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Letter to the Editor

Tachycardia amongst subjects recovering from severe acute respiratory syndrome (SARS)

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Abstract

SARS is a new infection in humans caused by a novel coronavirus [1] with unknown medium- or long-term complications. Hong Kong reported a total of 1755 cases and 299 deaths. Palpitation in the form of tachycardia at rest and becoming more marked during mild exertion was noted amongst patients recovering from SARS. Possible causes are deconditioning [2], impaired pulmonary function, impaired cardiac function, cardiac arrhythmia, thyroid dysfunction, anaemia, autonomic dysfunction [3] and anxiety state. This prospective cross-sectional cohort study was conducted to assess the extent of tachycardia and identify possible cause for it.

Fifteen consecutive patients with resting heart rate of more than 90 beats per min (BPM) were recruited from the initial 100 patients who underwent lung function testing at about 2 months from onset of illness. All patients had at least 4-fold rise in SARS-coronavirus antibody titre. The resting 12-lead ECGs showed a sinus heart rate ranging from 90 to 109 BPM. Holter monitoring results are listed in Table 1. Overall heart rate faster than 100 BPM was observed during the daytime (9am–9pm) but not at night. No other arrhythmia was detected. Heart rate variability using the time domain analysis showed that the standard deviation of all normal RR interval (SDNN) was normal (\( \text{N} \leq 100 \text{ ms} \) in patients \( \text{b} \leq 60 \text{ years of age} \) and 97 ms in the 62-year-old patient) (Table 1). Signal-average ECG was within normal in all subjects. Echocardiography revealed no abnormality apart from the 62-year-old patient who had mild diastolic dysfunction.

Only one patient had a moderate restrictive pulmonary function defect (Table 1). Chest radiography findings, haemoglobin level, length of hospital stay, time elapsed after discharge, presence of complications, WHO Quality of Life (QOL) score and Monitored Functional Task Evaluation (MFTE) score [4] are shown in Table 2.

The normal CBP, ESR, LFT, LDH, CK, CRP, as well as results of clinical assessment, suggested that ongoing active disease is unlikely. Normal thyroid function tests excluded thyrotoxicosis. Although coronavirus infection had been demonstrated to cause an autoimmune myocard-
ditis in rabbits that may progress to dilated cardiomyopathy [5], normal troponin I, echocardiography and other negative cardiac investigations in our cohort excluded myocarditis and cardiomyopathy. Mild residual CXR changes, minor lung function impairment and normal blood gas makes pulmonary defect unlikely to be a significant cause of sinus tachycardia during normal activity.

This cohort of patients had more severe disease with a high proportion having various complications. The prolonged hospitalization of 18–54 days together with confinement at convalescence could lead to physical deconditioning. The QOL domain score was impaired (score < 75) in 11/15 in physical health, 13/15 in psychological well-being, with a very low score of ≤50 in six patients. MFTE score was less than 20 (range 17.6–19.7) in 10 patients indicating the presence of mild functional difficulties.

Deconditioning and anxiety state causes tachycardia in the daytime but not at night, and is compatible with the

| Sex | Age | Min HR | Max HR | Mean HR | HR variability SDNN (ms, N>100ms) | FEV1 % predicted | TLC % predicted | DLCO/VA % predicted | PFT interpretation |
|-----|-----|--------|--------|---------|-----------------------------------|-----------------|-----------------|-------------------|-------------------|
| M   | 25  | 50     | 141    | 87      | 133                               | 97              | 97              | 103               | Normal            |
| F   | 30  | 46     | 154    | 77      | 181                               | 107             | 102             | 127               | Normal            |
| F   | 25  | 47     | 153    | 84      | 167                               | 71              | 78              | 120               | Restrictive mild  |
| M   | 40  | 52     | 136    | 82      | 131                               | 86              | 101             | 92                | Normal            |
| F   | 34  | 61     | 152    | 85      | 104                               | 78              | 90              | 128               | Restrictive mild  |
| F   | 28  | 53     | 145    | 91      | 123                               | 52              | 78              | 95                | Restrictive moderate |
| M   | 33  | 50     | 137    | 87      | 118                               | 79              | 85              | 79                | Restrictive mild  |
| M   | 49  | 51     | 142    | 83      | 137                               | 120             | 121             | 128               | Normal            |
| F   | 26  | 49     | 129    | 77      | 135                               | 84              | 114             | 123               | Normal            |
| F   | 39  | 51     | 116    | 79      | 103                               | 109             | 121             | 97                | Normal            |
| M   | 62  | 53     | 114    | 70      | 97                                | 98              | 123             | 88                | Normal            |
| M   | 36  | 57     | 123    | 83      | 111                               | 112             | 91              | 110               | Normal            |
| F   | 25  | 55     | 163    | 85      | 147                               | 107             | 102             | NA                | Normal            |
| M   | 26  | 54     | 147    | 83      | 122                               | 79              | 82              | 97                | Restrictive very mild |
| M   | 47  | 50     | 135    | 82      | 140                               | 91              | 103             | 103               | Normal            |

Age=Age in years; Min HR=Minimum heart rate beats per minute; Max HR=Maximum heart rate beats per minute; SDNN=Standard deviation mean RR interval; FEV1%=Force expiratory volume in the first second; TLC%=Total lung capacity; DLCO/VA%=Diffusing capacity for carbon monoxide corrected for alveolar volume; PFT=Pulmonary function test.

| Table 2 Other factors |
|-----------------------|
| CXR finding | Hb (g/dl) | LOS (days) | Discharge to PFT (days) | Complication | QOL |
|-------------|-----------|------------|-------------------------|--------------|-----|
|             |           |            |                         |              | Physical health domain | Psychological health domain |
|             |           |            |                         |              | I   | II  |
| Mottling RLZ | 13        | 35         | 31                      | AD           | 75  | 63  |
| N           | 12.8      | 25         | 36                      | AD           | *44 | *50 |
| Bilat shadowing | 13.3      | 54         | 21                      | SP, CI       | 69  | 69  |
| N           | 14.5      | 37         | 14                      | Pne          | 56  | *44 |
| Bilat lower zone hazziness | 12.8 | 30 | 18 | ICU | 75 | 75 | 18.8 |
| Bilat lower zone hazziness | 12.9 | 39 | 23 | ICU | 88 | 81 | 19.5 |
| Bilat middle zone hazziness | 14.1 | 35 | 21 | ICU | 63 | 75 | 18.7 |
| Mild hazziness RLZ, LMZ | 13.1 | 21 | 51 | AD | 63 | 63 | 20 |
| N           | 13.9      | 24         | 33                      | AD           | 63  | 56  |
| N           | 10.6      | 31         | 18                      | UTI          | 63  | 56  |
| Bilat diffuse hazziness | 12.6 | 18 | 34 | CI | 75 | 63 | 19.8 |
| N           | 13.6      | 21         | 21                      | CI           | 55  | *50 |
| N           | 14.9      | 25         | 23                      | ITP          | 69  | *50 |
| Bilat lower zone hazziness | 13.5 | 29 | 29 | ICU | 63 | *25 |

Hb=Haemoglobin level; LOS=Length of hospital stay; Discharge to PFT=Discharge to day of pulmonary function test in days; ICU=ICU Care; ITP=Idiopathic thrombocytopenic purpura; UTI=Urinary tract infection; CI=Chest infection; CD=Anxiety depression; SP=Steroid psychosis; Pne=Pneumomediastinum and subcutaneous emphysema; QOL=Quality of life score; MFTE=Monitoring functional task evaluation; *=Score ≤ 50; QOL score—Normal 75; MFTE score—Normal 20.
pattern observed in this cohort. In the absence of significant cardiac, pulmonary, thyroid and haematological dysfunction, we believe that sinus tachycardia is attributable to physical deconditioning and contributed by impaired psychological well-being. Appropriate rehabilitation programs should be instituted to enhance recovery of physical and psychological fitness.

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