

Three Cases of Fatal Pulmonary Embolism in Obstetrics

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Abstract

We conducted a retrospective analysis of maternal deaths in our hospital from January 1992 to December 1995. Cases of fatal pulmonary embolism were identified and analysed with respect to their past history, antenatal and peripartum progress, clinical presentation and investigation.

There were 7 maternal deaths during this period and autopsies were performed in all cases. Pulmonary embolism was the leading cause of maternal mortality, responsible for 3 deaths. The incidence of fatal pulmonary embolism was 4.9 per 100 000 maternities. One case occurred antepartum and 2 occurred postpartum. The antepartum case occurred after a period of immobilisation, and both postpartum cases occurred after emergency Caesarean sections. Dyspnoea and sudden cardiovascular collapse were the commonest presentations. Electrocardiograph and arterial blood gases were abnormal in both patients in whom the tests were performed. Death occurred within 11 hours of presentation of symptoms in all 3 cases.

Pulmonary embolism was more common among our population than previously reported, and was the leading cause of maternal mortality in our institution over the last 4 years. Immobilisation and Caesarean section were the major risk factors. Identification of high risk situation, antithrombotic prophylaxis and a high degree of suspicion were the key to reducing the incidence of fatal pulmonary embolism in obstetric patients.

Ann Acad Med Singapore 1997; 26:356-9

Key words: *Anticoagulation, Caesarean section, Deep vein thrombosis, Maternal death, Thromboembolism*

Introduction

Pregnancy is known to be a risk factor for venous thrombosis, as a result of hypercoagulability and venous stasis. Pulmonary embolism from venous thrombosis is an important cause of maternal mortality in most Western countries.^{1,2} Despite advances in the understanding of venous thromboembolic disease, the prevention, diagnosis and treatment of pulmonary embolism remain a clinical challenge. Venous thromboembolism is often undiagnosed and autopsy studies revealed that only about 30% of fatal cases of pulmonary embolism were diagnosed before death.³

Pulmonary embolism was found to occur less frequently among Asians as compared to the Western population. In a previous analysis of maternal mortality in Alexandra Hospital from 1978 to 1988,⁴ pulmonary embolism was a rare cause of mortality, after amniotic fluid embolism, disseminated intravascular coagulation, pre-eclampsia and myocarditis. However, with

changes in socio-economic factors and obstetric practice, in particular the increase in Caesarean section rate, the pattern of maternal deaths may have changed in our institution. The aim of this study was to determine the incidence and characteristics of fatal pulmonary embolism among obstetric patients in Kandang Kerbau Hospital.

Material and Methods

All cases of maternal mortality in the Kandang Kerbau Hospital were presented and discussed at the Hospital Audit Committee meetings. There were 7 cases of maternal deaths between January 1992 and December 1995. The medical records were traced and cases of pulmonary embolism identified. Data were obtained from the patients' files, hospital records and postmortem reports. The factors analysed were demographic characteristics, antenatal progress, peripartum features, clinical presentations and investigations.

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Maternal death was defined as any death of a woman while pregnant or within 42 days of termination of the pregnancy irrespective of the duration or site of the pregnancy, or from any causes related to or aggravated by the pregnancy or its management.' The denominator used in calculating incidence was the total number of maternities from 1992 to 1995. This was a count of the number of mothers who delivered live or stillborn infants as distinct from the number of babies born, which included twins and other multiple births.'

Results

Between 1992 and 1995 there were 60 776 maternities. There were 7 maternal deaths giving a maternal mortality rate of 11.5 per 100 000 maternities. Three deaths were due to pulmonary embolism giving a maternal mortality rate due to pulmonary embolism of 4.9 per 100 000 maternities. The causes of maternal mortality are listed in Table I.

TABLE I: CAUSES OF MATERNAL MORTALITY FROM 1992 TO 1995

Causes of death	Number
Pulmonary embolism	3
Pre-eclampsia/eclampsia	1
Amniotic fluid embolism	1
Ectopic pregnancy	1
Cardiac failure	1
Total	7

Of the 3 pulmonary embolic deaths, 1 occurred in the antepartum period and 2 occurred after Caesarean sections. A summary of the 3 cases is presented below:

Case A

A 33-year-old primipara, weighing 65 kg, presented at 8 weeks of amenorrhoea to the hospital emergency department with left calf swelling for a duration of 2 days. The calf swelling occurred after 5 hours of prolonged sitting during a game of mahjong the day prior to her symptom. While undergoing pelvic ultrasonography, which demonstrated the presence of a viable, intrauterine foetus, the patient suddenly collapsed. The electrocardiogram (ECG) showed generalised ST depression and T inversion in V1-3; arterial blood gas analysis showed hypoxaemia and hypercapnia. The chest X-ray was normal. In spite of cardiopulmonary resuscitation and pulmonary embolectomy, she died 11 hours after she collapsed. Post-mortem examination showed no residual emboli but there was venous thrombosis in the popliteal vein of the right leg.

Case B

A 32-year-old para 4, weighing 70 kg, underwent an

emergency Caesarean section at 37 weeks amenorrhoea for breech presentation. She was found to be febrile, tachycardic and dyspnoeic 15 hours after the operation. The ECG showed a S1Q3T3 pattern and a right bundle branch block; arterial blood gas analysis showed hypoxaemia and hypocapnia. The chest X-ray was normal. The patient died 8 hours later. Post-mortem examination showed large pulmonary emboli occluding the main pulmonary artery and bilateral deep vein thrombosis of the popliteal vein and venae comitantes of the posterior tibial artery.

Case C

A 30-year-old para 3, weighing 78 kg, underwent an emergency Caesarean section at 40 weeks amenorrhoea for foetal distress. She had a generalised fit on the second postoperative day accompanied by cyanosis and dyspnoea. She died an hour later. Post-mortem examination showed large pulmonary embolism occluding the main pulmonary artery but no lower limb deep vein thrombosis.

There was a total of 11 018 Caesarean sections from 1992 to 1995. The incidence of fatal pulmonary embolism after Caesarean section was 18.2 per 100 000 Caesarean section.

Discussion

Deep vein thrombosis and pulmonary embolism were generally thought to occur infrequently in the Asian population, even during pregnancy. Previous analysis of maternal mortality in other hospitals in Singapore supported the impression.^{4,5} However, our study showed that pulmonary embolism was the leading cause of maternal mortality in the largest maternity hospital in Singapore over the last 4 years. The incidences of fatal pulmonary embolism in other series are shown in Table II.

The current study and the other 2 local series^{4,5} may

TABLE II: INCIDENCE OF PULMONARY EMBOLISM AS A CAUSE OF MATERNAL MORTALITY

Series	Place	Period	Cases	Incidence per 100 000 maternities
Ayhan et al ⁶	Turkey	1968-1992	7*	11.7**
Vengadasalam ⁴	Singapore	1978-1988	1	2.5
Hogberg et al ²	Sweden	1980-1988	8	0.9**
Keeling et al ⁷	Jamaica	1986-1987	3	5.5***
Duthie et al ⁸	Hong Kong	1986-1990	8	2.2***
Loh et al ⁵	Singapore	1986-1992	1	3.8
Metters et al ⁷	United Kingdom	1988-1990	24	1.0
Present series	Singapore	1992-1995	3	4.9

* all thromboembolism

** per 100 000 live births

*** per 100 000 total births

not be strictly comparable due to the difference in the study population. However, it appeared that there may be a rising trend in the incidence of fatal pulmonary embolism. Paradoxically, this increased incidence occurred when England was experiencing a fall.¹ Moreover, our incidence rate was higher than that recorded for either England or Sweden.^{1,2}

There are several reasons for the increasing importance of pulmonary embolism as a cause of maternal mortality in Singapore. As the incidence of other causes of maternal mortality such as sepsis and postpartum haemorrhage fell, pulmonary embolism would account for a greater percentage of maternal mortality. There was no maternal death due to postpartum haemorrhage or sepsis in our institution over the last 4 years.

Secondly, with increased physician awareness of the condition and more accurate diagnosis of cause of death, pulmonary embolism would be established as the cause of death in cases in which the diagnosis would have been missed in the past. This was the experience in Hong Kong where pulmonary embolism was a rare cause of maternal mortality for the period from 1961 to 1985,⁹ but became the leading cause of maternal mortality for the period from 1986 to 1990.⁸ It was felt that part of this reported difference could be due to improved diagnosis, as all maternal deaths in Hong Kong since 1986 were investigated by a coroner's postmortem.

Thirdly, there could be an actual increase in the incidence of pulmonary embolism as a result of changes in obstetric practice. The most noticeable change was an increase in Caesarean section rate in our institution from 12.7% in 1985 to 18.9% in 1995, as shown in Figure 1. The risk of pulmonary embolism after Caesarean section, especially after an emergency procedure, is 20 to 40 times higher than after a vaginal delivery.^{1,10} The increased risk is probably due to reduced mobility and trauma to the pelvic veins at the time of operation.¹⁰ Both the postpartum cases in the present series occurred after emergency Caesarean sections.

The most important measure in the prevention of

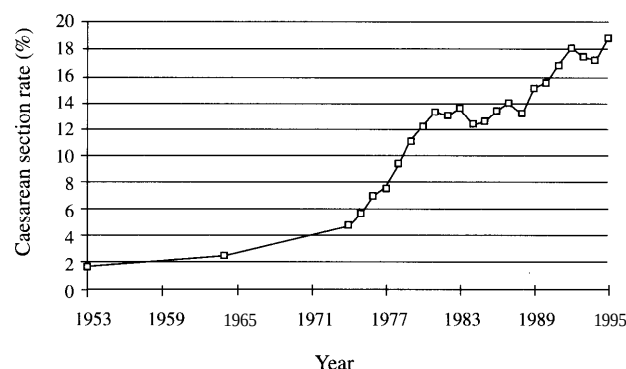


Fig. 1. Caesarean section rate in Kandang Kerbau Hospital.

thromboembolism is early mobilisation in the puerperal period. The use of anticoagulants is indicated in patients at increased risk of developing thrombosis. Previous proven venous thromboembolic episode, family history of venous thromboembolism or familial thrombophilia, presence of lupus anticoagulant or anticardiolipin antibody, and medical disorders predisposing to thrombosis, such as inflammatory bowel disease are considered high risk factors, and the patient will require anticoagulants from the antenatal period onwards. These patients should be managed jointly with a haematologist. Older maternal age, obesity, prolonged duration of surgery, prolonged bed rest and Caesarean section are relative indications for the use of anticoagulants in the intrapartum period.

The present study was based on maternal deaths recorded in our hospital. There were 2 groups of patients who had been managed in our hospital, and whose deaths should be considered in our study but their mortality data were not available. As our institution provided only obstetric and gynaecological services, patients with non-obstetric conditions would be transferred to and managed in other hospitals. Their deaths would not be shown in our statistics. The result was an absence of maternal death due to indirect causes in our study. The second group of patients not reflected in our data would be patients who died after discharge from our hospital but who still satisfied the criteria of maternal death. The solution to the above problems would be a national registry of maternal mortality similar to the Confidential Enquiries in the United Kingdom. Only then would the collection of maternal mortality be complete.

Dyspnoea and sudden collapse were the commonest presentations in our study. Dyspnoea of sudden onset, syncope, tachycardia and chest pain were common presentations of pulmonary embolism in other series.¹¹⁻¹³ Syncope was often the first manifestation of massive pulmonary embolism and common among fatal cases.^{11,12} Syncope in a hospitalised patient, even in the absence of other symptoms or signs, should suggest the presence of pulmonary embolism.

Electrocardiograph and arterial blood gases were abnormal in both patients in whom the tests were performed. There were numerous ECG signs associated with pulmonary embolism, of which tachycardia and ST segment depression were the most common.¹³ The S1Q3T3 pattern due to acute cor pulmonale in pulmonary embolism would be present only in 16% of patients.¹³ The arterial blood gas data typically showed hypoxaemia and hypocapnia, the latter as a result of marked hyperventilation.¹³ However, in massive pulmonary embolism, hypercapnia from impaired pulmonary gas exchange may occur.

For patients who are suspected to have pulmonary

embolism but are haemodynamically stable, the diagnosis will need to be confirmed by further tests. Pulmonary angiography is the gold standard for the diagnosis of pulmonary embolism, but is invasive. Perfusion and ventilation lung scanning is the most useful non-invasive tests in patients with clinically suspected pulmonary embolism.¹⁴ The result may be normal, high probability (defined as 75% or greater segmental perfusion defect with normal ventilation) or intermediate probability. This last group will require further testing with duplex ultrasound and/or pulmonary angiography. The method for diagnostic evaluation for suspected pulmonary embolism is shown in Figure 2.

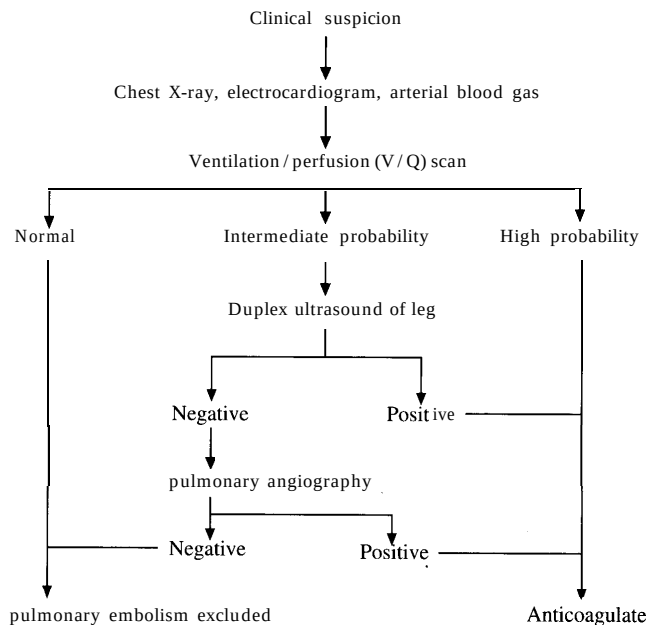


Fig. 2. Diagnostic evaluation of suspected pulmonary embolism.¹⁴

Massive pulmonary thromboembolism is a well known cause of sudden and rapid death, and is fatal within the first hour in a third to two thirds of patients.^{14,15} Often death occurs before diagnosis could be confirmed by the tests discussed earlier. In this series, although one patient survived for 11 hours after collapse, she remained deeply comatose throughout the resuscitation and was only formally declared brain dead 11 hours later.

In conclusion, pulmonary embolism was more common among our population than previously reported, and was the leading cause of maternal mortality in our institution over the last 4 years. Immobilisation and Caesarean section were the major risk factors. As the condition is often rapidly fatal, identification of high risk situation, antithrombotic prophylaxis and a high degree of suspicion are the key to reducing the incidence of fatal pulmonary embolism in obstetric patients. There is an urgent need for a national registry of maternal mortality in Singapore.

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