

# Cor pulmonale secondary to pulmonary tuberculosis in pregnancy: A report of two cases\*

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## ABSTRACT

Cor pulmonale is defined as alteration in structure and function of the right ventricle of the heart caused by a primary disorder of the lungs. Presented are two cases of gravidocardiic patients from cor pulmonale secondary to multi-drug resistant tuberculosis. The first case is a case of a 37-year-old gravida 4 para 3 (3-0-0-3) and the second case is that of a 24-year-old primigravid, both of which were on their third trimester with no known cardiac disease, both initially presenting with dyspnea and heart failure symptoms. The first patient was not in labor, managed conservatively and was discharged clinically improved; the latter was delivered abdominally who later succumbed to fatal arrhythmia. Presented are the strategies in management and challenges encountered in managing a pregnant cardiac patient from cor pulmonale, specifically from pulmonary tuberculosis.

*Keywords: Cor pulmonale, pulmonary heart disease; pregnancy complications, cardiovascular; pulmonary tuberculosis*

## INTRODUCTION

Tuberculosis remains a major public health problem in the Philippines and remains one of the top 10 causes of the death in the Philippines.<sup>1</sup> The 2014 WHO report on tuberculosis in the Philippines shows a prevalence rate of 417 per 100,000 and mortality rate of 0.08 per 100,000. For multidrug resistant tuberculosis, 2% of current pulmonary tuberculosis cases were new cases and 21% were retreatment cases.<sup>2</sup>

Though there is a wide array of possible complications from tuberculosis, it has been known to cause pulmonary hypertension leading to cor pulmonale via irreversible injuries to the vessels from pneumosclerotic changes and circulating immune complex effects.<sup>2</sup> Several pathophysiologic mechanisms have been attributed to pulmonary hypertension and subsequently cor pulmonale - the end result of these mechanisms however is the same: increased pulmonary arterial pressure and resistance thereby dilating the right ventricle and later on hypertrophy causing heart failure.

Two cases are hereby presented exemplifying cor pulmonale from pulmonary tuberculosis and its complications in management during pregnancy. The first case is that of a 37-year-old gravida 4 para 3 (3-0-0-3) on her 28th week age of gestation while the second case is that of a 24-year-old primigravid at 35th week age of gestation. The patient of first case was not in labor, was managed conservatively and sent home; the latter was in labor, her baby delivered abdominally and later on

developed post-operative complications. The strategies in management are hereby discussed.

## CASE 1

The first case is a 37-year-old gravida 4 para 3 (3-0-0-3) on her 28 3/7 weeks age of gestation admitted because of difficulty of breathing. Two years prior to admission, she was diagnosed with multi-drug resistant pulmonary tuberculosis, and was treated with 8 months of Anti-Koch's medications. During her first trimester, patient developed easy fatigability and generalized body malaise. At approximately 24 weeks age of gestation, she noted bipedal edema, 3-pillow orthopnea, oliguria, hemoptysis and progressive difficulty of breathing, prompting hospital consult.

On admission, her blood pressure was 100/60 mmHg, heart rate of 104 beats/minute, respiratory rate of 24 breaths/minute, with oxygen saturation of 75%, which improved to 98% upon supplementation with oxygen facemask at 8 liters/min. Her temperature on admission was 36.8°C. Patient was cachectic and weak looking. She had crackles on bilateral lung fields, from the middle to the basal area. There were no murmurs heard on auscultation of the chest. Upon abdominal examination, there was note of fluid-wave. She had a fundic height of 22 centimeters. The estimated fetal weight was 800 to 1000 grams, with the fetus in transverse lie. The fetal heart tones were appreciated at the hypogastric area with a rate of 140 beats/minute. The patient had pitting bipedal edema up to the level of the hypogastric area.

Laboratory examinations including complete blood count, blood chemistry, and arterial blood gases were taken, as well as initial biophysical profile and biometry were done showing normal results. Chest radiograph images showed extensive pulmonary tuberculosis and left-sided cardiomegaly with minimal pleural effusion (Figures 1 and 2). The electrocardiogram showed sinus tachycardia, right axis deviation, left ventricular hypertrophy, with non-specific ST-T wave changes. 2D echocardiogram demonstrated concentric left ventricular hypertrophy with good wall motion and contractility and preserved overall systolic function, dilated right atrium, dilated right ventricle with normal contractility and systolic function, right ventricular pressure and volume overload, tricuspid valve sclerosis with moderate tricuspid regurgitation, pulmonic valve sclerosis with pulmonic regurgitation, dilated main pulmonary artery and mild pulmonary artery hypertension. Sputum culture, acid-fast bacilli smear, and tuberculosis polymerase chain reaction were sent, together with screening for human immunodeficiency virus (ICC ELISA), which revealed negative results. The initial impression was pregnancy uterine 28 weeks and 3 days age of gestation by amenorrhea, cephalic, not in labor, cor pulmonale from pulmonary tuberculosis bronchiectasis, community-acquired pneumonia, moderate risk, rule out primary cardiac or renal pathology.



**Figure 1.** Chest radiograph in postero-anterior view showing cardiomegaly and pulmonary tuberculosis in the patient of the first case.



**Figure 2.** Chest radiograph in lateral view showing cardiomegaly and pulmonary tuberculosis in the patient of the first case.

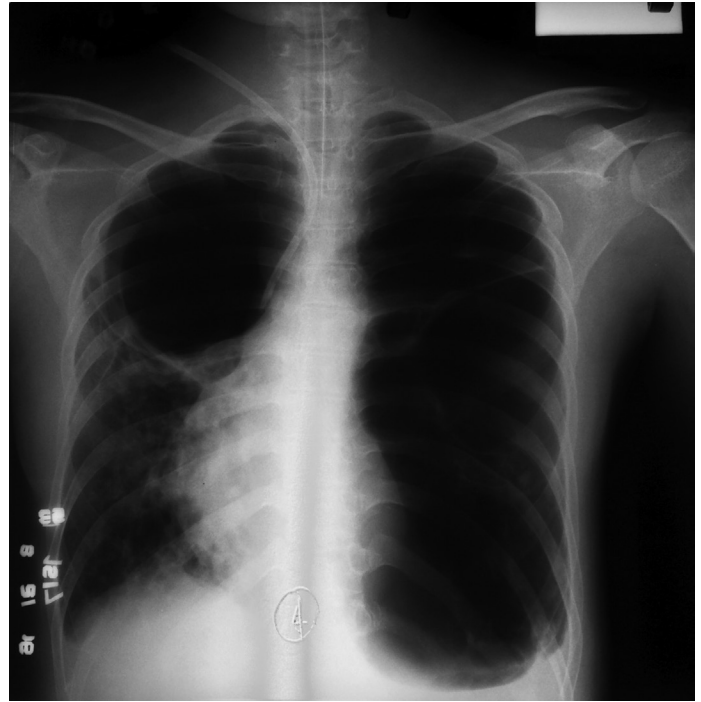
The complete line of medications during her admission is as follows: ceftriaxone 2 grams intravenously once a day, azithromycin 500 milligrams per tablet once a day, multivitamins 1 capsule once a day, ferrous sulfate 1 tablet twice a day, calcium carbonate 1 tablet twice a day, furosemide 20 milligrams intravenously for frank congestion, and digoxin 0.25 mg per tablet once a day. The patient was put on a normal diet with limits on the water intake. Fetal well-being studies were carried out and continued. She was maintained on oxygen support via facemask at 8 liters per minute. The patient's fluid input and output were monitored and recorded. In the absence of new-onset indications, the planned mode of delivery was assisted vaginal delivery under epidural anesthesia. Decrease in edema and dyspnea was noted after 11 days, and the patient was discharged on oral antibiotics and prenatal medications, and was advised to follow-up at the high-risk clinic for close monitoring (Decano, S. 2015, unpublished data). The patient was however lost to follow up and upon investigation, expired with the baby undelivered reportedly because of a heart attack.

## CASE 2

The second case is that of a 27-year-old primigravid on her 35 1/7 weeks age of gestation, admitted for dyspnea. The patient was previously diagnosed with pulmonary tuberculosis five separate times in 2009, 2011, 2012, 2013 and in 2015, all with poor compliance to medication. Two months prior to admission, she experienced dyspnea and bipedal edema and consulted a local hospital. She was advised transfer to a tertiary institution. Two weeks prior to admission, she was seen at the outpatient department by OB Infectious Diseases, Cardiology and Pulmonology services. On the day of consult, she was on check up at the High Risk Clinic where she was noted to be in respiratory distress and was referred to the OB Admitting Section.

She was received at OB Admitting Section weak and in cardiorespiratory distress at 32 breaths per minute, speaking only in phrases, stretcher borne and on oxygen support at 90% O<sub>2</sub> saturation. Her blood pressure was 110/70, heart rate of 121 beats/minute with temperature of 37.2°C. She had grade 1 bipedal edema and absent breath sounds on almost all lung fields with harsh breath sounds on the right lower lung field. She had a fundic height of 25 cm, estimated fetal weight of 1.6-1.8 kilograms, cephalic, with good heart tones at the right lower quadrant of the abdomen. On internal examination, she was noted with 1 cm cervical dilatation and beginning effacement at station -3 with intact bag of waters.

Initial laboratory examination results including complete blood count, serum electrolytes and coagulation studies showed normal results. Culture studies were also done showing normal gram stain results, gram positive cocci in pairs in blood culture and no multi drug resistant TB in PCR. Chest radiograph with abdominal shield showed large multicystic structures with bilateral hemithorax, reticulonodular opacities on the right lung field with her heart not enlarged (Figures 3 and 4). Her 12 L ECG showed sinus tachycardia, normal axis with right atrial enlargement. 2D Echo results showed normal left ventricle with good systolic function (ejection fraction=76%), dilated right atrium with signs of right ventricular pressure overload and thickened pericardium to consider pericarditis with minimal effusion. The initial impression was 35 1/7 weeks age of gestation by amenorrhea, cephalic in preterm labor; chronic respiratory failure secondary to TB bronchiectasis, chronic obstructive pulmonary disease; gravidcardiac functional class IV secondary to cor pulmonale secondary to chronic obstructive pulmonary disease from TB bronchiectasis (bullous emphysema); rule out disseminated tuberculosis (pulmonary, pericardial); rule out multidrug resistant pulmonary tuberculosis;



**Figure 3.** Chest radiograph in postero-anterior view of patient in the second case showing large multicystic structures with bilateral hemithorax, reticulonodular opacities on the right lung field with her heart not enlarged

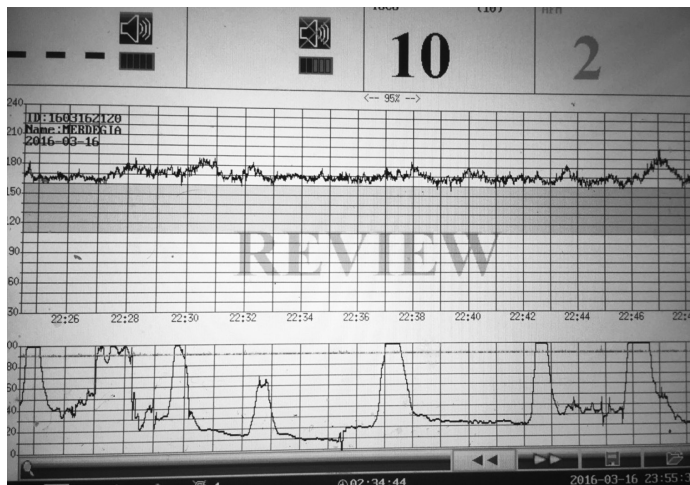


**Figure 4.** Chest radiograph in lateral view with large multicystic structures with bilateral hemithorax, reticulonodular opacities on the right lung field with her heart not enlarged

community acquired pneumonia moderate risk; gravida 1 para 0.

The initial plan was to carry the pregnancy as close to term as possible. She was given Dexamethasone 6mg intramuscularly every 12 hours to complete four doses. Magnesium sulfate was administered at 6g slow intravenous push then 1g per hour as IV drip for tocolysis. She was also started on Piperacillin-Tazobactam 4.5g IV every 8 hours, Salbutamol with Ipratropium nebulization every 4 hours and N-acetylcysteine 600mg. She was intubated due to continued respiratory distress. An internal jugular vein access was also made.

A cesarean section was then called to hasten delivery due to the deteriorating maternal status with fetal distress (Figure 5). Her baby was delivered via primary low segment cesarean section with bilateral tubal ligation under general anesthesia at 35 2/7 weeks age of gestation. She delivered a live baby boy, 32 weeks by pediatric aging, 2000 grams with APGAR score of 5 becoming 9. The baby became apneic by the 7th minute of life and was intubated and sent to the neonatal intensive care unit with the consideration of hyaline membrane disease versus neonatal pneumonia.



**Figure 5.** Intrapartum monitoring showing fetal tachycardia during the distressed state of the mother in the second case

Post operatively the patient was continued on Piperacillin-Tazobactam and other preoperative medications, with the addition of Omeprazole 40 mg IV and Enoxaparin 0.4cc subcutaneously. On inspection, her wound was well coapted and dry with no bleeding and discharge. On her 5th hospital day, she was weaned to SIMV mode on mechanical ventilator. However, with increased secretions and coughing over her postoperative course she was now assessed to have ventilator acquired pneumonia on top of her community acquired pneumonia, high risk. On her 6th hospital day, a 4 cm wound dehiscence with bowel evisceration

(Figure 6) was noted and an en bloc fascial closure was done. Antibiotic treatment was shifted to Meropenem 1g IV every 12 hours. On the 10th hospital day the patient had progressing pneumonia and was started on triple inotropes due episodes of hypotension. On her 12th hospital day she was advised hemodialysis by the renal service. During hemodialysis, the patient had a hypotension episode and although restarted on Norepinephrine, coded on her 4th hour of hemodialysis with the sign out of fatal arrhythmia as cause of death.



**Figure 6.** Post operative bowel evisceration of the patient of the second case.

## CASE DISCUSSION

The two cases provide a spectrum on what cor pulmonale from pulmonary tuberculosis may present as. Cor pulmonale is defined as “dilation and hypertrophy of the right ventricle in response to diseases of the pulmonary vasculature and/or lung parenchyma”<sup>3</sup>. The basic pathophysiology of cor pulmonale is the presence of pulmonary hypertension from an underlying pulmonary disease causing right-sided failure. This ultimately results to a decrease in cardiac output and right-sided fluid overload. Patients usually present with symptoms of heart failure such as dyspnea, orthopnea, paroxysmal nocturnal dyspnea, ascites, and edema. On examination, tachypnea, hepatomegaly, and lower-extremity edema, cyanosis and desaturation are seen as exemplified in the index cases discussed.

Although cor pulmonale may be a result of different etiologies including infectious causes, its development from pulmonary tuberculosis, even more

so in a gravid patient, is not a common occurrence. It is said to be largely due to the damage of tuberculosis on the pulmonary vasculature, evident in both cases. The reduction of pulmonary capillaries at the site of the tuberculosis process contributes to pulmonary artery hypertension. Irreversible injuries to the vessels are due to the pneumosclerotic changes and the circulating immune complex effects. These immune complexes act on peripheral veins ultimately decreasing circulating blood volume by 30-40% and reducing cardiac output. This results to a deficit of blood flow to the right compartments of the heart. The atrium functions at a higher load thus leading to cardiac hypertrophy. Peripheral vasodilators and cardiac glycosides such as digoxin, as used in the first case, are recommended for the prevention and treatment of chronic cor pulmonale.<sup>4</sup>

The work of the heart increases approximately 50 percent during pregnancy and that increase in work reaches maximum at around the eighth month. The heart enlarges, blood volume increases, minute output of blood increases together with velocity of blood flow.<sup>5</sup> Hence pregnancy, which alters right ventricular volume, is a precipitant of decompensation for hypoxemic events. Individuals with pre-existing pulmonary hypertension, and subsequently cor pulmonale, may have difficulty tolerating physiologic changes of pregnancy especially the elevation of heart rate and circulating blood volume.<sup>6</sup>

Basic diagnostics to assess heart and lung function are warranted in the gravidocardiatic patient. These include electrocardiogram, chest x-ray, spirometry, arterial blood gases, two-dimensional (2D) echocardiography, magnetic resonance imaging of the chest and right-heart catheterization.<sup>3</sup>

Several dilemmas in choosing proper management may occur in gravid patients with cor pulmonale including the type of anesthesia/analgesia, mode of delivery, hemodynamic monitoring and postpartum care. The European Society of Cardiology guidelines present strategies for management of cardiovascular diseases during pregnancy. There should be an individualized delivery plan for each patient informing the team of the timing of the delivery, the mode of induction, anesthesia and the level of monitoring required.

Vaginal delivery is associated with less blood loss and risk of infection compared with cesarean delivery. Cesarean delivery is reserved for obstetric complications, as that seen with the second case. There is no absolute contraindication to vaginal delivery since this is dependent on maternal status at the time of delivery and the anticipated cardiopulmonary tolerance of the patient. In certain centers, cesarean delivery is advocated for cases of cor pulmonale.<sup>7</sup> In a 2015 study done by Monagle, et al, 11 out of 19 (58%) cases were successfully delivered

via caesarean section, 7 of which were done due to acute heart failure or deteriorating maternal condition.<sup>7</sup> What seems clear is that the severity of the disease and degree of compensation must be considered, patients with better compensation and less severe disease may better tolerate labor and vaginal delivery.

The recommended choice of anesthesia is lumbar epidural anesthesia because it reduces pain-related elevation of sympathetic activity, reduces the urge to push for the mother and provides anesthesia for surgery. The provision of continuous lumbar epidural anesthesia with local anesthetics or continuous opioid spinal anesthesia can be safely administered.<sup>7</sup>

A slow intravenous infusion of oxytocin (<2 U/min) is administered after placental delivery to prevent maternal hemorrhage. Methylergonovine is contraindicated because of the risk (>10%) of vasoconstriction and hypertension. Meticulous leg care, elastic support stockings, and early ambulation are important to reduce the risk of thromboembolism. Delivery is associated with important hemodynamic changes and fluid shifts, especially in the first 12–24 hours therefore monitoring should be continued for at least 24 hours after delivery.<sup>7</sup>

Any pulmonary infection must be treated initially with empiric antibiotics then later on with antibiotics guided by culture results. The oxygen saturation must be maintained at levels  $\geq 90\%$  in order to decrease pulmonary vascular resistance. Pregnant women with cor pulmonale must be advised to have oxygen supplementation available at all times to assist them during times of decompensation. In severe cases, mechanical ventilation should be considered.

Monitoring of the patient post-partum cannot be overemphasized. During this postpartum state, reversal may occur drastically resulting to the patient's further compromise. Other factors must also be considered as infectious and other physiologic changes are altered during the usual recovery of a postpartum patient. The patient should ideally be placed in an intensive care unit set-up with diligent monitoring, which may last up to a week following delivery. In the case of abdominal delivery, wound healing should be ensured as to prevent any causes of further infection and decompensation of the patient's fragile state.

## DISCLOSURE

This paper has been presented as a poster presentation in the following congresses:

- 5th International Congress on Cardiac Problems in Pregnancy, 22-25 February, 2018. Bologna, Italy
- 26th Asia and Oceania Federation of Obstetrics and Gynecology Congress, 10-14 November 2019, Manila, Philippines ■

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