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Fait clinique

Reverse TakoTsubo or Fulminant myocarditis ? Life saving VA ECMO in a COVID 19 patient



Reverse Takotsubo ou myocardite fulminante ? Succès de VA ECMO chez une patiente ayant une atteinte cardiaque liée COVID 19

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A B S T R A C T

A 45 years old female patient was admitted to our facility for COVID -19 infection complicated by fulminant cardiac injury and refractory cardiogenic shock. She had echographic findings of reverse takotsubo cardiomyopathy. She was successfully treated by VA-ECMO allowing complete recovery of the left ventricle function and weaning from support

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R É S U M É

Une dame de 45 ans était admise à notre hôpital chock cardiogénique compliquant une infection sévère altération sévère de la fonction ventriculaire gauche. Le diagnostic différentiel est un reverse Takotsubo ou une myocardite fulminante. La patiente a bénéficié d'une implantation d'assistance mécanique transitoire VA ECMO permettant une normalisation du ventricule gauche.

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Background

Since March 2020, we have been facing a worldwide pandemic due to the novel coronavirus (severe acute respiratory syndrome coronavirus 2 – SARS-CoV-2) [1]. The clinical presentation spectrum is wide, from asymptomatic patients to critically ill cases. Most

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pulmonary infections are mild, but severe and critical cases have been described, especially in the elderly, developing with dyspnea, hypoxia, major lung involvement, respiratory failure, shock and multiple organ failure [1,2].

Cases of cardiac injury related to the coronavirus 2019 (COVID-19), such as acute myocarditis have also been described, mainly in severe cases [1,3,4]. Chest computed tomography, however, is of limited diagnostic impact in terms of heart assessment, cardiac involvement should be assessed by other imaging methods, such as echocardiography and cardiac magnetic resonance imaging (CMR) [5–7].

The clinical presentation and course of myocarditis is variable, with some patients not requiring treatment and others experiencing severe heart failure that requires subsequent, mechanical support, heart transplantation or eventually can lead to death [1,8,9]. We report a very interesting case of a 45 years old lady with rapidly deteriorating cardiac function related to COVID 19 infection, successfully treated with life saving Venoarterial extracorporeal membrane oxygenation (VA-ECMO).

Case presentation

A 45-years old female patient known to have diabetes mellitus for 15 years on oral antidiabetics, presented to our emergency room after she was discharged against medical advice from another health facility, where she presented with fever (38.5 °C), vomiting, diarrhea and abdominal pain 3 days earlier, real-time polymerase chain reaction SARS-CoV-2 identification was positive on a nasal-pharyngeal swab sample. On presentation to emergency room she was hypotensive with a blood pressure of 95/45 mmHg, tachycardic (heart rate 125/min), dyspneic (respiratory rate 33/min and hypoxemic (Oxygen saturation 75 %), she was started on oxygen therapy 15 Liters non-rebreather face mask. Admission tests revealed High anion gap metabolic acidosis with pH 6.93 associated with hyperglycemia, ketosis, and hypoxemia PO₂ : 63 mmHg. Management started with our protocole treatment for severe diabetic ketoacidosis, as well as antibiotics, corticosteroids, antiviral, insulin infusion and fluid therapy. Rapid deterioration necessitated intubation and mechanical ventilation with initiation of vasoactive medication : norepinephrine and vasopressin. Electrocardiogram (ECG) did not show signs of ischemia, troponin I was high (Peak troponin was 162 ng/L), NT -ProBNP was elevated as well (Peak NT-pro BNP 7078 pg/ml), inflammatory markers were also elevated procalcitonin high (2.6ng/ml)and white blood cells were elevated $35.94 \times 10(3)/\text{mL}$ with neutrophillia. The first echocardiogram was unremarkable and showed normal left ventricular ejection fraction (LVEF).

Patient's condition continued to deteriorate despite escalating doses of vasopressors, repeated troponin T was lower than the admission 33 pg/mL, repeated ECG did not show signs of ischemia, control echocardiogram after 24 h of admission showed a major drop in the LVEF that reached 15-20 % with basal and midventricular akinesia and normal apical contractility (Fig. 1).

The patient became rapidly non responsive despite introduction of Dobutamine, she remained hypoxemic on 100 % FIO₂ ventilated with PCV mode, PEEP 10 mmHg, inspiratory pressure 25 mmHg, with severe hypoperfusion and multi organ failure mainly liver failure

(bilirubin : 22.5 umol/L, AST : 360 IU/L,ALT 302 IU/L) as well as acute kidney injury.

Based on the severe clinical condition with evidence of acute cardiac injury, cardiogenic shock and multi organ failure (INTERMACS profile 1) and after multidisciplinary discussion decision for circulatory support with VA ECMO was taken. VA ECMO was implanted via a percutaneous approach with 19 Fr inflow cannula in right femoral artery along with a 6 french distal perfusion cannula into distal femoral artery and a 23 french drainage cannula in left femoral vein advanced to the right atrium. Full optimal flow according to body surface was achieved. Heparin infusion was continued throughout the ECMO period with PTT maintained between 50 and 60. Distal limb perfusion was monitored clinically and with Doppler.

Her metabolic derangements corrected rapidly with normalisation of pH and base excesses. Inotropic support was reduced to minimal requirement of noradrenaline only. Over the course of next 5 days, she showed marked improvement clinically and in the kidney and liver function. Radiologically, she had no more congestion on the chest X Ray, and the ventilatory parameters were adequate. Daily echographic screening was done, which showed gradual recovery from the 3rd day onwards. A small dose of Dobutamine was restarted in preparation of weaning from ECMO. From day 5, gradual weaning of the ECMO was done with flow and sweep gas reduction.

On day 7 of ECMO she was on minimal required flow on ECMO and minimal doses of Dobutamine and Noradrenaline. A team decision was made for ECMO removal based mainly upon maintaining LVEF 45 %, mixed venous oxygen saturation 70 %, LVOT VTI > 10 cm on cardiac ultrasound, and good pulsatility. She was taken to the operating room and cannulas were removed with repair of femoral artery.

Two days later she was successfully weaned of ventilator and extubated. She then had a prolonged hospital stay for physiotherapy and rehabilitation. She was discharged home on the 37th day after Admission. At discharge, cardiac ultrasound showed complete myocardial recovery, LVEF 50–55 % (Fig. 2). She was ambulatory and stable.

Discussion

COVID-19 has been associated with an increased incidence of cardiovascular complications including acute cardiac injury and cardiogenic shock with a very limited usage of VA-ECMO. According to the World Health Organization, the current ongoing COVID-19 pandemic has infected over 10 million people and has led to approximately 500,000 deaths worldwide. A high burden of acute cardiac injury

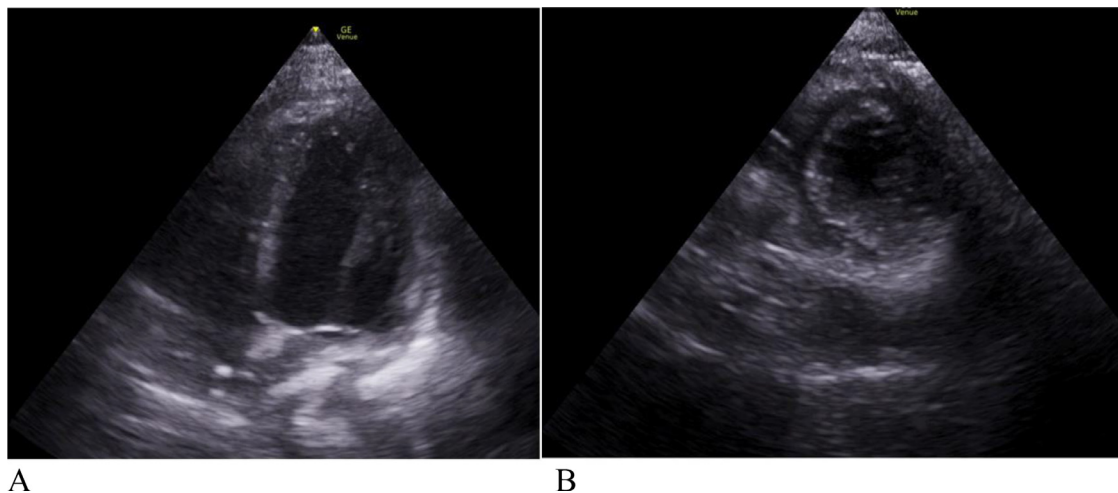


Fig. 1. (A) Apical four chambers view showed normal Apical contractility with akinesia of the mid an basal segments of the septum and the lateral wall. (B) Normal apical contraction seen via the short axis parasternal view.

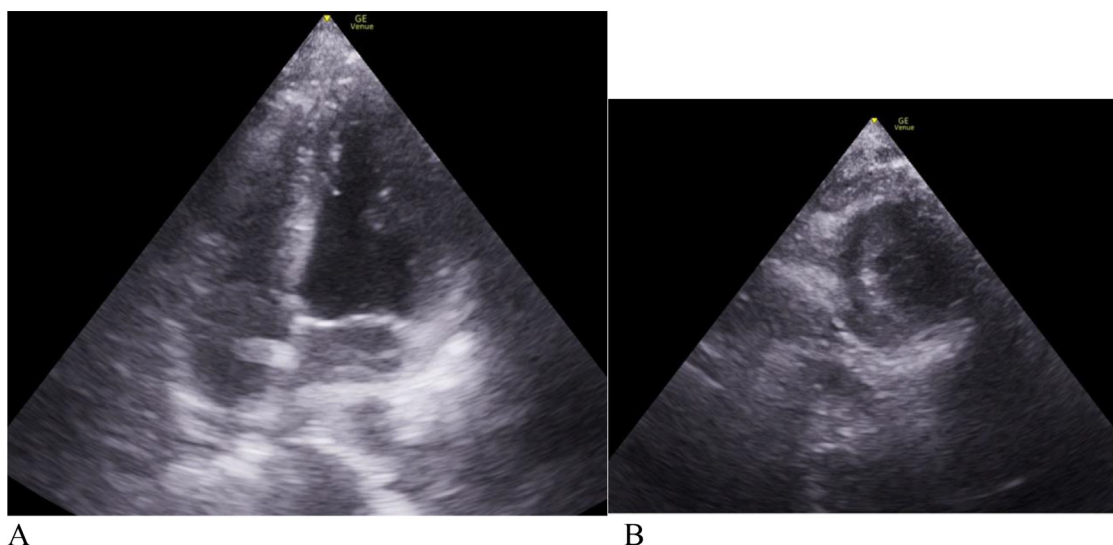


Fig. 2. (A) Apical four chambers view showed normalization of all segments motion. (B) Normal apical contraction seen via the short axis parasternal view.

(19.7–27.8 %), leading to significantly high mortality, has been reported in these patients [8–10].

We report this interesting case of fulminant myocardial injury with refractory cardiogenic shock successfully treated with VA-ECMO implantation, followed by rapid myocardial recovery. The most likely diagnosis is reverse Takotsubo although fulminant myocarditis could not be rule out. Both reverse takotsubo and fulminant myocarditis were reported as life threatening cardiac injuries related to COVID 19 [11,12], the respective incidence of each cardiac injury related to COVID 19 was not clearly reported, nevertheless both entities can and should be treated with life saving mechanical circulatory support such as VA-ECMO or Impella when complicated by refractory cardiogenic shock, unfortunately mechanical circulatory support was inserted in only 0.02 % of the patients [11,12]. New-onset heart failure or cardiomyopathy was also reported in many series as a complication in up to one-third of critically ill patients admitted with COVID-19 infection [13].

Hyperinflammatory states could lead to acute stress and injury, and can eventually lead to takotsubo cardiomyopathy (TTC) that was also reported in COVID 19 patients, [10,14,15]. There are 12 cases reported of TTC associated with COVID-19 infection with mean age of 70.8 ± 15.2 years. The time interval from the first symptom to TTS was 8.3 ± 3.6 days [10].

Reverse TTC (RTTC) is a very rare variant, characterized by basal and midventricular.

LV akinesia plus apical sparing that was also reported in COVID 19 related cardiac injury [15,16]. Overlapping picture of myocarditis and RTTC was also reported [16] which is very possible in our case, the patient had echocardiographic findings typical of RTTC increasing the likelihood of this diagnosis but had also on the other hand higher cardiac enzymes than the expected for TTC and RTTC, the cardiac MRI would have had a great diagnostic impact but was unfortunately not tolerated by the patient and thus was not performed.

Regardless of what is the most accurate diagnosis VA-ECMO was the life saving procedure in our case, unfortunately VA-ECMO is still underused in cardiogenic shock in general and in COVID 19 patient in particular whereas veno-venous (VV)-ECMO is widely used in COVID 19.

VA-ECMO was inserted as bridge to decision with the perspective of bridge to recovery or bridge to bridge according to the patient's response.

VA-ECMO is a rescue therapy that can stabilize patients with hemodynamic compromise, with or without respiratory failure, for days or weeks. In cardiology, the main indications for ECMO include,

Patients with cardiogenic shock refractory to Inotropes : INTERMACS profile 1/2 as bridge to decision, bridge to recovery, bridge to bridge or bridge to transplantation [17,18].

Since VA-ECMO is a life saving procedure for patients at imminent risk of death the only absolute contra indication is preexisting or acute conditions that are incompatible with survival, such as neurologic injury, end-stage malignancy which preclude a meaningful chance of intermediate-term survival or functional recovery [19].

Weaning from VA ECMO after myocardial recovery can be very challenging, we were able to successfully wean the patient from VA ECMO after she fulfilled the weaning criteria [20].

Conclusion

COVID-19 related severe cardiac injury can be life threatening, and could be successfully treated by VA-ECMO, nevertheless this technique is still widely underused.

Limitation

Cardiac MRI was ordered, but unfortunately the patient could not tolerate the exam, and the procedure was stopped thus we have no further imaging to illustrate the diagnosis.

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None.

Conflict of interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi : [10.1016/j.ancard.2022.06.011](https://doi.org/10.1016/j.ancard.2022.06.011).

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