Severe Influenza Requiring Extracorporeal Membrane Oxygenation: Impact of Surgery in the Postpartum Patient

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Background

Influenza infection in pregnancy is a well-recognised cause of maternal morbidity and mortality.

Recently, two women delivered by Caesarean section in regional Queensland hospitals were cared for in the Gold Coast University Hospital (GCUH) Intensive Care Unit (ICU) with severe influenza precipitating Acute Respiratory Distress Syndrome (ARDS) refractory to ventilation alone, requiring Extracorporeal Membrane Oxygenation (ECMO) support. ECMO provides cardiopulmonary life-support by passing blood externally through a mechanical pump, where it becomes oxygenated, before reinfusion into the circulation (Figure 1).

This case series examines the potential role that surgery played in their deterioration.

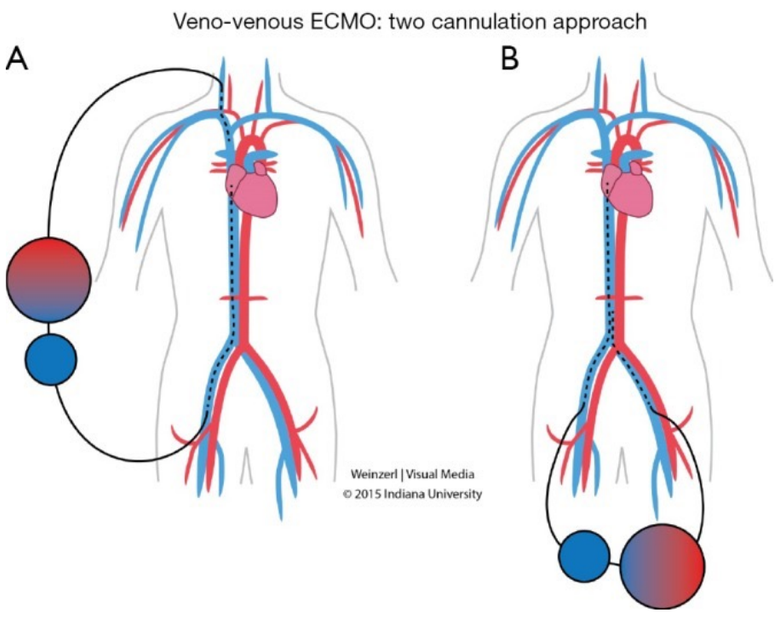


Figure 1 Veno-venous ECMO: two cannulation approach (A) femoral vein (for drainage) and right internal jugular for infusion, (B) both femoral veins are used for drainage and perfusion.
Citation: Makdisi and Wang, 2015.[1]

Objectives

To explore the significance and associated risks of the post-operative state for the otherwise-healthy peripartum woman with influenza, and their strategic management.

Methods

Patient consent was obtained and the case study series was reviewed by the GCUH ethics committee. It was deemed not to require HREC approval as a Clinical Case Study (EX/2023/QGC/99874).

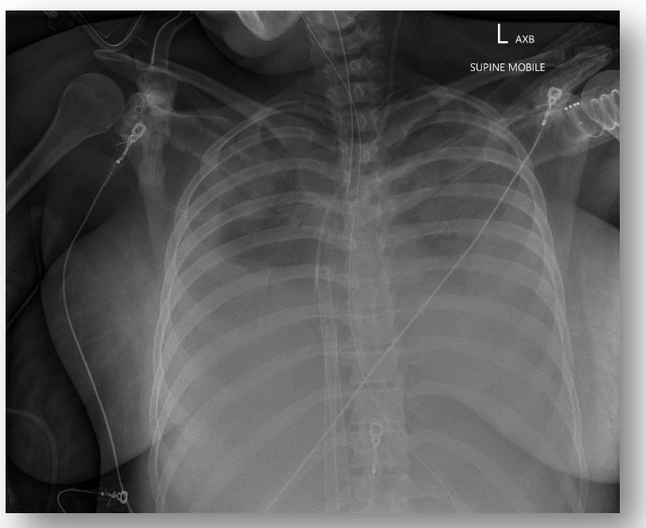
Case One

A 20yo G1P0 at 41 weeks pregnant presented to her local regional hospital with mild viral symptoms. She was diagnosed as Influenza A positive on viral swab. Her antenatal course was uncomplicated other than mild hypothyroidism requiring thyroxine 25mcg daily.

She underwent induction of labour due to postdates gestation and decreased variability on cardiotocograph. Delivery occurred by emergency lower uterine segment Caesarean section under general anaesthesia (GA) due to obstructed labour at 4cm of cervical dilation, complicated by thrombocytopaenia.

Day 2 postnatally a new oxygen requirement developed. A CT Pulmonary Angiogram (CTPA) demonstrated bilateral consolidation with ground-glass infiltrates in all lung lobes, with bilateral pleural effusions. She was commenced on oseltamivir and piperacillin-tazobactam, but deteriorated rapidly, requiring intubation and ICU transfer. Diagnosed with Type 1 respiratory failure (T1RF) secondary to Influenza A, she remained ventilated and requiring inotropic support. The decision was made to transfer and commence VV ECMO in conjunction with our metropolitan tertiary hospital.

On Day 10, weaning of ECMO parameters began as physical exam demonstrated improved lung air entry. Uncomplicated VV ECMO decannulation occurred on Day 14 postnatally. On Day 17 she was found to have a palpable haematoma below the Caesarean incision, likely due to ECMO anticoagulation, which was conservatively managed. She was successfully extubated on Day 20 postpartum, and transferred back to her regional hospital for allied health support and transition home.

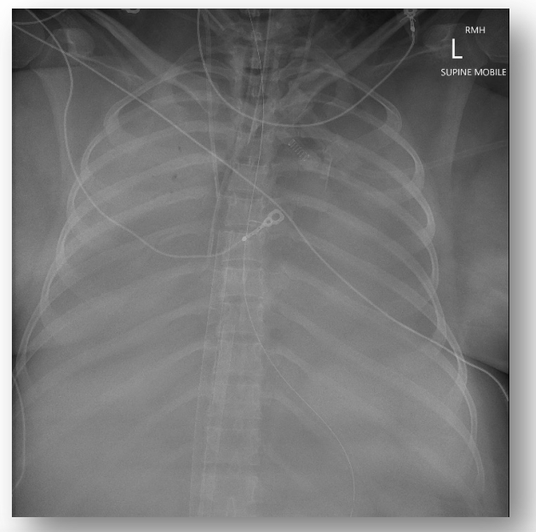


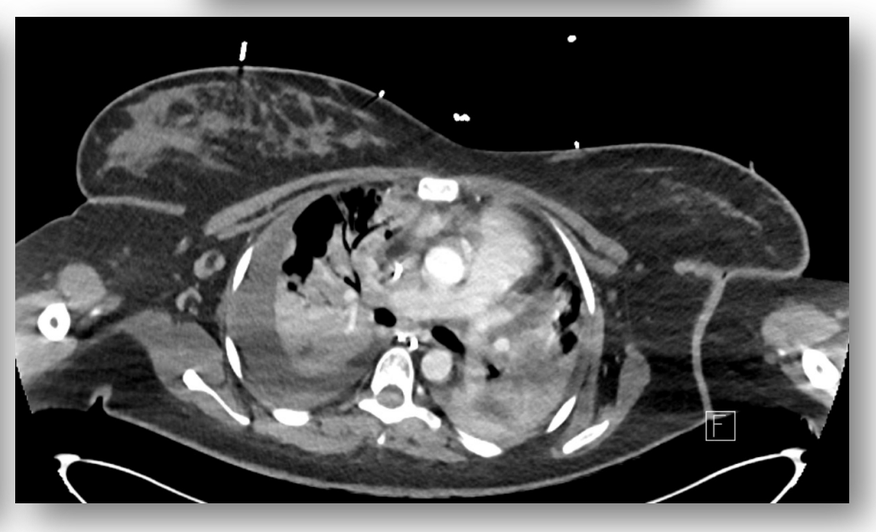
Case Two

A 30yo G1P0 developed mild coryzal symptoms preceding her term elective Caesarean section. She was diagnosed with Influenza A on a rapid swab test on the day of her surgery, and Caesarean continued as planned and was uncomplicated. Her antenatal course was complicated by well-controlled gestational diabetes mellitus. She had a BMI 37, past medical history of mild asthma and was an ex-smoker.

On Day 3 postnatally, she developed significant shortness of breath. A CTPA revealed extensive airspace pulmonary infiltrates consistent with influenza pneumonitis. She was transferred to a larger regional hospital ICU on Day 3 postpartum due to T1RF and ARDS and was managed with intubation and ceftriaxone, azithromycin and oseltamivir. On Day 6 she was transitioned to ECMO and continued on inotropes at our tertiary ICU. A chest X-ray showed bilateral white-out. Her ICU course was complicated by a groin Candida rash, acute kidney injury and endometritis.

Multiple deep vein thromboses (DVT) were detected on ultrasound pre-decannulation, including an occlusive 3cm thrombus within the right posterior peroneal vein. However, this did not delay ECMO decannulation, which occurred on Day 19. CT chest/abdomen/pelvis revealed an inferior vena cava thrombus and a right common femoral venous thrombus which reflected a cast of the ECMO cannula, but as the patient was anticoagulated on a heparin infusion and the provoking agent had been removed, no further management was required. On Day 26 postpartum, she was transferred regionally on apixaban 10mg BD for 3 months (as not breastfeeding), with antiphospholipid syndrome screening to be performed when well.





Discussion

Post-operative atelectasis and pneumonia occur due to small airway collapse from diaphragmatic relaxation during GA and pain-related limitations on deep inspiration; as such, it is reasonable that post-operative patients with viral illnesses may have increased risk of severe disease. A large-scale Taiwanese study found that patients who had influenza within seven days pre-operatively had increased risks of post-operative complications (including pneumonia and sepsis), and those with influenza within 14 days pre-operatively were more likely to require ICU, and have a prolonged and costlier admission.[2] A case study of a young man with acute appendicitis requiring open appendicectomy, who deteriorated from influenza post-operatively to the point of ECMO requirement, supports that surgery may influence viral outcome severity.[3] A recommendation from the Taiwanese study was to postpone surgery for 1-2 weeks after influenza infection if possible;[2] however, this may be difficult in practice for pregnant patients requiring delivery.

It is unclear from documentation if either patient was vaccinated against influenza in 2023; however, data supports the attenuation of influenza illness from vaccination.[4] Influenza vaccination is also protective against post-operative complications in coronavirus-positive patients (including sepsis, DVT and wound dehiscence); this may suggest a similar benefit for post-operative complications from influenza.[5] In Queensland, the Northern Territory and Western Australia from 2012 to 2017, only 15% of pregnant women received an antenatal inactivated influenza vaccine, and a further 12% received both influenza and pertussis immunisation.[6] Given subpar influenza vaccination rates throughout pregnancy in Queensland and many areas of Australia, ongoing practitioner and public health awareness commitment to improving influenza vaccine uptake is important.

Conclusion

Whilst only a small amount of literature exists regarding the role of surgery in prompting respiratory deterioration in patients with influenza, caution should be taken not to underestimate the potentially severe effects of influenza, especially in recently-postpartum women and those with other risk factors including obesity, asthma, cigarette smoking, diabetes, and Aboriginal and Torres Strait Islander background. Improving national uptake of influenza vaccination during pregnancy should be a focus for obstetric clinicians, due to the protective effects of herd immunity but also the severity-reduction effects of influenza illness after vaccination.

References