Severe pulmonary hemorrhage in a 3-week old neonate with COVID-19 infection: A case report

Anood Al-Assaf[1], Khaled Ellithy[1], Tejas Mehta[1], Walid Aljbawi[1], Hossamaldein Ali[1], Ashraf Soliman[1], Mohammed Al Amri[1], and Abdulqadir Nashwan[1]

[1]Hamad Medical Corporation

May 23, 2022

Abstract

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Anood Alassaf[1,6], Khaled Ellithy[2], Tejas Mehta[2], Walid Aljbawi[2], Hossamaldein Ali[3], Ashraf Soliman[4], Mohammed Al Amri[5], Abdulqadir J. Nashwan[7*]

Affiliations

1. Pediatrics Department, Sidra Medicine, Doha, Qatar
2. Pediatric Intensive Care Unit, Hamad Medical Corporation, Doha, Qatar
3. Pharmacy Department, Hamad Medical Corporation, Doha, Qatar
4. Pediatric Endocrinology Department, Hamad Medical Corporation, Doha, Qatar
5. Pediatric Emergency Department, Hamad Medical Corporation, Doha, Qatar
6. Pediatrics Department, Hamad Medical Corporation, Doha, Qatar
7. Nursing Department, Hamad Medical Corporation, Doha, Qatar

AAlassaf@hamad.qa; Khaledsayedellithy@gmail.com; TMehta@hamad.qa; WAljbawi@Hamad.qa; Hali20@hamad.qa; Asoliman@hamad.qa; MAlamr@hamad.qa; anashwan@hamad.qa

*** Corresponding author:**

Mr. Abdulqadir J. Nashwan

anashwan@hamad.qa Tel: (+974) 40240487

Mob: (+974) 66473549 P.O.Box 3050

Hamad Medical Corporation, Doha, Qatar

Abstract

This is a 3-week-old female, her presenting complaints were low-grade fever and a blocked nose for one day. Eventually, she developed progressive desaturation, hypotension, and poor perfusion due to severe pulmonary hemorrhage. Then, she developed cardiac arrest and was declared dead.

Keywords: Pulmonary hemorrhage; SARS-CoV-2; COVID-19; Sepsis; Newborn

Key Clinical Message

Pulmonary hemorrhage has been reported in adults but rarely in children. Up to our knowledge, this is the youngest age at which a patient with COVID-19 infection developed pulmonary hemorrhage with no other underlying cause of it.

Introduction

During the SARS CoV-2 pandemic, the majority of pediatric cases presented with lung involvement as the main disease, with the severity of symptoms ranging from mild pneumonia to severe lung injury and ARDS. Emerging studies found that some patients may experience uncommon complications, such as thrombotic or hemorrhagic episodes[1]. Cases of pulmonary hemorrhage have been reported in adults with COVID 19 infection; however, reports about similar presentations in pediatrics are rare. We present a case of a 3-week-old neonate with COVID -19 infection and no other underlying comorbidities who had a fatal pulmonary hemorrhage. Our case report demonstrates the unusual presentation of COVID-19 infection in neonates and presents the challenges associated with it.

Case Presentation

The patient is a 3-week-old female baby, a product of full-term pregnancy and uneventful normal vaginal delivery. She was delivered to a 37-year-old healthy GBS negative mother and was discharged after 24 hours in good condition. She presented to the emergency department with a high-grade fever, hypoactivity, and poor oral intake for a one-day duration. Physical examination at that time was significant for fever reaching 38.9 and tachycardia, which improved after a bolus of 10 ml\kg normal saline 9%. The rest of the examination was unremarkable, the fever responded to antipyretics, and the patient was doing well. A full septic workup was done, and cultures from blood, urine, and CSF were taken. Her initial blood workup, including blood gas and CSF study, was reassuring (Table 1). Her SARS-CoV-2 RT-PCR was positive (CT value 17.77). Both parents were COVID-19 positive, and the father was symptomatic. She received the first doses of IV ampicillin 50mg\kg\dose and cefotaxime 50 mg\kg\dose along with IV fluid and paracetamol for fever. Shortly after admission to the pediatric ward, the patient was noticed to have frothy bloody secretion coming out of the mouth and she suddenly developed cardiopulmonary arrest. CPR was initiated, and the patient was intubated. She was found to have a pulmonary hemorrhage, as evidenced by the fresh blood from the endotracheal tube and the XR findings of ground-glass opacities and dense consolidation (Figure A). Suction yielded approximately 30 ml of bloody secretion. She was given adrenaline and cold normal saline to control the bleeding and transferred to PICU for further care. After initial brief initial stabilization, the patient started deteriorating, requiring escalation of respiratory support to HFOV. Her sensorium had improved, necessitating initiation of IV continuous sedation, as the child was requiring high pressures and oxygen requirements. Given that the patient had a pulmonary hemorrhage and severe coagulopathy, ECMO was not initiated. The patient continued to deteriorate and developed bilateral pneumothorax requiring bilateral chest tube insertion (Figure B). After chest tube insertion, there was mild improvement in oxygenation with a reduction of FiO2 to 0.8 transiently, but it was again increased back to 1.0 due to desaturation. The patient was on the maximum ventilatory settings of MAP of 28, frequency of 8.0, and amplitude of 47, but she kept having frequent desaturation, requiring frequent manual bag to tube ventilation. Echocardiography was done and showed good cardiac function with no evidence of heart disease. Later, she started developing progressive hypotension, that required support with maximum doses of inotropes. Adrenaline doses were increased from 0.05 mcg/kg/min up to 1.8 mcg/kg/min. In addition, noradrenaline was started at 0.1 mcg/kg/min and increased to 0.5 mcg/kg/min. Her urine output started to decrease, for which IV frusemide bolus followed by continuous infusion were started with no response. Blood investigations showed a severe DIC picture. She received platelet transfusion, packed RBC transfusion, fresh frozen plasma, and was empirically covered with meropenem and vancomycin along with remdesivir and dexamethasone for COVID 19 pneumonia. Eventually, the child developed progressive desaturation, hypotension, and poor perfusion. Blood gases showed worsening metabolic acidosis. She eventually developed cardiac arrest and was declared dead.

Discussion

Severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) is the third virus of the twenty-first century to become a global concern[2]. The clinical picture of COVID 19 infection in the pediatric population seems more indistinct and less severe than in adults, with the most common symptoms being fever, cough, dyspnea, and malaise[3]. These symptoms are extremely common among children with a variety of respiratory diseases, which they are highly susceptible to due to their developing immune systems. This is thought to be a contributing factor to the delayed presence of published pediatric cases with COVID-19 infection and their particular ways of disease presentation[4]. Children are susceptible to infection with COVID 19 virus as it is mainly transmitted via respiratory droplets[5]. The incubation period in children is similar to adults and is about 1 to 14 days, up to 24 days. Children, generally, have immature immunity, and some exhibit a long incubation period after SARS-CoV-2 infection[6].

Newborns can also be infected with SARS-CoV-2 due to the immaturity of their immune systems; however, uncommon presentations have been associated with this age group[2]. In the few published cases of COVID-19 in neonates, the presentation was that of late neonatal sepsis; interestingly, the lung involvement was not as common as in the older children and adults[7].

Our patient presented in her neonatal period with pulmonary hemorrhage, which has been reported in adults, but rarely in children with COVID 19 infection[8]. It is such a diagnostic challenge because it can be caused by multiple alternative diagnoses, such as chest infections and ANCA vasculitis. However, history, examination, and workup can give a clue to whether the pulmonary hemorrhage is caused by diseases other than COVID-19 infection. For example, a key distinguishing feature between ANCA-positive vasculitis and COVID-19 infection in adults and children who can cough is the presence of hemoptysis. The literature suggests that hemoptysis is uncommon in COVID-19 and has a symptom prevalence of 2%[9].

Regarding the etiology of pulmonary hemorrhage in patients with COVID 19, some case reports in adults suggested that patients with COVID infection had increased inflammatory states that led to developing vasculitis and consequently pulmonary hemorrhage[10]. Autopsies performed on deceased adult patients revealed that pulmonary hemorrhage was interestingly associated with the inappropriate formation of thrombi. Furthermore, they showed signs of diffuse alveolar damage with a rich infiltrate of inflammatory cells, which could contribute to damage to small alveolar vessels[1]. Due to the rarity of cases of pulmonary hemorrhage in pediatrics, data about presumed etiology is limited and mostly adopted from adults. COVID 19 virus keeps showing itself in many unfamiliar ways, which leaves physicians in a challenging situation. The acuity of the cases often makes extensive investigations hard to achieve. However, it is necessary to rule out causes such as other viral infections, bacterial diseases, and states of coagulopathy before we can assume hemorrhage is caused primarily by the COVID 19 virus. The patient in our case underwent screening for infections and coagulation disorder and came out negative. Her young age and acute presentation make rheumatological diseases extremely unlikely. Up to our knowledge, this is the youngest age at which a patient with COVID-19 infection developed pulmonary hemorrhage with no other underlying cause of it.

Early bronchoalveolar lavage (BAL) is the diagnostic test needed to confirm diffuse alveolar hemorrhage. The gold standard is the sequential rise in red blood cells or haemosiderin-laden macrophages on repeat BAL[9]. This invasive procedure was not done in our case for two main reasons; First, she was clinically unstable to perform bronchoscopy. Secondly, the procedure is highly aerosol-generating that should only be performed in the most necessary of cases, to minimize the potential risk of COVID-19 transmission[11].

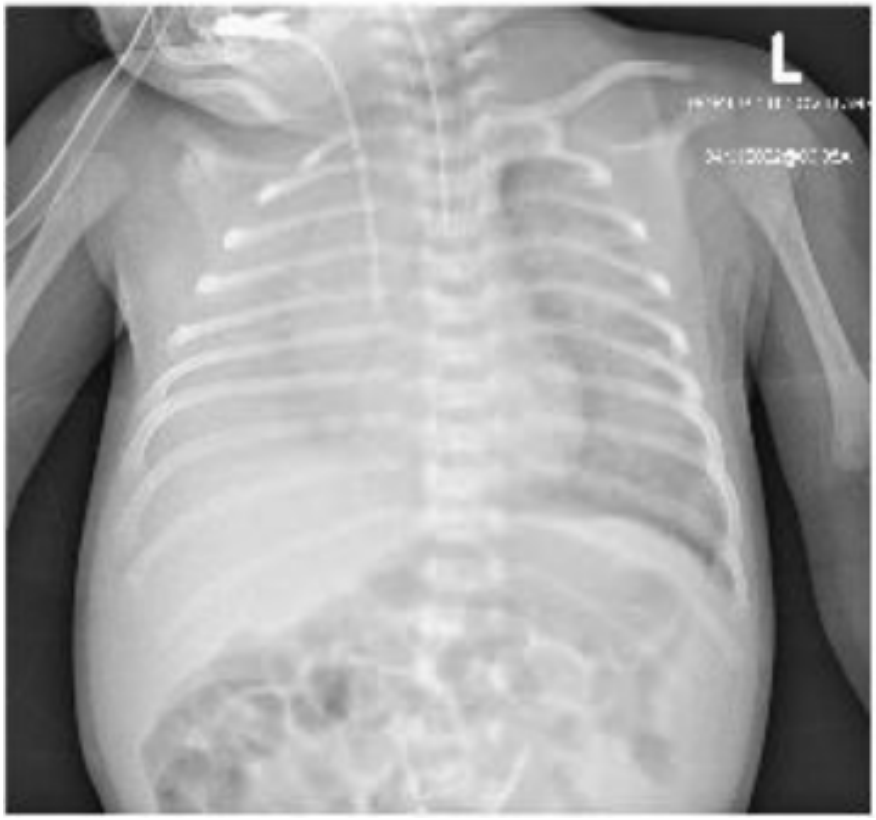
Conclusion

Pulmonary hemorrhage has been reported in adults but rarely in children. Some reports in adults suggested that patients with COVID-19 infection had an increased inflammatory state that led to the development of vasculitis and pulmonary hemorrhage. While many of the cases of COVID infection in children are mild, fatal complications like pulmonary hemorrhage can be present. Adding new challenges to the management of this novel and widely spreading virus.

Table 1: Laboratory Investigations

Lab test on admission	Lab test on admission	Lab test on admission
Lab test	Result	Reference range
CBC	CBC	CBC
WBC	8.7 10ˆ3/µL	(6.0-16.0) 10ˆ3/µL
Hgb	12.5 gm/ dl	(11.1-14.1) gm/ dl
HCT	35.4 %	(30.0-38.0)%
MCV	90.5 fL	(72.0-84.0) fL
MCH	32 pg	(25.0-29.0) pg
Platelet	397 10ˆ3/µL	(200-550) 10ˆ3/µL
CSF	CSF	CSF
CSF WBC	6/µL	0-5/µL
CSF RBC	3000 /µL	0-5 /µL
CSF glucose	2.1 mmol/L	(3.33-4.44) mmol/L
CSF protein	0.8 gm\L	(0.15-0.45) gm\L
CSF viral PCR	negative	
CSF Culture	No growth	
Other	Other	Other
Ammonia	79 µmol/L	0-80 µmol/L
Blood culture	No growth for 1 day	
Urine culture	No growth	
Blood virology PCR panel	Negative	
Lab tests after 9 hours of admission	Lab tests after 9 hours of admission	Lab tests after 9 hours of admission
Ferritin	38530 µg/L	0-450 38530 µg/L
IL-6	1697 pg/L	-
D-Dimer	>35 mg/L	0 – 0.46 mg/L
Fibrinogen	<3 gm/L	1.6 – 4.6 gm/L
INR	4	-
Urea	6.2 mmol/L	0.8 – 5.5 mmol/L
Cr	76 µmol/L	-
Lab tests after 12 hours of admission	Lab tests after 12 hours of admission	Lab tests after 12 hours of admission
D-Dimer	>180 mg/L	0 – 0.46 mg/L
Fibrinogen	<0.3 gm/L	1.6 – 4.6 gm/L
INR	3.8	-
Platelets	79 10ˆ3/µL	170 – 500 10ˆ3/µL
Lactate	13 mmol/L	0-3 mmol/L

Figure A: There is a diffuse bilateral alveolar infiltrate obscuring the right hemithorax. Central venous catheter, endotracheal tube, and nasogastric tubes are shown in the X-ray.



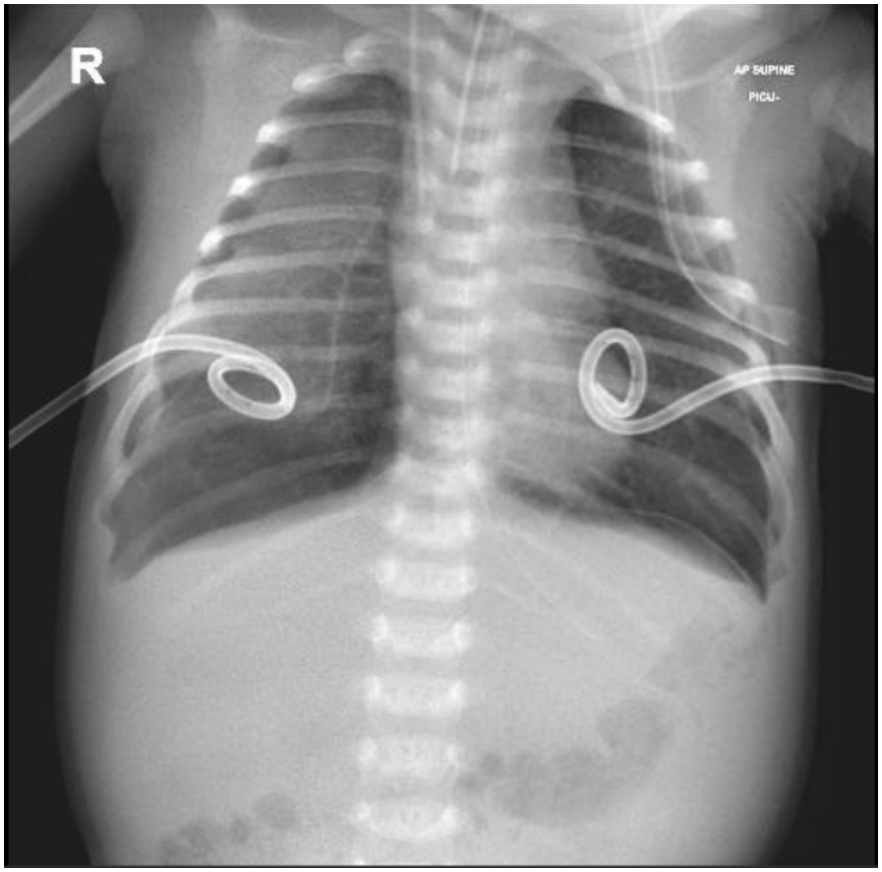


Figure B: Bilateral partial pneumothoraxes, for which pig tail catheters were inserted and seen in place.

Declarations

Ethics approval and consent to participate

The article describes a case report which was approved by the Medical Research Center at Hamad Medical Corporation (MRC-04-22-053) with a waiver of ethical approval.

Consent for publication

The consent for publication was obtained from the patient's guardian.

Availability of data and material

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

Funding

This study was not funded.

Authors' contributions

AA, KE, TM, WA, HA, AS, MA, AJ: Data Collection, Literature Search, Manuscript Preparation (draft and final editing)

All authors read and approved the final manuscript

Acknowledgments

Open Access funding provided by the Qatar National Library.

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