Journal of Cardiology Cases 13 (2016) 21–24

Contents lists available at ScienceDirect

Journal of Cardiology Cases

journal homepage: www.elsevier.com/locate/jccase

Case Report

Cardiac sarcoidosis, the complete atrioventricular block of which was completely recovered by intravenous steroid pulse therapy

Hiroaki Watanabe (MD)[a], Kazuo Eguchi (MD, PhD)[a,*], Toshinobu Saitou (MD, PhD)[a], Masahisa Shimpo (MD, PhD)[a], Michiaki Hiroe (MD, PhD, FJCC)[b], Kazuomi Kario (MD, PhD, FJCC)[a]

[a] Division of Cardiovascular Medicine, Department of Medicine, Jichi Medical University School of Medicine, Shimotsuke, Tochigi, Japan
[b] Department of Cardiology, National Center for Global Health and Medicine, Tokyo, Japan

ARTICLE INFO

Article history:
Received 20 April 2015
Received in revised form 13 September 2015
Accepted 14 September 2015

Keywords:
Cardiac sarcoidosis
Steroid pulse therapy
Complete atrioventricular block

ABSTRACT

Atrioventricular block (AVB) in individuals with cardiac sarcoidosis (CS) is one of the major complications caused by inflammation of the conducting system of the heart, as a sign of worse prognosis. We report the case of a 53-year-old Japanese woman whose electrocardiogram showed complete AVB by the clinical diagnosis of CS. We administered intravenous methylpredonisolone (1 g/day) for 3 days. On the second day of steroid pulse therapy, the complete AVB improved to sinus rhythm of 1st degree AVB and complete right bundle branch block. Normal sinus rhythm was then observed after oral steroid therapy. These results suggest that in cases of complete AVB, steroid pulse therapy with a strong anti-inflammatory effect may be recommended first.

<**Learning objective:** This case illustrates a typical case of CS with complete AVB, but the cardiac contraction was normal. In this setting, steroid pulse therapy may be effective when (1) the active inflammation of the conduction system can be suppressed by steroid pulse therapy; (2) the time to start steroid therapy is short enough to recover.>

Introduction

Atrioventricular block (AVB), a common complication of cardiac sarcoidosis (CS), is caused by inflammation of the conducting system of the heart. AVB is a sign of worse prognosis, and thus its early diagnosis and treatment are important. There have been some reports of CS patients in which atrioventricular (AV) conduction disturbances were improved by steroid therapy [1]. However, there have been few reports of patients with CS who underwent steroid pulse therapy for AVB. We report herein the case of a patient with CS whose complete AVB was completely recovered by intravenous steroid pulse therapy followed by oral steroid treatment.

Case report

A 53-year-old Japanese woman was admitted to our hospital with exertional shortness of breath and dizziness that had begun one month earlier. She had no history of cardiovascular disease. On physical examination, the Cannon sound was audible on the chest. An electrocardiogram (ECG) showed complete AVB with an escaped rhythm of the left bundle branch block type (Fig. 1A). The left ventricular ejection fraction (LVEF) on echocardiography was 66% with no abnormality in the size of the heart. Interventricular septum was thickened to 13 mm without morphological changes. Chest X-ray showed no cardiomegaly or hilar lymph-adenopathy. The patient's plasma brain natriuretic peptide level was elevated (174.3 pg/mL), but other laboratory tests such as serum calcium and angiotensin-converting enzyme were within normal range. Cardiac magnetic resonance imaging (CMR) demonstrated late gadolinium enhancement (LGE) at the anteroseptal and lateral walls of the left ventricle (LV) (Fig. 2).

T2-weighted CMR showed high-intensity signal areas at the anteroseptal wall of the LV (Fig. 1D). ^{67}Gallium imaging and ^{18}F-fluorodeoxyglucose positron emission tomography (^{18}F-FDG PET), performed under long-fasting state >18 h [2], showed increased uptake in the lateral and anteroseptal wall of the LV and in the hilar and mediastinum lymph nodes (Fig. 2). Endomyocardial biopsy was performed from the right ventricle, but typical non-caseating granulomatous changes were not detected.

* Corresponding author at: Division of Cardiovascular Medicine, Department of Medicine, Jichi Medical University School of Medicine, 3311-1 Shimotsuke, Tochigi, Japan. Tel.: +81 285 58 7344; fax: +81 285 44 5317.
E-mail address: ke112@jichi.ac.jp (K. Eguchi).

http://dx.doi.org/10.1016/j.jccase.2015.09.003
1878-5409/

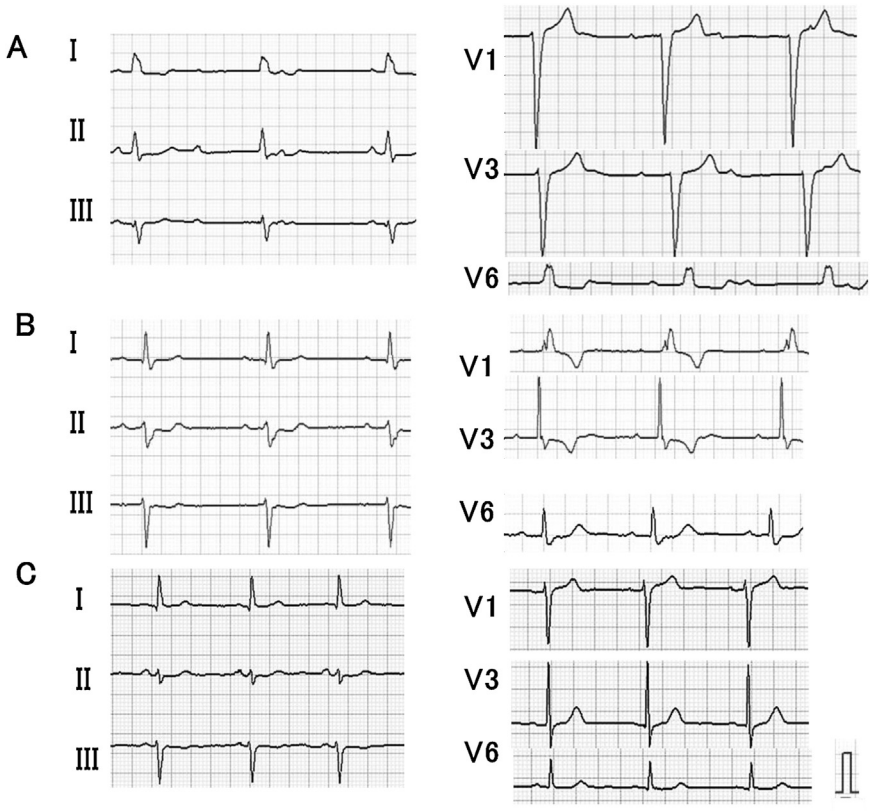

Fig. 1. The electrocardiogram (ECG) of the patient, a 53-year-old woman, showed complete atrioventricular block (AVB) with escape beats of the left bundle branch block type (A). ECG showed 1°AVB with complete right bundle branch block on the second day of steroid pulse therapy (B). ECG, after 2 months of oral steroid therapy, showed normal sinus rhythm (C).

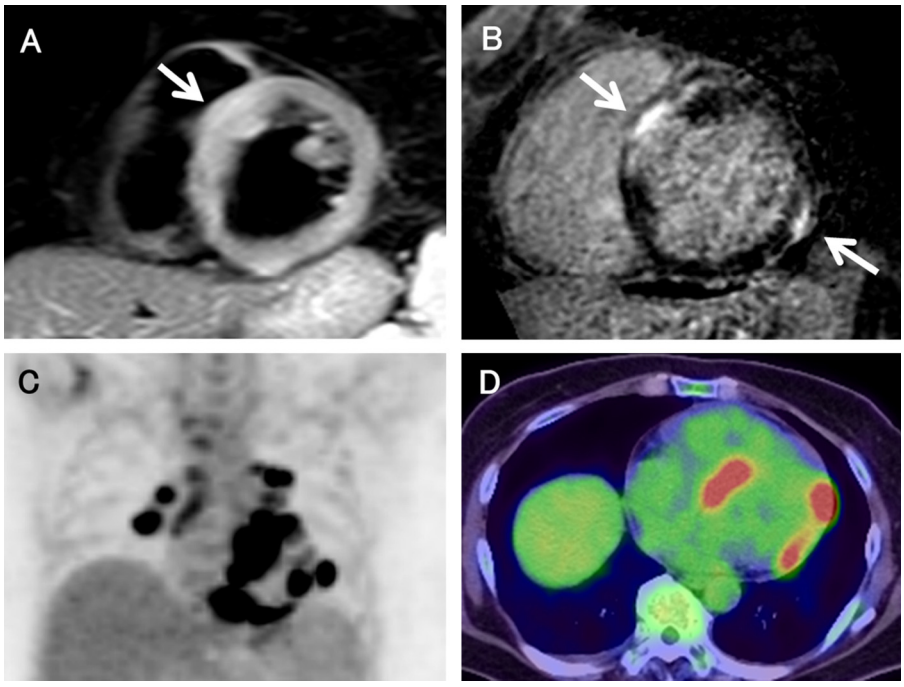

Fig. 2. T2-weighted cardiac magnetic resonance (CMR) showed high-intensity signal areas and wall thickening at anteroseptal wall of the left ventricle (arrow) (A). CMR imaging demonstrated late gadolinium enhancement at the anteroseptal and lateral walls of the left ventricle (arrow) (B). ^{18}F-fluorodeoxyglucose positron emission tomography images demonstrating abnormal uptake in the hilar lymph nodes and the anterior and inferior wall of the left ventricle (C), horizontal plane, the interventricular septum and the lateral wall of the left ventricle (D).

Based on the Japanese Diagnostic Criteria of CS 2006, we confirmed the clinical diagnosis of systemic and cardiac sarcoidosis [3]. Expecting a strong anti-inflammatory effect and fewer adverse effects, we administered intravenous methylpredonisolone (1 g/day) for 3 days. On the second day, the ECG revealed a change to 1°AVB with complete right bundle branch block (CRBBB) (Fig. 1B). We then started the patient on oral prednisolone treatment (30 mg/day). The dose was tapered by 5 mg per 4-week interval, and then maintained at the dose of 8 mg/day. One month after the initiation of steroid therapy, the focal uptakes of ^{18}F-FDG PET presented in the anteroseptal and lateral wall of the left ventricle were diminished. Two months later, the ECG normalized to sinus rhythm without QRS abnormality (Fig. 1C). Prednisolone was maintained as a dose of 8 mg/day, and no recurrence of the AV conduction disturbances was observed 1 year later.

Discussion

We presented the case of a patient with cardiac sarcoidosis whose complete AV block was completely recovered to 1°AVB with CRBBB by intravenous steroid pulse therapy, and then to normal sinus rhythm on oral steroid treatment. Three possible mechanisms may be involved in the remission of the complete AVB in this case of CS. The first mechanism is that the active inflammation in the LV anteroseptal wall, running through the electrical conduction system, was suppressed by intravenous steroid therapy, because the uptake of ^{18}F-FDG PET disappeared in the LV anteroseptal wall on steroid therapy. The efficacy of per-oral steroid therapy in CS was reported: 57.1% [4] and 63% [5] of cases treated with this therapy returned to sinus rhythm.

The second possible mechanism is the use of a high dose of steroid as an intravenous pulse therapy. We expected a strong anti-inflammatory effect and faster expression by this regimen compared to the oral administration of a steroid. In a study that evaluated the long-term prognoses of CS by the initial dose difference of steroid, there were no significant differences in the long-term prognosis between the low-dose group (prednisolone $\leq$30 mg/day) and the high-dose group (prednisolone $\geq$40 mg/day) [6]. However, it has also been reported that high-dose prednisolone or intravenous steroid pulse therapy was effective in CS [7]. To our knowledge, there has been no report of a CS case in which intravenous steroid pulse therapy was performed from the beginning, as in the present case. We believe that only a high dose of steroid can promptly suppress the active inflammation that contributes to the manifestation of complete AVB.

The third candidate mechanism involves the timing of the initiation of steroid treatment. Because the present patient's estimated duration of complete AVB was only 2 months, it was short enough to recover to sinus rhythm. Kato et al. proposed that the shorter the time to start steroid treatment from the onset of AVB in CS, the greater the chance of improvement of the AV conduction disturbance by steroid therapy [8]. In the present case, the time to start steroid treatment from the onset of AVB was <6 months. These mechanisms together could have contributed to the dramatic improvement in our patient's AVB.

Steroid pulse therapy has been reported to have fewer side effects compared to oral steroid therapy in general [9]. Regarding the possible side effects of steroid pulse therapy, a susceptibility to infection and edema has been noted, but even such adverse effects can be easily managed as steroid pulse therapy is performed under hospitalization.

If the anti-inflammatory effect of steroid treatment is attenuated and the inflammation of sarcoidosis itself is reactivated, there is a risk of the relapse of complete AVB. However, it is possible to manage this by the early detection of symptoms under frequent follow-up in an outpatient clinic. The risk of wound infection could be increased when a pacemaker implantation is performed. However, low-dose steroid treatment does not always increase the operative risk [10]. We thus believe that a pacemaker implantation even under steroid therapy does not always increase the risk of adverse effects.

Complete AVB is a condition that can be a cause of sudden cardiac death, and it is thus sometimes necessary to implant a permanent pacemaker to prevent sudden cardiac death. When a magnetic resonance imaging (MRI)-conditional pacemaker is implanted, it is possible to follow the activity of the CS using MRI [11]. However, this method provides only a limited assessment of the quality of the myocardium, because of the artifacts due to pacemaker leads. Orii et al. recently reported that the improvement in the inflammation can be sensitively assessed by FDG-PET rather than by using the LGE on cardiac MRI in CS patients with complete AVB [12]. In the present patient's case, we obtained CMR images before and at 2 months after the steroid pulse therapy (Fig. 3), but the LGE was not changed by the treatment. In the Orii

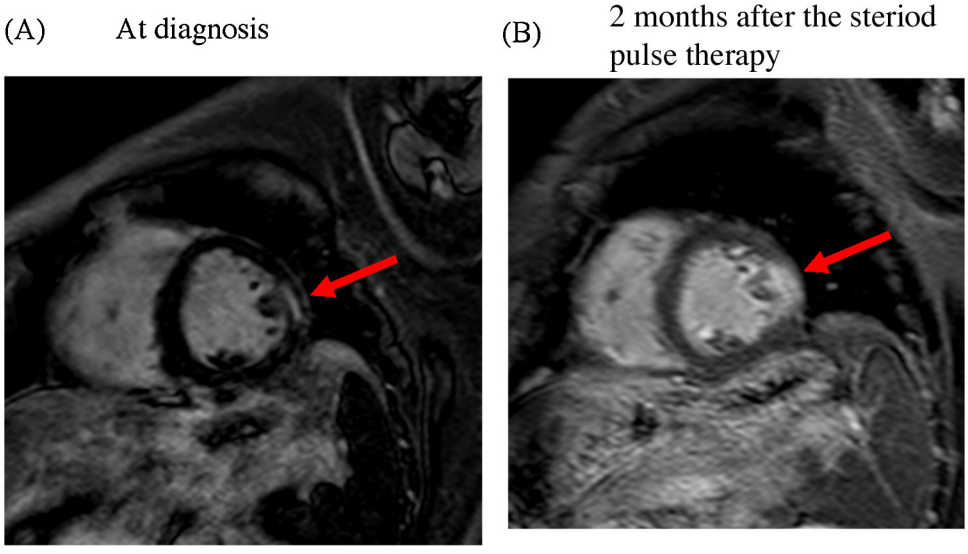

Fig. 3. CMR imaging demonstrated late gadolinium enhancement at anterolateral wall of the left ventricle before the steroid pulse therapy (arrow) (A) and at the 2nd month after the steroid pulse therapy (arrow) (B).

study, FDG-PET was used to assess the effect of steroid therapy on myocardial inflammation, and those authors reported that FDG-PET was superior to CMR to predict the potential to improve complete AVB when steroid therapy is being administered [12]. We thus decided to use FDG-PET to follow up the disease activity of our CS patient, and we observed that her FDG-PET findings at 2 months and at 1 year after the completion of steroid therapy had improved in accordance with her stable clinical condition presenting as normal sinus rhythm.

In conclusion, we treated a CS patient whose complete AVB was immediately improved by intravenous steroid pulse therapy. In cases of CS with new-onset complete AVB, a short duration of complete AVB and preserved LVEF could be major signs of successful intravenous steroid pulse therapy.

Conflict of interest

The authors have no conflict of interest to report.

References

[1] Tsuchida A, Nishisato K, Agata J, Nanba M, Endou T, Andou T, Iimura O. Clinical characteristics of cardiac sarcoidosis with complete atrioventricular block: the relationship with disease activity and prognosis. J Cardiol 2005;46(Suppl. I):344 [in Japanese].
[2] Morooka M, Moroi M, Uno K, Ito K, Wu J, Nakagawa T, Kubota K, Minamimoto R, Miyata Y, Okasaki M, Okazaki O, Yamada Y, Yamaguchi T, Hiroe M. Long fasting is effective in inhibiting physiological myocardial ^{18}F-FDG uptake and for evaluating active lesions of cardiac sarcoidosis. EJNMMI Res 2014;4:1.
[3] Soejima K, Yada H. The work-up and management of patients with apparent or subclinical cardiac sarcoidosis: with emphasis on the associated heart rhythm abnormalities. J Cardiovasc Electrophysiol 2009;20:578–83.
[4] Kato Y, Morimoto S, Uemura A, Hiramitsu S, Ito T, Hishida H. Efficacy of corticosteroids in sarcoidosis presenting with atrioventricular block. Sarcoidosis Vasc Diffus Lung Dis 2003;20:133–7.
[5] Banba K, Kusano KF, Nakamura K, Morita H, Ogawa A, Ohtsuka F, Ogo KO, Nishii N, Watanabe A, Nagase S, Sakuragi S, Ohe T. Relationship between arrhythmogenesis and disease activity in cardiac sarcoidosis. Heart Rhythm 2007;4:1292–9.
[6] Yazaki Y, Isobe M, Hiroe M, Morimoto S, Hiramitsu S, Nakano T, Izumi T, Sekiguchi M, Central Japan Heart Study Group. Prognostic determinants of long-term survival in Japanese patients with cardiac sarcoidosis treated with prednisone. Am J Cardiol 2001;88:1006–10.
[7] Chapelon-Abric C, de Zuttere D, Duhaut P, Veyssier P, Wechsler B, Huong DL, de Gennes C, Papo T, Blétry O, Godeau P, Piette JC. Cardiac sarcoidosis: a retrospective study of 41 cases. Medicine (Baltimore) 2004;83:315–34.
[8] Kato Y, Morimoto S, Uemura A, Hiramitsu S, Ito T, Hishida H. Atrioventricular block in cardiac sarcoidosis. JJSOG 2011;31:66–72.
[9] Sinha A, Bagga A. Pulse steroid therapy. Indian J Pediatr 2008;75:1057–66.
[10] Malone DL, Genuit T, Tracy JK, Gannon C, Napolitano LM. Surgical site infections: reanalysis of risk factors. J Surg Res 2002;103:89–95.
[11] Kono T, Ogimoto A, Saito M, Fujimoto K, Fujii A, Uetani T, Nagai T, Nishimura K, Inoue K, Suzuki J, Okura T, Kido T, Miyagawa M, Mochizuki T, Higaki J. Cardiac magnetic resonance imaging for assessment of steroid therapy in a patient with cardiac sarcoidosis and a magnetic resonance-conditional pacemaker. Int J Cardiol 2014;176:e89–91.
[12] Orii M, Hirata K, Tanimoto T, Ota S, Shiono Y, Yamano T, Matsuo Y, Ino Y, Yamaguchi T, Kubo T, Tanaka A, Akasawa T. Comparison of cardiac magnetic resonance imaging and ^{18}F-fluoro-2-deoxyglucose positron emission tomography manifestations, and regional response to corticosteroid therapy in newly diagnosed cardiac sarcoidosis with complete heart block. Heart Rhythm 2015. http://dx.doi.org/10.1016/j.hrthm.2015.06.032 [Epub ahead of print].