EDITORIAL

Sympathetic nervous activation and hypertension

Satoshi Hoshide¹ · Masaki Mogi² · Kazuomi Kario¹

Keywords Hypertension · Sympathetic nervous activation · Asia

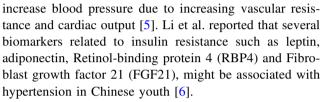
Received: 16 May 2023 / Accepted: 16 May 2023 / Published online: 5 July 2023 © The Author(s), under exclusive licence to The Japanese Society of Hypertension 2023

Sympathetic nervous activation is closely related to hypertension. In this month's Asian Special Issue of *Hypertension Research*, the association between sympathetic nervous activation-related diseases and hypertension is reported.

Asthma has been reported to be the risk of hypertension partly due to sympathetic activation [1]. In addition, betastimulants, which are often used in the treatment of asthma, may increase blood pressure. Lee et al. reported that the history of asthma was associated with an increased risk of all-cause mortality and myocardial infarction incidence in hypertensive Korean patients from the data of the National Health Insurance Service-Health Screening Cohort [2]. This study also showed that the use of longacting *β*2-agonist (LABA) inhalers had higher risk of allcause mortality, myocardial infarction and end-stage renal disease. Sympathetic nervous activity has been reported to provide hyperuricemia and activate its precursors, i.e., hypoxanthine and xanthine. This association provides a vicious cycle in which each compound reinforces the other, leading to detrimental effects on the cardiovascular system [3]. Kochi et al. investigated the impact of hyperuricemia for the association between blood pressure and the prevalence of proteinuria in Japanese general population [4]. This association was more pronounce in participants with hyperuricemia than those without. Thus, the status of hyperuricemia may be result in sympathetic nervous activation, which may lead to accelerated hypertensive related organ damage. Hyperinsulinemia/insulin resistance activates the sympathetic nervous system, which

Satoshi Hoshide hoshide@jichi.ac.jp

² Department of Pharmacology, Ehime University Graduate School of Medicine, Ehime, Japan



What is the useful treatment for sympathetic nervous activation? Recent paper reported that hot water bath decreased sympathetic nervous activity [7]. Wang et al. added the further evidence to this topic [8]. In summer season, hot water bath increased heart rate, cardiac output, and left ventricular dP/dt Max, while in winter season hot water bath extremely decreased blood pressure. In that study, the temperature of hot water bath was at about 38–40 °C, and the participants were immersed in a sitting posture to the chest level for 20 m. Although hot water bath may be generally beneficial for the prevention of cardio-vascular disease, hemodynamic change according to the season need to be considered.

In this issue, two papers related to home blood pressure monitoring in Asian population has been reported [9, 10]. Hypertension Research addresses home blood pressure monitoring as another topic "Home Blood Pressure-Centered Management of Hypertension". Please see the following website: https://www.nature.com/hr/call-for-paper.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

 Ferguson S, Teodorescu MC, Gangnon RE, Peterson AG, Consens FB, Chervin RD, et al. Factors associated with systemic hypertension in asthma. Lung. 2014;192:675–83.



¹ Division of Cardiovascular Medicine, Jichi Medical University School of Medicine, Shimotsuke, Japan

- Lee CJ, Hwang J, Kang CY, Kang D, Kim DH, Park HJ, et al. Asthma and increased risk of myocardial infarction and mortality among hypertensive Korean patients. Hypertens Res. 2023. https://doi.org/10.1038/s41440-023-01257-3.
- Chapman CL, Grigoryan T, Vargas NT, Reed EL, Kueck PJ, Pietrafesa LD, et al. High-fructose corn syrup-sweetened soft drink consumption increases vascular resistance in the kidneys at rest and during sympathetic activation. Am J Physiol Ren Physiol. 2020;318:F1053–65.
- Kochi M, Kohagura K, Oshiro N, Zamami R, Nagahama K, Nakamura K, et al. Association of blood pressure and hyperuricemia with proteinuria and reduced renal function in the general population. Hypertens Res. 2023. https://doi.org/10.1038/s41440-023-01250-w.
- 5. Usui I. Hypertension and insulin resistance in adipose tissue. Hypertens Res. 2023;46:1478–81.
- 6. Li B, Hou C, Li L, Li M, Gao S. The associations of adipokines with hypertension in youth with cardiometabolic risk and the

mediation role of insulin resistance: the BCAMS study. Hypertens Res. 2023. https://doi.org/10.1038/s41440-023-01243-9.

- Cui J, Gao Z, Leuenberger UA, Blaha C, Luck JC, Herr MD, et al. Repeated warm water baths decrease sympathetic activity in humans. J Appl Physiol. 2022;133:234–45.
- Wang PC, Song QC, Chen CY, Su TC. Cardiovascular physiological effects of balneotherapy: focused on seasonal differences. Hypertens Res. 2023;1–12. https://doi.org/10.1038/s41440-023-01248-4.
- Suzuki D, Hoshide S, Kario K. Impact of diabetic status and contribution of office and home blood pressure across diabetic status for cardiovascular disease: the J-HOP study. Hypertens Res. 2023. https://doi.org/10.1038/s41440-023-01242-w.
- Wang TD, Ohkubo T, Bunyi ML, Chadachan VM, Chia YC, Kario K, et al. Current realities of home blood pressure monitoring from physicians' perspectives: results from Asia HBPM survey 2020. Hypertens Res. 2023. https://doi.org/10.1038/s41440-023-01259-1.