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Two different respiratory trend patterns during COVID-19 pneumonia in pacemaker patients recorded by remote monitoring

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Introduction

Cardiac implantable electrical devices (CIEDs) such as pacemakers, cardioverter-defibrillators, and cardiac resynchronization therapy are monitored with continuous measurement of clinical data, including respiratory rate and activity level by remote monitoring (RM) systems. Previous reports have shown that sudden increase in device-detected respiratory rate (RR) and a substantial decrease of activity level may be helpful for diagnostic evaluation of COVID-19 infection in patients with CIEDs.[1,2] In this case series, we report respiratory rate trend (RRT) patterns and present a daily diagnostic trend graph of RR monitoring in 2 pacemaker patients monitored via RM during COVID-19 infection.

Case report

Case 1

A 90-year-old woman with a pacemaker (ACCOLADE MRI; Boston Scientific, St. Paul, MN) implanted for sick sinus syndrome was diagnosed with COVID-19 in July 2020, with fever and cough as the main symptoms. As depicted in Figure 1A, there was a significant increase in the RRT for 8 days during COVID-19 infection (between the red lines). The analysis of Figure 1A showed that the RR was remarkably increased, from an average of 17 to 24 breaths, due to fever and cough 2 days before the COVID-19-positive date, when the hospitalization period began. Furthermore, there was a substantial decrease in activity level during the hospitalization. Thereafter, the RR returned to the original level with the disappearance of symptoms and the patient was transferred to another hospital.

Case 2

A 79-year-old man who received pacemaker (ACCOLADE MRI; Boston Scientific, St. Paul, MN) implantation due to complete atrioventricular block was diagnosed with COVID-19 with symptoms of fever, cough, and respiratory distress. The mean RR was significantly increased, from 22 to 26 breaths, during the COVID-19 infection period (between the red lines in Figure 1B). However, there was a significant increase in the RRT from 1 month before COVID-19 infection due to atrial flutter (AFL) occurrence. Activity level was clearly decreased due to hospitalization during infection isolation period. Owing to continued AFL, the RR remained high regardless of the disappearance of his symptoms. Thereafter, the RR gradually dropped to its original level after AFL termination.

Discussion

The changes in RRT and activity level observed in case 1 were consistent with the typical pattern during COVID-19 infection. In case 2, the patient had complicated AFL prior to the COVID-19 infection; therefore, the increase in RRT due to the COVID-19 infection was obscured. This patient had a history of the chronic heart failure; therefore it may be considered that the high RR was maintained with worsening heart failure due to AFL.

In conclusion, we described 2 distinct RRT patterns associated with COVID-19 pneumonia in CIED patients. Although RM may have a potential for early detection of COVID-19 infection and subsequent therapeutic intervention, we should keep in mind that the accuracy of diagnosis based on RRT pattern and activity level is limited in the presence of comorbidities.

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KEYWORDS Pacemaker; Respiratory rate; COVID-19; Pneumonia; Remote monitoring; Respiratory rate trend

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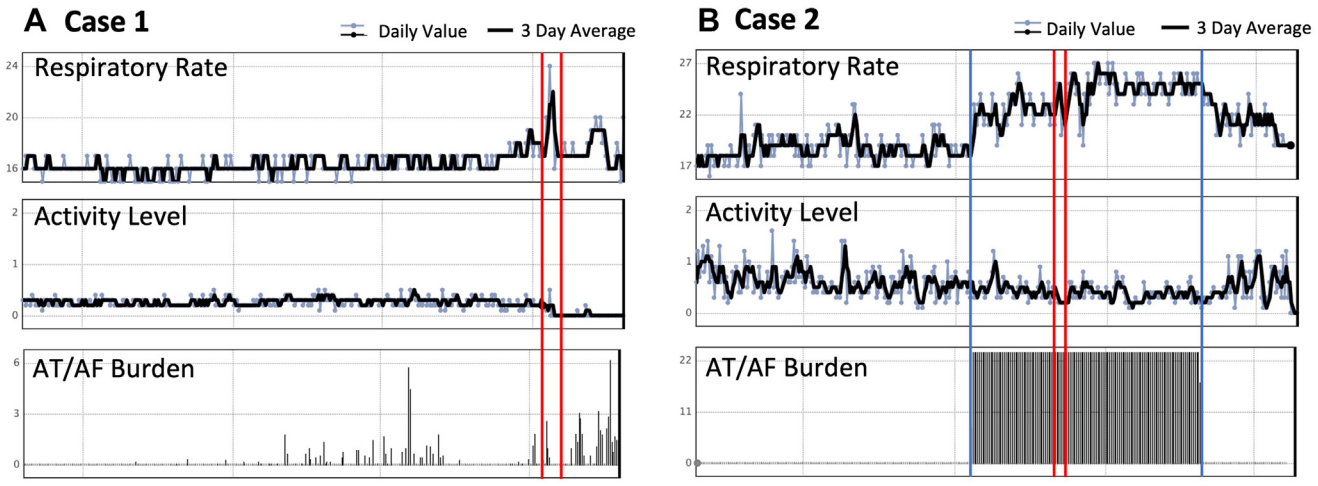

Figure 1 Change in device-detected respiratory rate trend and activity level in pacemaker patients during COVID-19 infection. **A:** Case 1. **B:** Case 2. The 2 red lines in panels A and B indicate time between COVID-19-positive date and end of infection isolation period. The blue line in panel B shows the duration of atrial flutter. AT/AF = atrial tachycardia / atrial fibrillation.

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