

Present and future of calcific aortic valve disease – multiomics approach

Katica Cvitkušić Lukenda^{1,2,*},
Marijana Knežević Praveček^{1,2},
Krešimir Gabaldo^{1,2},
Blaženka Miškić^{1,2},
Mario Udovičić³,
Ana Livun³

¹General Hospital “Dr. Josip Benčević” Slavonski Brod, Slavonski Brod, Croatia

²Faculty of Dental Medicine and Health Osijek, Osijek, Croatia

³University Hospital Dubrava, Zagreb, Croatia

KEYWORDS: calcific aortic valve disease, multiomics, miRNA.

CITATION: *Cardiol Croat.* 2023;18(9-10):251. | <https://doi.org/10.15836/ccar2023.251>

***ADDRESS FOR CORRESPONDENCE:** Katica Cvitkušić Lukenda, Opća bolnica “Dr. Josip Benčević” Slavonski Brod, Andrije Štampara 42, HR-35000 Slavonski Brod, Croatia. / Phone: +385-98-556-576 / E-mail: kclukenda@gmail.com

ORCID: Katica Cvitkušić Lukenda, <https://orcid.org/0000-0001-6188-0708> • Marijana Knežević Praveček, <https://orcid.org/0000-0002-8727-7357> • Krešimir Gabaldo, <https://orcid.org/0000-0002-0116-5929> • Blaženka Miškić, <https://orcid.org/0000-0001-6568-3306> • Mario Udovičić, <https://orcid.org/0000-0001-9912-2179> • Ana Livun, <https://orcid.org/0000-0002-6758-1677>

Aortic stenosis (AS) is the most common structural heart disease. The prevalence of calcific aortic valve disease (CAVD) is increasing due to the aging of the population and the pandemic of obesity, diabetes, arterial hypertension, and renal failure. Men are twice as likely to develop AS, and when they do develop the disease, they have significantly more pronounced calcifications¹. The disease is multifactorial, and we still do not understand the processes leading to the onset and progression of CAVD. It can be asymptomatic for many years, but when symptoms occur and no treatment is given, the mortality rate within 2 years is almost 80%². Surgical replacement of the aortic valve (AVR) with a mechanical or bioprosthetic prosthesis is the gold standard for the treatment of patients with severe AS. The

introduction of transcatheter aortic valve replacement (TAVR) allowed the treatment of high-risk patients, and now the indication has been extended to patients with lower surgical risk. Understanding the regulatory mechanisms involved in the development and progression of the disease appears to be critical to the discovery of biomarkers that could have diagnostic, prognostic, and therapeutic value. According to published research, microRNA is a future biomarker for numerous chronic diseases, including CAVD. Identifying patients prone to calcification could be important in selecting the type of artificial heart valve to be implanted to avoid repeat surgery. Influencing their expression by up- or down-regulation is a challenge of modern molecular biology. An integrated multiomics approach to uncover the pathophysiology of the disease using systems biology techniques and employing (epi)genomics, transcriptomics, proteomics, and metabolomics is now promising in heart valve disease (Figure 1).³ Combining data from different layers and revealing their communication allows us to understand the molecular mechanisms responsible for CAVD.

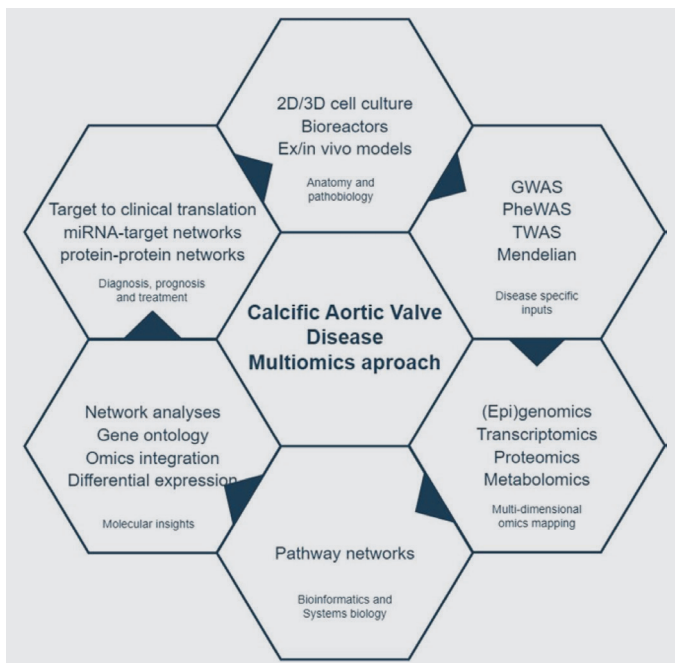


FIGURE 1. Calcific aortic valve disease: multiomics approach.

RECEIVED:
August 4, 2023

ACCEPTED:
August 13, 2023



LITERATURE

- Goody PR, Hosen MR, Christmann D, Niepmann ST, Zietzer A, Adam M, et al. Aortic Valve Stenosis: From Basic Mechanisms to Novel Therapeutic Targets. *Arterioscler Thromb Vasc Biol.* 2020 Apr;40(4):885-900. <https://doi.org/10.1161/ATVBAHA.119.313067>
- Nader J, Metzinger L, Maitrias P, Caus T, Metzinger-Le Meuth V. Aortic valve calcification in the era of non-coding RNAs: The revolution to come in aortic stenosis management? *Noncoding RNA Res.* 2020 Feb 29;5(2):41-47. <https://doi.org/10.1016/j.ncrna.2020.02.005>
- Blaser MC, Kraler S, Lüscher TF, Aikawa E. Multi-Omics Approaches to Define Calcific Aortic Valve Disease Pathogenesis. *Circ Res.* 2021 Apr 30;128(9):1371-1397. <https://doi.org/10.1161/CIRCRESAHA.120.317979>