Peer Review File

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Reviewer comments:

Comment 1: The introduction should describe the current literature with similar cases and the knowledge gap; how can current case add to the existing literature.

Reply 1: Included in the manuscript as follows

Extracorporeal membrane oxygenation (ECMO) is now a well-established, lifesaving option for patients with acute cardiorespiratory failure as described in the Extracorporeal Life Support Organization Guidelines in 2017(1). Thus far, there have been several case reports and case series describing the successful use of ECMO in patients with thyrotoxicosis. As early as 2011, a case series(2) described the survival of 3 out of 4 patients in which ECMO was used as a rescue for thyrotoxicosis induced cardiovascular collapse. Another case series published in 2015(3) described the use of ECMO in 5 patients with thyroid storm, out of which 3 survived. A case series published in 2018(4) described 14 cases of the use of ECMO for thyrotoxicosis induced cardiomyopathy of which 11 patients survived. 3 other case reports described the successful use of ECMO as a rescue therapy for thyrotoxicosis induced cardiogenic shock and haemodynamic collapse(5–7). One case report described the use of ECMO with plasma exchange(8). We describe the successful use of both VA-ECMO, plasma exchange as a bridge to total thyroidectomy for control of thyrotoxicosis in a patient with thyroid storm complicated by multiorgan failure.

Comment 2: More details of the ECMO treatment should be described.

Reply 2: Included in the manuscript as follows

ECMO speed was set at 3385 rpm achieving a flow of 3.7L/min to 4.2L/min. Fractional inspired oxygen (FiO2) was set at 100% and the gas sweep speed was maintained at 2L/min to achieve adequate carbon dioxide (CO_2) clearance and maintain the arterial partial pressure of CO_2 ($PaCO_2$) of 35mmHg to 40mmHg. A heparin infusion was used to maintain an activated clotting time (ACT) of 150sec to 200sec. Haemoglobin levels were maintained between 9.5g/dL to 10.5g/dL.

Comment 3: What is the main purpose of using Plasmapheresis? Some serum biomarkers should be reported for improving conditions after using Plasmapheresis.

Reply 3: Plasmapheresis was meant to decrease the level of circulating active thyroid hormones as many of the anti-thyroid medications were contraindicated in this patient due to multi-organ failure. As mentioned in the manuscript, the level of thyroid hormones effectively decreased after 3 cycles of plasmapheresis. Presenting levels of thyroid hormones

at the emergency department as mentioned were markedly elevated (free thyroxine (T4): 57pmol/L; free triiodothyronine (T3): 12.4pmol/L). After plasmaphyresis, the levels of thyroid hormones decreased to near normal (T4: 22pmol/L; T3: 6.0pmol/L).

Comment 4: How did you manage coagulation profile while performing operation when the patient was still on ECMO?

Reply 4: Included in the manuscript as follows

On the 3rd day on VA ECMO, a trial of weaning to facilitate was done to facilitate surgical thyroidectomy. ECMO flow was successfully weaned with Noradrenaline support; the cannulas were explanted, and the heparin infusion stopped. Thyroidectomy was performed the following day.

The coagulation profile was sent off on the morning of surgery and blood products prepared based on the laboratory coagulation tests. His activated partial thromboplastin time (aPTT) was 52.0sec more than 6 hours after stopping heparin, prothrombin time (PT) was 22.5sec, international normalised ratio (INR) 2.4, platelet levels were 57 x10^9/L and fibrinogen was 0.53g/L. Thus, 1 litre of fresh frozen plasma, 2 units of cell separated platelets, 10 units of cryoprecipitate were transfused prior to incision. In the operating theatre, a rotational thromboelastometry (ROTEM) was performed which showed an EXTEM A10 of 33mm, and FIBTEM A10 of 6mm, thus another 10 units of cryoprecipitate was given intra-operatively. Haemostasis was checked with a Valsalva manoeuvre prior to closure. Post procedure, the INR remained below 1.5, aPTT remained less than 1.5 times the upper limit normal, fibrinogen remained above 1g/L and platelets remained above 50 x10^9/L without any further transfusion.