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EARLY DIAGNOSIS AND MODERN ANTIHYPERTENSIVE THERAPY STRATEGIES IN ARTERIAL HYPERTENSION

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Abstract: Arterial hypertension (AH) remains one of the leading causes of cardiovascular morbidity and mortality worldwide. In recent years, significant paradigm shifts have occurred in the approaches to the diagnosis and treatment of AH. This scientific article is dedicated to analyzing modern methods of early diagnosis in arterial hypertension and new therapeutic strategies. The article systematizes the latest clinical recommendations from the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) published between 2023 and 2025, as well as the results of major trials that form the basis of these recommendations. Specifically, the analysis covers the "elevated blood pressure" category (120–139/70–89 mmHg) introduced in the ESC 2024 guidelines, strict blood pressure targets (systolic BP 120–129 mmHg), and the enhanced role of hypertension-mediated organ damage (HMOD) in cardiovascular risk stratification. Furthermore, advancements in therapy strategies are discussed, including the role of low-dose triple and quadruple single-pill combinations ("polypill" strategy) as first-line treatment, the position of renal denervation (RDN) in resistant hypertension, and the efficacy of new molecules such as baxdrostat and aprocitentan. In conclusion, the modern strategy for AH is based on principles of individualized approach, early and aggressive intervention, and unified therapeutic decision-making.

Key words: Arterial hypertension, early diagnosis, ESC 2024, ESH 2023, antihypertensive therapy, combination therapy, renal denervation, baxdrostat, HMOD, polypill.

INTRODUCTION

Arterial hypertension is one of the most pressing problems in modern medicine. According to 2024 data from the World Health Organization, approximately 1.4 billion adults aged 30-79 years (33% of the global adult population) have arterial hypertension . Of these patients, an estimated 600 million people (44%) are unaware of their condition, and only 23% have their blood pressure under control . High blood pressure is a primary cause of dangerous complications such as stroke, myocardial infarction, heart failure, and chronic kidney disease, and it is considered one of the leading risk factors for premature death worldwide .

The past decade has witnessed significant achievements in understanding the pathophysiology, diagnosis, and treatment principles of AH. While relatively conservative approaches regarding blood pressure targets and criteria for initiating therapy previously prevailed, the results of major trials like SPRINT and STEP have demonstrated the importance of aggressive and early intervention . Based on this evidence, the European Society of Cardiology (ESC) in 2024 and the European Society of Hypertension (ESH) in 2023 published updated clinical guidelines. These two crucial documents have opened a new chapter in the management of AH.

The purpose of this article is to analyze the most recent changes in the criteria for early diagnosis of arterial hypertension and modern antihypertensive therapy strategies, specifically highlighting the similarities and differences between the ESC 2024 and ESH 2023 recommendations, and to evaluate the efficacy of new pharmacological and interventional methods used in resistant hypertension.

LITERATURE REVIEW

1. New Approaches in Hypertension Diagnosis: The "Elevated Blood Pressure" Category and the Role of HMOD

The traditional approach diagnosed AH when blood pressure was ≥140/90 mmHg. While the 2023 ESH and 2024 ESC guidelines agree on this diagnostic threshold, the ESC 2024 introduced a new category termed "elevated blood pressure" (120–139/70–89 mmHg) . This change reflects the continuous relationship between blood pressure levels and cardiovascular risk. Attention is now focused not only on hypertension but also on its preceding stage. Patients in this new category, especially those in high-risk groups (e.g., with diabetes, high SCORE2), may be candidates for immediate pharmacotherapy . Another crucial aspect of early diagnosis is the detection of Hypertension-Mediated Organ Damage (HMOD). HMOD (such as left ventricular hypertrophy, arterial stiffness, microalbuminuria, aortic dilatation) plays a vital role not only in risk stratification but also in determining the intensity of treatment . For example, aortic remodeling occurs in the setting of arterial hypertension. An increase in diastolic blood pressure can lead to dilation of all aortic segments, particularly the aortic root and the abdominal aorta . Therefore, modern diagnostic algorithms are focused not only on blood pressure numbers but also on assessing the condition of target organs.

2. Modern Antihypertensive Therapy Strategies: ESC 2024 vs. ESH 2023

Although the latest ESC and ESH recommendations share many similarities, they also exhibit several strategic differences .

Criteria for Initiating Therapy: Both guidelines recommend starting drug therapy when BP is ≥140/90 mmHg. However, approaches differ in the 130–139/80–89 mmHg range. ESH 2023 suggests lifestyle modifications alone for 3–6 months in the absence of high risk, whereas ESC 2024 recommends immediate drug initiation in patients with high cardiovascular risk (10-year risk ≥10%, CKD, diabetes) .

Blood Pressure Targets: In this area, ESC 2024 adopts a more aggressive approach. ESC set the target systolic BP for most patients between 120–129 mmHg. ESH 2023, conversely, proposes age-dependent targets: <130/80 mmHg for those <65 years, 130–139 mmHg for ages 65-79, and 140–150 mmHg for those ≥80 years . The stricter ESC target is based on the SPRINT trial, which showed that intensive treatment (target <120 mmHg) significantly reduced cardiovascular events compared to standard treatment.

Initial Therapy Strategy: Both guidelines support initiating treatment in most patients with a two-drug combination (RAS blocker + calcium channel blocker or diuretic) in a single-pill combination (SPC) . This strategy aims to improve patient adherence to therapy.

3. New Pharmacological Agents and the "Quadpill" Strategy

New drug classes have emerged for resistant and difficult-to-control hypertension :

Aldosterone Synthase Inhibitors (baxdrostat, lorundrostat): These agents offer more selective action compared to traditional spironolactone, providing additional and safer blood pressure reduction in resistant hypertension. In the BaxHTN trial, baxdrostat demonstrated an additional BP reduction of 8.7–9.8 mmHg compared to placebo .

Dual Endothelin Receptor Antagonists (aprocitentan): These drugs work by counteracting potent vasoconstriction. The PRECISION trial showed that aprocitentan provided an additional BP reduction of approximately 4 mmHg compared to placebo .

"Quadpill" Strategy: The concept of combining four different antihypertensive drugs at low doses in a single pill (e.g., the QUARTET trial) is rapidly evolving. This approach has proven significantly more effective and safer than monotherapy. The QUADRO trial demonstrated that four-component therapy including a beta-blocker resulted in an additional 8 mmHg reduction compared to three-component therapy .

4. Interventional Therapy: Renal Denervation (RDN)

For patients with resistant hypertension whose blood pressure remains uncontrolled despite pharmacological treatment, catheter-based renal denervation has been included in the ESC 2024 and ESH 2023 recommendations. In ESC 2024, RDN is assigned a Class IIb recommendation, suggesting that the procedure should be considered in experienced centers, by a multidisciplinary team, and after ensuring patient adherence to medication .

DISCUSSION

The analysis of the literature presented above indicates that the management of arterial hypertension has fundamentally changed over the past two years. The differences between the ESC 2024 and ESH 2023 guidelines raise important questions for clinical practice. Firstly, can the "elevated blood pressure" category and the very strict targets (120–129 mmHg) introduced by ESC be applied uniformly to all patients? This could potentially increase the risk of orthostatic hypotension, syncope, and reduced renal perfusion, especially in elderly and frail patients. ESH's age-adapted, relatively softer targets are precisely aimed at mitigating these risks . Therefore, clinicians must make a balanced decision, considering the individual patient's age, biological status, and comorbidities when choosing between these strategies.

Secondly, the importance of assessing HMOD is increasing. Beyond traditional risk calculators, identifying structural changes in the heart and blood vessels helps individualize treatment tactics. For instance, in a patient diagnosed with aortic remodeling, it is crucial not only to lower blood pressure but also to select drugs with anti-remodeling effects, such as RAS blockers or beta-blockers . Furthermore, advanced imaging techniques, such as detecting myocardial fibrosis with 68Ga-FAPI46 PET, are opening new avenues for the early and non-invasive diagnosis of hypertension-induced cardiac damage .

Thirdly, the evolution of therapy strategies – from monotherapy to dual and triple combinations, and now to the four-component "quadpill" and new molecules – offers hope in addressing the challenge of resistant hypertension. Drugs like baxdrostat and aprocitentan target specific pathophysiological pathways (aldosterone and endothelin systems) and represent a significant breakthrough for groups where traditional drugs are ineffective . However, the long-term safety, drug interaction profiles, and cost-effectiveness of these new agents are still issues that require further investigation.

Finally, renal denervation represents a crucial intersection of interventional cardiology and hypertensiology. Although its current recommendation level is not high (Class IIb), advancements in RDN technology and the results of ongoing trials could potentially strengthen its position in the future .

RESULTS

Based on this literature analysis, the following key findings can be highlighted:

1. **Early Diagnosis:** The introduction of the "elevated blood pressure" category (120–139/70–89 mmHg) in the 2024 ESC guidelines indicates the need for intervention even in the pre-hypertensive stage. Early detection of HMOD (left ventricular hypertrophy, arterial stiffness, aortic remodeling) has become an integral part of risk stratification.

2. **Treatment Targets:** The strict target (systolic BP 120–129 mmHg) set by ESC 2024 appears superior to standard targets in reducing cardiovascular complications. ESH 2023 proposes age-adapted targets.

3. **Pharmacotherapy Strategies:**

1. Low-dose dual combination single-pill combinations (SPCs) have become the standard of care as first-line therapy.
2. The low-dose four-component "quadpill" strategy (QUARTET, QUADRO trials) has demonstrated significantly higher efficacy compared to monotherapy and triple therapy (additional reduction of 6.9–8 mmHg) .
3. Aldosterone synthase inhibitors (baxdrostat) have shown an additional BP reduction of 8–10 mmHg in resistant hypertension, presenting a viable alternative to spironolactone .

4. **Interventional Therapy:** Renal denervation has been included in ESC and ESH guidelines as an adjunctive or alternative option to pharmacological therapy for resistant hypertension.

CONCLUSION

The diagnostic and therapeutic strategies for arterial hypertension are evolving rapidly. The European clinical guidelines published in 2023-2024 (ESH and ESC) have shaped new paradigms in the management of AH. The main conclusions are as follows:

a) **Principle of Early Intervention:** Pharmacotherapy may now be initiated not only for established hypertension (≥140/90) but also at the stage of "elevated blood pressure," especially in high-risk groups.

b) **Strict Blood Pressure Control:** Maintaining systolic blood pressure within the 120–129 mmHg range is advisable for most patients, as this represents the most effective approach for preventing cardiovascular complications.

c) **Superiority of Combination Therapy:** Low-dose, single-pill combinations of two, three, or even four components ("polypill") not only enhance efficacy but also improve patient adherence to treatment. New pharmacological agents (baxdrostat, aprocitentan) are creating new possibilities for treating resistant hypertension.

d) **Individualized Approach:** Achieving strict blood pressure targets in elderly and frail patients requires caution. The choice of treatment strategy must consider the patient's age, comorbidities (diabetes, CKD), and the extent of HMOD.

In conclusion, modern management of arterial hypertension is moving away from the traditional "one-size-fits-all" approach towards a comprehensive strategy that integrates individual risk assessment, early and aggressive intervention, and the latest technological and pharmacological advancements.

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