Metabolic Mechanisms in Heart Failure

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Abstract: (600 words)

Despite the fact that neurohumoral antagonism has lowered heart failure morbidity and mortality, the rate of residual impairment and death is still too high. Though problems in myocardial metabolism are linked to heart failure, new research suggests that heart failure may induce metabolic alterations like insulin resistance, in part through activating neurohumoral pathways. It's possible that a harmful self-perpetuating loop (heart failure changed metabolism heart failure) accelerates the progression of heart failure. As a result, we'll go through the cellular mechanics and pathophysiology of heart failure's altered metabolism and insulin resistance. Neurohumoral activation, increased unfavourable free fatty acid metabolism, decreased protective glucose metabolism, and, in some circumstances, insulin resistance are thought to be the causes of the subsequent harmful cardiac energetic disturbances. As a result, myocardial ATP, phosphocreatine, and creatine kinase are depleted, and mechanical work efficiency is reduced. Intensive neurohumoral antagonism, limiting of diuretics, correction of hypokalemia, exercise, and diet are all viable therapy to attenuate abnormal metabolism based on the processes indicated. More innovative mechanistic-based medicines to improve metabolism and insulin resistance in heart failure are also discussed. Metabolic modulators, for example, may improve heart function and exercise performance beyond conventional treatment by optimising myocardial substrate consumption. Decreased myocardial energy levels and flux have been reported as a common characteristic of HF in various studies. 6,7 These findings have been backed up by genetic studies8, and metabolic regulation as a treatment for HF has gotten a lot of attention. 6 Changes in myocardial carbohydrate metabolism, as well as the related state of myocardial insulin resistance (IR), in which given insulin concentrations cause a reduced glucose response, have piqued researchers' interest as potential causes of aberrant myocardial energetics. Bing and colleagues' early metabolic studies in diabetes individuals revealed decreased myocardial glucose and increased fatty acid extraction.

Importance of Research: (200 words)

D It's possible that a negative self-perpetuating cycle promotes the progression of heart failure. As a result, we'll go through the cellular mechanics and pathophysiology of heart failure's altered metabolism and insulin resistance. Neurohumoral activation, increased unfavourable free fatty acid metabolism, decreased protective glucose metabolism, and, in some circumstances, insulin resistance are thought to be the causes of the subsequent harmful cardiac energetic disturbances. As a result, myocardial ATP, phosphocreatine, and creatine kinase are depleted, and mechanical work efficiency is reduced. Intensive neurohumoral antagonism, limiting of diuretics, correction of hypokalemia, exercise, and diet are all viable therapy to attenuate abnormal metabolism based on the processes indicated. More innovative mechanistic-based medicines to improve metabolism and insulin resistance in heart failure are also discussed. Metabolic modulators, for example, may improve heart function and exercise performance beyond conventional treatment by optimising myocardial substrate consumption. The ability of metabolic-based therapy to reduce residual mortality in heart failure will determine its eventual effectiveness. n.

Biography: (200 words)

Gabriela Villaca Chaves is a Professor of Surgery and author of 88 paper published on PubMed and serves as an Editorial Board Member in various journals. During his bachelor degree. He was awarded multiple Gold medals during his student life. He is an active Medical Educator and continues to participate and present at various national and international meetings with more than 145 conference abstract presentations to her credit. He has deep interest for resuscitation, acute critical illness, trauma anesthesia, pediatric congenital cardiovascular anesthesia and perioperative patient safety.

Institute Photograph:

References:

1. Birkmeyer JD, Barnato A, Birkmeyer N, Bessler R, Skinner J. The Impact Of the COVID-19 pandemic on hospital admissions in The United States. Health Aff. 2020;39(11): 2010–17. pmid:32970495

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2. Santi L, Golinelli D, Tampieri A, Farina G, Greco M, Rosa S, et al. Non-COVID-19 Patients in Times of Pandemic: emergency department visits, hospitalizations and cause-specific mortality in Northern Italy. PLoS One. 2021;16(3): e0248995. pmid:33750990

View ArticlePubMed/NCBIGoogle Scholar

3. Bodilsen J, Nielsen PB, Søgaard M, Dalager-Pedersen M, Speiser LOZ, Yndigegn T, et al. Hospital admission and mortality rates for non-covid diseases in Denmark during covid-19 pandemic: nationwide population based cohort study. BMJ. 2021;373: n1135. pmid:34035000.

4. World Health Organization. WHO Health Emergency Dashboard [Internet]. Geneva: World Health Organization; 2021 [cited 2021 Jun 23]. Available from: https://COVID19.who.int/region/amro/country/br

5. Maselli-Schoueri JH, Carvalho LEW, Rezende LFM, Fonseca FLA, Ferrari G, Adami F. Hospital Admissions associated with noncommunicable diseases during the COVID-19 outbreak in Brazil. JAMA Netw Open. 2021;4(3): e210799. pmid:33683330

6. Normando PG, Araujo-Filho JA, Fonseca GA, Rodrigues REF, Oliveira VA, Hajjar LA, et al. Reduction in Hospitalization and increase in mortality due to cardiovascular diseases during the COVID-19 pandemic in Brazil. Arq Bras Cardiol. 2021;116(3): 371–80. pmid:33566937

7. Guimarães NS, Carvalho TML, Machado-Pinto J, Lage R, Bernardes RM, Peres ASS, et al. Increased home death due to cardiopulmonary arrest in times of COVID-19 pandemic. Arq Bras Cardiol. 2021;116(2): 266–71. pmid:33656075

8. Belo Horizonte (MG). Reabertura gradual de atividades e protocolos de funcionamento [Internet]. Belo Horizonte: Prefeitura de Belo Horizonte; 2021 [cited 2021 Jun 23]. Available from: https://prefeitura.pbh.gov.br/reabertura-de-atividades

9. Malta DC, Gomes CS, Silva AGD, Cardoso LSM, Barros MBA, Lima MG, et al. Use of health services and adherence to social distancing by adults with Noncommunicable Diseases during the COVID-19 pandemic, Brazil, 2020. Cien Saude Colet. 2021;26(7): 2833–42. pmid:34231696

10. De Filippo O, D'Ascenzo F, Angelini F, Bocchino PP, Conrotto F, Saglietto A, et al. Reduced rate of hospital admissions for ACS during Covid-19 outbreak in Northern Italy. N Engl J Med. 2020;383(1): 88–9. pmid:32343497

11. Brant LCC, Nascimento BR, Teixeira RA, Lopes MACQ, Malta DC, Oliveira GMM, et al. Excess of cardiovascular deaths during the COVID-19 pandemic in Brazilian capital cities. Heart. 2020;106(24): 1898–1905. pmid:33060261

12. Ribeiro ALP, Duncan BB, Brant LC, Lotufo PA, Mill JG, Barreto SM. Cardiovascular health in Brazil: trends and perspectives. Circulation. 2016;133(4): 422–33. pmid:26811272

13. Agência Nacional de Saúde Suplementar (Brazil) [Internet]. Brasília (DF): Agência Nacional de Saúde Suplementar; 2021 [cited 2021 Jun 23]. Available from: https://www.gov.br/ans/pt-br

14. Guedes MBOG, Assis SJC, Sanchis GJB, Araujo DN, Oliveira AGRDC, Lopes JM. COVID-19 in Brazilian cities: impact of social determinants, coverage and quality of primary health care. PLoS One. 2021;16(9): e0257347. pmid:34534235

15. Belo Horizonte (MG). Coronavírus [Internet]. Belo Horizonte: Prefeitura de Belo Horizonte; 2021 [cited 2021 Jun 23]. Available from: https://prefeitura.pbh.gov.br/saude/coronavirus