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Case Series

Peri-Intubation Need for RRT; Revised Intubation Bundle for COVID 19 ARDS

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Abstract

Critically ill COVID 19 patients are prone for acute kidney injury. Temporal relationship between respiratory failure requiring invasive mechanical ventilation and worsening of kidney injury have been reported by some authors. In ARDS patients, lung protective ventilation with permissive hypercapnia gives limited margin for accumulation of renal acids. Besides this, prone ventilation in a patient who also requires renal replacement therapy needs proper planning and preparation. Current article presents three COVID 19 cases with severe ARDS where need for renal replacement therapy came immediately after intubation and starting of invasive mechanical ventilation. We suggest including preparation for renal replacement therapy as a component of intubation bundle for critically ill COVID 19 patients with severe ARDS.

Keywords: *COVID 19; Intubation Bundle; Renal Replacement Therapy*

Introduction

Hemodynamic decompensation during intubation of critically ill patients is well recognised in literature and vasopressor support forms an essential component of intubation bundle but the same is not true for acute renal decompensation. A large number of critically ill COVID 19 patients suffer from acute kidney injury which can worsen in the peri-intubation period. Worsening of renal injury with subsequent accumulation of renal acids leading to metabolic acidosis gives limited margin for permissive hypercapnia which is one of the strategies to allow lung protective ventilation. Various guidelines and expert opinions advice considering intubation in patients with P/F ratio less than 150 [1,2]. This value is also considered a cut off to start prone ventilation. Prone ventilation in a patient on vasopressor support, who can also become a candidate for renal replacement therapy (RRT) requires planning from beforehand.

We present three cases of severe COVID with ARDS in which kidney injury acutely worsened in the peri-intubation period requiring RRT in order to maintain the acid base haemostasis.

Case Presentation

Case 1 (Figure 1)

A 68 years old gentleman who was a known case hypertension (on metoprolol), type 2 diabetes (on oral hypoglycaemic agents) and old myocardial infarction (on nitrates), was admitted to our ICU with breathlessness and fever for 10 days. At the time of admission patient was conscious but distressed, his pulse rate was 160/min sinus rhythm, B/P 130/70 mmHg, SpO_2 84% with NIV support and 6 litres Oxygen, R/R 30/min, urine output 50 to100ml/hr. His labs showed TLC 24,100/mm^3 and raised inflammatory markers. He was managed with NIV support (EPAP 5 cm and IPAP 15 cm), fluid resuscitation, intravenous antibiotics, injection remdesivir and injection dexamethasone. His initial P/F ratio was 70 which improved over next 24 to 36 hrs to 130. But after initial stabilization he deteriorated on day 3 of admis-

sion in form of increase in oxygen requirement and need for volume resuscitation and norad support (0.03 to 0.04 microgm/kg/min). In view of worsening organ failures, he was intubated on day 4 and started on mechanical ventilation. Postintubation there was escalating requirement of vasopressors with worsening metabolic and respiratory acidosis. Renal replacement therapy could not be started due to refractory shock and he rapidly succumbed to his illness.

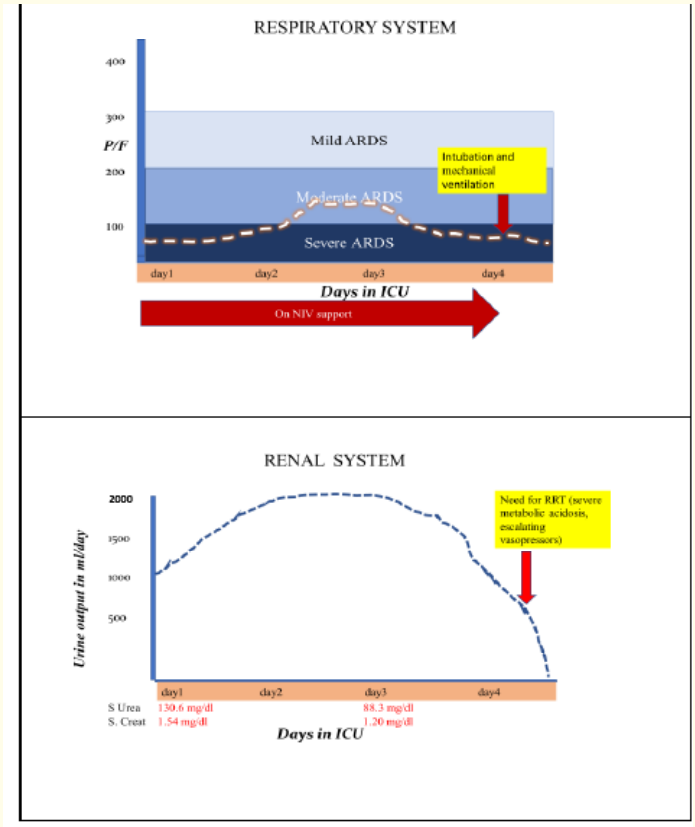

Figure 1: *Temp* *end of P/F ratio in respiratory system and urine output in renal system).*

Case 2 (Figure 2)

A 67 years old gentleman, who was a known case of hypertension (on metoprolol) and coronary artery disease (on nitrates) presented with breathlessness and fever for the past 6 days. At admission he was conscious with SpO_2 78% on nonrebreathing mask, R/R 45/min, HR 144/min, B/P 146/101 mmHg, urine 100 ml/hr. He was managed with NIV support (EPAP 5 cm IPAP12 cm) 100% FiO_2, volume resuscitation, intravenous antibiotics, injection remdesivir, injection dexamethasone and low molecular weight heparin. His condition did not improve over next few hours and he was intubated in view of ongoing tachypnoea and high oxygen requirements. Immediately post intubation patient went into shock which was managed with volume resuscitation and vasopressors. His urine output decreased and he became anuric over next 6 hrs. Continuous renal replacement therapy was started for volume management and metabolic acidosis. He remained stable for next five days, but later developed sepsis and refractory shock leading to death.

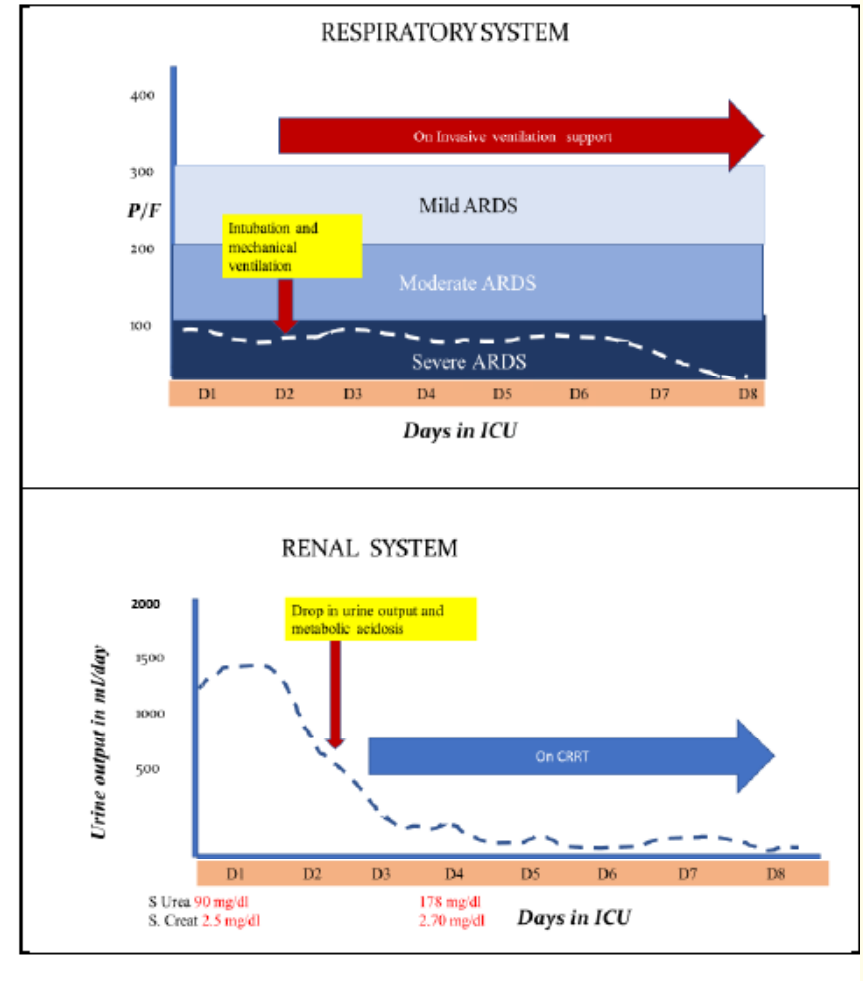

Figure 2: *(Case 2) (CASE 2) Temporal course of Respiratory and Renal failure (Dotted line shows the trend of P/F ratio in respiratory system and urine output in renal system).*

Case 3 (Figure 3)

A 55 years old gentleman was admitted with uncontrolled diabetes with fever, breathlessness for 6 days. He was managed with high flow nasal oxygen, injection remdesivir, steroids, antibiotics and iv insulin. There was decrease in oxygen requirement over next 4 to 5 days but his condition worsened on day 6th of admission in the form of tachypnoea, tachycardia and increased oxygen requirement. Worsening organ failure led to intubation and starting of mechanical ventilation. Postintubation his ventilatory requirements remained high with escalating requirement of vasopressors and drop in urine output. Respiratory and metabolic acidosis led to worsening of pH and he finally succumbed to his illness due to rapid progression of organ failures.

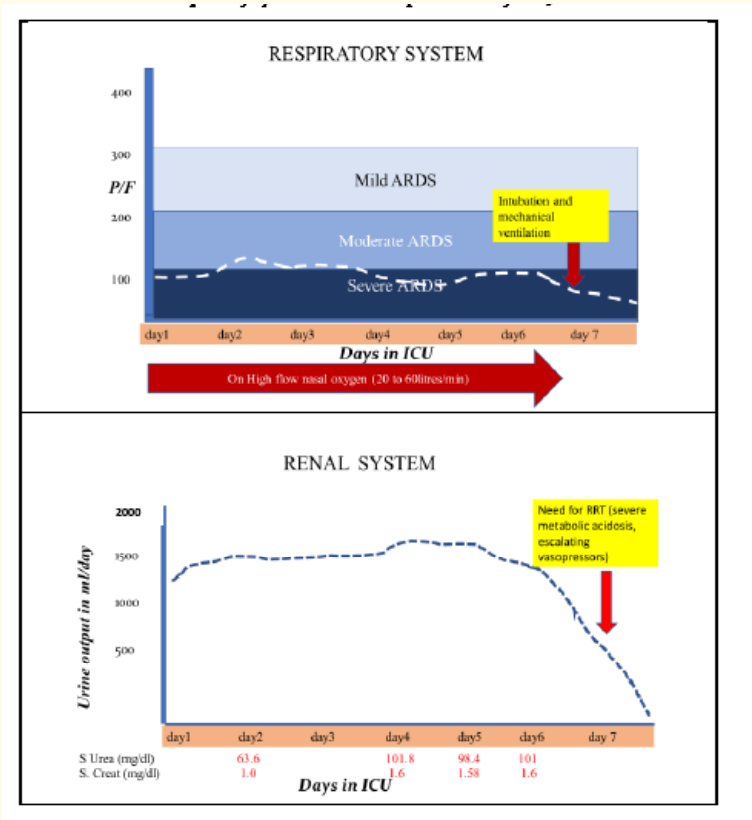

Figure 3: *(Case 3) Temporal course of Respiratory and Renal failure (Dotted line shows the trend of P/F ratio in respiratory system and urine output in renal system).*

Discussion

Acute kidney injury has been reported in 20% of hospitalised and 50% of ICU patients suffering from COVID 19 [3]. A meta-analysis which included15739 COVID 19 patient from 21 observational studies, reported 67% (95% CI 39.8% to 86.2%) mortality among AKI patients with 13 times higher risk of death when compared with non-AKI COVID patients. Around one fourth of the AKI patients required RRT and mortality among those cases was 89 to 100% [4]. Authors also reported temporal relationship between respiratory and renal failure though no statistical data was given regarding the same. Pathogenic mechanism behind AKI among COVID patients include direct as well as indirect insult. Some of mechanisms postulated for direct insult are collapsing glomerulopathy, endothelial damage and complement activation. Organ cross-talk, baseline patient characteristics, fluid dynamics multiple nephrotoxins, mechanical ventilation etc are some of indirect factors affecting progression of AKI [3].

The intubation bundle for COVID 19 has been revised by various guidelines to inculcate the airborne precautions for aerosol generating procedures [5]. Our case series suggests that pre-empting need for RRT is important while starting mechanical ventilation and should be included in intubation bundle. The reason for this approach is two pronged, firstly most patients who are intubated and started on mechanical ventilation have P/F ratio < 150, therefore they qualify for prone ventilation also. If such patients require RRT, placement of

dialysis catheter should be pre-empted. Secondly, permissive hypercapnia is one of the strategies to safely ventilate ARDS lungs. This gives very little margin for accumulation of renal acids in patients with AKI and early RRT should be considered to maintain acid-base haemostasis. Table 1 shows suggestion for revised intubation bundle in COVID 19 patients.

• Presence of at least two intensivists
• Airborne precautions
• Review need for fluid bolus/vasopressor support
• Review need for RRT (timely placement of dialysis catheter if prone ventilation is planned for P/F <150)
• Pre-oxygenation using NIV and in-line HEPA filter
• Rapid sequence intubation
• Lung protective ventilation

Table 1: *Revised intubation bundle for COVID 19 patients.*

Conclusion

In view of multisystem involvement in critically ill COVID 19 patients, one must remain alert regarding worsening of renal failure during peri-intubation period and include preparation for RRT in the intubation bundle.

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Ethics Approval and Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Competing Interests

The authors declare they have no competing interests.

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