

# The Assessment of the Effectiveness of Combined Angiotensin II Receptor Antagonists and Cardiac Glycosides in the Treatment of Hypertension Complicated by Chronic Heart Failure

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## ABSTRACT

Hypertension and chronic heart failure (CHF) are closely linked conditions contributing to significant cardiovascular morbidity and mortality. This study evaluates a combined therapeutic approach in managing CHF stage II B (NUNA III FK), focusing on cardiac function, renal performance, and clinical symptoms. The treatment resulted in an 8.5% increase in left ventricular ejection fraction, improved renal function as evidenced by a rise in glomerular filtration rate from 98 to 110 mL/min, and optimized hemodynamic parameters with reductions in systolic and diastolic blood pressure. Diuresis improved significantly, alongside reductions in dyspnea and peripheral edema. Electrocardiographic and echocardiographic evaluations, paired with monitoring plasma potassium levels and urine output, provided a comprehensive assessment of therapy efficacy. Despite short-term findings, this approach highlights the need for long-term research to confirm its broader applicability and impact. These results underscore the potential for tailored interventions in improving outcomes in hypertensive CHF patients.

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## Introduction

Hypertension and chronic heart failure (CHF) are two interrelated conditions that contribute significantly to cardiovascular morbidity and mortality worldwide. The coexistence of these conditions presents a clinical challenge due to their shared pathophysiological mechanisms, such as neurohormonal activation, endothelial dysfunction, and systemic inflammation, which exacerbate disease progression [1,2]. Hypertension is a leading modifiable risk factor for CHF, as it increases afterload and promotes left ventricular hypertrophy, eventually leading to structural and functional cardiac impairments [3].

Chronic heart failure is categorized into various stages based on clinical and diagnostic criteria, with stage II B (NUNA III FK) denoting significant functional limitations and symptoms even during minimal physical activity [4]. Effective management of such patients requires a comprehensive approach that addresses not only the hemodynamic abnormalities but also renal function, which plays a pivotal role in fluid balance and systemic homeostasis [5].

Renal function assessment is crucial in patients with hypertension complicated by CHF due to the intricate relationship between cardiac output, renal perfusion, and electrolyte balance. Glomerular filtration rate (GFR) serves as a key indicator of renal function and is commonly calculated using the Cockcroft-Gault formula, which

accounts for age, body weight, and serum creatinine levels [6]. This formula allows for individualized evaluation, enabling clinicians to monitor renal function dynamically during treatment [7].

Electrocardiography (ECG) and echocardiography (EchoCG) are indispensable diagnostic tools for evaluating cardiac function in patients with CHF. ECG provides information on electrical conduction and rhythm abnormalities, while EchoCG offers detailed insights into structural and functional cardiac parameters, such as left ventricular ejection fraction and valvular integrity [8, 9]. These assessments, coupled with biochemical analysis of plasma potassium levels and diuresis monitoring, provide a holistic view of the patient's clinical status.

Despite advancements in the therapeutic management of CHF and hypertension, challenges persist, particularly in optimizing fluid balance and maintaining electrolyte homeostasis. The systematic measurement of daily urine output serves as a practical marker for assessing diuretic response and the effectiveness of intensive therapy [10-15].

This study aims to evaluate the efficacy of intensive therapy in patients with hypertension complicated by CHF stage IIB.

## Materials and methods

This study involved the examination of 72 patients aged 18 to 75 years diagnosed with hypertension complicated by

chronic heart failure (CHF) stage II B (NUNA III FK). The research was conducted in the therapy department of the regional multidisciplinary medical center. The inclusion criteria for participants were based on confirmed diagnoses of hypertension and CHF, while exclusion criteria included severe comorbidities that could interfere with the study outcomes.

#### **Clinical and Laboratory Assessments:**

Comprehensive clinical evaluations were performed for all patients, including:

- **Electrocardiography (ECG):** To assess cardiac electrical activity and detect arrhythmias or ischemic changes.
- **Echocardiography (EchoCG):** To evaluate structural and functional cardiac parameters, including left ventricular ejection fraction, wall motion abnormalities, and valvular function.
- **Biochemical Analyses:** Blood samples were collected to determine plasma potassium concentrations, which are critical for evaluating electrolyte imbalances often associated with CHF.

**Renal Function Assessment:** Glomerular filtration rate (GFR) was calculated using the Cockcroft-Gault formula. This formula allowed for the assessment of renal function, an essential factor given the potential impact of hypertension and CHF on renal perfusion.

**Monitoring of Diuresis:** Daily urine output was systematically measured for all participants both before and during the course of intensive therapy. This parameter provided insights into renal response to treatment and the overall efficacy of the therapeutic regimen.

**Therapeutic Protocol:** Patients received a standardized therapeutic protocol consisting of antihypertensive agents, diuretics, and, where necessary, potassium-sparing

medications. Adjustments to the treatment regimen were made based on individual responses, laboratory results, and clinical observations.

**Ethical Considerations:** The study adhered to ethical standards outlined by the regional ethics committee. Informed consent was obtained from all participants, ensuring their understanding of the study's purpose, procedures, and potential risks.

**Data Analysis:** Statistical analyses were performed using appropriate software, with continuous variables expressed as means  $\pm$  standard deviations and categorical variables as frequencies and percentages. Comparisons between pre- and post-therapy measurements were conducted using paired t-tests or non-parametric equivalents, depending on data distribution.

## **Results**

The outcomes of the combined therapy were promising, demonstrating substantial clinical improvement in patients by the sixth day of treatment. The effectiveness of the complex treatment was primarily evaluated through changes in left ventricular ejection fraction (LVEF) and diuresis parameters. Table 1 summarizes the key findings regarding echocardiographic measures and diuresis levels in patients with chronic heart failure (CHF) classified as NYHA III.

By the sixth day of therapy, the global left ventricular (LV) contractility remained stable, while LVEF increased by 8.5%, from a baseline value of 36.5% to 45.2%. This improvement indicates a moderate enhancement in myocardial function. Similarly, diuresis showed a marked increase, rising from  $650 \pm 75$  mL to  $1600 \pm 100$  mL, reflecting the effectiveness of the therapy in managing fluid overload, a hallmark of CHF.

**Table 1. EchoCG and diuresis in a group of patients with CHF class III (according to NUNA)**

Parameters	EchoCG and Diuresis	HF NYHA III (Before treatment)
LVEF (%)	$36.5 \pm 2.6$	$45.6 \pm 2.3$
LVSD(cm)	$5.4 \pm 0.6$	$5.3 \pm 0.5$
Diuresis (ml)	$650 \pm 75$	$1600 \pm 100$

Baseline systolic blood pressure (SBP) was recorded at  $160.4 \pm 8.5$  mmHg, and diastolic blood pressure (DBP) at  $100 \pm 6.3$  mmHg. Following the treatment, SBP decreased to  $130.4 \pm 6.3$  mmHg, while DBP was reduced to  $90 \pm 7.5$  mmHg, indicating improved hemodynamic stability. Renal function, as assessed by glomerular filtration rate (GFR), increased from 98 mL/min to 110 mL/min, which corresponded with a resolution of oliguria observed at baseline.

Notably, 26 patients (36.1%) exhibited a significant improvement in cardiac rhythm, with the tachycardia form of atrial fibrillation (HR: 110–150 beats/min) transitioning to a normosystolic form (HR: 74–88 beats/min). Blood plasma potassium concentrations, which ranged from 3.6 to

4.2 mmol/L, remained within the physiological range, ensuring the prevention of arrhythmic complications associated with hypokalemia or hyperkalemia.

Patients experienced significant symptomatic relief by the end of the treatment course. Leg edema was notably reduced, shortness of breath diminished, and overall physical functioning improved. These clinical benefits highlight the effectiveness of the combined therapy in addressing the multi-dimensional challenges of CHF.

The combined therapeutic regimen showed moderate but clinically meaningful efficacy in improving cardiac performance, alleviating symptoms, and optimizing renal and hemodynamic parameters. These findings support the integration of this approach into the management of CHF in

patients with hypertension, particularly those with advanced disease stages.

The observed improvements in renal function and blood pressure parameters further underscore the effectiveness

of the combined therapeutic approach. Table 2 highlights changes in glomerular filtration rate (GFR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) before and after treatment in patients with CHF NYHA III.

**Table 2. EchoCG and diuresis in a group of patients with CHF class III (according to NUNA)**

Parameters	EchoCG and Diuresis	HF NYHA III (Before treatment)
LVEF (%)	36.5 ± 2.6	45.6 ± 2.3
LVSD(cm)	5.4 ± 0.6	5.3 ± 0.5
Diuresis (ml)	650 ± 75	1600 ± 100

The baseline GFR value of  $98 \pm 15$  mL/min indicated a mild reduction in renal filtration capacity, consistent with the chronic hemodynamic burden of CHF. After six days of intensive therapy, GFR improved significantly to  $110 \pm 18$  mL/min, reflecting enhanced renal perfusion and functionality. This improvement is attributed to the combined effects of optimized blood pressure control, fluid management, and reduced cardiac congestion.

Hypertension management was effective, with SBP decreasing from  $160.4 \pm 8.5$  mmHg to  $130.4 \pm 6.3$  mmHg, and DBP decreasing from  $100 \pm 6.3$  mmHg to  $90 \pm 7.5$  mmHg. These reductions demonstrate improved hemodynamic stability and lower afterload on the heart, contributing to better cardiac performance and reduced progression of CHF.

The observed improvements in GFR and blood pressure parameters align with better management of CHF-associated systemic and renal challenges. Lower SBP and DBP reduce myocardial workload, while increased GFR indicates enhanced renal function, contributing to improved fluid regulation and overall patient stability.

The combined therapeutic approach led to statistically and clinically significant improvements in cardiac function (LVEF), renal performance (GFR), diuresis, and blood pressure parameters. Symptom relief, including reduced dyspnea and edema, alongside stabilization of cardiac rhythm and potassium levels, underscores the efficacy of this comprehensive treatment strategy in managing CHF NYHA III in patients with hypertension. Further long-term studies are recommended to evaluate sustained benefits and potential adaptations to therapy for maximizing patient outcomes.

## Conclusions

This study highlights the efficacy of a combined therapeutic approach in managing hypertension complicated by chronic heart failure (CHF) stage II B (NUNA III FK). The treatment resulted in significant improvements in cardiac function, evidenced by an 8.5% increase in left ventricular ejection fraction (LVEF), enhanced renal performance with an increase in glomerular filtration rate (GFR) from 98 to 110 mL/min, and optimized hemodynamic stability through reductions in systolic and diastolic blood

pressure. Additionally, clinical symptoms such as dyspnea and edema markedly improved, alongside stabilization of cardiac rhythm and maintenance of normal potassium levels.

The findings underscore the potential of a multidimensional therapeutic strategy to address the complex interplay of cardiac, renal, and systemic dysfunctions in CHF. However, the short-term nature of the study calls for further research to assess long-term outcomes and broader applicability. This approach provides a solid foundation for improving patient management and achieving better clinical outcomes in this high-risk population.

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