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BEGINNER

IMAGING VIGNETTE: CLINICAL VIGNETTE

Atrial Flutter in Patient With Critical COVID-19

Beneficial Effects of Rhythm Control on Respiratory Distress

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ABSTRACT

We report the case of a patient critically ill with coronavirus disease–2019 (COVID-19) in which atrial flutter with high ventricular response rate occurred, contributing to worsening of the respiratory distress. After failure of noninvasive rate and rhythm control strategies, successful transcatheter ablation was performed and the respiratory distress of the patient improved. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2021;3:162–4) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Coronavirus disease-2019 (COVID-19) has important implications for the cardiovascular system, including the onset of arrhythmias (1). Furthermore, arrhythmias may contribute to deteriorating respiratory distress, establishing a vicious circle.

We report the case of a 61-year-old man admitted to the hospital with dyspnea, cough, and fever (39°C). Blood pressure was 120/60 mm Hg and oxygen saturation level was 89% with respiratory rate of 33 breaths per minute. The acute deterioration of respiratory distress needed invasive ventilation and the patient was promptly intubated. High-resolution computed tomography showed bilateral severe interstitial pneumonia with "crazy paving" aspects (**Figure 1A**). At admission, the electrocardiogram showed sinus tachycardia of 100 beats/min. The nasopharyngeal swab detected severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) viral RNA. After 9 days the patient improved and was downgraded to noninvasive ventilation with helmet. The following day, the respiratory distress worsened and atrial flutter with high ventricular response rate occurred (**Figure 1B**). The echocardiogram showed left ventricular ejection fraction of 50%, mild right atrial dilatation, and signs of increased left ventricular filling pressures (mean averaged E/e′ was 16). An external electrical cardioversion initially restored sinus rhythm but atrial flutter relapsed early. A second cardioversion was attempted with intravenous amiodarone; sinus rhythm lasted only few hours and then atrial flutter started again. Due to the failure of rhythm, rate control strategy with prolonged intravenous full dose of metoprolol, verapamil, and digoxin was attempted but was equally ineffective. The persistent ventricular rate of 150 beats/min contributed to deterioration of the respiratory status, raising the issue of reverting to invasive mechanical ventilation. Therefore, after extensive multidisciplinary team discussion, we decided to perform transcatheter ablation of atrial flutter to achieve rhythm control. In addition to the difficulties of invasive procedure for a patient with COVID-19, we were well aware of two other problems: 1) the patient with helmet is normally seated but has to remain supine during the whole procedure, which, therefore, needs to be as fast as possible;

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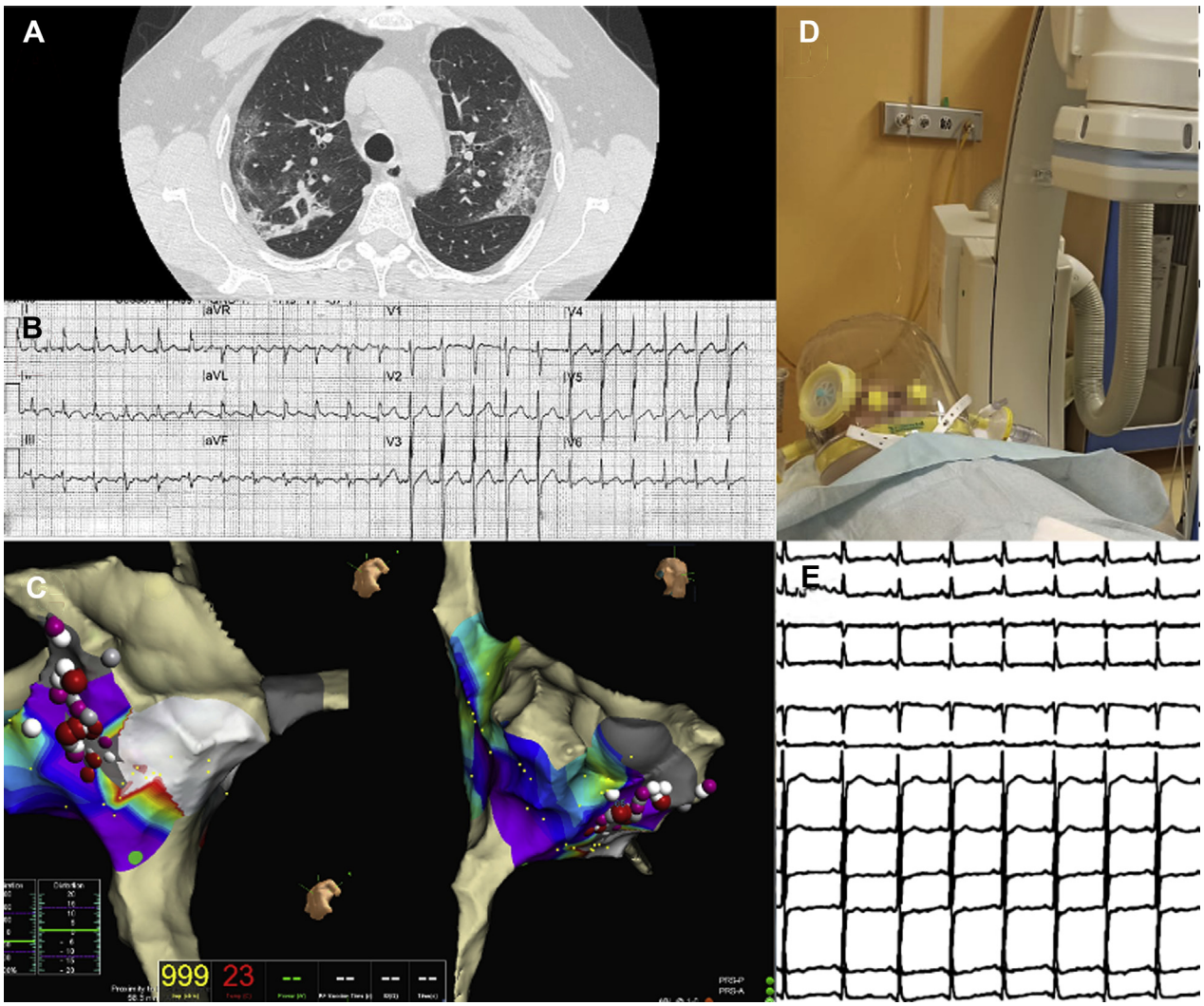
and 2) the use of fluoroscopy is challenging by the presence of the helmet. Our option was for a zero fluoroscopy procedure, using a three-dimensional electroanatomic mapping system (EnSite Precision, Abbott, St. Paul, Minnesota) (2). Recommendations from international consensus were followed to ensure patient safety and minimize healthcare professional exposure (3). The only people allowed in the operative room with full protection, including FFP3 face mask, surgical gown, double gloves, and face shield, were a senior electrophysiologist, 2 anesthesiologists, and a specialized nurse. Double right femoral venous access was used, and the patient was maintained supine, ventilated with noninvasive helmet (Figure 1D). Endocardial mapping confirmed a cavo-tricuspid isthmus-dependent atrial flutter that was treated with radiofrequency ablation, restoring sinus rhythm.

ABBREVIATIONS AND ACRONYMS

COVID-19 = coronavirus disease-2019

SARS-CoV-2 = severe acute respiratory syndrome-coronavirus-2

FIGURE 1 Transcatheter Ablation of Atrial Flutter in a Critically Ill COVID-19 Patient



(A) High-resolution computed tomography showing bilateral interstitial pneumonia with "crazy paving" pattern. **(B)** Surface 12-lead electrocardiogram showing typical atrial flutter with high ventricular rate. **(C)** Non-fluoroscopic three-dimensional electroanatomic map of right atrium in caudal left anterior oblique and right anterior oblique view. Note signs of radiofrequency erogation in cavo-tricuspid isthmus **(white and red dots)** and the color-coded map shows counterclockwise block of the isthmus pacing from coronary sinus ostium. **(D)** Supine position of the patient with noninvasive ventilation helmet in electrophysiology laboratory and fluoroscopy system outside the operating field. **(E)** Post-operative 12-lead electrocardiogram showing sinus rhythm. COVID-19 = coronavirus disease-2019.

Bidirectional conduction block across the cavo-tricuspid isthmus was confirmed using activation map pacing from the coronary sinus ostium (**Figure 1D**) and from the lateral wall of right atrium. Procedural time including preparation of the patient was < 1 h. With the restoration of sinus rhythm (**Figure 1E**), the respiratory status improved, the oxygen saturation rapidly increased from 84% to 98%, and the patient was feeling better. This case highlights the contribution of atrial flutter with high ventricular response rate to respiratory deterioration in patients with COVID-19 and the beneficial role of rhythm control achieved with transcatheter ablation (with ad hoc precautions). The efficacy of medical therapy for rate or rhythm control of atrial flutter in critically ill patients is generally low for several reasons, including the trigger constituted by the underlying disease, the organism response, or the concomitant treatments. Furthermore, using amiodarone for rhythm control has potentially severe adverse effects of pulmonary toxicity (direct cytotoxicity and hypersensitivity reaction) and it should be used with caution in patients with respiratory distress. Transcatheter ablation is relatively simple and the most effective treatment to maintain sinus rhythm in atrial flutter, but, thus far, there are no specific data in the setting of COVID-19.

AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS atrial flutter, cavo-tricuspid isthmus ablation, coronavirus disease-2019, severe acute respiratory syndrome-coronavirus-2