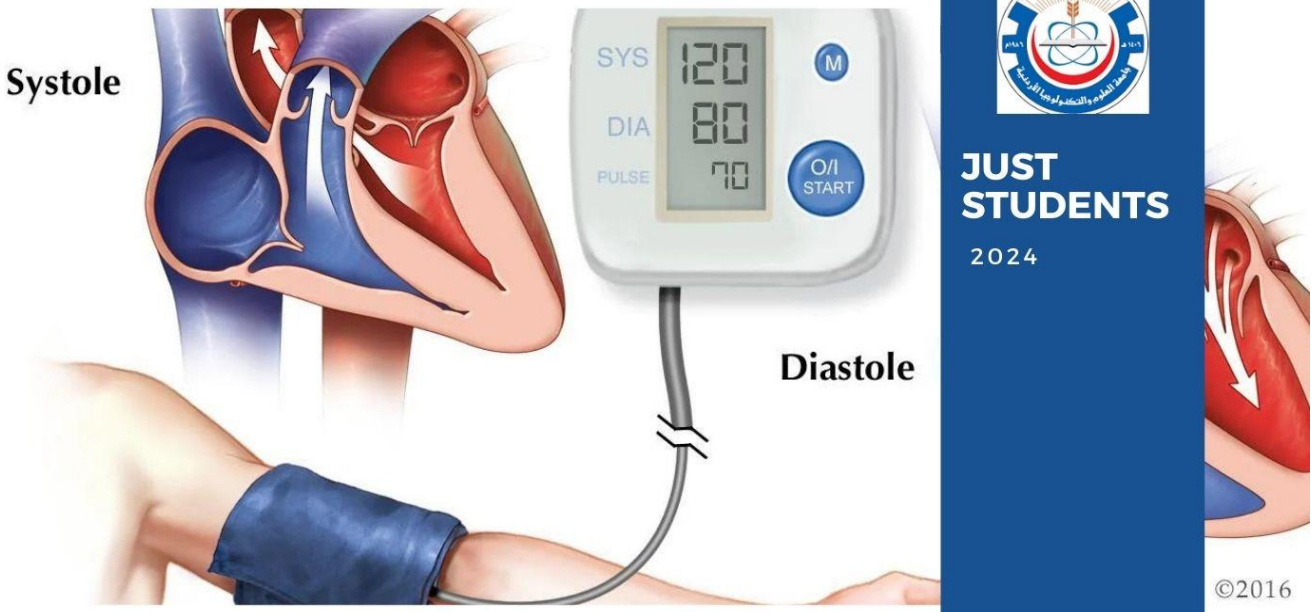
لو أن الناس كلما استصعبو أمراً تركوه
ماقام للناس دنيا ولا دين



JUST STUDENTS
2024

CHAPTER-1
HYPERTENSION

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إن رأيتم مني خيراً
ادعوا لوالدَي

HYPERTENSION / CHAPTER-1

Complication :

organ damage , stroke, myocardial infarction (MI), end-stage renal disease, and heart failure (HF).

Various guidelines recognize that the lowest risk of adverse cardiovascular or renal outcomes is at a BP around 115/75 mm Hg,

The 2017 ACC/AHA guidelines classify BP and provide guidance on accurate assessment of BP as well as the nonpharmacologic and pharmacologic approaches to managing hypertension

Table 6–1

Classification of Hypertension in Adults[a,2]

BP Classification	Systolic BP (mm Hg)		Diastolic BP (mm Hg)
< Normal	< 120	AND	< 80
Elevated	120–129	AND	< 80
Stage 1 hypertension	130–139	OR	80–89
Stage 2 hypertension	≥ 140	OR	≥ 90

The goal of BP for all pt is <130/80

When you should to give medication ?

in the case of stage 2 hypertension and average BP of 20/10 mm Hg above the BP targe

OR in stage 1 but have Clinical ASCVD or estimated 10-y CVD risk ≥ 10%.

<<The prevalence >>

- In age <64 --- prevalence in men >women
- In age >65---prevelance in women > men
- It is highest in non-Hispanic **black** individuals > non-Hispanic **white** > Mexican Americans

- ETIOLOGY:

- The cause of hypertension is usually unknown and referred to as primary hypertension in more than 90% of patients. However, in some patients there is an identifiable cause of hypertension, referred to as secondary hypertension(CKD , Drug-induced/related, Obstructive sleep apnea , Primary aldosteronism ,Renovascular hypertension or fibromuscular dysplasia, thyroid disorder..)
- These drugs contribute to secondary HTN and resistant HTN (Amphotericin B, Cocaine, amphetamines, Cyclosporine and tacrolimus Erythropoietin, minoxidil, Inadequate diuretic therapy, lithium,**NSAID,** Contraceptive , caffeine or nicotine intake, Excess sodium intake)

A Comorbidities can also affect such as Obesity Excess alcohol intake Chronic pain syndromes…)

Resistant HTN:

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Patients failing to achieve goal BP despite adherence to optimal doses of three antihypertensive agents of different classes (ideally, one being a diuretic) or those achieving goal BP on four or more antihypertensive medications

Pseudohypertension (apparent):
elevated BP resulting from a myriad of potentiating factor including:
- therapy nonadherence(Failure to receive or take antihypertensive medication appropriately
-white coat hypertension
-Inadequate doses (subtherapeutic)
-Improper antihypertensive selection or combination
- poor BP measurement technique(Improper blood pressure measurement)

PATHOPHYSIOLOGY:

-underlying cause of primary hypertension remains unknown.
it is most likely multifactorial AND exerts its effects ON cardiac output (CO) and peripheral vascular resistance (PVR).
-The development of primary hypertension involves interplay between genetic and environmental factors interacting with multiple physiological systems including neural, renal, hormonal, and vascular:
1- genetics : Despite the identification of more than 1000 genetic loci associated with BP regulation, these loci together only explain about 5.7% of the variability of SBP, DBP, and pulse pressure

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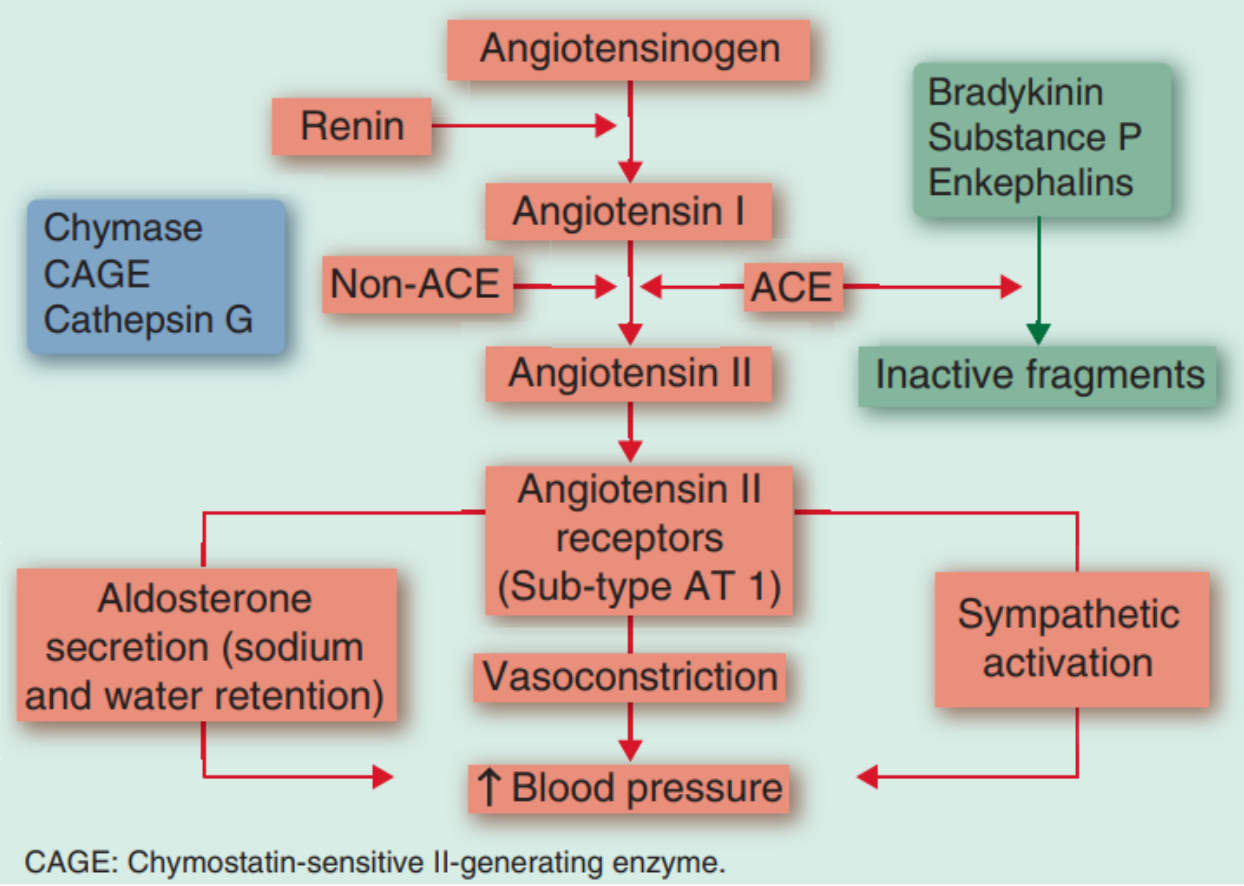
2- renal mechanism : related to excess sodium intake or abnormal excretion ((reducing dietary sodium intake while increasing dietary potassium intake reduces BP and cardiovascular disease (CVD).))

3- hormonal mechanism :

When impaired renal perfusio happen it is stimulate the rennin

Rennin(convert angiotensin to angiotensin 1)

ACE (convert angiotensin 1 to angiotensin 2) which is vaso constrictionthat increase BP



-The release of renin is the rate-limiting step in the eventual formation of angiotensin II, which is a potent vasoconstrictor

-The role of the renin-angiotensin-aldosterone system (RAAS) in primary hypertension is supported by the presence of high levels of renin

4- environmental factors :

Nicotine use, caffeine, alcohol consumption , postnatal weight gain,obesity , physical inactivity , premature birth and low birth weight, potassium and magnesium depletion, vitamin D deficiency.

5- neural mechanism :

- Overactivity of the sympathetic nervous system (SNS) in the early stages of primary HTN manifests as increased HR, CO, and peripheral vasoconstriction **(increase afterload)**

6-Vascular Mechanisms :

Elevated PVR is the hemodynamic hallmark of primary hypertension.

7- Contributing Comorbiditie: like DM , CKD , dyslipidemia, obesity is higher risk so that cardiovascular disease (ASCVD) risk in all patients with hypertension should be part of the management plan

MEASUREMENT OF BLOOD PRESSURE:

Factors may effect on BP measurement like : body position, cuff size, device selection, auscultatory technique, and dietary intake prior to the visit

Some recommendation : avoid exercise, alcohol, caffeine, or nicotine 30 minutes before BP measurement.

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Patients should be sitting comfortably with their back supported and arm free of constrictive clothing with legs uncrossed and feet flat on the floor for a minimum of 5 minutes before the first reading , patient and clinician should not talk during measurement .The measurement arm should be supported and positioned at heart level.

The sound you should hear it is Korotkoff sounds , which should be taken as systolic and diastolic pressure, respectively. A minimum of two readings at least one minute apart are then averaged.

بياخدو قرائتين ضغط الفاصل بينهم دقيقة وبحسبو الافرج لو بالقراءة التانية كان الفرق عن القراءةالأولى 5 مم زئبقي برجعو بياخدو كمان قرائتين والفاصل بينهم دقيقة بعدين بحسبو افرج القراءات

BP classification is based on the average of two or more properly measured BP readings on each of two or more office visits

ولأنه صعب يضلو المرضى يقيسو بالمكتب عند الطبيب غالبا بستخدمو قياس الضغط بال24 ساعة: يلي هو جهاز ضغط بتركب بالمريض وبضل ياخد قراءات خلال 24 ساعة بعد هيك بيطبعو المخطط للقراءات والدكتور بشوفه وعلى اساسه بقرر هو باي ستيج بناءا عالجدول يلي تحت

Finally, measurement of clinic or office BPs is often poorly so that clinicians are increasingly using 24-hour ABPM, AOBP monitoring, and HBP monitoring.

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Table 6–5

Corresponding Values (mm Hg) of Systolic BP/Diastolic BP for Various Methods of BP Measurement[2]

Clinic	HBPM[a]	Daytime ABPM[a]	Nighttime ABPM[a]	24-Hour (Overall) ABPM[a]
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

[a]Average of recorded values.

ABPM, ambulatory BP measurement; BP, blood pressure; HBPM,

TREATMENT

We always give nonpharmacologic firstly

NON PHARMACOLOGIC TREATMENT:

1-weight reduction

2-Adopt DASH eating plan(rich in fruits and vigitabels , low fat)

3- Dietary sodium restriction

4- Physical activity: (walking (at least 30 min/day)

5- reduce alcohol consumption

Pharmacological :

The pharmacologic : (when pt on stage 2 or

stage 1 (primary prevention in adults with an estimated 10-year ASCVD risk of 10% or higher and whose SBP/DBP exceeds 130/80 mm Hg))

here: we will consider (black pt , HF…)

-The 2017 ACC/AHA guidelines state that it is reasonable to initiate pharmacologic therapy with a single agent in patients with stage 1 hypertension.

We recommend to start with

ACEI/ ARBS , CCB, THIAZIDE …. Firstly then if not controlled add another options

1-**Diuretics :** ممنوع استخدمه لوحده

We have 4 types :

- Thiazides and thiazide-like (Chlorthalidone, Hydrochlorothiazide, Microzide, Indapamide , Metolazone)

- Chlorothalidone >> HCTZ **in reducing BP**
- **S.E: (its dose related)** and CI to use in crcl<30 ml/min : (hyperlipidemia and hyperglycemia) and electrolyte-related (hypokalemia, hypomagnesemia, hyperuricemia, and hypercalcemia

- Loops (Bumetanide , Furosemide (Lasix) , Torsemide , Ethacrynic acid)

بينعطى مرتين باليوم حتى يشتغل كخافض لضغط الدم وليس مدر

their **diuretic efficacy** is superior from other , With the exception of torsemide, which has a longer half-life

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this group can use in crcl <30ml/min

- If the pt have sulfonamide sensitivity use Ethacrynic acid , du to does not contain a sulfonamide moiety
  - **S.E :** The most significant is excessive diuresis leading to hyponatremia or hypotension.(hypokalemia, hypomagnesemia, and hypocalcemia, less effect on hyperglycemia, dyslipidemias, and hyperuricemia)
  - Potassium-sparing (Amiloride , Triamterene):
    These agents are often prescribed in combination with potassium wasting diuretics
    S.E : hyperkalemia ; كتير مهم اضل اراقب البوتاسيوم خاصة لو بياخد مكملات بوتاسيوم او مسكنات ,**NSAID , ACEI , ARBS**

  - Aldosterone antagonists (Eplerenone , Spironolactone)
    S.E: hyperkalemia , (spironolactone is associated with **gynecomastia**).

2- β-Blockers :

- used in pt with (HF with reduced ejection fraction (HFrEF), recent MI , ischemic conditions including acute coronary syndromes (ACS)).
- β-blockers with ISA are not recommended for use in the post-ACS patient.

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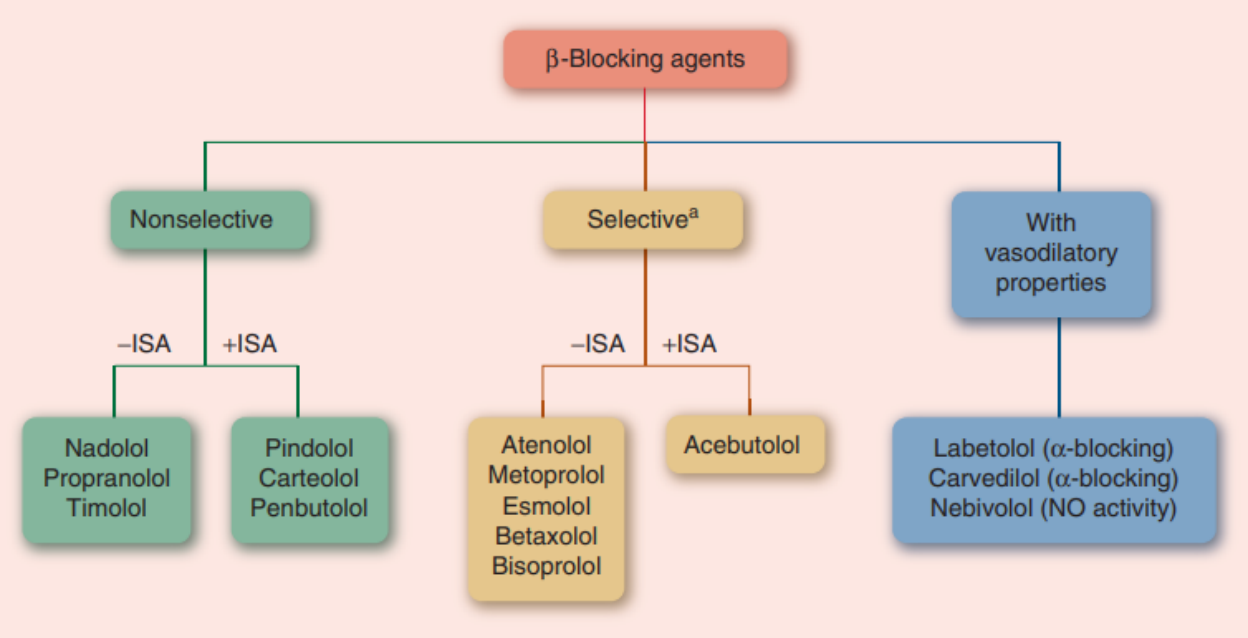

Cardioselectivity : it is very important especially in **asthma / COPD**

-It is important to remember that cardioselectivity depends on dose, with diminished selectivity exhibited with higher doses**.**

كارديو سيليكتيف يعني بشتغل على بيتا 1 اما لما احكي نون سيليكتيف يعني بشمل بيتا 1 وبيتا 2 او الفا , لكن مرضى الربو لازم اختارلهم ادوية سيليكتيف يعني تشتغل بس على بيتا 1 لانها لو اشتغلت على بيتا 2 وسكرتهم رح يختنقو المرضى وهم أصلا عندهم ربو ومو قادرين يتنفسو فمثل كانه زدت الطين بلة :)

ISA: β-Blockers possessing this property effectively block the β-receptor at higher circulating catecholamine levels, such as during exercise, while having modest β-blocking activity at times of lower catecholamine levels, such as at rest.

S.E: bradycardia , heart block

abrupt discontinuation of β-blockers has been cited as a precipitating factor in the development of ischemic syndromes مممنوع يتوقف فجأة بتتقلل الجرعة من ايام لحد 2 ويك

Lastly, β-blockers, particularly first-generation agents (ie, those other than carvedilol and nebivolol), have a greater effect on glucose metabolism as well as other metabolic effects, and they should be used cautiously, if at all, with diuretics unless compelling indications exist for both

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3-CCB : is 2 class

- **1*- Dihydropyridine** :(nifedipine and amlodipine)**
- **S.E :** edema
  Nifedipine **cant** use in pt with rEF
- **2- Nondihydropyridine: (**verapamil and diltiazem**)**
- preferable in pt with HTN +Afib / reduced LVEF du to negative chronotropic and inotropic effects and act on AV node
  -CCB have some vasodilation effect so can used in angina pt **(1)*.**

4-ACEI :

Their role in patients with hypertension who have a history of type 1 or 2 DM, HF, MI, CKD, or stroke.2
S.E : Hyperkalemia, dry cough (caused by accumulation of bradykinin resulting from a direct effect of inhibiting ACE.)**+**
CI in: 1- AKI
2- bilateral renal stenosis
3-preexisting kidney dysfunction/ crcl<30
4-blood dyscrasias,
5- angioedema.

-in case of cough happened → convert to ARBS

5- ARBS :

الأخ الشقيق ل4 ولكن مميز عنه انه ما بعمل سعال+

better tolerated than ACE-Is, so that consider alternatives to ACE-Is for patients with select comorbidities (CKD, DM, and prior MI and alternatives when ACE-Is are not well-tolerated.

- Don't give it in pt wit angioedema
- Don't combined with ACEI

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نوتة : كلاهما بعطو فعالية أكبر مع المدرات

6- rennine :

Aliskarin **:** it acts within the RAAS, it is unique in that it directly blocks renin

-**combining two or more RAAS blocking agents (ACEIs, ARBs, or renin inhibitors) for the treatment of hypertension is not recommended**.

S.E : monitoring serum potassium and kidney function should be similar to those of ACE-Is and ARBs.

7- α1 -Blockers : يعتبرو الخط الرابع او الخامس بالعلاج

Ex : doxazosin , terazosin, prazosin

-α1 -blockers **should not** be used as monotherapy

-combination therapy with a thiazide is recommended to minimize potential edema resulting from the α1 -blocker's tendency to cause sodium and water retention.

S.E: dizziness, palpitations, or syncope following the first dose and **orthostatic hypotension** with chronic use , Due to their ability to cross blood–brain barrier(asthenia, vivid dreams, and depression) , **priapism.**

8- Central α2 -Agonists: ,used in resistance HTNنادرة الاستخدام

Ex: clonidine, methyldopa, guanfacine, guanabenz.

- adding clonidine to other antihypertensive agents may be used for individuals with resistant hypertension

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.(you can find clonidine patch once weekly for non adherence pt as an alternative)

- **don't abruptly DC it** , du to severe rebound hypertension , you should gradually reduce the dose

- in case of pt take β-blocker+ clonidine (firstly you should DC β-blocker in several days then DC clonidine because withdrawing clonidine while on a β-blocker could experience unbalanced α-mediated vasoconstriction)

- **note : methyldopa is aviable option for pregnancy.**

9- other agent :

1- Direct Vasodilator:

Ex : hydralazine and minoxidil
(alternative agents used for patients with resistant hypertension.)
We use them in combination with β-blockers and diuretics such as furosemide du to reflex tachycardia and fluid retention

S.E :

-associated with minoxidil(pericardial effusion, nonspecific T-wave change on the ECG, and **hypertrichosis** (excessive body hair), particularly in women)
- associated to hydralazine : lupus-like syndrome(toxicity of hydralazine happened in (NAT1) and NAT2 genes as biomarkers)

Risk factors of S.E : Although uncommon, females, those receiving doses in excess of 200 mg/day, individuals with slow hepatic

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acetylation capacity, or having certain immunogenic factors appear to be at greater risk

2-**Reserpine ,guanethidine and guanadrel**

(have little role in the management of hypertension because of significant adverse effects.)

<< Antihypertensive Toxicity and Management>>

1- . Early gastrointestinal decontamination

Supportive care: {bradycardia, hypotension ,seizure}

-IV crystalloid boluses

-airway protection

-vasopression

If not response and β-blocker toxcicity : we give glucagon → if not response (high insuline + glucose)

- In CCB : early use of high insulin + IV calcium (While administering calcium, one should monitor the ECG, avoid rapid infusions, and never infuse calcium in the same line as phosphate-containing solutions to prevent precipitation)

<< SPECIAL PATIENT POPULATIONS Considerations >>

جددددا مهممة ركزو فيها

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1-ACS/or stable angina + HTN→ β-blocker+ long acting CCB

2-If persistent angina / controlled ACS sympt→ nitrate

3-Post MI: (esp reduce LVEF) → β-blocker+ACEI/ ARBs

4-post MI+ reduce LVEF+D.M/HF → a;dosteron antagonist

5-HFrEF+HTN → β-blocker(bisoprolol, carvedilol, metoprolol succinate) +ACEI/ARBS+ aldosterone antagonist

If HF with volume overload → diuretics

6-african American with symptomaticHFrEF→ combination of isosorbide dinitrate +hydralazine

7-HFrEF + Uncontrolled B.P → dihydropyridine CCB , amlodipine or felodipine هون ممنوع أستخدم النون دايهايدرو منعا باتاً

8-HFpEF → non dihydropridine CCB (diltiazem , verapamil) ما بشجع عليهم وبفضل أستخدم ال

Aldosterone antagonist

9-HTN+D.M –(without CKD (regardless of age)): 2 class

1-**Black pt** : start with hiazidetype diuretics or CCBs alone or in combination
(Alternatively, ACE-Is or ARBs. When the albuminuria (≥ 300 mg/day or ≥ 300 mg/g creatinine [34 mg/mmol creatinine]) is present.

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2- **Non-Black patients**: start with ACE-Is or ARBs as well as thiazide-type diuretics and CCBs for initial therapy

10-HTN + CKD>=stage 3 / stage1or2with albuminuria (≥ 300 mg/day or ≥ 300 mg/g creatinine [34 mg/mmol creatinine]→ give ACEI/ ARBS

11-HTN + preior stroke :→ACEI+thiazide diuritics

12- HTN + asymptomatic aortic stenosis: treated with standard pharmacologic therapy with low dose

13- HTN + chronic aortic dissection:→ β-blockers, and don't give ACEi

14-HTN +Afib → ARB therapy is suggested

15- HTN crisis:(BP >180/120 mm Hg)

- hypertensive emergencies:(with end organ damage)
- hypertensive urgencies(without end organ damage)

- The goal in most hypertensive emergency cases is to reduce SBP by up to 25% in the first hour; if stable, then lower to 160/100–110 mm Hg over the next 2 to 6 hours; and then carefully lower to normal over the following 24 to 48 hours

.- For individuals with compelling conditions, including aortic dissection, severe preeclampsia or eclampsia, or pheochromocytoma crisis, a more aggressive BPlowering approach (reduce SBP to < 140 mm Hg in the first hour and < 120 mm Hg in aortic dissection) should be taken

بشكل عام الأدوية المستخدمة بهالحالة **وريدية** وتشمل التالي : بملف الجداول رح تلاقوهم مع الجرعات ومعلومات الدوا

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(Esmolol hydrochloride, Labetalol hydrochloride, Phentolamine, Enalaprilat, Clevidipine, Nicardipine hydrochloride, Fenoldopam mesylate, Hydralazine hydrochloride, Nitroglycerin, Sodium nitroprusside).

- **hypertensive urgency (>180/110)**: BP can usually be managed by restarting or intensifying oral therapy and treating anxiety as needed with close follow-up in the ambulatory setting.

نوتة : دائما الأشخاص يلي أعمارهم فوق ال65 منبلشلهم العلاج بجرعات قليلية وبصير أرفعها

African origin pt response to ACE-Is and ARBs > diuretics or CCBs

Asian patients.: response more to long-acting CCBs and RAAS inhibitors with or without a diuretic

-16- HTN+ pregnancy : favor **methyldopa, nifedipine, and/or labetalol**

ACE-Is, ARBs, or aliskiren should not be used in women du to fetal risk.,

<<لو أن الناس كلما استصعبوا أمراً تركوه , ماقام للناس دنيا ولا دين , >>

إن رأيتم مني خيراً ادعو لوالدَي (أمي وابي).

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