. Sonja A and colleagues report that immunologic changes occur during pregnancy that place women at increased risk for severe complications when infected with certain agents, including influenza virus. Alterations in other systems, such as respiratory and cardiovascular systems, also result in an increased risk for influenza-associated complications [5].

Vaccination: For elderly, nearly half of pneumococcal disease-related deaths could potentially be prevented through

the use of vaccine [6]. The vaccines for influenza and pneumonia are a safe, effective and cost-efficient way to dramatically reduce the burden of these diseases in older adults, and prevent tens of thousands of deaths [7]. For pregnant women, Janice K and co-workers suggest that vaccination of pregnant women is strongly encouraged. However, regardless of vaccination history, clinicians should remain vigilant for 2009 H1N1 infection when the virus is in circulation, and should not delay antiviral treatment of pregnant women with suspected influenza [8]. Of the 30 patients, none of them had influenza A H1N1 influenza vaccine. Madoka H and colleagues present that pregnant women have a high risk of being infected with and having morbidity from influenza, vaccination with an inactivated influenza vaccine during pregnancy is recommended. Single vaccination induces sufficient immune response and transfer of immunity to the fetus in pregnant women with no pre-existing antibodies [9]. If next influenza broke out, pregnancy women could have vaccination to prevent infection. In addition, pregnant women should be treated regardless of whether they have been vaccinated, because influenza vaccination is only about 60% effective [10].

The effects of severe pneumonia on maternal and fetal

In our research, 90% of the 30 cases combined myocardial injury; 83% of the 30 cases combined hepatic dysfunction; 33% of the 30 cases combined renal disease; 87% of the 30 cases combined unbalance electrolyte. Comparing the two groups, the difference of myocardial injury, hepatic dysfunction, renal disease and unbalance electrolyte were significant ($p < 0.05$). And lung disorders were associated with severe disease and death [11]. Among the 30 cases of severe pneumonia in pregnancy, there were 11 people assisting respiration by nasal catheter, and five people using oxygen mask, and nine people with non-invasive ventilator, and five people suffered invasive ventilator. The four maternal deaths were died of respiratory failure. Doctors have ascribed the problem to the fact that the immune system is tamped down by pregnancy previously.

The symptoms associated with the virus may also have deleterious effects on the growing fetus. Maternal hyperthermia in the first trimester doubles the risk of neural tube defects and may be associated with other birth anomalies such as cleft lip/palate and congenital heart defects [12]. Both animal and human epidemiological studies support the association of first trimester hyperthermia with increased subsequent birth defects. Maternal fever during labor may also result in adverse neonatal or developmental outcomes, including neonatal seizures, encephalopathy, cerebral palsy, and even neonatal death [13]. The birth weight of experimental group is significantly lower than in control group ($P < 0.01$). The infants whose mother effected severe pneumonia were all admitted NICU for intensive care. Therefore, none of them were infected with severe pneumonia or birth anomalies, and all of them were cured. It probably benefited from prompt and effective therapeutic measures concluding positive cesarean section, as well as elaborates nursing care in the intensive care unit.

The termination weeks and methods for the pregnancy

There were 23 cases experiencing cesarean section accounting for 77% of group infecting severe pneumonia, while 6 cases suffered cesarean delivery accounting for 16% of the control group. The situation that infecting severe pneumonia increased

the probability of abnormal production. 20 patients underwent cesarean section in 24 hours once identified severe pneumonia. Because of gestational age (22-30 weeks) and condition allowed, seven patient's induction of labor after severe pneumonia cured. If admitted severe pneumonia, they should be treated timely, seek out the appropriate time of termination of pregnancy to reduce the mortality of mother and the fetuses.

Among the 30 patients, a patient without serious pulmonary infection, hypoxemia and obstetric complications could terminate a pregnancy when the pathological physiological state was appropriate. Four patients died. All of them were transferred to our hospital because of severe respiratory failure, one patient transferred from other hospitals after surgery; three patients did surgery in our hospital within 12 hours. After admission, invasive mechanical ventilation was applied to them, but doctors were still unable to improve respiratory failure. They died due to respiratory failure. If the patient combined with severe hypoxemia or combined obstetric complications, they should end the pregnancy as soon as possible. The pregnancy with severe pneumonia combined fetal distress easily, because of hypoxemia or respiratory failure. The termination weeks and method of labor mainly depends on gestational age. If gestational age < 30 weeks, induction is advised because neonatal survival is low. If the gestational age > 32 weeks, the termination of pregnancy should be as soon as possible in order to rescue infants. At the same time, termination of pregnancy reducing intra-abdominal pressure can improve the respiratory condition. If the gestational age is between 30-32 weeks, it should depend on both the condition and the infants. If the patients with organ dysfunction, pregnancy should be ended after organ function improved as soon as possible. Approach to the labor, cesarean section is appropriate.

In short, the biggest of body mass index, the more easily to infect severe pneumonia. Pregnancies ought to control their weight and prevent infection. Pregnancies with pneumonia symptoms are advised treatment as soon as possible. If admitted severe pneumonia, they should be treated timely, seek out the appropriate time of termination of pregnancy to reduce the mortality of mother and the fetuses. Cesarean section may be appropriate. With the time going, the new opinion is that pregnant women should be take vaccination and treated regardless of whether they have been vaccinated.

Conflicts of Interest

None

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