Health Sciences & Disease
The Journal of Medicine and Biomedical Sciences

Clinical Case

Association of Acute Cor Pulmonale and COVID-19 in a Young Malian: a Case Report

Association cœur pulmonaire aigu et COVID-19 chez un jeune malien: à propos d'un cas

Mamadou Diakité[1,4*], Jean Paul Dembélé[3,4], Mamadou Touré[2,4], Yacouba Cissoko[3,4], Bouréma Dembélé[1], Mariam Sako[3,4], Ghislain G. Poda[5], Souleymane Coulibaly[1,4], Ichaka Menta[2,4], Sounkalo Dao[2,4]

[1] Cardiology Department, CHU Point G, Bamako-Mali
[2] Cardiology Department of the Gabriel Touré Hospital Center, Bamako-Mali
[3] Infectious and Tropical Diseases Department of the CHU Point G, Bamako-Mali
[4] Faculty of Medicine of Odontostomatology (FMOS), Bamako-Mali
[5] Public Health Department, University of Ouagadougou, Burkina Faso

***Corresponding author:** Mamadou Diakité, MD, Cardiologist, Department of Cardiology, Teaching Hospital -Point G. Phone: +223 74196750- Email:diakitemamadoua@yahoo.fr

Keywords: SARS-Cov-2; acute cor pulmonale; Young female
Mots clés : COVID-19 ; CPA ; Jeune femme

RÉSUMÉ

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a complex, multi-facial disease that involves viral, inflammatory, and thrombotic phases. We report a picture of a pulmonary heart in a young overweight subject under combined estrogen-progestin contraception. Paraclinical examinations find parameters of overload of the right cavities and myocardial lesions responsible for troponin elevation, inflammatory syndrome, and severe hypoxemia. Computed tomography pulmonary angiogram showed a bilateral pulmonary embolism associated with COVID-19 pneumonia and deep femoral thrombosis on Doppler ultrasound of the limbs. SARS-CoV-2 infection was confirmed. The patient was then put on oxygen and adequate treatment leading to a favorable evolution. The management of acute cor pulmonale in COVID-19 is a challenge because it requires a multidisciplinary team.

ABSTRACT

L'infection à ''Severe acute respiratory syndrome coronavirus 2'' (SARS-CoV-2) est une maladie complexe à plusieurs visages qui implique des phases virales, inflammatoires et thrombotiques. Nous rapportons le tableau de cœur pulmonaire chez un jeune sujet en surpoids sous contraception œstrogène-progestative. Les examens paracliniques trouvent des indices de surcharge des cavités droites et des lésions myocardiques responsables de l'élévation de la troponine, du syndrome inflammatoire et de l'hypoxémie sévère. L'angio-tomodensitométrie pulmonaire a montré une embolie pulmonaire bilatérale associée à une pneumonie de COVID-19 et à une thrombose fémorale profonde à l'échographie Doppler des membres. L'infection par le SRAS-CoV-2 a été confirmée. Le patient a ensuite été mis sous oxygène et un traitement adéquat conduisant à une évolution favorable. La prise en charge du cœur pulmonaire aigu dans la COVID-19 est un défi car elle nécessite une équipe multidisciplinaire.

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 infection is a complex multi-facial disease that involves viral, inflammatory, and thrombotic phases [1]. Although the infectious-respiratory picture caused is in the foreground; extrapulmonary manifestations have been observed, especially in the cardiovascular system [2]. Indeed, an abnormally high incidence of venous thromboembolic events (VTE) has been observed, particularly in patients with the most severe forms [3,4]. In addition, their occurrence during the disease worsens the prognosis [5,6]. We report in young subjects an unusual clinical form with acute revelation on the cardio-respiratory system (Acute Pulmonary Heart: APC).

CASE REPORT

This was the case of HD aged 39, 4 gestures, three alive and one death. In addition, patient had been taking combined estrogen-progestin oral contraceptives for 2 years. She presented in consultation with sudden respiratory distress at night. Weight= 102 Kg, Height=178 cm; BMI= 31.6 TT= 107cm.

On clinical examination, the patient was anxious, polypneic at 35 cycles per minute, with signs of respiratory struggle.

Vital parameters were as follows: pulse: 115 bpm; BP: 160/120 mm Hg; Temperature: 37°8C; SaO2: 85% in ambient air and under high concentration oxygen at 12 liters/min, it increases to 89%.

The conjunctivae were normally colored. Cardiopulmonary auscultation found rapid and muffled heart sounds without added noise. The lungs were clear, without. There were no signs of peripheral heart failure and the Homans sign was negative.

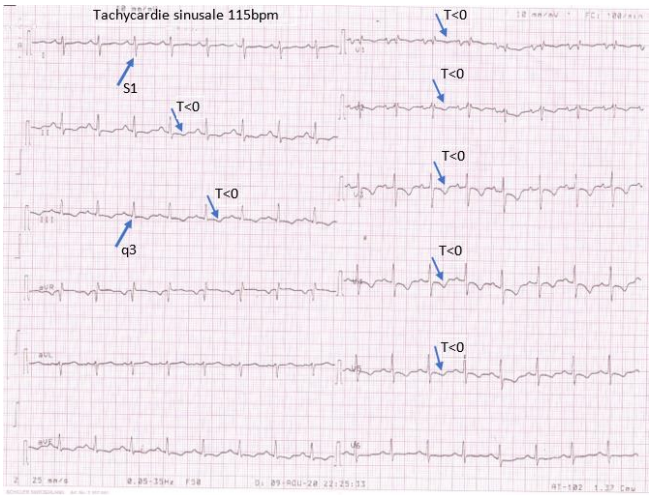
Clinical diagnosis

This figure of acute respiratory failure syndrome in a young obese woman taking combined estrogen-progestin oral contraceptives and consideration of other data lead us to make a tentative diagnosis of acute cor pulmonale whose etiology could be pulmonary embolism (PE) given the pre-test clinical probability score developed in the emergency room (sorting patients in the emergency room) and the D-dimers. The ECG (*Figure 1*) showed sinus tachycardia at 115bpm with signs of pulmonary heart that are: a right axis (S1q3), an early transition to V3 with signs of VD overload (V1-V4 negative T-wave). On cardiac ultrasound, we found dilatation of the right ventricle (RV), a paradoxical septum and pulmonary arterial hypertension (PAH) measured at 50 mm Hg. Chest CT findings were consistent with PE (*Figure 2*). Venous Doppler of the lower extremities (MI) showed subtotal thrombosis from the common femoral vein (CRV) to the left popliteal vein with two floating thrombi in the deep femoral.

Given the context of the COVID-19 pandemic, we presumed it to be the etiology, even in the absence of precession symptomatology before the occurrence of the event. However the RT-PCR came back inconclusive.

Management and evolution

The patient was not transferred to COVID-19 department and was managed in the cardiac intensive care. Apart from high-concentration oxygen therapy, she benefited from solute intake (1500 ml/24 hours); enoxaparin at a curative dose (i.e. 200IU/kg/day divided into 2 S/C injections), methyl-prednisolone 1 mg/kg in 2 doses administered IV over a week. She also received azithromycin per os 500mgx2/d. At day five of hospitalization; the respiratory status was satisfactory with a decrease in respiratory rate and oxygen requirements. The results of the blood gas analysis performed in ambient air before the patient are shown in Table 3. Hemodynamic stability and biologically lower inflammation parameters (normalization of leukocytes and lower CRP levels) as well as troponins.



ECG figure 1: Sinus tachycardia with tendency to a micro voltage of peripheral bypasses aspect S1q3T3, aspect Rs in all precordial leads; inversion of T waves in lower and antero-septo-apical

Table 1: Biochemistry and biological markers for diagnosis and prognosis

Hemoglobin: 15 g/dl	Drop Thickness: negative
Hematocrit: 44 %	Creatinine: 135 µmol/l clearance: 75ml/min
White Blood Cells: 10270/^{mm3}	CRP: 229.59 mg/l
Pads: 375000/^{mm3}	Pro-calcitonins: 320 ng/l
TP: 75 %	Troponins T: 242800 pg /l
INR: 1.2	D Dimers: 4510 µg /l

Table 2: Gas from arterial blood to the ambient air (AA): severe hypoxia; PaO2/FiO2 $_{ratio}$= 236mmHg

Arterial blood gas (AA)	1. Desaturation
PH: 7.5	2. Hypoxemia
PaO_2: 49.6 mmHg	3. Hypocapnia
PaCO2: 26.5 mmHg	
HCO_3^- : 21.5 mmol	
SaO2: 82.7%	

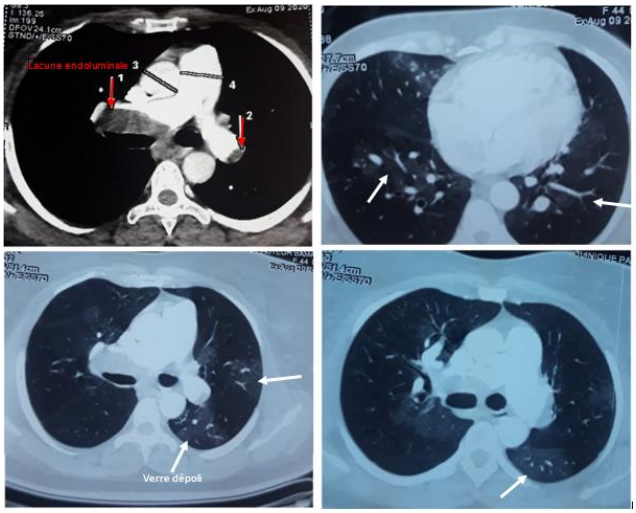


Figure 2: Angio (Computed Tomography) Pulmonary CT: Massive proximal and bilateral pulmonary embolism associated with typical COVID-19 pneumonia (bilateral frosted glass ranges, subpleural peripheral, posterior and basal).

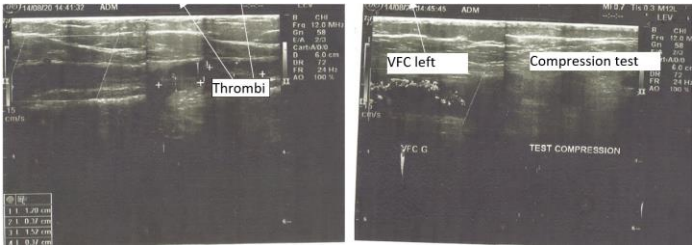


Figure 3: Venous Doppler of the lower extremities (MI) shows subtotal thrombosis from the common femoral vein (CRV) to the left popliteal vein with the presence of two floating thrombi in the deep femoral measuring 15x3 mm and 12x3 mm

Table 3: Arterial blood gas recontroled to ambient air before hospital discharge: PaO2/FiO2 ratio=359mmHg

Arterial blood gas (AA)
PH: 7.4
PaO2: 75.4 mm Hg
PaCO2: 33.2 mm Hg
HCO3- : 22.1 mmol
SaO2: 94.2%

DISCUSSION

Asymptomatic and/or presymptomatic forms of COVID-19[7] vary between studies and range from 6.4% to 12.6%. Our patient until the occurrence of her severe paroxysmal dyspnea subject to her consultation at our emergency room could be considered a presymptomatic form. However, the RT-PCR test performed came back negative: knowing that this method can lead to up to 35% of cases [8]. We confirmed the SARS-CoV-2 infection by the serological test of IgG by ELISA showing a positive reaction (strong reactivity with the SARS-Cov-2 antigen). In addition, some clinical cases of thrombosis on COVID-19 demonstrate that they can be late manifestations of the infection remained inapparent with a negative RT-PCR but the presence of antibodies against SARS-CoV2 [9,10,11]. However, it is possible that it is the thromboembolic event that allows the discovery of SARS-CoV2 infection [11].

Respiratory and cardiovascular complications are a life-threatening diagnostic alternative in COVID-19 patients [12]. The latter often have respiratory symptoms that largely overlap with the clinical presentation of acute PE [10]. It is therefore important to know how to evoke the diagnosis of acute PE in the face of any respiratory distress of sudden worsening, the appearance of ECG signs evoking an acute pulmonary heart or in case of signs of deep vein thrombosis [13]. However, we found no clinical signs in favor of thrombophlebitis on clinical examination (no edema in the lower limbs, no induration on a venous path in the lower limbs and dorsi-flexion of the soles of the feet in search of Signs of Homans was negative). A review of the literature shows that most authors also made the same finding in cases of venous thrombosis of the lower limbs on COVID-19 [14].

On the other hand, venous Doppler of the lower extremities objectified a subtotal thrombosis of the femoral vein common to the left popliteal vein with the presence of two floating thrombi in the deep femoral. The diagnostic criterion for deep vein thrombosis is the incomplete compressibility of the vein, which indicates the presence of a clot [15]; we wanted to reproduce this technique (Figure 3). The ECG (*Figure 1*) of our patient showed sinus tachycardia at 115bpm with signs of pulmonary heart that are: a right axis (S1q3), an early transition to V3 with signs of VD overload (V1-V4 negative T-wave). Among the clinical tools available in emergency, the ECG is easy to perform, cost-effective and widely available. The detection of signs of right ventricle overload (defined by a new deviation of the right axis and/or an S1Q3T3 aspect and/or an under shift of the ST segment with T-wave reversal in the V1 to V3 leads and the II, III, aVF leads that did not exist on the previous ECG) is a simple and powerful tool with an early discriminatory capability [16,17]. The determination of D-dimers in severe patients with COVID-19 is at the same time an integral part of the diagnostic algorithms for pulmonary embolism, starting with a pre-test probability [18,19].

Our patient had a level greater than 9 times normal (*Table 1*); considered significantly increased to be a prognostic marker. As for risk factors, covid-19 patients are known to be exposed to several known risk factors for VTE such as bed rest, age and obesity. It appears that VTE associated with COVID-19 have their own predisposing factors such as male sex, time between onset of symptoms and hospitalization, marked inflammatory syndrome, and hypoxemia [20]. If the latter (hypoxia the inflammatory syndrome) are at their peak in our patient; on the contrary

she was young, had few factors (obesity) while she was in the process of estrogen-progestin treatment. Clinically the severity of acute PE is determined based on early mortality defined by hospital mortality at 30 days. VD failure due to acute pressure overload is considered the leading cause of death in severe forms [21]. In the case of COVID-19; electrocardiographic, echo cardio graphic parameters and troponin assay are used to facilitate the identification of elements of gravity. Several studies have found that myocardial lesions, which cause troponin elevation, are associated with the occurrence of complications, including acute distress syndrome and mortality [22,23]. The mechanism by which these myocardial lesions per COVID-19 and the poor prognosis developed by these patients is not clearly established [17]. There is, however, a relationship between the overload parameters of the right cavities at the ECG and myocardial lesions. Our patient had this association (troponin elevation up to 26 times normal: *Table 1* and electrical signs of VD overload: *Figure 1*). The resulting CPA is mainly a consequence of respiratory instability and hypoxemia is the typical finding it is due to the mismatch between ventilation and infusion. In addition, hypoxia can cause thrombosis by stimulating the synthesis of inducible transcription factors [24].

Our patient was in severe hypoxemia with a $_{PaO2}$/FiO2 ratio = 236 mm Hg. This situation is consistent with the lesions of COVID-19 pneumonia objectified to pulmonary CT (*Figure 2*). And the administration of additional oxygen is indicated in patients with PE and SaO2 <90%, especially by high-flow oxygen [25]. Initially the oxygen needs of our patient were greater than 10 liters per minute administered with a mask to obtain a saturation of 90% at pulse oximetry. However, our patient had no signs of hemodynamic instability. In parallel she received an infusion of crystalloid fluid (1500ml of isotonic salt serum per 24 hours). In short, hemodynamic, and respiratory support is vital in patients with acute VD failure. A modest solute intake (500 ml) may help increase heart index in patients with PE with low cardiac output and normal blood pressure [26].

Anticoagulant therapy is the cornerstone of acute PE, it is recommended with the aim of preventing both premature death and recurrent symptoms and/or fatal VTE. During the acute phase, treatment consists of parenteral anticoagulation [unfractionated heparin (UFH), LMWH or fondaparinux] for the first 5 to 10 days [27]. This was consistent with our practice of administering two doses of 100IU/Kg enoxaparin in S/C.

CONCLUSION

This study using clinical observation highlighted an unusual case of cardiopulmonary disease in a young woman. This figure confirms that SARS-CoV-2 is polymorphic and multi-systemic. The management of this clinical figure is still a challenge for our health system. It is therefore important to strengthen the capacity of health actors for better patient care in Mali.

Conflict of interest

The authors declare that they have no conflict of interest

Acknowledgement

Through this case, we pay tribute to the patient who subsequently died some 3 months after her discharge from the hospital while she was in full activity, sudden death. She had given all her consent for the disclosure of her case.

Our thanks go to all the staff of the Cardiology, Infectious and Tropical Diseases and Medical Imaging departments of CHU Point G.

Finally, we would like to thank the collaborators of the UCRC “University Center for Clinical Research Center” for having retrospectively made possible the IgG serological test of SARS-CoV-2 in the patient.

REFERENCES

1- Bonny V, Maillard A, Mousseaux C, Plaçais L, Richier Q. COVID-19 : physiopathologie d’une maladie à plusieurs visages [COVID-19: Pathogenesis of a multi-faceted disease]. Rev Med Interne. 2020 Jun;41(6):375-389. French. doi: 10.1016/j.revmed.2020.05.003. Epub 2020 May 27. PMID: 32507520; PMCID: PMC7250743.

2- [Gupta A, Madhavan MV, Sehgal K, Nair N, Mahajan S, Sehrawat TS, et al. Extra-pulmonary manifestations of COVID-19. Nat Med 2020;26:1017–32]

3- Bikdeli B, Madhavan MV, Jimenez D, Chuich T, Dreyfus I, Driggin E, et al. COVID-19 and thrombotic or thromboembolic disease: implications for prevention,antithrombotic therapy, and follow-up. J Am Coll Cardiol 2020;75:2950–73.

4- Maatman TK, Jalali F, Feizpour C, Douglas A, McGuire SP, Kinnaman G, et al. Routine venous thromboembolism prophylaxis may be inadequate in thehypercoagulable state of severe coronavirus disease 2019. Crit Care Med2020;48:e783–90.

5- Klok FA, Kruip MJHA, van der Meer NJM, Arbous MS, Gommers DAMPJ, KantKM, et al. Incidence of thrombotic complications in critically ill ICU patientswith COVID-19. Thromb Res 2020;191:145–7.

6- Helms J, Tacquard C, Severac F, Leonard-Lorant I, Ohana M, Delabranche X,et al. High risk of thrombosis in patients with severe SARS-CoV-2 infection: amulticenter prospective cohort study. Intensive Care Med 2020;46:1089–98.

7- Wei, W.E., Li, Z., Chiew, C.J., Yong, S.E., Toh, M.P. and Lee, V.J., 2020. Presymptomatic Transmission of SARS-CoV-2—Singapore, January 23–March 16, 2020. Morbidity and Mortality Weekly Report, 69(14), p. 411

8- Li Y, Yao L, Li J et al. Stability issues of RT-PCR testing of SARSCoV-2 for hospitalized patients clinically diagnosed with Covid-19. J Med Virol. 2020; 1-6.

9- Schweblin C, Hachulla AL, Roffi M, Glauser F. Delayed manifestation of COVID-19 presenting as lower extremity multilevel arterial thrombosis: a case report. Eur Heart J Case Rep. 2020 Nov 19;4(6):1-4. doi: 10.1093/ehjcr/ytaa371. PMID: 33437919; PMCID: PMC7717202.

10- Veyre F, Poulain-Veyre C, Esparcieux A, Monsarrat N, Aouifi A, Lapeze J, Chatelard P. Femoral Arterial Thrombosis in a Young Adult after Nonsevere COVID-19. Ann Vasc Surg. 2020 Nov;69:85-88. doi: 10.1016/j.avsg.2020.07.013. Epub 2020 Jul 28. PMID: 32736027; PMCID: PMC7386281.

11- Santosa YP, Yuwono A. Two Different Clinical Presentations of Acute Limb Ischemia Caused by Acute Thrombotic Events in COVID-19. Cureus. 2021 Sep 12;13(9):e17916. doi: 10.7759/cureus.17916. PMID: 34660110; PMCID: PMC8511142.

12- Long B, Brady WJ, Koyfman A, Gottlieb M. Cardiovascular complications in COVID-19. Am J Emerg Med 2020;38:1504–7

13- Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DSC, Du B, Li LJ, Zeng G, Yuen KY, Chen RC, Tang CL, Wang T, Chen PY, Xiang J, Li SY, Wang JL, Liang ZJ, Peng YX, Wei L, Liu Y, Hu YH, Peng P, Wang JM, Liu JY, Chen Z, Li G, Zheng ZJ, Qiu SQ, Luo J, Ye CJ, Zhu SY, Zhong NS, China Medical Treatment Expert Group for C. Clinical Characteristics of Coronavirus Disease 2019 in China. N Engl J Med 2020.

14- Mazzaccaro D, Giannetta M, Fancoli F, Milani V, Modafferi A, Malacrida G, Righini P, Marrocco-Trischitta MM, Nano G. COVID and venous thrombosis: systematic review of literature. J Cardiovasc Surg (Torino). 2021 Sep 14. doi: 10.23736/S0021-9509.21.12022-1. Epub ahead of print. PMID: 34520137.

15- Da Costa Rodrigues J, Alzuphar S, Combescure C, Le Gal G, Perrier A. Diagnostic characteristics of lower limb venous compression ultrasonography in suspected pulmonary embolism: a meta-analysis. J Thromb Haemost 2016;14:1765_1772

16- Huisman MV, Barco S, Cannegieter SC, Le Gal G, Konstantinides SV, Reitsma PH, Rodger M, Vonk Noordegraaf A, Klok FA. Pulmonary embolism. Nat Rev Dis Primers 2018;4:18028

17- Raad, M. et al. Right Heart Strain on ECG in COVID-19. J Am Coll Cardiol EP. 2021; 7 (4): 485–93

18- Fei Zhou et al.: Clinical course and risk factors for mortality of adult in patients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020. doi.org/10.1016/ S0140-6736(20)30566-3

19- Kline JA, Mitchell AM, Kabrhel C, Richman PB, Courtney DM. Clinical criteria to prevent un necessary diagnostic testing in emergency department patients with suspected pulmonary embolism. J Thromb Haemost 2004;2:1247_1255

20- Fauvel C, Weizman O, Trimaille A, Mika D, Pommier T, Pace N, et al. Pulmonaryembolism in COVID-19 patients: a French multicentre cohort study. Eur HeartJ 2020;41:3058–68.

21- Jime´nez D, Aujesky D, Moores L, Go´mez V, Lobo JL, Uresandi F, Otero R, Monreal M, Muriel A, YusenRD. Simplification of the pulmonary embolism severity index for prognostication in patients with acute symptomatic pulmonary embolism. Arch Intern Med 2010;170(15):1383–1389

22- Kuno T, Takahashi M, Obata R, Maeda T. Cardiovascular comorbidities, cardiac injury and prognosis of COVID-19 in New York City. Am Heart J 2020;226:24–5

23- Shi S, Qin M, Shen B, et al. Association of cardiac injury with mortality in hospitalized patients with COVID-19 in Wuhan, China. JAMA Cardiol 2020;5:802–10

24- Gupta N, Zhao Y-Y, Evans C.E. (2019). The stimulation of thrombosis by hypoxia. thrombosis research, 181, 77-83

25- Messika J, Goutorbe P, Hajage D, Ricard JD. Severe pulmonary embolism managed with high-flow nasal cannula oxygen therapy. Eur J Emerg Med 2017;24:230_232.

26- Mercat A, Diehl JL, Meyer G, Teboul JL, Sors H. Hemodynamic effects of fluid loading in acute massive pulmonary embolism. Crit Care Med 1999;27(3):540–544

27- Samama MM, Poller L. Contemporary laboratory monitoring of low molecularweight heparins. Clin Lab Med 1995;15(1):119–123. .