Management of a rare cause of sudden maternal hypoxia guided by bedside ultrasound: A Case Report

Cowan R, Fraser V, O'Connor R.

Southern General Hospital, Glasgow

Case

A 22 year old ASA 1 patient underwent uneventful elective caesarean section under spinal anaesthesia. Following discharge from the recovery area, she developed uterine atony and PV bleeding resulting in hypotension, anaemia and hypofibrinogenaemia (BP-84/54, Hb-54g/l, Fib-0.55g/l). The haemorrhage resolved following pharmacological treatment with an estimated blood loss of 3800ml. Transfusion of 4 units of packed red cells, 4 units of FFP and 2 units of cryoprecipitate achieved haemodynamic stability. Including perioperatively infused crystalloid, a total volume of 4500ml was administered.

Shortly after cryoprecipitate transfusion, she developed respiratory distress, wheeze, agitation, hypertension (BP 180/110) and cyanosis with SpO_2 <70% on air. Arterial blood gas sampling confirmed respiratory failure despite high flow oxygen (pO_2-7.5,pCO_2-6.3,H^+-44.7).

Several diagnoses were considered but a combination of clinical findings, B-lines seen on lung ultrasound and the absence of right heart strain on echocardiography led to a working diagnosis of pulmonary oedema which initially responded to diuretic/vasodilator/CPAP treatment. Chest X-ray imaging subsequently confirmed the ultrasound findings but was not immediately available due to the remotely sited labour ward.

She was transferred to ICU where she was intubated and ventilated. She was difficult to oxygenate with florid bilateral pulmonary infiltrates on CXR (figure 1). After 24 hours her oxygenation improved rapidly and she was successfully extubated. Discussion with Haematology led to a presumptive diagnosis of transfusion related acute lung injury (TRALI). Full serological investigation is ongoing.

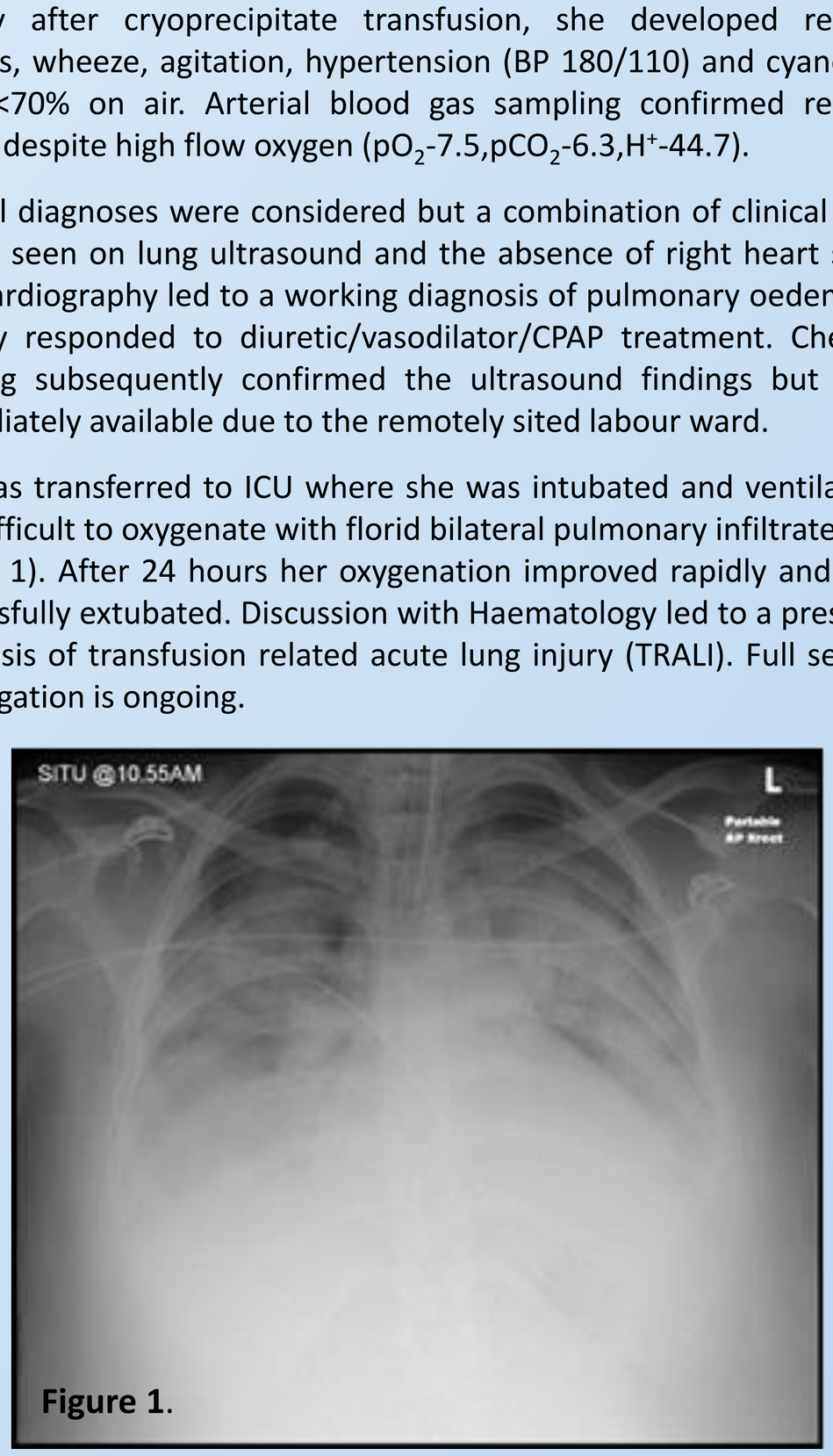

Figure 1.

Discussion

Transfusion-related acute lung injury (TRALI) is defined as acute dyspnoea with hypoxia and bilateral pulmonary infiltrates during or within 6 hours of transfusion, not due to circulatory overload or other likely causes. It is a rare complication with 10 cases reported to the 2013 Serious Hazards Of Transfusion (SHOT) report. This is in the context of 2,758,495 'issues' of blood components over the duration of the report[1]. The exact pathogenesis of TRALI is unclear but neutrophil activation is considered the main underlying mechanism. Donor anti-leukocyte antibodies perhaps in addition to other transfused molecules are thought to be the most likely triggers for this activation[2].

Multiple differential diagnoses must be considered when assessing hypoxic patients on the labour ward. The labour ward in our hospital is situated in a separate building to the radiology service which is nearly 1 km away. This can lead to delays in obtaining x-ray imaging, particularly out-of-hours.

Table 1. Differential diagnoses of sudden maternal hypoxia

Lung ultrasound findings	Echo findings	Clinical findings	Possible Diagnosis
A-profile	Normal/RV failure	Bronchospasm	Acute asthma
	RV Failure	Collapse/shock	Pulmonary Embolism
Loss of pleural sliding	Normal/RV failure	Reduced air entry	Pneumothorax
A or B Profile	RV Failure +/- LV failure (stage 2)	DIC/coagulopathy, collapse	Amniotic Fluid embolism
B Profile	Normal	Recent transfusion, hypo/hypertension, fever	TRALI
	Normal	Proteinuria, hypertension, +ve fluid balance	Pre-eclampsia related pulmonary oedema
	Normal/LV Failure	Raised JVP,+ve fluid balance	Transfusion associated circulatory overload
	LV Failure	ECG changes	Peripartum Cardiomyopathy
	Valvular abnormality	Murmur/shock	Cardiac valve lesion

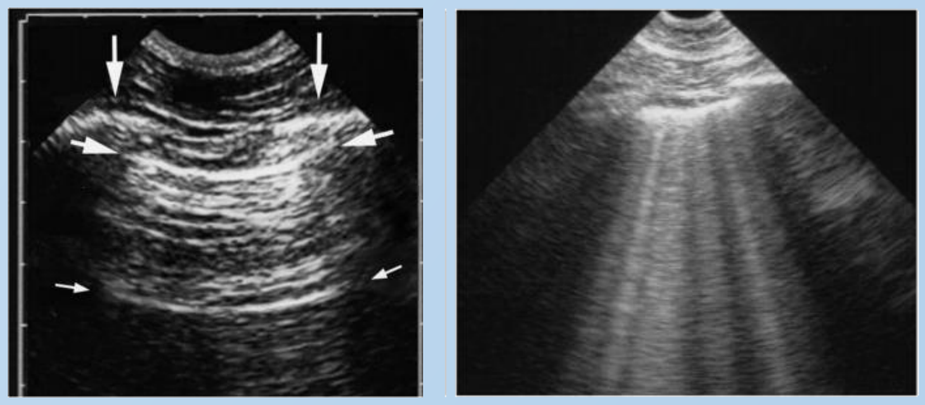

Figure 2. A-lines (left), B-lines (right)[3]

In contrast, advanced ultrasound imaging equipment is immediately available on the labour ward at all times for foetal assessment.

This case highlights the usefulness of ultrasound imaging in diagnosing maternal hypoxia. Lung ultrasound can be used to assess for the presence of 'A' or 'B' line artefacts and the presence of pleural sliding (Figure 2.) An 'A' profile signifies a high air:fluid ratio and a 'B' profile represents the opposite[3]. Combining this with focused echocardiography and clinical findings can lead to rapid exclusion of diagnoses requiring immediate specific interventions (Table 1.) The many embolic pathologies associated with pregnancy often lead to acute right heart failure with characteristic echocardiographic findings (figure 3.)[4]

The immediate accessibility of bedside ultrasound equipment in this case meant that several differentials could be rapidly excluded and targeted supportive therapy commenced. Clinicians caring for critically unwell obstetric patients should consider the acquisition of basic diagnostic ultrasound assessment skills.

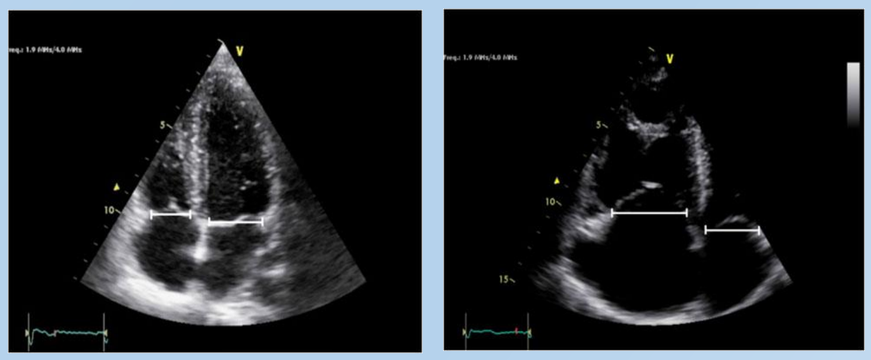

Figure 3. Normal heart (left), Dilated Right heart (right)[4]

References:

1. Bolton-Maggs PHB(Ed), Poles D, Watt A and Thomas D on behalf of the Serious Hazards of Transfusion (SHOT) Steering Group. The 2013 Annual SHOT Report (2014) available at: http://www.shotuk.org/shot-reports/
2. Sachs UJH; The pathogenesis of transfusion-related acute lung injury and how to avoid this serious adverse reaction of transfusion, Transfusion and Apheresis Science, Vol 37:3, Dec 2007, p 273-282
3. Lichtenstein DA; Lung ultrasound in the critically ill, Ann Intensive Care. 2014 Jan 9;4(1):1.
4. Marko A, Parnell A, Morgan-Hughes N; Right Ventricular Function, FICM ICE-BLU e-learning module accessed online via eLfH platform: http://www.e-lfh.org.uk/programmes/icu-echoultrasound/