ESC Council on Hypertension

Guidelines Implementation Workshop

Hypertensive emergency: acute heart failure in a 42 years old female patient

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Tuesday 21 January 2020

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Declaration / conflict of interest / Disclosures

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Non conflict of interest for this presentation

Woman 42 yrs of age

- Arterial hypertension known for at least 7 years
- Therapy only for a few months, self-suspended

- Family history of hypertension

- During the last month dyspnea on exertion and orthopnea

Access to Emergency Department for:

- acute worsening of dyspnea at rest
- orthopnea
- throbbing headache
- (no chest pain)

✓ Dyspneic; **BP 260/145** mmHg (right=left); HR 120 r; SatO2 88%, T 36C°
✓ **Bilateral pulmonary rales**

Complete blood count: within normal range
Creatinine 0,7 mg/dl
AST e ALT slightly increased
Troponin I 0,02 ng/mL; CK-MB in normal range
Coagulation: normal
D-dimer: negative
Arterial blood gas analysis: mild hypoxyemia

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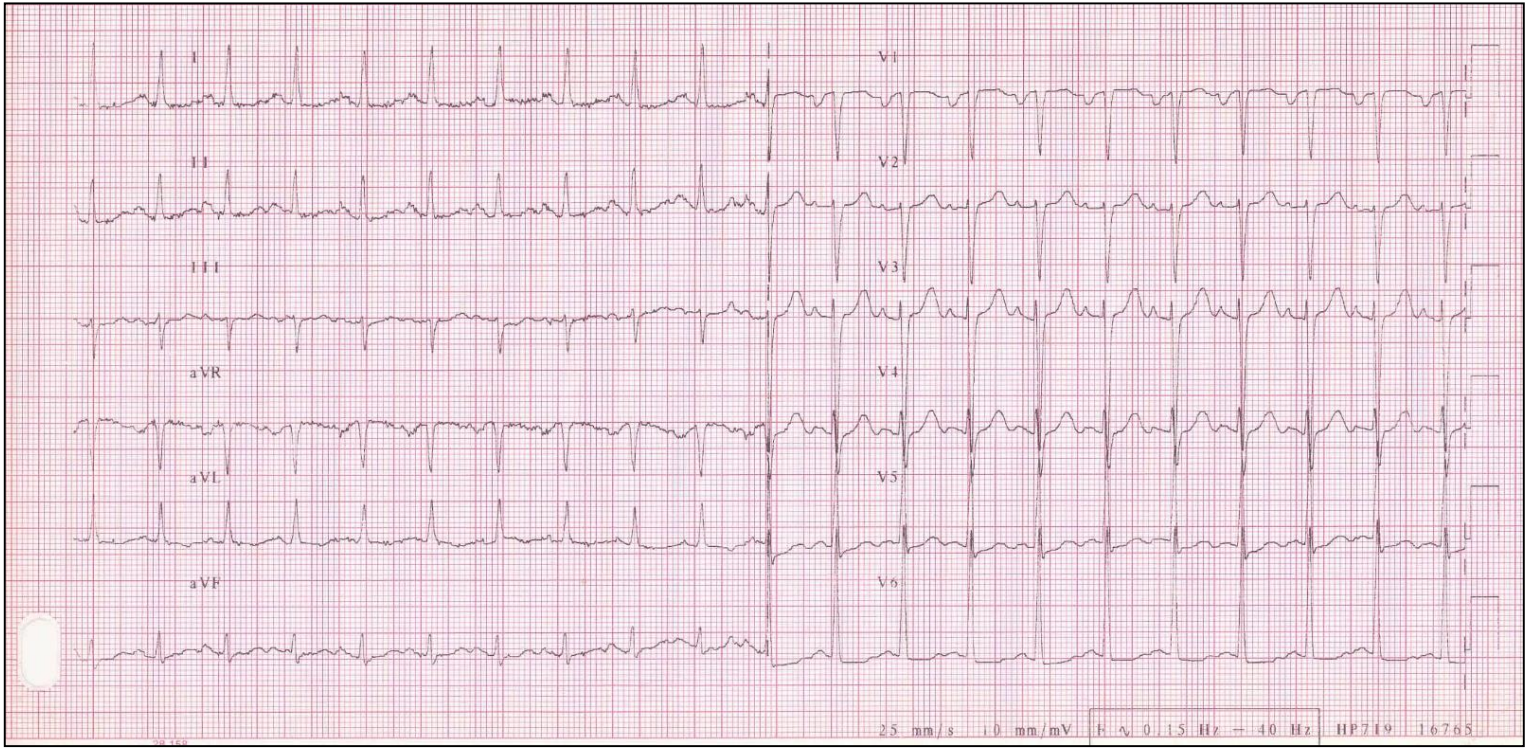

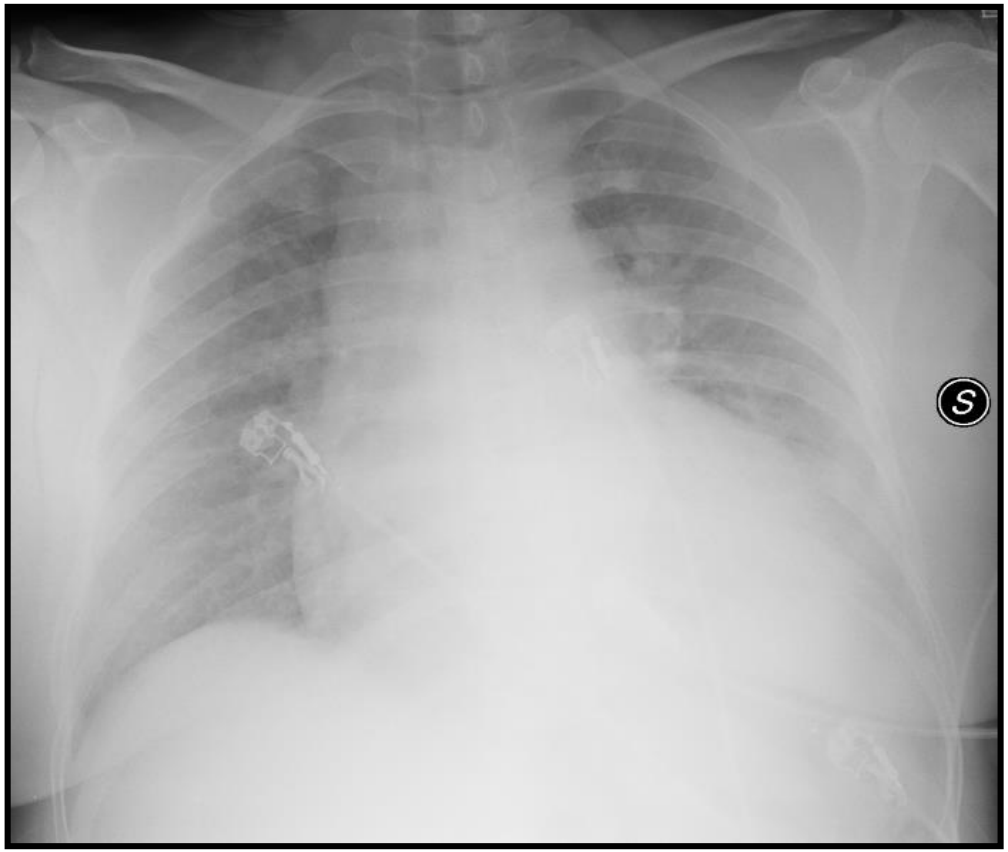
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ESC Council on hypertension position document on the management of hypertensive emergencies

Bert-Jan H. van den Born (chair)[1]*, Gregory Y.H. Lip (co-chair)[2,3], Jana Brguljan-Hitij[4], Antoine Cremer[5], Julian Segura[6], Enrique Morales[6], Felix Mahfoud[7], Fouad Amraoui[1], Alexandre Persu[8], Thomas Kahan[9], Enrico Agabiti Rosei[10], Giovanni de Simone[11], Philippe Gosse[5], and Bryan Williams[12]

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"**Hypertensive emergencies** are situations where **very high BP values are associated with acute hypertension-mediated organ damage**, and therefore, require immediate BP reduction to limit extension or promote regression of target organ damage. Key target organs of acute hypertension-mediated damage are the heart, retina, brain, kidneys, and large arteries"

B.-J.H. van den Born et al. European Heart Journal - Cardiovascular Pharmacotherapy, 2018

2018 ESC/ESH Guidelines for the management of arterial hypertension

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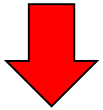
"**Hypertension emergencies** are situations in which **severe hypertension (grade 3) is associated with acute hypertension-mediated organ damage**, which is often life threatening and requires immediate but careful intervention to lower BP, usually with intravenous (i.v.) therapy"

Williams, Mancia et al, J Hypertension & European Heart Journal

In the ED: Labetalol ev 75 mg



BP 170/120 mmHg

Admitted to the ICU: BP 180/130 mmHg; HR 80 bpm (r)

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Echocardiography:

- Severe concentric LV hypertrophy
- Preserved of global and regional systolic function (EF 57%)
- normal right dimensions
- MI ++; TI ++ sPAP 64 mmHg
- Dilated IVC
- E/e’ 15

PATIENT EVALUATION

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Medical history

- Known hypertension?
- Previous treatment?
- Rate of rise in BP? (home BP monitoring?)
- Drug withdrawal (e.g. clonidine, propranolol)?
- Clinical symptoms
- Specific background?

    pheochromocytoma

    drugs

    MAO-inhibitors + thyramin (cheese reaction?)

Treatment of Hypertensive Emergencies and Urgencies, ESH newsletter 2011 J. Hypertens. and www.eshonline.org

Proposed diagnostic studies in patients with suspected hypertensive emergency

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Lab tests

Table 2 Proposed diagnostic studies in patients with suspected hypertensive emergency
Laboratory analysis • Haemoglobin, platelet count • Creatinine, sodium, potassium, lactic dehydrogenase (LDH), haptoglobin • Quantitative urinalysis for protein, urine sediment for erythrocytes, leucocytes, cylinders and casts

Common tests for all potential causes
Haemoglobin, platelet count, fibrinogen
Creatinine, eGFR, electrolytes, LDH, haptoglobin
Urine albumin:creatinine ratio, urine microscopy for red cells, leucocytes, casts
Pregnancy test in women of child-bearing age

Diagnostic examination

Table 2 Proposed diagnostic studies in patients with suspected hypertensive emergency
• ECG (ischaemia, arrhythmias, left ventricular hypertrophy) • Fundoscopy

Common tests for all potential causes
Fundoscopy is a critical part of the diagnostic workup
12-lead ECG

ESC Council on hypertension position document on the management of hypertensive emergencies, Eur Heart J 2018

ESH/ESC guidelines 2018, Williams, Mancia et al, J Hypertension & European Heart Journal

PATIENT EVALUATION

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✓ Prescription drugs

Corticosteroids and mineralocorticoids
Estrogen
NSAID
Cyclosporine, tacrolimus, erytropoietine
Carbamazepine, metoclopramide
Inhibitors of angiogenesis……..

✓ Street drugs and “natural products”

Cocaine and cocaine withdrawal
Ma huang, “herbal ecstasy”,
Anabolic steroids, narcotic withdraval, ergotamine, ….

✓ Food substances

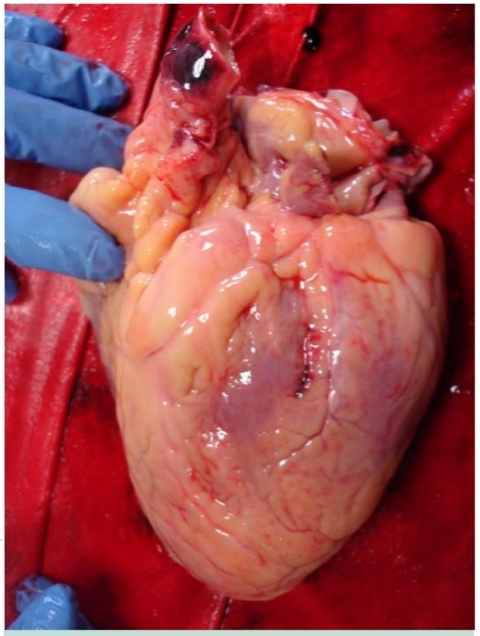
Ethanol
Lead, mercury, lithium salts
MAO-inhibitors + thyramin (cheese reaction?)

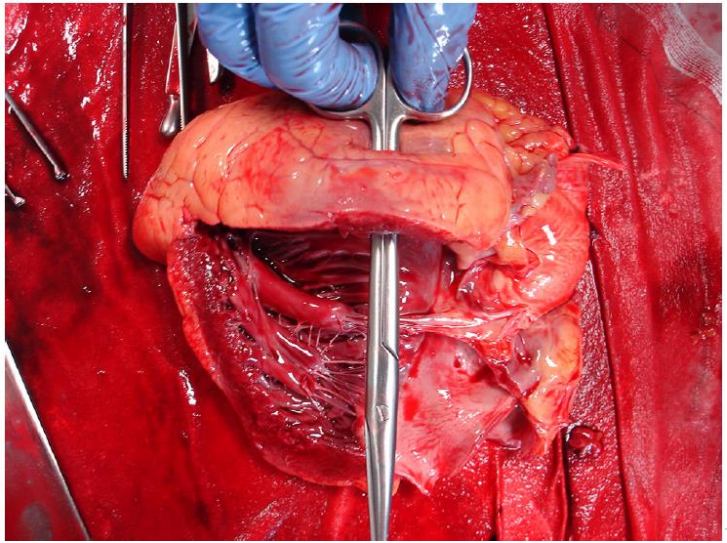
Approximately 5% to 10% of emergency department visits in the US have been attributed to cocaine use.

Cardiac Rupture in a Young Male Cocaine User

Adelaide Conti, Anna Paini, Chiara Rossetti, Marzia Bernini, Maria Lorenza Muiesan, Massimo Salvetti

A 25-year-old man was found unconscious by his wife in the bathroom of his apartment. She called emergency services and cardiopulmonary resuscitation was promptly initiated within a few minutes. The patient was intubated, transferred to the Emergency Department (ED) of a local hospital, and after 1 hour of advanced cardiac life support he was pronounced dead. His relatives reported a history of cocaine abuse; he had complained of epigastric discomfort during the previous 2 days





The American Journal of Medicine, Vol 131, No 5, May 2018

Triggering of Myocardial Infarction by Cocaine

Murray A. Mittleman, MD, DrPH; David Mintzer; Malcolm Maclure, ScD; Geoffrey H. Tofler, MB;
Jane B. Sherwood, RN; James E. Muller, MD

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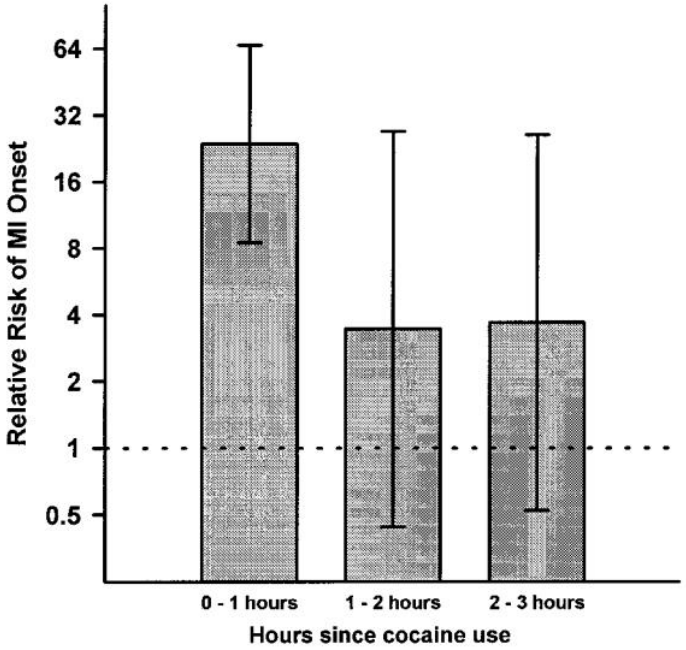
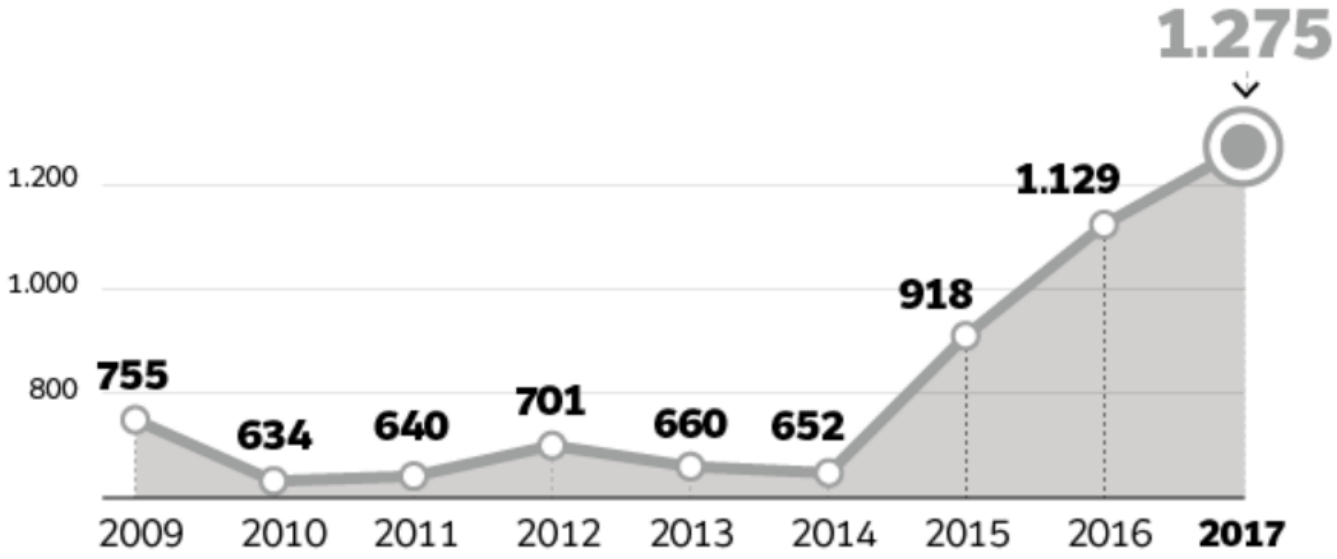


*"…**The risk of myocardial infarction onset was elevated 23.7 times over baseline** (95% CI 8.5 to 66.3) **in the 60 minutes after cocaine use**. The elevated risk rapidly decreased thereafter…"*

Circulation. 1999

Cocaine busts in tons (world)



Cocaine and the Heart

Robert A. Kloner, M.D., Ph.D., and Shereif H. Rezkalla, M.D.

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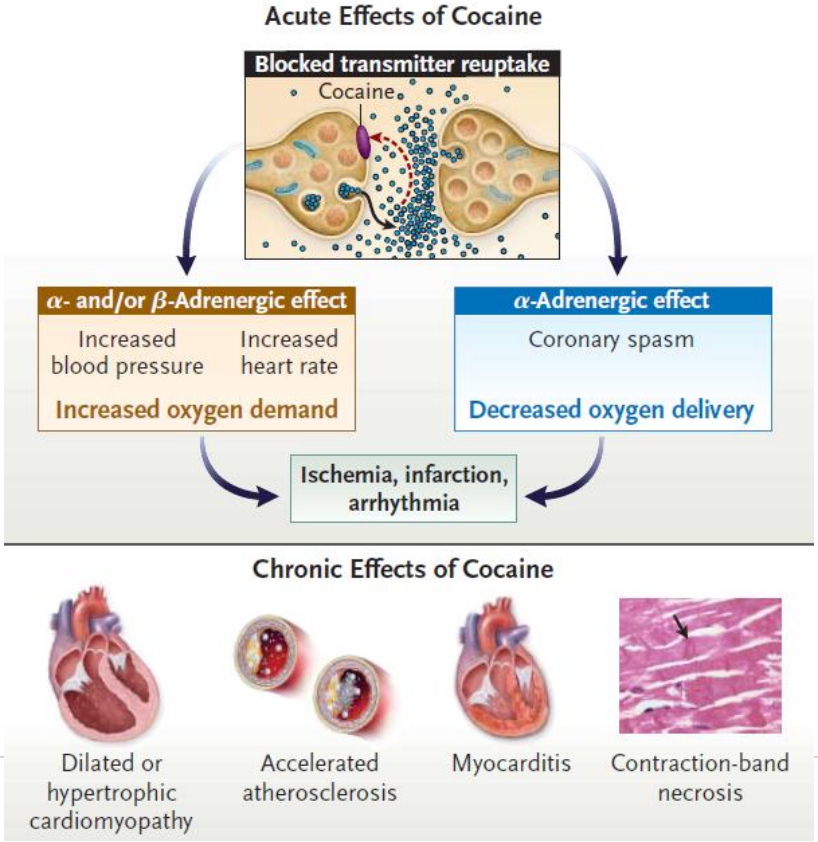


Treatment

- **nitroglycerin, oxygen, aspirin, benzodiazepines, or calcium antagonists, alpha blockers**
- **Beta-blockers should be administered with caution, since their use may worsen vasospasm** by allowing unopposed stimulation of alpha receptors.

New England Journal of Medicine, 348;6

Infusion with intravenous sodium nitroprussiate, boluses of furosemide and Metoprolol

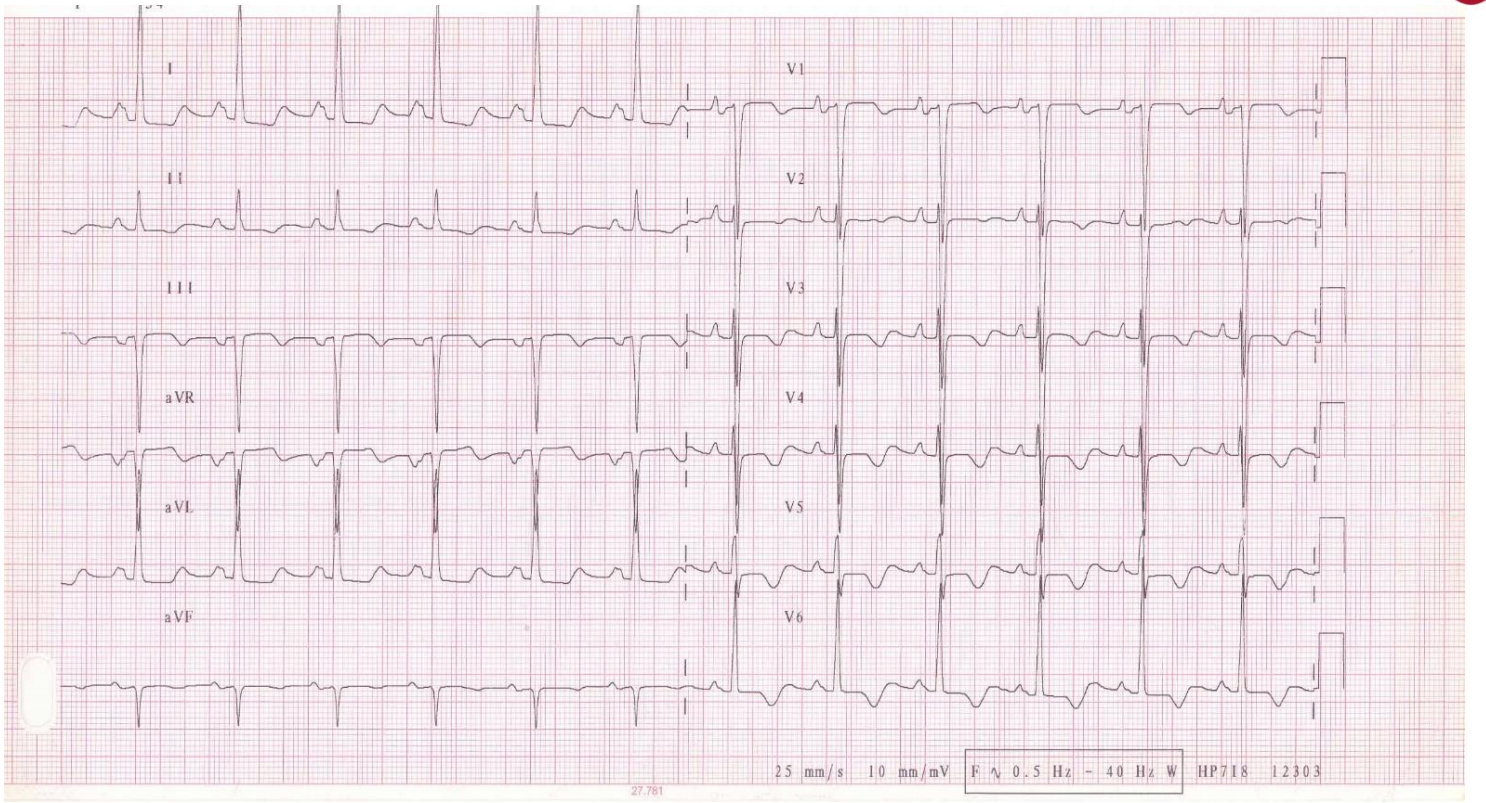
In 3 hours

BP 260/145 mmHg → 170/120 mmHg → PA 140/90 mmHg

→ BP 120-130/80-85 mmHg in 20 hours

Marked improvement of dyspnea
Onset of retrosternal “discomfort”
Onset of negative T waves at ECG
Troponin I: normal

Moved to our Internal Medicine Intensive Care Unit


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
25 mm/s 10 mm/mV F ∿ 0.5 Hz - 40 Hz W HP718 12303

In the internal Medicine Intensive Care Unit

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Stop iv sodium nitroprussiate

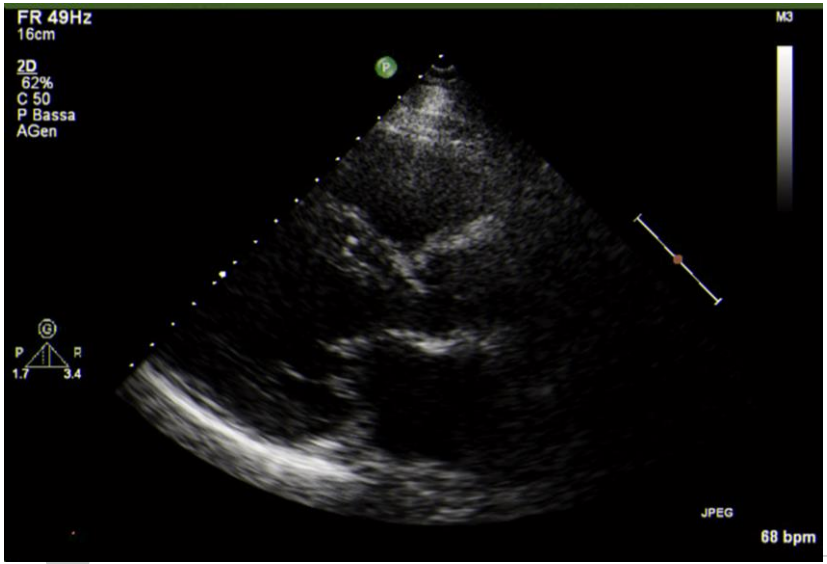
Continue with iv boluses of furosemide

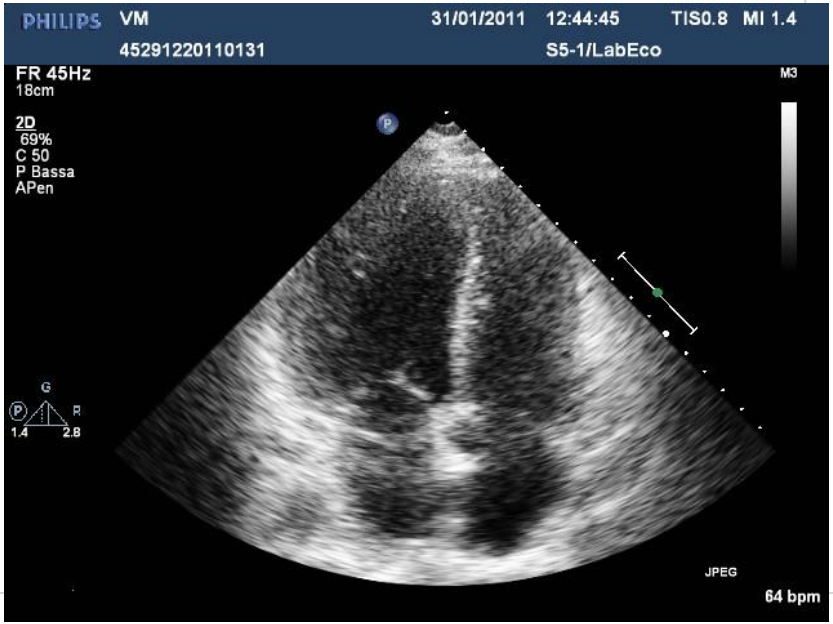
Progressive shift to oral therapy:
- Bisoprolol
- Amlodipine
- Doxazosin

Echocardiogram:

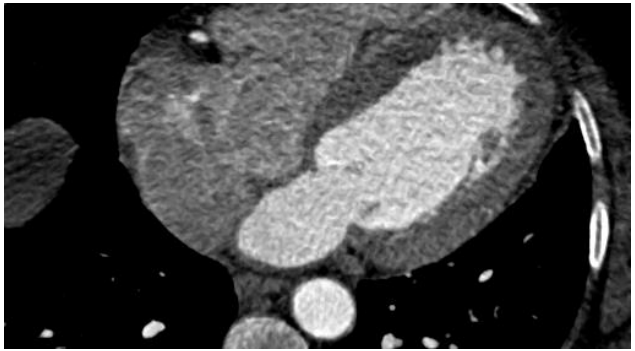
- Severe concentric LVH (LVM/h^2.7: 87.4 g/m^2.7; RWT 0.62)

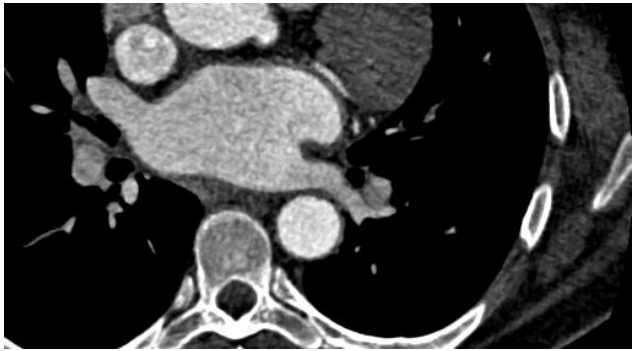
- Preserved EF (58%); hypokinesis of the basal interventricular septum





CT scan Angiography





"… normal coronary angiogram…Concentric LVH…"

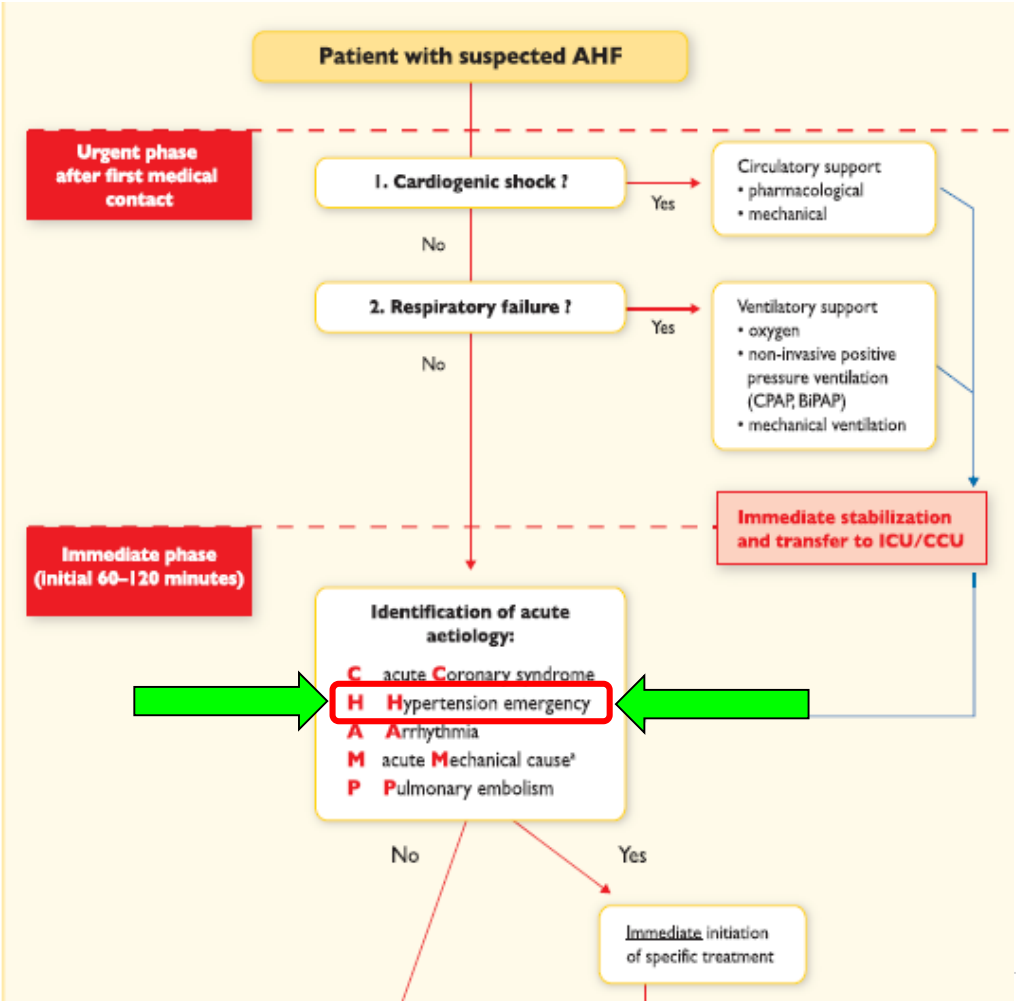
ECG changes during first phase of treatment (precipitous BP reduction)

Patient with severe LV hypertrophy and severely elevated BP values:

Precipitous reduction of BP values	→ EKG changes suggestive for myocardial injury (neg T waves) in parallel with BP changes

Hypertensive LVH
Impaired coronary flow reserve
↑ media/lumen ratio of resistance vessels (media hypertrophy)
→Higher BP values necessary for adequate myocardial perfusion
→Rapid reduction of BP values (→ "coronary steal")→ subendocardial hypoperfusion

M.Pepi, M.Alimento, D.Guazzi, Eur Heart J 1988



2015 ESC Heart Failure Guidelines, European Heart Journal 2016

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Clinical and Research Considerations for Patients With Hypertensive Acute Heart Failure: A Consensus Statement from the Society of Academic Emergency Medicine and the Heart Failure Society of America Acute Heart Failure Working Group

"…Hypertensive acute heart failure (H-AHF) is defined as the rapid onset of pulmonary congestion in the setting of a systolic blood pressure >140 mm Hg, and often >160 mm Hg…"

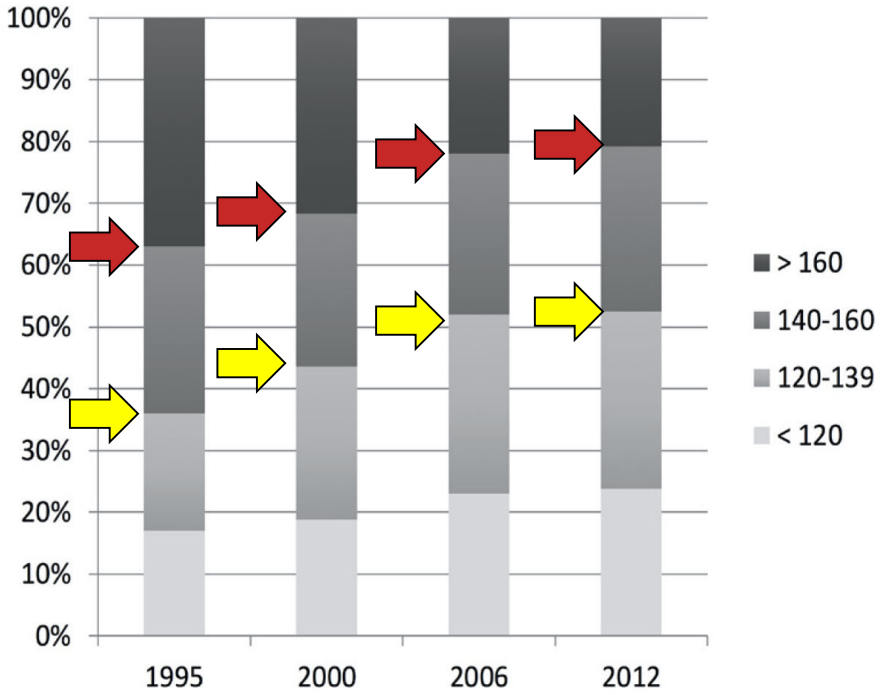
J Cardiac Fail 2016;22:618–627

Presentations of Hypertensive Acute Heart Failure

Darling et al J Cardiovasc Dis Diagn. 2017

four historical, cross-sectional cohorts with AHF who were admitted to tertiary care medical centres in the North-eastern USA in 1995, 2000, 2006, and 2011–13.

Hypertensive Acute HF



Hypertensive emergencies and urgencies: a single-centre experience in Northern Italy 2008–2015

M Salvetti, A Paini, E Colonetti, L Tarozzi, F Bertacchini, C Aggiusti, D Stassaldi, C Agabiti Rosei, E Agabiti Rosei, MLMuiesan

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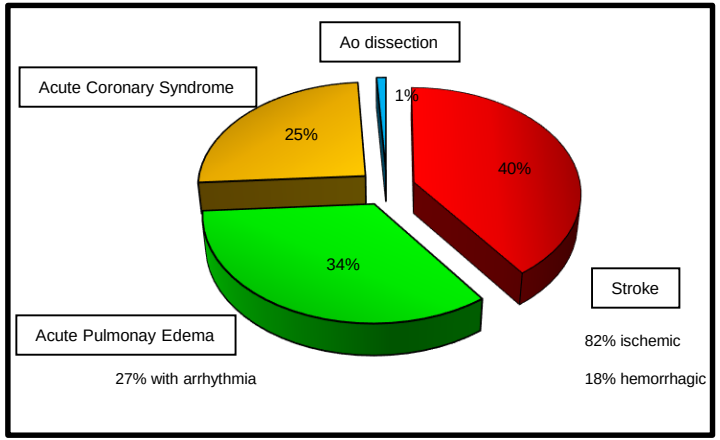
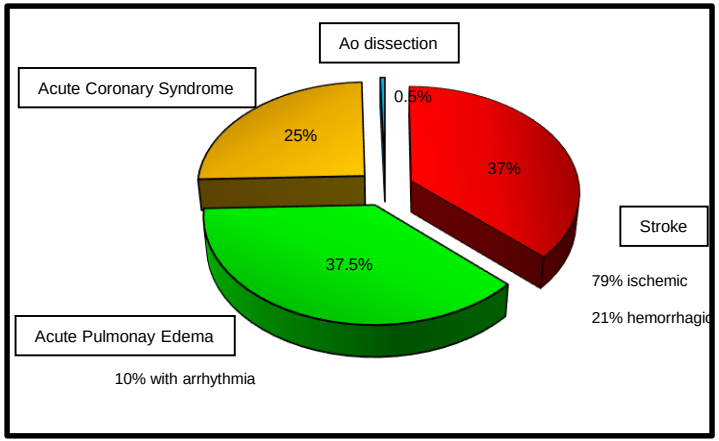
- Consecutive patients aged at least 18 years, admitted to the ED of the Spedali Civili in Brescia in 2008 and in 2015 and **presenting with SBP at least 180 mmHg and/or DBP at least 120 mmHg** were prospectively collected and analysed
- The prevalence of patients admitted with acute BP rise was 2.0% (n=1551, age 70±14 years) in 2008 and 1.75% (n=1214, age 70±15 years) in 2015
- Patients with acute organ damage (**i.e.hypertensive emergencies) were 20.4 % in 2008 and 15.4% in 2015**

2008



2015



* Total admissions to the ED in 2008: 77 154 and 69101 in 2015

Journal of Hypertension 2019

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- ✓ Acute heart failure precipitated by rapid and excessive increase in arterial blood pressure typically manifests as acute pulmonary oedema.

- ✓ A **prompt reduction in blood pressure should be considered as a primary therapeutic target** and initiated as soon as possible.

- ✓ Aggressive blood pressure reduction (in the range of **25% during the first few hours and cautiously thereafter**) with i.v. vasodilators in combination with loop diuretics is recommended.

ESC Heart Failure Guidelines, European Heart Journal 2016

Intravenous vasodilators used to treat acute heart failure

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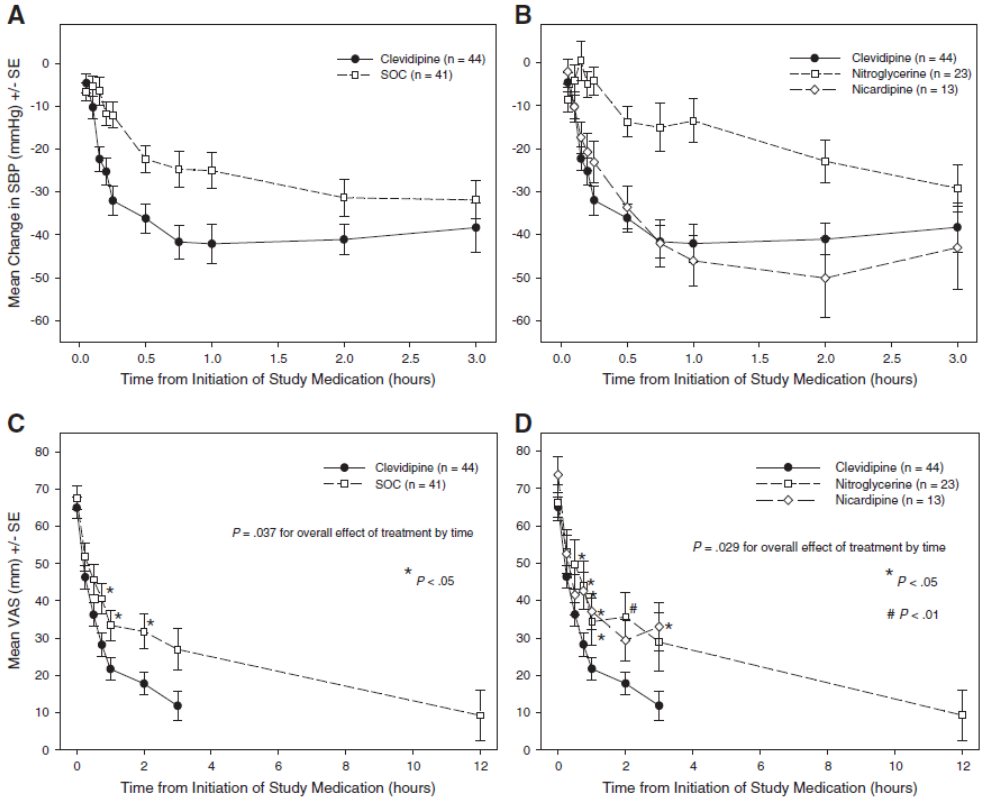
Vasodilator	Dosing	Main side effects	Other
Nitroglycerine	Start with10–20 µg/min, increase up to 200 µg/min	Hypotension, headache	Tolerance on continuous use
Isosorbide dinitrate	Start with 1 mg/h, increase up to 10 mg/h	Hypotension, headache	Tolerance on continuous use
Nitroprusside	Start with 0.3 µg/kg/min and increase up to 5 µg/kg/min	Hypotension, isocyanate toxicity	Light sensitive
Nesiritide	Bolus 2 µg/kg + infusion 0.01 µg/kg/min	Hypotension	

European Heart Journal (2016) **37**, 2129-2200 - doi:10.1093/eurheartj/ehw 128

EUROPEAN SOCIETY OF CARDIOLOGY®

Clevidipine in acute heart failure
Blood Pressure Control in Acute Heart Failure A Pilot Study (PRONTO)



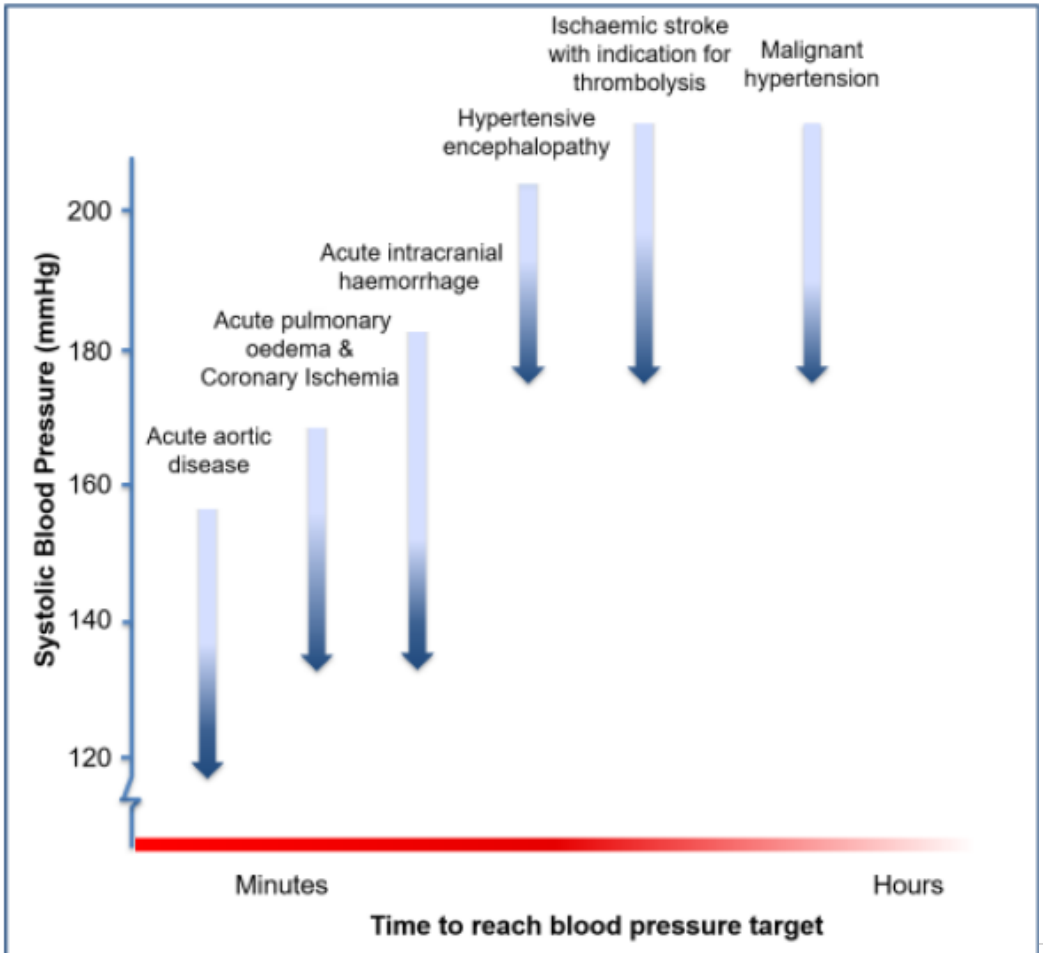
Serious adverse events (24% vs 19%) and 30-day mortality (3 vs 2) were similar between clevidipine and SOC, respectively, and there were no deaths during study drug administration

Peackock FW et al Am Heart J 2014;167:529-36

ESC Council on hypertension position document on the management of hypertensive Emergencies *European Heart Journal - Cardiovascular Pharmacotherapy, 2018*

Table 4 Intravenous drugs for the treatment of hypertensive emergencies

Drug	Onset of action	Duration of action	Dose	Contraindications	Adverse effects
Esmolol	1–2 min	10–30 min	0.5–1 mg/kg as bolus; 50–300 mg/kg/min as continuous infusion	History of 2nd or 3rd degree AV block (and in the absence of rhythm support), systolic heart failure, asthma, and bradycardia	Bradycardia
Metoprolol	1–2 min	5–8 h	15 mg intravenous (iv), usually given as 5 mg iv, and repeated at 5 min intervals as needed	History of 2nd or 3rd degree AV block, systolic heart failure, asthma, and bradycardia	Bradycardia
Labetalol	5–10 min	3–6 h	0.25–0.5 mg/kg; 2–4 mg/min until goal BP is reached, thereafter 5–20 mg/h	History of 2nd or 3rd degree AV block, systolic heart failure, asthma, and bradycardia	Bronchoconstriction and foetal bradycardia
Fenoldopam	5–15 min	30–60 min	0.1 µg/kg/min, increase every 15 min until goal BP is reached		
Clevidipine	2–3 min	5–15 min	2 mg/h, increase every 2 min with 2 mg/h until goal BP		Headache and reflex-tachycardia
Nicardipine	5–15 min	30–40 min	5–15 mg/h as continuous infusion, starting dose 5 mg/h, increase every 15–30 min with 2.5 mg until goal BP, thereafter decrease to 3 mg/h	Liver failure	Headache and reflex-tachycardia
Nitroglycerine	1–5 min	3–5 min	5–200 mg/min, 5 mg/min increase every 5 min		Headache and reflex tachycardia
Nitroprusside	Immediate	1–2 min	0.3–10 mg/kg/min, increase by 0.5 mg/kg/min every 5 min until goal BP	Liver/kidney failure (relative)	Cyanide intoxication
Enalaprilat	5–15 min	4–6 h	0.62–1.25 mg iv	History of angioedema	
Urapidil	3–5 min	4–6 h	12.5–25 mg as bolus injection, 5–40 mg/h as continuous infusion		
Clonidine	30 min	4–6 h	150–300 µg iv in 5–10 min		Sedation and rebound hypertension
Phentolamine	1–2 min	10–30 min	0.5–1 mg/kg bolus injections OR 50–300 µg/kg/min as continuous infusion		Tachyarrhythmias and chest pain



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San Sebastiano, Antonello da Messina (1478)

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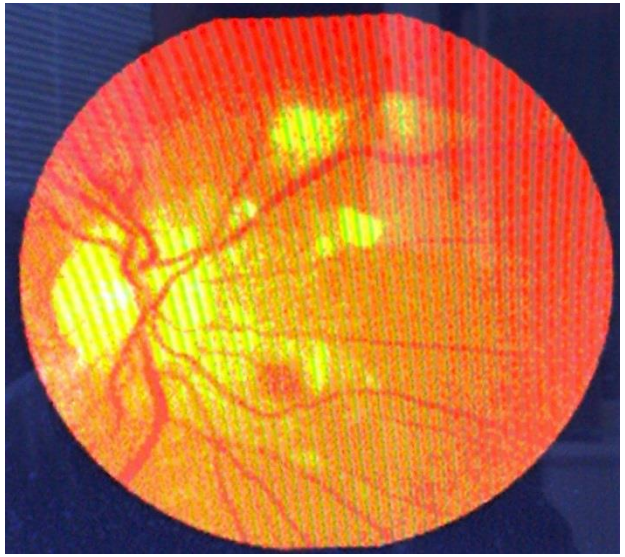
- Dosaggi ormonali per escludere cause secondarie di ipertensione arteriosa:

- Dosaggio catecolamine e metanefrine urinarie: nella norma
- Aldosterone urinario, Renina aldosterone e test di infusione salina : nella norma
- Cortisolemia e cortisoulira: nella norma
- Funzione tiroidea: nella norma

<u>Fundus oculi</u>:

“ …numerose emorragie e alcuni essudati cotonosi OD>>OS. Visus conservato; Non papilledema”→ <u>retinopatia ipertensiva III stadio</u>



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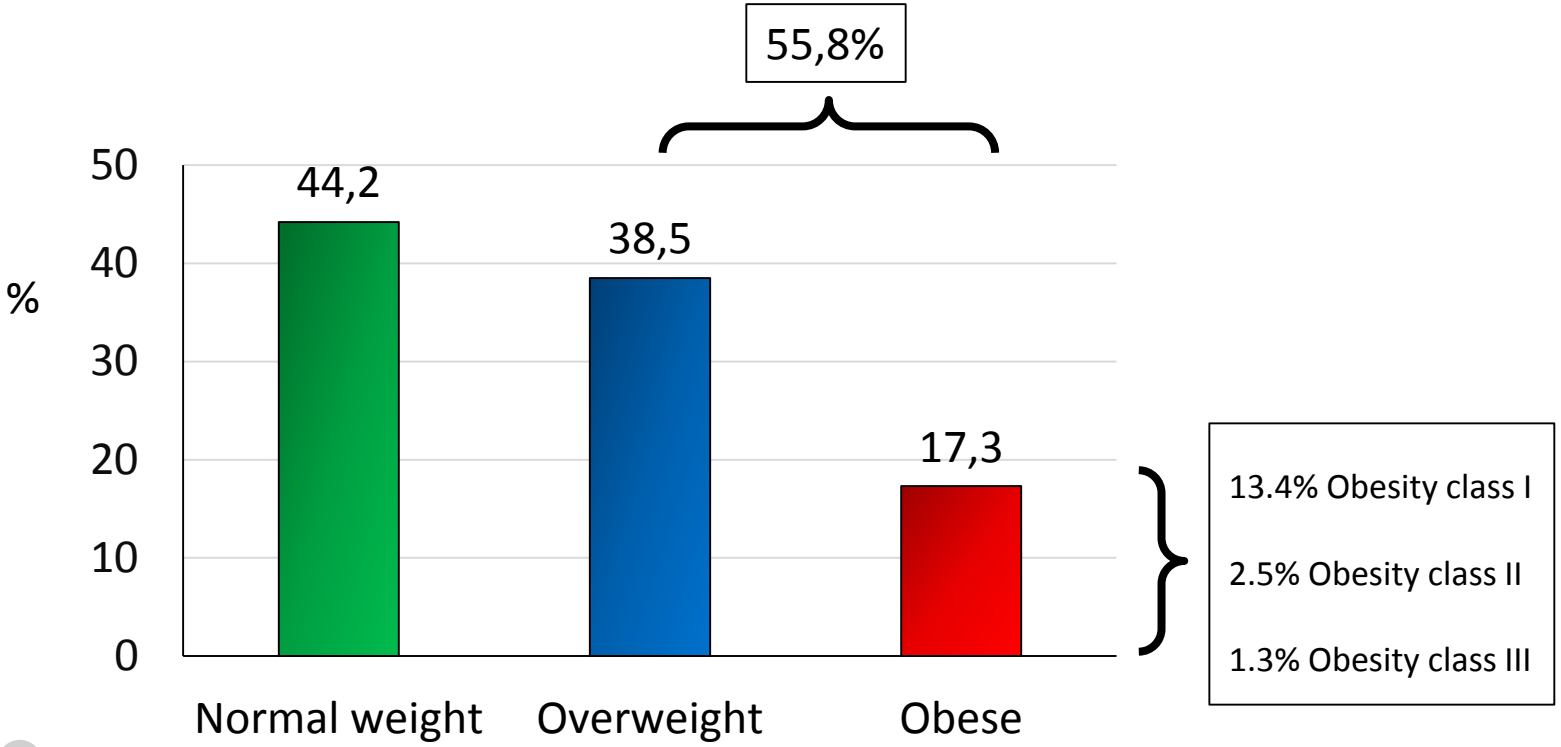
3872 patients undergoing an echocardiogram for cardiovascular risk stratification at an ESH excellence centre in Italy (mean age 56±15 years, 48% females)



Prevalence of LVH

SBP (mmHg)	134/79	138/82	139/83	137/83	141/86

LVH indexing for $h^{2,7}$

Prevalence of Left Atrium Enlargement

LAE indexing for h^2