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Evaluation the role of Troponin-I, Renin, Endothylline-1 hormones and peroxy nitrate in the heart failure patients in Tikrit city.

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Conclusion:

The current study aimed to evaluate the role of Renin Troponin, 1- Endothylline, and Peroxynitrite in the heart failure patients in Tikrit city. The study was conducted during the period from September 2022 to February 2023. Study samples were collected from Tikrit Teaching Hospital in the district, and after confirming the case of heart failure with laboratory tests, samples were taken from (40) male and female patients, in addition to selecting a random group belonging to (20) healthy people, aged (58-78 years), represented by the control group. The results of the tests showed a significant increase in the levels of Troponin-I, Renin Endothylline1 hormones, and Peroxy nitrate in the patients' blood serum.

Key word: Heart Failure , Troponin-I , Renin, Endothylline-1 ,Peroxy nitrate

Introduction:

Heart failure, is the inability of the heart to pump blood sufficiently for the needs of the body, as the cardiac output is insufficient for the needs of the tissues and organs of the body [1] The incidence of heart failure increases with increasing age, as 80% of people with heart failure are Among the elderly [2], among the main causes of heart failure are disturbances in the function of the heart muscle, as happens in myocardial infarction, and the presence of severe resistance that impedes blood flow, so the heart increases its effort to overcome this resistance, such as aortic valve stenosis and high blood pressure, in addition to some pathological conditions that make The heart pumps large amounts of blood above the normal rate, including thyrotoxicosis, anemia, and aortic valve incompetence [3]. In addition to a group of factors that lead to the development of heart failure known as the Precipitating Factor, which is pregnancy, irregular heart rate, infection, severe stress, high body temperature and high levels of plasma cholesterol [4].Heart failure can be complete failure or failure that includes the right side or the left side of it, and heart failure can occur gradually and creep slowly, and it can also occur suddenly after a crisis of irregular heartbeat, severe muscular effort, or nervous or emotional tension Acute heart failure is divided into two main types, left heart failure and right heart failure. [5].

Renin: is a enzyme whose main source in the circulatory system is the kidneys, where its expression and secretion are regulated by the cells adjacent to the glomeruli, the juxtaglomerular apparatus (JGA), through the renal baroreceptor and sodium chloride (NaCl). Resonance is compounded and stored in an inactive form called pro-renin in the Juxtaglomerular cells (JG), which are smooth muscle cells found in the walls of the afferent arteriole in the last part of the thick ascending arm of the Henle tube [6]. When the arterial pressure drops, it generates The internal reactions in the kidneys themselves are the cleavage of many primary resonance molecules in the cells adjacent to the glomeruli, the resonance is released, and most of the resonance enters the blood and leaves the kidneys to circulate through the bloodstream, although a small amount of it remains in the local fluids of the kidneys to start many functions within them [7]. Resonance raises blood pressure [8].

Endothelin-1: is a small, biologically active peptide derived from a larger precursor molecule with a short biological half-life in the circulation due to its rapid removal of 21 amino acids produced primarily in the endothelium that plays a key role in vascular homeostasis. Endothelin-1 is associated in vascular diseases in many organ systems, including the heart, lungs, kidneys, and brain [9] Endothelin-1 constricts blood vessels and raises blood pressure. Normally, endothelial homeostasis is maintained by other mechanisms, but when overexpressed, they contribute to hypertension and heart disease [10].

Troponin: a type of protein found in the heart muscles that regulates muscle contraction, which is one of the tests for heart enzymes, and there is no troponin in the blood, but when the heart muscles are damaged, troponin is sent into the bloodstream, and when heart damage and heart injury worsen, larger amounts are released From troponin in the blood, which is a special and conclusive evidence of damage and death of heart muscle cells, including a heart

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attack, it is released into the blood early (within 2-4 hours of the occurrence of a heart attack) and remains for up to 7 days [11].

Peroxy nitrate: is one of the most effective types of nitrogen. It is a substance that has cytotoxic activity with strong oxidative properties towards various vital compounds such as lipids, amino acids and nucleic acids. It can cause cell death, lipid peroxidation, carcinogenesis, aging. It is generated inside the body of the organism through the inner epithelial cells and epithelial cells. Kupffer cells in the liver, neutrophils and macrophages. Peroxynitrite is a relatively stable species compared to other types of free radicals. It affects cellular metabolism and signal transmission, and ultimately has the ability to participate in cell and tissue damage by breaking DNA strands. programmed death of cells in body tissues [12].

Materials and methods :

The study included (60) samples belonging to the control group and a group of patients with heart failure, whose ages ranged from both sexes (58-78 years), where the samples were collected from Tikrit Teaching Hospital.

Blood samples were obtained from the brachial vein with a size of (10ml) by means of a medical syringe in taking some information pertaining to each of them, where the blood samples were placed in test tubes and were separated in a centrifuge at a speed (3500 rpm for 15 minutes) to obtain serum Blood Serum, which was placed in new plastic test tubes, and all information was recorded on it, and the serum was kept at a temperature of -20 C. Tests were performed for the hormones renin and endothelin 1, as they were measured using an enzyme-linked immunosorbent assay (ELISA) using a Reader ELISA device. The BioTek ELx800 type equipped by the Chinese SUNLONG company, and the analysis was carried out using the manual provided with the kit. Troponin was examined within 24-48 hours after the patient entered the hospital and had chest pain and symptoms of myocardial infarction. The concentration of peroxynitrite radical was also estimated using the modified method [13].

The study samples were divided into four groups:

-The first group: male patients with heart failure included (20) people.

-The second group: female patients with heart failure included (20) people.

- The third group: a control group of healthy males included (10)

- The fourth group: a control group of healthy females included (10)

The data were analyzed statistically by the analysis of variance T test with a significant level ($P \leq 0.01$) by applying the Minitab statistical program [14].

Results:

Table (1) The level of Troponin-I ,Renin , Endothylline-1 hormones in the blood serum of infected Male and Female Patients with heart Failure

Group / Parameters	Troponin-I ng / ml	Renin pg/ml	Endothylline - 1 pg/ml	Peroxy nitrate µmole/L
Control male	0.01±0.00b	219.14±5.75b	53.500±8.771b	25.340 ± 7.241b
Patients male	0.45±0.05a	369.20±12.15a	98.40 ± 14.36a	41.669 ± 6.789a
Control Female	0.01±0.00b	240.12±7.33b	38.433±9.349b	23.260 ± 9.451 b
Patients Female	0.39±0.04a	393.48±11.99a	85.78 ± 10.87a	39.885 ± 9.674 a

The various letters manifestation a significant difference.

Discussion:

The results of the current research indicate a significant increase ($P \leq 0.01$) in Troponin-I, renin, endothelin-1 and Peroxy nitrate in male and female patients compared with the control group as shown in Table (1).

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The reason for the rise of the renin hormone in patients with heart failure, males and females, was found to be a significantly close relationship between the formation of atherosclerotic plaque resulting from high blood fats and the activation of the renin-angiotensin system, and thus be a major cause of cardiovascular disease, which contributes significantly to a lot of Deaths due to its complications. The renin hormone works to decompose proteins and form angiotensin I, which is transformed by another enzyme in the blood into angiotensin II, and this causes narrowing of blood vessels and thus high blood pressure and heart failure [15].

Resonance works to raise blood pressure and the occurrence of heart failure through three mechanisms. First: Inside the afferent artery, there are granular cells that secrete the resonance hormone into the blood. This hormone acts as a catalyze in converting angiotensinogen (AGT), a protein secreted from the liver into angiotensin I. -I, which is then converted to Angiotensin-II by the angiotensin converting enzyme ACE located on the surface of the vascular epithelial cells of the lung. Second: Angiotensin-2 AngII also stimulates the adrenal cortex to secrete aldosterone, which stimulates the epithelial cells of the distal tubule and the collecting duct. For the kidneys to increase the reabsorption of sodium, and exchanges with potassium for electrochemical conservation and water, which leads to an increase in blood volume and an increase in blood pressure [8].Third: the renin-angiotensin system also acts on the central nervous system to increase water intake by stimulating thirst, as well as maintaining volume blood, by reducing urine loss through vasopressin secretion from the posterior pituitary [16]. Several studies indicated that although the activity of plasma resonance is normal, AngII plays a key role in the emergence of hypertension diseases, including heart failure [17].

The increase in endothelin-1 in both groups of male and female patients is because it stimulates platelet aggregation, expression of cell adhesion molecule, growth and proliferation of vascular smooth muscle cells and parietal fibroblasts, which are very important early features of atherosclerosis resulting from elevated lipid profile [18]. Aging and high blood pressure are two major independent risk factors for cardiovascular disease (CVD). Many of the cardiovascular complications associated with aging and hypertension have been attributed, at least in part, to endothelial dysfunction, particularly vasoconstriction [19]. Although the majority of studies (in humans) have focused on the adverse effects of aging and hypertension on endothelium-dependent nitric oxide-dependent vasodilation, it is becoming increasingly clear that both conditions are associated with greater activity of the endothelial vasoconstrictor endothelin-1 (endothelin-1). Recent studies in adult humans using selective and non-selective endothelin-1 receptor antagonists indicate an important role for endothelin-1-dependent vasoconstriction with age [20].

Endothelin-1 constricts blood vessels and raises blood pressure. Endothelial homeostasis is normally maintained by other mechanisms, but when overexpressed, it contributes to hypertension (high blood pressure), heart disease and possibly other diseases [21].

Although much attention has focused on the effects of aging, hypertension, and cardiovascular disease on endothelium-dependent vasodilation, the effects of endothelial vasoconstriction mediated by renin and endothelin-1 on vascular health and disease should not be overlooked. The activity of the renin-angiotensin system and the endothelin-1 system increases with age, is involved in the primary etiology of hypertension, and contributes to endothelial dysfunction and the development of atherosclerotic vascular disease. The results of the current research agreed with [22], which suggested an increase in the activity of the vascular ET-1 system in patients with hypertension compared to healthy subjects with normal blood pressure.

The research results also showed an increase in the level of the enzyme Troponin-I, which is an indicator of damage to the heart muscle. Elevated troponin is a predictor of myocardial damage and consequently myocarditis, pericarditis, or severely impaired contractility in the elderly and a sign of danger of death. Myocardial damage may be caused by hypoxia, sepsis, pulmonary thrombosis, embolism, and excessive adrenaline stimulation.

The current results also indicated a rise in Peroxy nitrate, and as we know it plays a role in the physiological conditions of the blood vessels by preserving the walls of the vessels from infections. Therefore, a healthy endothelium maintains the integrity of the vessels and their structure by regulating the balance between their contraction and relaxation [24].

However, its increase in the patients group is attributed to the increased production of free radicals and lipid peroxidation, which means the deterioration of fats containing a number of carbon double bonds, and thus the formation of a number of toxic compounds through this process [25].

Stress acts as a key to activate eNOS in normal physiological states and thus predisposes its diffusion into the cardiac output. The large amounts of No produced by iNos, a form analogue of NO, are found in muscle cells, macrophages, and are activated by immune and inflammatory stimulation as part of inflammatory processes that facilitate peroxisomes formation. Solidification-inducing nitrite [26].

Reference:

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[1]Strange, G.R. ; Do biesz, V.A. ; Ahrens, W.R. ; McQuillen, K.K. ; Lee, P. and Prendergast, H.M. (2004). Pediatric emergency medicine: Just the facts. McGraw - Hill.
[2] Briscoe, T. A., Earle, S. R., Lob, M. K., & Somerville, L. L. (2004). The treatment of heart failure in the elderly patient with comorbidities. *Director (Cincinnati, Ohio)*, *12*(1), 36-41.
[3]Wan, N., & Travin, M. I. (2021). Cardiac PET assessment of myocardial microvascular flow may help identify subclinical left ventricular dysfunction and increased risk from aortic stenosis.
[4]Al-Alkanaani, M. I., Rajab, E. R., Abdulwahed, A. M. H., Dabos, T., Alshammiri, B., Abdullah, S. N., & Al-Samarraie, M. Q. (2020). Visfatin hormone level and lipid profile in some hyperlipidemia patients in samarra city. Biochem. Cell. Arch, 20(1), 1191-1193.
[5]Tierney, W.M. ; Mcphee, S.J. and papadakis, M.A. (2006). Current medical diagnosis and treatment. 44 ed. McGraw – Hill companies, Inc.
[6]Voors, A. A.; Von Haehling, S.; Anker, S. D.; Hillege, H. L.; Struck, J.;Hartmann, O.; Bergmann, A.; et al. (2009). C-terminal provasopressin (copeptin) is a strong prognostic marker in patients with heart failure after an acute myocardial infarction: Results from the OPTIMAAL study. European Heart Journal, 30(10), 1187–1194.
[7] Paul, M; Mehr, A. P;and Kreutz, R. (2006). Physiology of local renin-angiotensin systems. Physiological Reviews, 86(3), 747–803.
[8] Tianxin Yang, T; and Xu, C. (2017). Physiology and pathophysiology of the intrarenal renin-angiotensin system: an update. Journal of the American Society of Nephrology, 28(4), 1040-1049.
[9] Davenport, A.P.; Hyndman, K.A.; Dhaun, N.; Southan, C.; Kohan, D.E. and Pollock, J.S. (2016). "Endothelin". *Pharmacological Reviews*. 68 (2): 357–418.
[10] Maguire, JJ.; and Davenport, AP. (2014). "Endothelin@25 - new agonists, antagonists, inhibitors and emerging research frontiers: IUPHAR Review 12". British Journal of Pharmacology. 171 (24): 5555–72.
[11] Jermy, L.(2006). Fast Facts: Renal Disorders, P 123-126.
[12]Islam, B. U., Habib, S., Ahmad, P., Allarakha, S., & Ali, A. (2015). Pathophysiological role of peroxynitrite induced DNA damage in human diseases: a special focus on poly (ADP-ribose) polymerase (PARP). *Indian Journal of Clinical Biochemistry*, *30*, 368-385
[13]VanUffelen, B. E., & VanderZee, J. (1998). deKoster BM.. VanSteveninck J., Elferink JGR. Intracellular but not extracellular conversion of nitroxyl anion into nitric oxide leads to stimulation of human neutrophil migration. *Biochem J*, *330*, 719-22.
[14] Duncan, D. B. (1955). Multiple range and multiple F tests. Biometrics, 11(1), 1-42.
[15]Kesireddy, V; Tan, Y; Kline, D; Brock, G;Odei, J. B; Kluwe, B; Effoe, V. S; et al. (2019). The association of life's simple 7 with aldosterone among African Americans in the Jackson heart study. Nutrients, 11(5), 1–17.
[16]Siragy, H. M; and Carey, R. M. (2010). Role of the intrarenal renin-angiotensin-aldosterone system in chronic kidney disease. American Journal of Nephrology, 31(6), 541–550.
[17]MG Meems, L., Van der Harst, P., H van Gilst, W., & A de Boer, R. (2011). Vitamin D biology in heart failure: molecular mechanisms and systematic review. *Current drug targets*, *12*(1), 29-41.
[18] Luscher TF, Barton M. Endothelins and endothelin receptor antagonists: therapeutic considerations for a novel class of cardiovascular drugs. *Circulation.* 2000;102:2434–2440.
[19] Taddei S, Virdis A, Mattei P, et al. Hypertension causes premature aging of endothelial function in humans. *Hypertension.* 1997;29:736–743.
[20] Van Guilder GP, Westby CM, Greiner JJ, et al. Endothelin-1 vasoconstrictor tone increases with age in healthy men but can be reduced by regular aerobic exercise. *Hypertension.* 2007;50:403–409.
[21] Davenport, A.P.; Hyndman, K.A.; Dhaun, N.; Southan, C.; Kohan, D.E. and Pollock, J.S. (2016). "Endothelin". *Pharmacological Reviews*. 68 (2): 357–418.
[22] Martin, P; Ninio, D; and Krum, H. (2002). Effect of endothelin blockade on basal and stimulated forearm blood flow in patients with essential hypertension. Hypertension, 39(3), 821–824.
[23] Chaulin, A. M. (2021). Elevation mechanisms and diagnostic consideration of cardiac troponins under conditions not associated with myocardial infarction. Part 1. *Life*, *11*(9), 914.
[24] Sheng, Y., & Zhu, L. (2018). The crosstalk between autonomic nervous system and blood vessels. *International journal of physiology, pathophysiology and pharmacology*, *10*(1), 17.
[25] Huang, X., & Ahn, D. U. (2019). Lipid oxidation and its implications to meat quality and human health. *Food science and biotechnology*, *28*, 1275-1285.
[26]Kumar, G., Dey, S. K., & Kundu, S. (2020). Functional implications of vascular endothelium in regulation of endothelial nitric oxide synthesis to control blood pressure and cardiac functions. *Life sciences*, *259*, 118377.