Hypertension & Cardiac Arrhythmias: An International Team Consensus

Υπέρταση & Καρδιακές Αρρυθμίες: Οδηγίες Διεθνούς Ομάδος Ειδικών

➢ Αντώνης Σ. Μανώλης
➢ Α’ & Γ’ Παν/κή Καρδιολογική Κλινική
➢ Ιατρική Σχολή, ΕΚΠΑ

➢ Antonis S. Manolis, MD
➢ 1st & 3rd Department of Cardiology
➢ Athens University School of Medicine
➢ Athens, Greece

Conflict of Interest: none x for participating in Task Force
Hypertension and cardiac arrhythmias: a consensus document from the European Heart Rhythm Association (EHRA) and ESC Council on Hypertension, endorsed by the Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS) and Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLEACE)


Hypertension (HTN) & Cardiac Arrhythmias

➢ HTN: common CV risk factor leading to: ● HF, ● CAD, ● stroke, ● PAD, & ● CKD

➢ Hypertensive heart disease can manifest as many cardiac arrhythmias, most commonly being ● AF

➢ Both supraventricular and ventricular arrhythmias may occur in hypertensive pts, especially in those with LVH or HF

➢ Also, some of the antihypertensive drugs commonly used to ↓ BP, such as thiazide diuretics, may result in electrolyte abnormalities (e.g. hypokalemia, hypomagnesemia), further contributing to arrhythmias, whereas

➢ Effective control of BP may prevent the development of the arrhythmias such as AF
Mechanisms of arrhythmias in hypertension

HYPERTENSION

Sympathetic activity

Inflammation

RAAS

LA stretch
LA size
LVH

Electrical and structural remodelling-Myocardial fibrosis

Atrial and Ventricular Arrhythmias

Atrial Fibrillation (AF)

- **AF** is the most frequent arrhythmia in hypertensive pts &
- **HTN** is the most prevalent co-morbidity in pts with **AF**
- Poor BP control seems to worsen outcomes in AF via
  - LV diastolic dysfunction (HFpEF),
  - LA overload/remodeling
- AF is also related to the circadian rhythm of BP / a blunted nocturnal fall ↑ the occurrence of AF/due to sustainability of high BP & the resultant hemodynamic burden on the LA
- HTN may induce an atrial CM
- Mechanical overload due to ↑BP may induce abnormal expression of ion channels and/or connexins 40 & 43 which can enhance myocardium vulnerability by triggering focal ectopic & reentry activity
- Activation of the RAAS occurs in HTN & is strongly implicated in the development of AF
- AF may also induce microvascular dysfunction in the ventricles
Ventricular Arrhythmias (VAs)

- LVH is also the major determinant of the development of ventricular arrhythmias & SCD in hypertensive pts.
- One of the proarrhythmogenic features in LVH is the presence of early after depolarizations, which may trigger sustained arrhythmias.
- Activation of the SNS & RAAS are important components of the pathophysiology & development of LVH.
- Sympathetic activation may trigger ventricular arrhythmias.
- Also pro-arrhythmogenic impact of LVH: Prolongation & dispersion of repolarization.
- Nocturnal arrhythmias have been reported in up to 50% of sleep apnea pts, and autonomic changes may be responsible.
- e.g. sinus arrest, 2° AV block, VPBs, & NSVT.
- Sleep apnea is also known to predispose to the development of AF.
- ~50% of sleep apnea pts are hypertensive, and ~30% of hypertensive pts also have sleep apnea.
Myocardial fibrosis in the LV is part of the structural remodelling process associated with LVH, & may lead to distortion of myocardial structure & ↑ myocardial stiffness, as part of the hypertensive diastolic dysfunction.

At the cellular level, structural remodelling induced by HTN is a/w impaired cell-to-cell communication at gap junctions, & these changes are the basis of non-homogenous impulse propagation & re-entrant ventricular arrhythmias.

Finally, LVH is also a source of myocardial ischemia due to the mismatch of oxygen supply & demand.

Microvascular dysfunction with myocardial ischemia has also been reported in the early stages of HTN, even in the absence of LVH, particularly in pts treated with thiazide diuretics.

Such myocardial ischemia may be a trigger of ventricular arrhythmias and SCD in some cases.
### Scientific rationale of recommendations

<table>
<thead>
<tr>
<th>Consensus statement instruction</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Should do this’</td>
<td><img src="image1.png" alt="Heart" /></td>
</tr>
<tr>
<td>‘May do this’</td>
<td><img src="image2.png" alt="Heart" /></td>
</tr>
<tr>
<td>‘Do not do this’</td>
<td><img src="image3.png" alt="Heart" /></td>
</tr>
</tbody>
</table>

Patients with frequent SVPBs and LVH have a higher probability of AF and prolonged electrocardiographic (ECG) monitoring for AF detection may be used.

Lifestyle changes may be used when managing majority of patients with SVPBs, including addressing precipitants relevant to some patients (e.g. alcohol, caffeine) and optimizing BP control especially where LVH is present.

### Consensus statements

**AF** should be considered as a manifestation of hypertensive heart disease, and optimization of hypertension management should be made.

Given that **stroke prevention** is central to the management of AF patients, detection of hypertension and good blood pressure control should be done to minimize the risk of stroke and thromboembolism, as well as the bleeding risk whilst on antithrombotic therapy.

### References

26, 35, 36

47–49

---

Both sinus node and AV conduction disturbances (particularly in patients with LVH) can occur in hypertensive patients as a consequence of sleep apnoea, and sleep disordered breathing is more common in hypertensive patients. Thus, assessment for these conditions may be performed in hypertensive patients.
Conduction delays occur both at the atrial and ventricular level in hypertensive patients, particularly in those with LVH, leading to AF or SCD, respectively. The presence of LBBB in hypertension, especially with LVH identifies patients at increased cardiovascular risk. Thus, assessment for these conditions may be performed in hypertensive patients.

An increased resting heart rate (>80–85 b.p.m.), portends an adverse prognosis not only in patients with CAD and HF, but in hypertensive patients as well. Routine lowering of the heart rate with use of beta-blockers or other agents may be considered in hypertensive subjects uncomplicated by other comorbidities (e.g. impaired LV function).

Proposed ‘workup’ standard for pts with HTN & suspected cardiac arrhythmias
Silent AF is common, and opportunistic screening for underlying AF amongst hypertensive patients should be performed.

In hypertensive patients with symptoms suggestive of a cardiac rhythm disorder, documentation of the presence and type of arrhythmia should be done, for adequate management of the arrhythmia.
**SVT / AF**

**Consensus statements**

Oral amiodarone should be used for ongoing management in patients with symptomatic SVT who are not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, flecainide, propafenone, sotalol, or verapamil are ineffective or contraindicated.

The priority in the treatment of patients with AF is stroke prevention, and AF patients with hypertension have a CHA₂DS₂-VASc score of at least 1; thus, effective stroke prevention may be considered with OAC in addition to good BP control.

With additional stroke risk factors, CHA₂DS₂-VASc score ≥2, OAC should be used, as well controlled VKA (TTR >70%) or a non-vitamin K antagonist oral anticoagulants (NOAC), with a preference for the latter.

Bleeding risk should be assessed with focus on the modifiable bleeding risk factors, most of which can be identified using the HAS-BLED score.

- The HAS-BLED score should be used to identify those ‘high risk’ patients (score ≥3) for more careful review and follow-up, and to address the reversible bleeding risk factors (e.g. uncontrolled hypertension).

Consensus Statements: Rx of AF / SVT

Consensus statements

- A high HAS-BLED score alone is not a reason to withhold OAC.

  Atrial fibrillation ablation should be used in hypertensive patients with symptomatic recurrences of AF on antiarrhythmic drug therapy who prefer further rhythm control therapy, and is first therapy in selected individuals as an alternative to antiarrhythmic drug therapy depending on patient choice, benefit, and risk.

In patients with re-entrant SVT and isthmus dependent flutter, catheter ablation should be used and is associated with a high success and low complication rate.

In patients with severe structural heart diseases, such as severe LVH, history of myocardial infarction and HF, a haemodynamically significant valvular disease, do not use flecainide or propafenone. Do not use Sotalol in LVH patients, or Diltiazem and verapamil in HFrEF.
Management of SVT/AF in pts with HTN
Potential mechanisms of ventricular arrhythmias & SCD in hypertensive patients

Hypertension

- LVH (Myocardial Fibrosis/Reentry/EADs/DADs)
- Myocardial Ischemia * (↑Automatism/Triggers)
- Impaired LV Function (systolic/diastolic)
- RAAS Activation (Myocardial fibrosis/Reentry)
- SNS Activation (↑Automatism/Triggers)
- Circadian/Sudden BP Variations (Triggers)
- Electrolyte Abnormalities (↑QT/triggered activity)

Ventricular Arrhythmias

Sudden Cardiac Death
NB: Only in rare cases does myocardial biopsy change management, and the benefit: risk of this is low
Consider ICD implantation if LVEF < 35% despite goal-directed medical Rx & sustained hypertension control
Consensus Statements: VAs

Achieving & maintaining adequate BP control should be an important priority when managing pts with HTN & VAs, esp. if severe LV systolic dysfunction (EF < 35%) is present.

Beta blockers should be used for management of HTN in the setting of CAD & HF.

ACE inhibitors & ARBs should be used for HTN management in pts at high risk for SCD.

Avoiding hypokalemia or QT prolonging drugs should be done in the context of HTN & LVH.
Consensus Statements: SuVAs

In pts with SuVAs or frequent NS VAs c LV systolic dysfunction, Rx c β-b, MRA & sacubitril/valsartan ↓ risk of SCD & should be used for pts c HFrEF & VAs, & catheter ablation, and/or ICD implantation should be used in addition to antihypertensive Rx.

An ICD should be used to ↓ risk of SCD & all-cause mortality in pts who have recovered from an unstable VA, & who are expected to survive for >1 y with good functional status.

- Pers. severe LV systolic dysfunction, despite adequate BP & other HF Rx, c frequent VPBs in pts thought to have a PVC-induced CM, ICD implantation may be used, if CAD is evident.

- An ICD should be used to ↓ risk of SCD & all-cause mortality in pts with symptomatic HF (NYHA II–III), & LVEF <35% despite ≥3 mos of OMT, provided they are expected to survive >1 y c good functional status, & they have: (i) IHD (unless they have had an MI in prior 40 d) — (ii) DCM.
Routine use of antiarrhythmic drugs is not to be used in patients with HF and asymptomatic ventricular arrhythmias because of safety concerns (worsening HF, proarrhythmia, and death).

Proposed algorithm for antithrombotic Rx of pts with HTN & non-valvular AF

1. **Patients with hypertension and non-valvular AF**
2. Assess the risk of bleeding (HAS-BLED)
3. Address modifiable bleeding risk factors (e.g., uncontrolled hypertension, concomitant ASA or NSAIDs)
4. Use informed shared decision-making with active patient role
5. Calculate SAMe-TT$_2$R$_2$
   - **S**ex (female) 1
   - Age (<60 years) 1
   - **M**edical history* 1
   - **T**reatment (interacting drugs, e.g., amiodarone) 1
   - Tobacco use (within 2 years) 2
   - Race (non-Caucasian) 2
   - **T**arget international normalized ratio (TTR) of > 0.65–0.70%

6. **OAC**
   - Schedule patients with a HAS-BLED of ≥ 3 for a more frequent clinical follow-up

* >2 of the following: HTN, DM, CAD/MI, PAD, CHF, previous stroke, pulm. dis., & hepatic or renal disease
Areas for further research

➢ How different circadian BP profiles, particularly blunted nocturnal BP, influence the presence of different arrhythmias

➢ Detection & management of hypertensive pts with silent AF to prevent stroke risk, & whether OAC instituted in population based screen detected AF results in a meaningful stroke reduction.

➢ Antihypertensive drugs and regression of myocardial fibrosis in pts with hypertension and LVH

➢ Primary prevention of arrhythmias in pts with uncomplicated HTN: is there a preferred antihypertensive drug or combination?

➢ Optimal antihypertensive treatment in pts with HFpEF

➢ Optimal BP targets in pts with HTN & OAC therapy

➢ AF management in asymptomatic cases detected by remote monitoring of implantable cardiac devices
Ευχαριστώ!
Thank you for your attention