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CASE REPORT

Trends in Pulmonary and Respiratory Medicine

Neonatal Acute Respiratory Distress Syndrome (Nrds) Secondary to Sars-Cov-2 Virus- Beneficial Role of Surfactant

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Abstract

We describe a preterm neonate with SARS-CoV-2-related neonatal acute respiratory distress syndrome (NRDS) in the second week of life with apneas and progressed to severe pulmonary disease requiring mechanical ventilation. He was administered surfactant therapy along with the other supportive care and had successful outcome. A recognition that these high-risk neonates could deteriorate, and as long as we do not have specific antiviral therapies against SARS-CoV-2, early patho-physiology based supportive therapy is the mainstay to prevent the progression of pulmonary failure, the most common cause of COVID-19 mortality. .

keywords: *neonatal ARDS, SARS-CoV-2, surfactant*

Introduction

The Montreux definition of neonatal acute respiratory distress syndrome (NRDS), is like ARDS in older children and adults, is characterized by extensive lung inflammation and surfactant catabolism leading to lung dysfunction [1]. Systematic review and synthesis of 176 published cases of neonates infected by SARS-CoV-2, confirmed that SARS-CoV-2 can infect neonates trans placentally [2] and no cases of NRDS were evident [3]. We report a case of a ten-day old preterm neonate, who developed NRDS secondary to SARS-CoV-2 virus with stormy course, responded well to surfactant administration and had a favorable outcome..

Case

A 33+4-week preterm male (2.3kg), was brought to the casualty on the 10th day of life with complaints of poor feeding, lethargy and high-grade fever for one day. He was delivered by a COVID negative mother, by vaginal route and cried immediately after birth. His early post-natal period was uneventful, and he was discharged on day three of life. On arrival, baby had bradypnea, peripheral cyanosis and mottling. His vitals were heart rate-125 beats per minute, respiratory rate-20 breaths per minute, saturation on room air- 92%, blood pressure- 89/53 mm Hg (50th centile), axillary temperature- 36°C with poor peripheral pulses and cold extremities. Central nervous examination showed poor cry, decreased tone and activity. Chest auscultation revealed bilaterally equal air entry and normal heart sounds. He was started on continuous positive airway pressure (CPAP) support, fluid bolus followed by epinephrine infusion and broad-spectrum antibiotics. On day 2 of admission, the baby had frequent apneic episodes with an episode of arrest requiring cardio-pulmonary resuscitation and intubation. He was subsequently put on mechanical ventilation on SIMV-PC+PS mode (synchronized intermittent mandatory ventilation- pressure control + pressure support) with PIP/PEEP/MAP (peak inspiratory pressure/positive end expiratory pressure/mean airway pressure) and FiO2 of 14/7/14/60. Oxygenation Index (OI) was 10 suggesting moderate NRDS [1].

Initial venous blood gas analysis showed severe respiratory acidosis with high lactate levels (pH 7.02/ pCO2 91; pO2 55; HCO3 16.5; lactate 7.59) Laboratory reports were suggestive of lymphopenia (800/mm3), hypoalbuminemia (2.3gm/L), high C-reactive protein (65mg/L), and D-dimers (743ng/ml). As per the protocol, COVID-19 RT-PCR was sent which was positive. Chest x ray revealed non homogenous bilateral opacities suggestive of a viral pneumonia. A chest CT suggested COVID-19 related lung changes with the severity score of 25/25 (CO-RADS 6) [4]. In view of critical COVID pneumonia, child was started on methyl prednisolone (2 mg/kg/day) along with lung protective ventilation strategy. Considering the recent evidence suggesting a protective barrier restoring and anti-inflammatory role of surfactant in patients with COVID-19 pneumonia [5], we administered surfactant (Survanta) 4ml/kg endotracheally. In our case, we did not use antivirals like Remdesivir owing to the small amount of evidence regarding its safety and efficacy in the neonatal population. Three days post steroids and surfactant use, there was a significant improvement in the lung compliance and hypercarbia with decreased FiO2 requirements. Visible clearing of left lung fields was noted on chest-X ray by day 11 of ICU stay. Baby was gradually weaned and successfully extubated after 12 days of mechanical ventilation. Supportive therapy in the form of chest physiotherapy and nutritional support were continued and the baby was discharged on day 30 of hospital stay. He is in close follow up and is doing well.

Discussion

We report neonatal ARDS (NRDS), an unheard complication of covid 19 infection, in a baby who responded well to surfactant treatment with other supportive measures and had a successful outcome. SARS-CoV-2 enters and replicates in the alveolar type II cells affecting the production and turnover of pulmonary surfactant resulting in alveolar collapse and inflammation leading to increased capillary permeability, surfactant deactivation and microvascular thrombosis. [6]. The pathological findings from adults who died

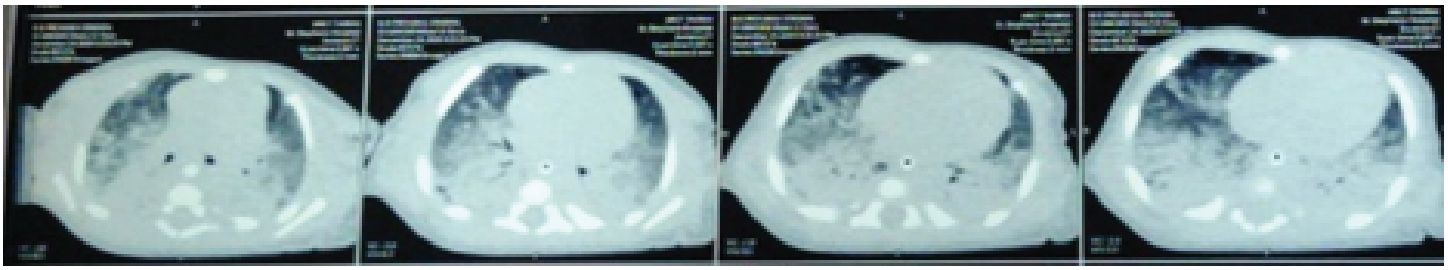

Figure 1. *Axial chest CT scan on day 4 of admission showing bilateral extensive peripheral, sub-pleural and non-lobar distribution of ground glass opacities with septal thickening with basal predominance. Bilateral dense air space consolidation with air bronchogram present.*

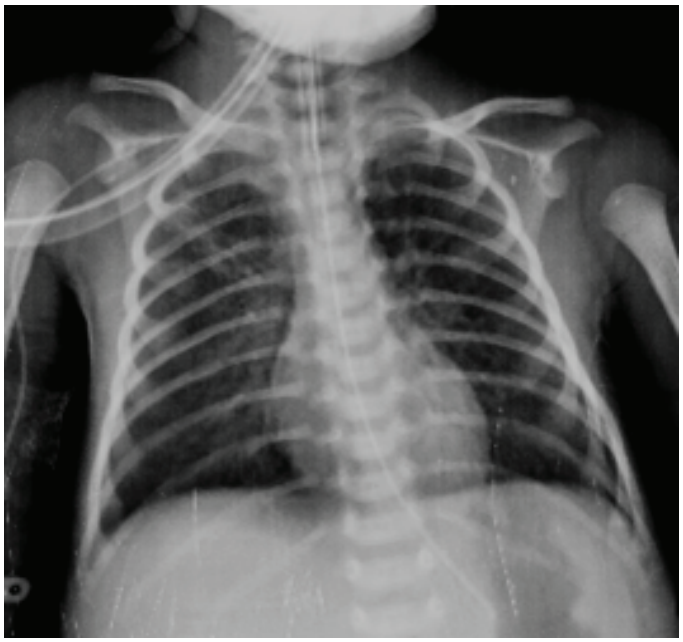

Figure 2. *Chest X-ray on day 11 of admission showing visible clearing of lung fields*

from COVID-19 are consistent with the histological rationale for NRDS, indicating the probability of secondary impairment of surfactant function in case of severe neonatal COVID-19 [7,8]. Several interventional trials are currently underway in the UK, USA, and Canada (ClinicalTrials.gov IDs: NCT04375735, NCT04362059, NCT04384731) to find out if surfactant administration could improve the COVID-19 patient outcome [9].

Conclusion

As our understanding gets better on the patho-physiology of SARS-CoV-2 virus inside lungs, it is expected that surfactant administration shall be effective in severe COVID-19 induced NRDS and/or ARDS for better outcome.

Contributions

DS and S examined and managed the case. DS searched the literature and drafted the manuscript. MP and MA critically reviewed the manuscript. MP shall act as a guarantor. Parag Agarwal is acknowledged for proof-read..

References

1. De Luca D, van Kaam AH, Tingay DG, Courtney SE, Danhaive O, et al. The Montreux definition of neonatal ARDS: biological and clinical background behind the description of a new entity. Lancet Respir Med. 2017; 5: 657-666.
2. Dhawan S, Pandey M. SARS-Cov-2 Vertical Transmission: Rare but A Potential Possibility. Indian J Pediatr. 2021; 88: 277.
3. Raschetti R, Vivanti AJ, Vauloup-Fellous C, Loi B, Benachi A, et al. Synthesis and systematic review of reported neonatal SARS-CoV-2 infections. Nature communications. 2020; 11: 1-0.
4. Prokop M, Van Everdingen W, van Rees Vellinga T, Quarles van Ufford H, Stöger L, et al. CO-RADS: a categorical CT assessment scheme for patients suspected of having COVID-19—definition and evaluation. Radiology. 2020; 296: E97-104.
5. Mirastschijski U, Dembinski R, Maedler K. Lung surfactant for pulmonary barrier restoration in patients with COVID-19 pneumonia. Front Med (Lausanne). 2020; 7: 254.
6. Nieman GF, Andrews P, Satalin J, Wilcox K, Kollisch-Singule M, et

al. Acute lung injury: how to stabilize a broken lung. Critical care. 2018; 22: 1-1.

7. Xu Z, Shi L, Wang Y, Zhang J, Huang L, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. Lancet Respir Med. 2020; 8: 420-422.
8. De Luca D, van Kaam AH, Tingay DG, Courtney SE, Danhaive O, et al. The Montreux definition of neonatal ARDS: biological and clinical background behind the description of a new entity. Lancet Respir Med. 2017; 5: 657-666.
9. Schousboe P, Wiese L, Heiring C, Verder H, Poorisrisak P, et al. Assessment of pulmonary surfactant in COVID-19 patients. Crit Care. 2020; 24: 552.

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