Author’s response to reviews

Title: Severe thoracic trauma caused left pneumonectomy complicated by right traumatic wet lung, reversed by extracorporeal membrane oxygenation support—a case report

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Author’s response to reviews:

Dear editor and reviewers,

First, thank you very much for your advice and guidance! After making the revision with your advice, we feel the quality of the manuscript was much better than before. We feel this is the right way to write a case report. It’s indeed a wonderful experience.

Before we answer the comments, we’d like to state an error we’ve made in our previous version, in the abstract and in the case presentation, we claimed that with the support of ECMO, the tidal volume may be lowered to 250-350ml, that’s not correct. We’ve mistaken the expiratory volume(VTex) and tidal volume(VT), VTex was varying between 250-350ml in most times, however, VT was set at 200ml in the first 10 days for lung protection. The data of ventilator and ECMO were all paper recorded, if needed, we can film and upload these data.

The first reviewer, professor Borges asked us about the PEEP setting/management throughout the mechanical ventilation of this patient (in details)? Any lung recruitment maneuver was done?
Though VT (200ml) and F(12/min) were kept low for lung protection, PEEP was kept at 5-8 cmH2O to prevent lung atelectasis before ECMO weaning. Referring to blood gas and chest X-ray, when lung recruitment was deemed necessary, for the seek of lung protection, respiratory balloon was used manually to expand the lung, no other lung recruitment measures were taken in this case. The patient not only had injured lungs, he also had pneumothorax in both sides, any lung recruitment measures that may significantly increase airway pressure were not considered.

Comment 1:

In the first week after operation, piperacillin-sulbactam was used to prevent possible lung infections, which was replaced by imipenem and levofloxacin when fever and white blood cells were ascending. The patient had ARDS after severe thoracic trauma, the exaggerated response of innate immunity and the amplification of inflammation were important etiologies for ARDS in the early phase. Ulinastatin, a Kunitz type serine protease inhibitor and exhibited moderate anti-inflammatory effects without any immunosuppression side-effects, was used for immunomodulation in our case. Because the invasive double-lumen intubation and right-side multiple ribs fractures caused considerable pain, appropriate analgesics and sedatives were essential for the post-op compliance of the patient. The combination of dexmedetomidine and fentanyl or midazolam and morphine were used alternatively for sedation and analgesia. The alteration reduced the risk of drug accumulation while keeping a satisfying effectiveness.

Comment 2:

About coagulation: In the ECMO treating period, appropriate anti-coagulation measures shall be applied to prevent thrombosis occur in the device. However, in traumatic and post-operation patients, anti-coagulation might cause severe organ bleeding complication. In this case, after the initiation of ECMO, heparin was micro-pump injected (125u-750u/hour), while activated clotting time (ACT) was monitored every 2 hours, was expected to be kept between 160s to 180s, which was fluctuating between 130s to 210s in our case without severe bleeding complication. After the initiation of ECMO, arterial and venous blood gas was tested every 6 hours, along with the lung injury repairing, concomitantly, the oxygen partial pressure escalated and the CO2 partial pressure deescalated in both. In spite of this, for the seek of lung protection, the FiO2 of ECMO was kept between 70% to 100% without further lowering in the treatment.

About ECMO weaning assess and procedures: 24 hours before ECMO weaning, the gas flow was reduced to 2 liters/min, 6 hours before weaning to 0 liters/min; FiO2 was reduced to 80%. The O2 and CO2 partial pressure of blood gas were dynamically stable, then ECMO was weaned and the related catheters were removed.
Comment 3:

We think V-V ECMO we applied was double lumen ECMO, one lumen in the right jugular vein, one in the right femoral vein. Upon selection of the veno-venous(V-V) ECMO model, catheters were inserted into the right jugular vein(arterial catheter, the tip nearly reached right atrium) and right femoral vein(venous catheter). Specifically, blood was drawn out from the right atrium to the ECMO device(Maquet, ROTAFLOW Console), after oxygenation it was infused into the right femoral vein, with the gas flow at 4-6L/min, fraction of inspiration O2(FiO2) 100% and the pump operating at 3480—3610 rpm.

Comment 4:

We’ve rewritten the first paragraph of the discussion according to your suggestion.

Comment 5:

With the support of ECMO, regardless of the severe lung edema caused by trauma, the oxygen needs was sufficient and CO2 could be removed swiftly from blood, so VT could be lowered to 3.0 ml/kg, which is beneficial for lung repair. Recently, Pavot et al also used ultra-protective ventilation to treat near-fatal asthma.

Comment 6:

In fact, we don’t have any ventilator that supports HFOV mode. Our pediatric colleagues were consulted, HFOV is being used to treat new-born babies or low weight infants, but not in other pediatric population. They say weight is the main factor that limits them to extend HFOV to big children. We don’t have any experience with HFOV, that’s why we didn’t mention it in our manuscript.

We also made some other revisions, such as the brand of ECMO and ventilator were specified, the parameters of ventilator during ECMO treatment were also provided. And 2 references were added, reference 12 and 15.

Finally, thank you a lot for your language support! The manuscript was translated by WFY, it may contain minor grammatical mistakes, but we’ll try our best to improve. THX!