



Pulmonary Embolism During Pregnancy and the Postpartum Period: Incidence, Intensive Care Management and Outcome

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Abstract

Objective: Pregnant people pose some challenge to the intensivists and their management is clinically important in the intensive care unit (ICU). Thrombotic events and pulmonary embolism (PE) is one of the most important causes of maternal morbidity and mortality. The aim of this study is to evaluate the incidence, diagnostic approaches, therapeutic interventions, intensive care management and outcome of parturient admitted to obstetric intensive care which were suspected to have PE.

Materials and Methods: In this study, all pregnant or postpartum women with the sign or symptoms of PE which admitted to obstetric ICU of Alzahra teaching hospital during 5 years were reviewed. Demographic data, clinical signs or symptoms, diagnostic approaches, patient management and final outcome of the patients were collected, noted and analyzed.

Results: Totally 200 parturient with the suspicion to have PE were admitted to ICU during 5 years. Mean age, weight and height of patients were 26.61 ± 4.28 years, 75.24 ± 3.06 kg and 157.87 ± 7.89 cm, respectively. 136 (68%) patients were assessed carefully with imaging techniques and pulmonary emboli PE was ruled out in 124 (62%) patients whose CT was normal and 76 (38%) revealed unilateral (59 patients) or bilateral (8 patients) PE. Mean admission time was 7 days and overall mortality was 2.6% (2 patients).

Conclusion: PE is an important cause of pregnancy-related mortality and morbidity and can mimic many other clinical conditions. However, high index of suspicion, accurate diagnostic approaches and timely prophylaxis and therapy can prevent maternal mortality.

Keywords: pulmonary embolism, pregnancy, obstetric ICU

Introduction

Obstetric patients present a unique individual in the intensive care unit to the intensivists and their management is clinically important due to physiologic changes of pregnancy, and pregnancy-specific conditions which may require critical care. These patients are young and otherwise healthy and is challenged by concerns of fetal viability, whose well-being is linked to the mother (1,2). Venous thromboembolism (VTE) a disease characterized by deep vein thrombosis (DVT) and pulmonary embolism (PE), is an important cause of maternal morbidity and death in the world. In spite of overall decrease in maternal mortality from hemorrhage or preeclampsia, PE remains one of the leading causes of death in pregnant women in all countries. The overall prevalence of PE during pregnancy is estimated to 0.06% to 0.2%, which represents a 4-fold and according to some studies 10-fold increase in risk in comparison to the non-pregnant populations and the greatest risk occurs during postpartum period (3-9). The increased risk may be related to hormonal (progesterone) induced vasodilatation, venous stasis by the enlarged uterus, hypercoagulability that associated with the pregnancy and endothelial injuries of the uteroplacental circulation

(1,2,5-10). Other risk factors of thromboemboli in these patients include history of thrombosis, advanced age, obesity, smoking, severe hemorrhage, diabetes mellitus, lupus erythematosus and cesarean delivery (11-13). The diagnosis of pulmonary emboli in pregnancy is difficult, because many classic symptoms are unspecific and also be associated with normal pregnancy. Lack of timely diagnosis and intervention can lead to some acute and severe disorders including hypoxia, low cardiac output, acidosis, pulmonary hypertension and even death. Approximately two-thirds of patients' mortality occur in the first 30 minutes in severe cases. In addition, some complications of pregnancy as placenta abruption, preeclampsia, intrauterine growth restriction (IUGR), abortion and fetal death are high in patients with PE. On the other hand, timely diagnosis and rapid medical and/or surgical therapy can significantly reduce maternal morbidity and mortality. Successful management of these patients who admitted to intensive care unit (ICU) depends on multidisciplinary approaches which need the cooperation of ICU personnel, obstetrician, anesthesiologist or intensivist and neonatologist (2-4,11-14). In this study we reviewed and analyzed 5-year trends of overall incidence, clinical features, diag-

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nostic ways, intensive care and final maternal and neonatal outcome of patients admitted to obstetric ICU with the suspicion of PE.

Materials and Methods

This study was conducted in an obstetric care unit at Alzahra educational tertiary center. After approval from ethics committee of the hospital, data of all patients suspected to have PE and admitted to ICU during 5 years (April 2009 to April 2014) were collected and reviewed. Patients were pregnant women or in the postpartum period with the initial signs or symptoms attributed to PE. Data were included the patients' demographics (age, weight, height and gravidity), history of any preexisting medical disorder (cardiovascular, pulmonary, lupus erythematosus, diabetes, preeclampsia, postpartum hemorrhage) previous thromboembolic events especially in previous pregnancies, smoking, route of delivery (vaginal or cesarean section). Also patients data were evaluated according to their chief complain and associated sign or symptoms, diagnostic approaches, patients' management and finally fetal-maternal outcome. All data were analyzed using SPSS, version 16. Results were given as number (percent) or mean \pm standard deviation (SD).

Results

A total number of 200 women with pregnancy or in the postpartum period who were suspected to have PE and admitted to obstetric ICU during 5 years (from April 2009 to April 2014), were evaluated. Demographic data are summarized in Table 1. According to Table 1, 96 patients (48%) were pregnant with gestational age between 19-40 weeks and 104 (52%) patients were in the postpartum period, became symptomatic immediately to at most 8 days after delivery. 18 (18.8%) pregnant were nulliparous and 78 (81.2%) were multiparous. In postpartum patients, 11 (10.5%) had vaginal delivery and 93 (89.5%) were underwent cesarean section with spinal anesthesia in 81 (87%) and general anesthesia in 12 (13%) patients. Patients risk factors for PE are summarized in Table 2. According to Table 2, the most common risk factor is patient immobilization in the recent 8 weeks. 22 patients had 2 and 8 pa-

tients had 3 risk factors. The most common complaint of patients during admission were dyspnea or dyspnea with tachycardia and the other signs or symptoms were hypoxia ($\text{SaO}_2 < 92\%$), chest pain, palpitation, cough, fever, lower extremities swelling and hypotension respectively (Table 3). Diagnostic approaches were included color Doppler ultrasonography, CT angiography and echocardiography. Regarding to the results of CT angiography, PE was ruled out in 124 (62%) patients whose CT was normal and 76 (38%) revealed unilateral (63 patients) or bilateral (13 patients) PE. Color Doppler was performed in all patients and 51 patients had DVT whereas 25 patients did not have. Further evaluation of 124 patients without PE revealed the diagnosis of pneumonia in 2 patients, pulmonary edema in 3, atelectasia in 3 and severe pulmonary artery hypertension (PAH) in 1 patient. For all patients medical therapy with full dose unfractionated heparin was initiated as soon as the patients were admitted to ICU with suspected PE. But according to CT angiography results, heparin was discontinued or changed to prophylactic dose in the 124 patients with negative results. Thirty-three patients with positive results in CT angiography and the diagnosis of PE were received anticoagulation as follow: from 54 patients who were pregnant, full dose heparin was continued in 25 patients and in 29 patients it was changed to LMWH (enoxaparin). Twenty-two patients were in the postpartum period (17 postcesarean and 5 after vaginal delivery) and received unfractionated full dose heparin (mean admission time 7 days). All patients with PE showed some degree of hypoxia (approximately SaO_2 between 80%-92%) and all received supplementary oxy-

Table 1. Patients Characteristics

| Patients with suspected PE, n (%) | 200 (100) |
|-----------------------------------|------------------------------|
| Age (years) | 26.6 \pm 4.28 ^a |
| Weight (kg) | 75.2 \pm 3.06 |
| Height (cm) | 157.89 \pm 7.89 |
| Pregnant (19-40 wk), n (%) | 96 (48) |
| Nulliparous | 18 (18.8) |
| Multiparous | 78 (81.2) |
| Postpartum, n (%) | 104 (52) |
| Mode of delivery, n (%) | |
| Vaginal delivery | 11 (10.5) |
| Cesarean section | 93 (89.5) |
| Spinal anesthesia | 81 (78) |
| General anesthesia | 12 (13) |

Abbreviation: PE, pulmonary embolism.

^aMean \pm standard deviation.

Table 2. Patients Signs or Symptoms During Hospitalization

| Sign or Symptom | Percent |
|---|---------|
| Dyspnea | 63.7 |
| Tachycardia (HR >110/min) | 41.6 |
| Hypoxia ($\text{SaO}_2 < 90\%$ without supplementary oxygen) | 32.4 |
| Chest pain | 17.12 |
| Orthopnea | 12.28 |
| Leg swelling (with or without pain) | 10.5 |
| Cough | 7.4 |
| Fever | 5.9 |
| Hypotension (BP <90/60 mm Hg) | 3 |

Table 3. Associated Risk Factors in the Patients With the Diagnosis of PE

| Risk Factor | No. of Patients (%) |
|---|---------------------|
| History of immobilization | 24 (31.6) |
| Obesity (BMI >20) | 12 (15.8) |
| Preeclampsia | 10 (13.1) |
| Endocrine disease (diabetes) | 9 (11.8) |
| Previous history of thromboembolic events | 8 (10.5) |
| Postpartum hemorrhage | 5 (6.5) |
| Cardiac disease | 4 (5.2) |
| Smoking | 3 (5.3) |
| Autoimmune disease (SLE) | 1 (1.3) |
| Total | 76 (100) |

Abbreviations: PE, pulmonary embolism; BMI, body mass index; SLE, systemic lupus erythematosus.

gen from nasal cannula, face mask or alternatively both of them. Only 7 patients need tracheal intubation and ventilatory support due to severe hypoxia. Four patients were extubated during 24-36 hours later without any complication but 2 patients needed continuous ventilator support and cardio-pulmonary resuscitation. Finally, from 124 patients who PE was ruled out in them, 123 patients discharged without any disorder or complication and only 1 patient died due to severe PAH. From 76 patients with PE, 2 (2.6%) patients died because of severe embolism (severe hypoxia, right heart failure and finally cardiopulmonary arrest) 2 and 7 hours after cesarean section, respectively.

Discussion

The clinical manifestations of pulmonary emboli are usually variable and nonspecific makes the diagnosis difficult. On the other hand, some clinical signs or symptoms like breathlessness, increased heart rate and high minute ventilation are some common signs or symptoms seen in normal pregnancy. Also many considerable variations are defined in pregnant women in their awareness of these symptoms. So, if there were not some clinical manifestations, excluding of PE is more difficult. In addition the safety of radiation investigations on fetal well-being is in doubt in pregnant women and their family and this can delay their decision to further investigations and finally diagnosis and treatment compared to non-pregnant state. Pulmonary emboli can be under or over diagnosed in pregnancy can expose women to the risks of fatal PE or unnecessary anticoagulant therapy (13-19). In this study, 200 patients admitted to obstetric ICU with the signs or symptoms suggesting PE during a period of 5 years. A total of 120 patients were pregnant and 80 in the postpartum period in the ages between 14 to 43 years old (mean \pm SD: 26.61 \pm 4.8). Stein et al in a review of 21-year trend of VTE in pregnancy showed that higher ages and cesarean section are associated with higher incidence of DVT, but PE occurred with less frequent in pregnant patient with DVT than non-pregnant patients with DVT (5). In our study mean age of patients was low, maybe because of epidemiologic or socio-economic differences, but there were not any significant difference in this study in the occurrence of PE in the two ranges of patients age (14-28 years) and (29-43 years). In this study, 12 patients developed PE after cesarean section and 5 patients after vaginal delivery. Most of patients in this study had at least one or two risk factors for thromboembolism according to Table 2 and the most common risk factor was patient immobilization in the recent 8 weeks. Arcelus et al studied 4011 patients with thrombotic events with and found that pregnancy is a risk factor of DVT in 11.5% of patients. They also reported that patient's immobilization more than 4 days in the recent 2 months is the main risk factor (20). Bulbul et al reported the presence of at least one risk factor in 69.4% of patients with PE (21) and Kroegel and Reissig resulted that 68.5% of patients with PE had at least one risk factor and in their study and history of DVT was seen in 13.8% (10), similar to our study (13%). Kayahan et al showed that

immobilization is the most common risk factor in 36% of patients (22). In our study dyspnea was the most common presenting symptom (Table 3). Bulbul et al and Kayahan et al also showed that dyspnea and chest pain are the most common clinical presentations in the patients as well as tachycardia (21,22), similar to our study. In this study, all patients underwent CT angiography for final diagnosis and beginning of treatment protocol. The diagnosis of PE was established in 33 patients. American Thoracic Society of thoracic radiologic clinical practice guidelines recommended that CT angiography is the gold standard of diagnosis of PE in pregnant women (23). Alonso-Martinez et al studied 375 patients with suspected PE and find that 187 patients had another disorders such as heart failure, pneumonia, bronchitis which completely mimic PE (18). Regarding with heparin is the selected anticoagulant therapy in the managing of pregnant patients (24), in this study; unfractionated heparin was begun for all patients suspected to have PE. After establishing the diagnosis, anticoagulant therapy was continued according to patients condition. Patients respiratory management also included supplementary oxygen via face mask, cannula and only 7 patients required ventilation support and finally 2 patients died (total mortality rate 1%) due to massive pulmonary emboli and resultant heart failure and cardio-pulmonary arrest.

Ethical Issues

The ethics committee of the hospital approved the study.

Conflict of Interests

None.

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