Tamponade in a child : think about COVID-19
Tamponnade chez un enfant : pensez au COVID-19

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ABSTRACT :

Introduction: On January 30, 2020, the WHO reassessed the potential impact of COVID-19 on global public health and subsequently declared COVID-19 a public health emergency of international concern. The presence of cardiac tamponade secondary to COVID-19 is uncommon. We present a case of a tamponade secondary to COVID-19 in a children to draw the attention of pediatricians to this complication.

Observation : An 11-year-old boy presented to the emergencies with shortness of breath, orthopnea and abdominal pain .Clinical examination finds a temperature of 38.2 °C and obesity with a BMI = 26 . He had a high blood pressure of 145/85 mmHg, tachycardia of 150 beats/min, deafened heart sounds, pericardial friction with a distended and sensitive abdomen. Cardiac ultrasound confirmed the diagnosis of tamponade. The patient was found to be presenting an acute pericarditis with pericardial tamponade. The patient was diagnosed with COVID-19 infection due to positive IgM serology and covid-19 pneumonia. Reverse transcriptase for SARS-CoV2 (RT-PCR SARS-CoV2) was negative twice. He required a pericardial drainage that brought 850 ml of sanguineous liquid. The patient was put on colchicine and high doses of acetylsalicylic acid. The patient presented was released on the seventh day after a normal echocardiography.

Conclusion : Since this cardiac complication of COVID 19 is rare and severe, we hope to attract the attention of pediatricians. on tamponade during the pandemic.

Key words : Cardiac tamponade, Child, COVID-19

RESUMÉ :

Introduction: Le 30 janvier 2020, l'OMS a déclaré que la COVID-19 est une urgence de santé publique de portée internationale. La présence de tamponnade cardiaque secondaire au COVID-19 est peu fréquente.

Observation : Nous rapportons le cas d'un garçon agé de 11 ans qui a été admis pour dyspnée et une distension abdominale afin d'attirer l'attention des pédiatres à cette complication du COVID-19. L'examen clinique a retrouvé une temperature à 38,2 °C et une obésité avec un IMC = 26 . Il avait une pression artérielle élevée de 145/85 mmHg, une tachycardie de 150 battements/min, des bruits du coeur assourdis , un frottement péricardique avec un abdomen distendu et sensible .L'echographie cardiaque a confirmé le diagnostic de tamponade . L'étiologie suspectée est une infection à COVID-19 en raison d'une sérologie IgM positive et d'une pneumonie à COVID-19. Il avait besoin d'un drainage péricardique qui a prelevé 850 ml de liquide sanguin. Le patient a été mis sous colchicine et à fortes doses d'acide acetylsalicylique . Il a été mis sortant le septième jour après une échocardiographie normale .

Conclusion : Étant donné que cette complication cardiaque du COVID-19 est rare et sévère , nous espérons attirer l'attention des pédiatres sur la tamponnade pendant la pandémie.

Mots Clés : Tamponnade cardiaque , enfant , COVID-19,

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Abbreviations list:

BMI : Body mass Index
Chest computed tomography: chest computed tomography
CICU: cardiac intensive care unit
CMV: cytomegalovirus
COVID-19 : Coronavirus disease 2019
CRP : C reactive -protein
EBV: Epstein-Barr virus
ECG: electrocardiogram
ESR : erythrocyte sedimentation rate
HHV : human herpes virus
LVEF: Left Ventricular Ejection Fraction
MIS-C : Multisystem inflammatory syndrome in children
NSAIDs : non-steroidal anti-inflammatory drugs
RT-PCR SARS-CoV2 : Reverse transcriptase for SARS-CoV2
SARS-CoV-2 : severe acute respiratory syndrome coronavirus 2
PCR : polymerase chain reaction
PTT : prothrombine time

INTRODUCTION :

Soon after the first acute respiratory coronavirus syndrome 2 (SARS-CoV-2) reported in China in December 2019, the humanity was experiencing a global pandemic. Children comprise a small proportion (1%–10%) of the total reported cases. Children predominantly contracted mild form of infection (1). Coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has a wide spectrum of respiratory clinical presentations. Extra-pulmonary manifestations have been frequently identified. Cardiac involvement may be observed with acute myocardial infarction, or cardiac rhythm disturbances (2); however, pericardial involvement has been rarely reported in children. We report one of the first severe presentations about an 11-year-old boy who was admitted for a COVID-19 related life-threatening tamponade.

CASE REPORT :

This observation was reported according to the CARE guidelines (3).
An 11-year-old boy with no medical history presented to the emergencies with shortness of breath, orthopnea, abdominal distention, and abdominal pain. The symptoms began three days prior to his admission. He had no fever, cough, asthenia or exposure to contacts with COVID-19. The clinical examination showed a non-toxic appearing child, a mild fever (38.2°c) and an obesity with a Body mass index (BMI) = 26 (> IOTF-30). He had a high blood pressure 145/85 mmHg, a tachycardia of 150 beats/min, muffled heart sounds, a multiphasic rub, without pulsus paradoxus. The respiratory rate was of 35 breaths/min, the oxygen saturation was 97% on room air, and there were rales at the lung bases bilaterally. The abdomen was enlarged with a sensitive hepatomegaly and an important scrotal edema. The rest of systemic examina¬tion was normal and urine dipstick test was negative. The chest X-ray revealed a cardiomegaly with no abnormalities on the pulmonary tissue (figure n°1).

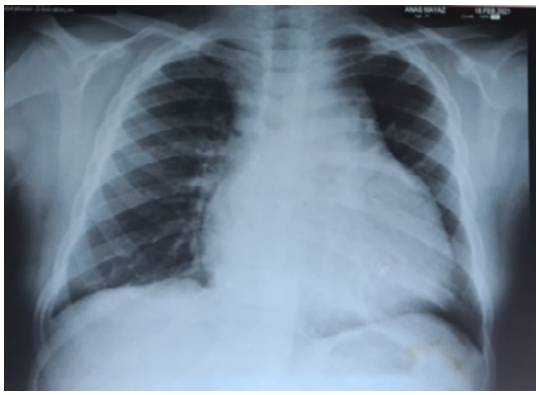

Figure 1 : chest X-ray showing importante cardiomegaly

The electrocardiogram (ECG) showed a sinus tachycardia. Transthoracic echocardiography revealed a large circumferential pericardial effusion with right atrial and ventricular wall collapse suggest¬ing echocardiographic tamponade (figure 2).

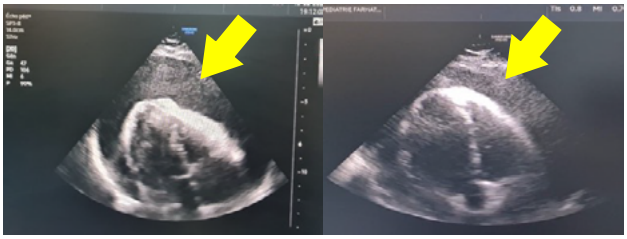

Figure 2 : severe pericradial effusion at initial presentation

The tamponade was circumferential and measured initially 35mm. Left Ventricular Ejection Fraction (LVEF) was mildly reduced at 40%, with no regional wall motion abnormalities. The patient was transferred to the cardiac intensive care unit (CICU) where he underwent pericardial drainage with pericardial drain placement performed under echocardiographic guidance. Given concerns for possible COVID-19, all procedures were performed in full personal protective equipment. Sanguineous fluid (850 mL) was removed until resolution of the pericardial effusion by echocardiography (figure n°3).

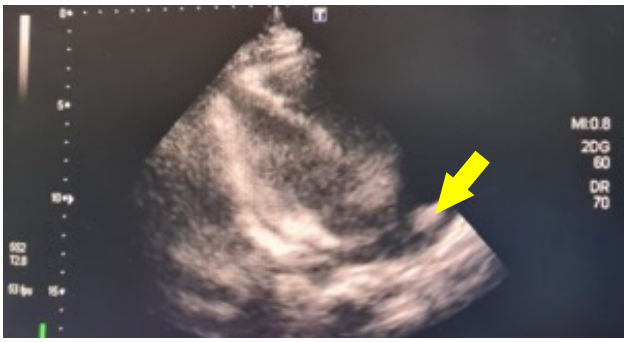

Figure 3: post pericardicentesis echocardiography

The fluid was consistent with a transudate and revealed an elevated protein (8 g/dL), red blood cells (137,367/mm3).
Pericardial fluid Gram stain, bacterial, mycobacterial and fungal cultures were all negative. The histological analysis showed no signs of hemo-lymphoid-malignancy. Laboratory testing demonstrated: peak of C -reactive protein (CRP) value 63mg/L, fibrinogen: 5.6 g/l and erythrocyte sedimentation rate (ESR) 35; normal serum troponins (3 pg/ml), high D-dimer to1668ng/ml and prothrombine time (PTT): 46%. Complete blood count showed leukocytosis (15.6. G/L) without lymphopenia and microcytic anemia (Hgb 8.5 g/dL). Arterial blood gas measurements on room air showed a hypocapnia to 30mmhg, due to polypnea. Reverse transcriptase for SARS-CoV2 (RT-PCR SARS-CoV2) was performed twice : on admission and 48 hours later, and was negative on both. It was also practiced on the tamponade liquid, and the result was negative. Nevertheless, COVID-19 serology showed positive IgM. We performed a chest computed tomography (chest CT) that showed a 10% COVID-19 pneumonia aspect, with no evidence of mediastinal masse or lymphadenopathy. The pericardial effusion was judged to be secondary to SARS-CoV-2-related acute pericarditis. The patient was treated by antibiotics (rapidly suspended), colchicine 1 mg/day, and acetylsalicylic acid at the dose of 100mg/kg/day (anti-inflammatory dose).
Further investigations were conducted in order to eliminate differential diagnosis. Hemocultures were negative. Epstein-Barr virus (EBV), cytomegalovirus (CMV) and human herpes virus (HHV) serologies showed old contact; Anti-dsDNA, anti-ENA, and ANCA were negative and C3 and C4 levels were normal. An echocardiography was practiced after 3 days (figure n°4) showing a decrease of the pericardial effusion and a proper myocardial function.

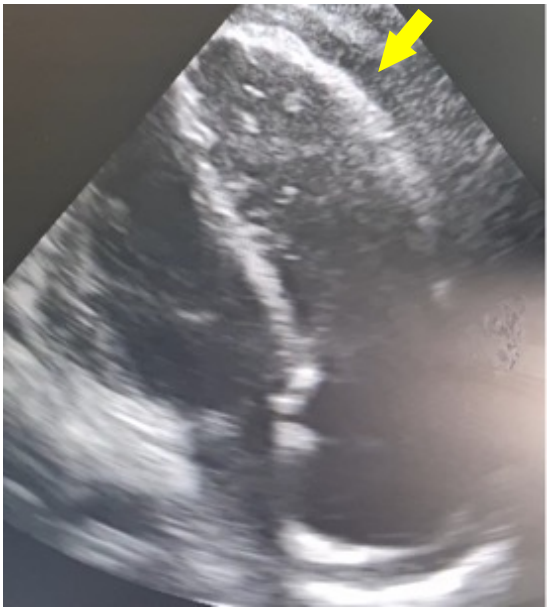

Figure 4: Echocardiography on the third day post-pericardicentesis: 3 to 4 mm pericardial effusion with no compression signs

Clinical improvement was rapidly observed, and the patient was discharged home on day 7 with maintenance dose of colchicine 1mg daily for 3 months. At 45-day follow-up, the patient remained asymptomatic, with a strict normal cardiac ultrasound and normal biologic parameters.

DISCUSSION :

Tamponade results from an excessive or rapid pericardial fluid accumulation , and it could be fatal. It is rare within the pediatric population. Cardiac tamponade is most commonly idiopathic or viral. It can also be secondary to metabolic disorders, neoplasms, trauma, or connective tissue diseases, postoperative and/or procedural, post-radiation, ischemic, and uremic effusions (4) . However, a tamponade revealing a COVID-19 infection was exceptional within the current worldwide epidemiology (5–6) 6 7. Children were reported to develop lower risk critical symptoms from COVID-19 infection with a mild disease, good outcomes, less hospitalization and lower mortality rate (1,2).

The clinical presentation of COVID-19 in children is heterogeneous including a wide spectrum of clinical features. Variability in symptoms makes COVID-19 pediatric-onset challenging to identify. The published systemic reviews reported fever and cough as the most common presenting symptoms in children (1). Children with SARS-CoV-2 infection may also be asymptomatic carriers of the disease (1). Most of the reported cardiac manifestations of COVID-19 in adults include myocardial injury, myocardial dysfunction, myocardial infarction, Takotsubo cardiomyopathy, cardiogenic shock, pericardial effusion, arrhythmias, and conduction abnormalities, but these manifestations are quite rare in pediatric patients (3).

Our case is one of the first reported pediatric cases of tamponade secondary to COVID-19. To our knowledge, only a few cases of cardiac tamponade occurring in children with Covid-19 infection have yet been reported (7-8) . The cardiac findings diagnosed in the pediatric population include myocarditis, myocardial dysfunction and coronary artery involvement in Multisystem inflammatory syndrome in children (MIS-C) (3).

Children who are less than one year of age or who have comorbidities including congenital heart disease ,kidney disease and obesity seem to be at a risk for more severe presentations (1). It was the case of our patient who presented obesity, which may explain the severe presentation.
Viral pericarditis is usually characterized by a gradual accumulation of transudate. It can as well be due to collecting transudate, exudate or blood in the pericardium. However, hemorrhagic pericardial effusions have been less commonly associated with viral infections, except in Coxsackie virus (6) . In our case, the extracted fluid was a sero-hematic. COVID-19 patients with cardiac tamponade can

develop exudative, transudative or sanguineous pericardial fluid (6) .
The pathogenesis of COVID-19 myo-pericarditis is yet unknown. Two mechanisms could be incriminated. The first mechanism consists in the fact that the heart affinity of the virus could be explained by SARS-CoV-2 S protein direct binding to human angiotensin-converting enzyme 2 present in the human heart, which allows for a cellular infection. Then, myo-pericarditis could follow a viral replication and dissemination in the blood, from day 7 up to 1 month after symptoms onset.The second mechanism involves cytokine storm triggered by an imbalanced response by type-1and type-2 T helper cells, similarly to COVID-19 direct pulmonary lesions (9) . Coronavirus disease 2019 has mostly been diagnosed using nasal orpharyngeal swabs or blood specimens which were positive for 2019-nCoV nucleic acid using real-time, reverse transcriptase-polymerase chain reaction assays (RT-PCR).
For our patient, RT-PCR was twice negative in the pharyngeal swabs, but blood serology showed positive IgM which refers to a recent infection. Chest CT showed SARS-Covid pneumonia. Despite an inconclusive testing for COVID-19, the PE was considered as COVID-19 related due to typical COVID-19 findings at chest CT, blood serology, clinical symptoms, and epidemiological criteria.
Treating COVID-19 and its complications is still a challenge for physicians due to lack of solid evidence as guidelines regarding the pericardial effusion and tamponade due to COVID-19. Echo-guided pericardiocentesis and pericardiostomy tube may be inserted through the subxiphoid approach after anaesthetizing the skin over the subxiphoid area with 1% lidocaine infiltration. Cardiac surgeons could intervene for thick or loculated pus not amenable to tube drainage.
High-dose acetylsalicylic acid and non-steroidal anti-inflammatory drugs (NSAIDs) are the mainstay of therapy for acute pericarditis. Corticosteroids are reserved for cases with a contraindication or failure of first-line therapies (4) . Obviously, the studies pose a lot of controversy concerning the interest of corticosteroids (10) .
Colchicine is a well-known and safe therapy for pericarditis. It presented interesting results in the treatment of COVID-19 pericardial effusions and affections, as suggested in ongoing prospective studies (COLCORONA NCT04322682), due to its action on NLRP3 inflammasomes and cytokine's release (4-9-10).
The use of therapeutic anticoagulation has been shown to improve prognosis in severe patients with COVID- 19. In case of sanguineous cardiac tamponade (as seen in our case), the use of anticoagulation may increase the risks of hemorrhagic accidents or the relapse of the sanguineous effusion after initial drainage. However, given the documented benefits of therapeutic anticoagulation in patients with COVID-19, particularly in patients with elevated D-dimers, it might be judicious to resume anticoagulation 12 hours postoperatively, with a high index of suspicion for re-bleeding.
For long-term prognosis, sequelae and predictors of survival in patients with Covid-19 developing transient myocarditis or cardiac tamponade remain to be observed yet. The surgical intervention and drainage of pericardial fluid in patients with COVID-19, while allowing for rapid relief from tamponade physiology, is associated with per and postoperative risk.

CONCLUSION :

Pediatricians should be vigilant and suspect COVID-19 in children who present with chest pain, dyspnea, orthopnea, pericardial effusion or tamponade. Treatment of such situations is still challenging due to the lack of treatment strategies and guidelines.

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