

A Case of Well-Managed Sarcoidosis with Cardiac Autonomic Dysfunction during Dental Therapy: Analysis of Heart Rate Variability

Yukihiro Momota¹, Nao Masuda¹, Hideyuki Takano², Koichi Kani¹,
and Masayuki Azuma¹

¹Department of Oral Medicine, Institute of Biomedical Sciences, Tokushima University Graduate Faculty of Dentistry, Tokushima, Japan

²Oral Health Management Center, Tokushima University Hospital, Tokushima, Japan

Corresponding Author: Yukihiro Momota

Abstract: We report a case of dental therapy performed on a patient with well-managed sarcoidosis. Generally considered a chronic inflammatory disease involving multiple organs, sarcoidosis causes cardiac autonomic dysfunction (CAD). CAD is a strong predictor of morbidity and mortality, and it should be properly managed during dental therapy. A heart rate variability (HRV) analysis is useful for detecting CAD. We analyzed the HRV of a CAD patient undergoing dental treatment. The patient was a 74-year-old Japanese woman. She was diagnosed with periodontitis, and her dental procedure was performed safely. The HRV analysis revealed the patient's latent sympathetic hyperactivity and proved valuable for her dental management.

Keywords: Sarcoidosis, Cardiac autonomic dysfunction, Dental therapy, Heart rate variability

Date of Submission: 27-12-2018

Date of acceptance: 12-01-2019

I. Introduction

Sarcoidosis is generally considered a chronic inflammatory disease involving multiple organs. Its etiopathogenesis is still unclear. Unknown inflammatory factors cause autonomic damage [1,2]. Patients with sarcoidosis commonly exhibit cardiac autonomic dysfunction (CAD) including tachycardia or bradycardia [2]. CAD is a strong predictor of morbidity and mortality [3,4], and a sarcoidosis patient's CAD should thus be properly managed during dental therapy. A heart rate variability (HRV) analysis is useful in assessing autonomic activity, and it can detect CAD because HRV is a biosignal for the functions of the autonomic nervous system [5-8]. An HRV analyzer looks just like a pulse oximeter and analyzes pulse-to-pulse variations in an individual's pulse rate by a built-in HRV analyzing system. The use of such an analyzer enables the real-time monitoring of autonomic activity without subjecting a patient to extra stress. However, the autonomic activity of a CAD patient has not been measured or elucidated by an HRV analysis during dental therapy. Here we describe our experience of administering dental therapy to a patient with well-managed sarcoidosis, and we provide the detailed results of the HRV analysis of CAD in this patient.

II. Case report

The patient was a 74-year-old Japanese woman. She visited the Department of Oral Medicine, Tokushima University Hospital because of dull pain in a lower anterior tooth. She was also in treatment for sarcoidosis with oral prednisolone (20 mg/day) at the Department of Cardiovascular Medicine, Tokushima University Hospital. She had experienced heart palpitations before the treatment with prednisolone. She was diagnosed with periodontitis, and her dental procedure was performed safely. Although irregular sinus rhythm was detected on an electrocardiogram, she did not develop tachycardia or bradycardia during the dental therapy including local anesthesia (infiltration of 1.2 ml of lidocaine containing 0.05% adrenaline) (Table 1). An HRV analysis was performed with an HRV analyzer (SA-3000P, Tokyo Iken Co. Ltd., Tokyo, Japan) during the dental therapy. The normalized low-frequency (LF norm) values and low-frequency/high-frequency (LF/HF) ratio were elevated; the high-frequency (HF norm) values were lowered before and after dental therapy (Table 1). During local anesthesia and tooth extraction, the LF norm values and LF/HF ratio decreased, and the HF norm values increased (Table 1).

In advance of this study, the HRV analysis procedure was explained to the patient, and her informed consent for the analysis was obtained.

Table 1. The HRV variables during the dental therapy of the 74-yr-old sarcoidosis patient

	Therapy onset	Local anesthesia	Tooth extraction	Therapy end
S/DBP ^a (mmHg)	156/102	149/69	139/71	136/85
HR ^b (bpm)	63	68	67	68
LF ^c (ms ²)	3911.9	2621.2	2471.1	4572.4
HF ^d (ms ²)	1113.6	907.6	1232.4	1771.6
LF norm ^e (nu)	77.8	74.3	66.7	72.1
HF norm ^f (nu)	22.2	25.7	33.3	27.9
LF/HF ratio ^g	3.51	2.88	2.00	2.58

HRV, heart rate variability. ^aSystolic/Diastolic blood pressure, ^bHeart rate, ^cLow-frequency component, ^dHigh-frequency component, ^eNormalized low-frequency component, ^fNormalized high-frequency component, ^gLow-frequency/high-frequency ratio.

III. Discussion

We have described dental therapy performed on an elderly patient with well-managed sarcoidosis.

Although the etiopathogenesis of sarcoidosis is unknown, steroid therapies are generally recognized as having beneficial effects on sarcoidosis [2]. Prednisolone succeeded in stabilizing our patient's autonomic function.

HRV variables are as follows: mean heart rate (mean HRT), low frequency (LF), high frequency (HF), LF norm, HF norm, LF/HF ratio. The LF ranges from 0.04 to 0.15 Hz and reflects sympathetic activity, and the HF ranges from 0.15 to 0.4 Hz and reflects parasympathetic activity [9-11]. LF norm and HF norm are the proportions of sympathetic and parasympathetic activity, respectively. The LF/HF ratio is an index of autonomic balance and should be maintained between 0.5 and 2.0; higher values reflect sympathetic dominance, and lower values reflect parasympathetic dominance. In our patient's case, the HRV analysis revealed latent sympathetic hyperactivity comprised of elevated LF norm values, an elevated LF/HF ratio, and low HF norm values before and after the dental therapy (Table 1). These data are consistent with those of previous reports [12,13]. During the dental therapy, these HRV values were accurately monitored by HRV analysis (Table 1). Our experience with the present patient thus emphasizes the importance of a real-time HRV analysis with respect to the secure and safe dental management of CAD.

IV. Conclusion

We performed dental therapy on a patient with well-managed sarcoidosis. Our experience emphasizes the importance of a real-time HRV analysis with respect to the secure and safe dental management of patients with CAD.

Competing interests

The authors have no conflict of interests to declare regarding this study or the publication of this paper.

Acknowledgements

This work was supported by JSPS KAKENHI, Grant Number 16K11888.

References

- [1]. Baughman RP, Lower EE, du Bois RM. Sarcoidosis. *Lancet* 361: 1111-1118, 2003.
- [2]. Hoitsma E, Faber CG, van Kroonenburgh MJPG, et al. Association of small fiber neuropathy with cardiac sympathetic dysfunction in sarcoidosis. *Sarcoidosis Vasc Diffuse Lung Dis* 22: 43-50, 2005.
- [3]. Krone A, Reuther P, Fuhrmeister U. Autonomic dysfunction in polyneuropathies: A report on 106 cases. *J Neurol* 230: 111-121, 1983.
- [4]. O'Brien GM, Baughman RP, Broderick JP, et al. Paranoid psychosis due to neurosarcoidosis. *Sarcoidosis* 11: 34-36, 1994.
- [5]. Johansen TL, Kambskar G, Mehlsen J. Heart rate variability in evaluation of the autonomic nervous system. *Ugeskr Laeger* 159: 6666-6671, 1997.
- [6]. Lindh V, Wiklund U, Sandman PO, et al. Assessment of acute pain in preterm infants by evaluation of facial expression and frequency domain analysis of heart rate variability. *Early Human Development* 48: 131-142, 1997.
- [7]. Sztajzel J. Heart rate variability: A noninvasive electrocardiographic method to measure the autonomic nervous system. *Swiss Med Wkly* 134: 514-522, 2004.
- [8]. Omerbegovic M. Analysis of heart rate variability and clinical implications. *Med Arh* 63: 102-105, 2009.

A Case of Well-Managed Sarcoidosis with Cardiac Autonomic Dysfunction during Dental Therapy:

- [9]. Malliani A, Pagani M, Lombardi F, et al. Cardiovascular neural regulation explored in the frequency domain. *Circulation* 84: 428-492, 1991.
- [10]. Malliani A, Lombardi F, Pagani M. Power spectrum analysis of heart rate variability: A tool to explore neural regulatory mechanisms. *Br Heart J* 71: 1-2, 1994.
- [11]. Doğru MT, Başar MM, Yuvaç E, et al. The relationship between serum sex steroid levels and heart rate variability parameters in males and the effect of age. *Türk Kardiyol Derns Ars* 38: 459-465, 2010.
- [12]. Tiran B, Heller I, Isakov A, et al. Heart rate variability in sarcoidosis: A frequency domain analysis. *Eur J Intern Med* 15: 518-522, 2004.
- [13]. Aktop Z, Tanrıverdi H, Uygur F, et al. Diurnal characteristics of heart rate variability in patients with sarcoidosis. *Herz* 42: 498-504, 2017.

Yukihiro Momota. "A Case of Well-Managed Sarcoidosis with Cardiac Autonomic Dysfunction during Dental Therapy: Analysis of Heart Rate Variability." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 1, 2019, pp 27-29.