



# **PERIOPERATIVE MANAGEMENT OF THE HYPERTENSIVE**

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Hypertension is the **most frequent preoperative abnormality in surgical patients**, with an overall prevalence of **20–25%**.





# Magnitude of the problem

- No exact data for surgeries in Europe
- By 2020 **25%** INCREASE IN SURGERIES

**50%** INCREASE IN ELDERLY



# FIND AND TREAT THEM

Target organ damage

Only **20%** are ONLY HYPERTENSIVES

CAUSE

ESC\_ESH



# Perioperative management of hypertension

**2009:** ESC, ESA: Guidelines for preoperative cardiac risk assessment



# Perioperative Screening and Management of Hypertensive Patients

- Athanasios J. Manolis, Serap Erdine, Claudio Borghi, Kostas Tsioufis.
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# Perioperative risks associated with hypertension

Much of the evidence for the perioperative risks associated with hypertension comes from **uncontrolled studies** performed before current (more effective) management was available

*Casadei, B, Abuzeid, H. J Hypertens 2005*





# Pathophysiology of Perioperative HTN

- ➡ Adrenergic stimulation (cardiac and neural)
- ➡ Baroreceptor denervation
- ➡ Rapid intravascular volume shifts
- ➡ Increase SVR, increase preload
- ➡ Renin angiotensin activation
- ➡ Serotonergic overproduction
- ➡ Altered cardiac reflexes



# anesthesia

**sns** increase of blood pressure by 20-30 mm Hg

the heart rate by **15-20** bpm in normotensive individuals (This response

may be more pronounced in untreated pts As the period of anesthesia progresses, patients

with preexisting HTN are more likely to experience intraoperative blood

pressure **lability** which may lead to **MYOARDIAL ISCHEMIA**



stress

RISE OF BP



# Which is the solution ?

- Is postponement synonymous to reduced risk?



NO NO NO NO

No no no no



- Numerous studies have shown that stage 1 or stage 2 HTN (<180/110 mm Hg) is not an independent risk factor for perioperative cardiovascular complications
- Do not delay
- Continue drugs post-op



GRADE 3  $\geq 180$  and/or  $\leq 110$

- COST/BENEFIT



# Clinical Predictors of Increased Perioperative Cardiovascular Risk (Myocardial Infarction, Heart Failure Death)

- The ACC/AHA guidelines list uncontrolled hypertension as a "minor" risk factor for perioperative cardiovascular morbidity and mortality.





- Arterial pressure was not considered a continuous variable
- HTN > 180/110 mm Hg
- Few hypertensives were included



# RISK

- TYPE OF SURGERY
- RISK FACTORS
- CIRCUMSTANCES
  
- IS IT URGENT ????



Breast

Dental

Endocrine

Eye

GYNAECOLOGY

Reconstructive

Urologic-minor

Orthopaedic-minor

**LOW RISK <1%**

Aortic and major vascular  
surgery

Peripheral vascular surgery

**HIGH RISK >5%**



# INTERMEDIATE RISK

1-5%

- Abdominal
- Carotid
- Peripheral arterial angioplasty
- Endovascular aneurysm repair
- Head and neck surgery
- Neurological/ orthopaedic- major hip-spine
- Pulmonary renal/ liver transplant
- Urologic- major



- FAMILY HISTORY
- CLINICAL ASSESMENT
- HIGH-MEDIUM-LOW RISK



## Clinical Risk Factors

- Ischemic heart disease
- Compensated or prior heart failure
- Diabetes mellitus
- Renal insufficiency
- Cerebrovascular disease



- Is he/she a sleepy pt during the day?



# Initial preoperative evaluation of hypertensive patient

- **Electrocardiogram**
- Should be part of all routine assessment of subjects with high BP in order to detect LVH, patterns of “strain”, ischaemia and arrhythmias.

## **ESH GDLS2007**

- Presence of Q waves or significant ST segment elevation or depression have been associated with increased incidence of perioperative cardiac complications





# *Recommendations for Preoperative Resting Echocardiography*

## *Class IIa*

1. Rest ECHO for LV assesment should be considered in pts undergoing high-risk surgery

*(Level of Evidence: C)*

## *Class III*

1. Rest perioperative evaluation of LV function in patients is not recommended.

*(Level of Evidence: B)*



# Assessment of Functional Capacity

4 METs

Can you...

1 MET

Take care of yourself?  
Eat, dress, or use the toilet?

Can you...  
Climb a flight of stairs or walk up a hill?  
Walk on level ground at 4 mph (6.4kph)?

Walk indoors around the house?

Run a short distance?

Walk a block or 2 on level ground at  
2 to mph (3.2 to 4.8 kph)

Do heavy work around the house like  
scrubbing floors or lifting or moving  
heavy furniture?

Do light work around the house like  
dusting or washing dishes?

Participate in moderate recreational  
activities like golf, bowling, dancing,  
doubles tennis, or throwing a baseball  
or football?

4 METs

Participate in strenuous sports like  
swimming, singles tennis, football,  
basketball or skiing?

Greater than  
10 METs



# STRESS TESTING

- It is recommended in **high risk** surgery pts with  $\geq 3$  clinical factors

CLASS I

LEVEL C

IN LOW RISK ☺ INCREASED MORTALITY



Stress test has a very **high negative predictive value** for postoperative cardiac events (90-100%) but a **low positive predictive value** (6-67%).

So stress test is more useful for reducing estimated risk if negative than for identifying patients at very high risk when positive



- The positive predictive value OF REVERSIBLE DEFECTS for perioperative death/MI has decreased over the years.
- Change in management and surgical procedure



## The ideal drug for perioperative BP control

- Easy to prepare, stable at ambient temperature and light
- Given by continuous intravenous infusion
- Compatible with range of diluents
- Easily titrable, with rapid onset and short duration of action
- Free of untoward or undesirable effects



## The ideal drug for perioperative BP control

- Free of effects on intracardiac conduction
- Mild reduction in myocardial contractility
- Vasodilator effects should be mostly confined to the arteriolar bed (i.e. resistance vessels)
- Vasodilator effects preferentially in vital organ beds, e.g. coronary, renal, splanchnic
- Effective treatment should maximise protective effects against complication of HTN, i.e. myocardial infarction



# B-blockers





## **a continuation of existing antihypertensive therapy**

Patients treated with  $\beta$ -blockers long-term should not have them withdrawn before any surgery (cardiovascular and non cardiac)

- **As a prophylactic treatment to reduce perioperative complications**
  - In patients at risk for CV complications and in patients undergoing vascular surgery
  - However we still do not know exactly which patients, which drug, for how long and what is the size of benefit.
- **As treatment for hypertension in the perioperative period**
  - Esmolol for acute BP control
  - Metoprolol, atenolol and labetalol for longer duration of the effect



# Esmolol

- B<sub>1</sub> selective adrenergic blocker
  - Reduction in heart rate (HR) and cardiac output (CO)
  - May see increase in PCWP, CVP, and SVR
- Rapid onset and short duration of action
- Elimination via RBC esterases (does not involve renal/hepatic function)
- May cause bradycardia, bronchospasm, seizures, and pulmonary edema



# Labetalol

- Non-selective adrenergic blocker
  - Alpha-1, Beta-1, Beta-2
  - 1:7 ratio of alpha:beta effects
  - Reduces SVR with little effects on HR, CO
  - Little to no effect on cerebral blood flow
- Moderate onset, long duration of action
- Commonly used in HTN emergency and in ICH
- Generally given by IV bolus in ED, OR; IV infusion used in ICU
- May cause bronchospasm, bradycardia, heart block, delayed hypotension



# $\beta$ -Blocker vs Combined $\alpha$ - and $\beta$ -Blocker

Parameters	Esmolol $\beta$ -Blocker	Labetalol $\alpha$ - and $\beta$ -Blocker
Administration	Bolus Continuous infusion	Bolus Continuous infusion
Onset	<b>Rapid (60 s)<sup>2</sup></b>	Intermediate (peak 5-15 min) <sup>2</sup>
Offset (Duration of action)	<b>Rapid (10-20 min)<sup>2</sup></b>	Slower (2-4 h) <sup>2</sup>
HR	<b>Decreased</b>	+/-
SVR	0	<b>Decreased</b>
Cardiac output	<b>Decreased</b>	+/-
Myocardial O <sub>2</sub> balance	Positive	Positive
Contraindications	Sinus bradycardia Heart block >1° Overt heart failure Cardiogenic shock	Severe bradycardia Heart block >1° Overt heart failure Cardiogenic shock

- Hoffman BB. In: Hardman JG, Limbird LE, eds. Goodman and Gilman's Pharmacological Basis of Therapeutics. 10th ed. New York, NY: McGraw-Hill; 1997
- Varon J, Malik PE. Chest. 2000



# DEBATE

- POISE      DCREASE IV
- Pts in B- blockers pre-op should continue
- AHA 2009 Class I      REC C



- For patients undergoing **vascular surgery** who are at **high cardiac risk**,  $\beta$ -blockers titrated to heart rate and blood pressure are probably recommended (IIa,B).



- For patients undergoing either **intermediate-risk** procedure or **vascular surgery**, the usefulness of initiating  $\beta$ -blockade is uncertain.
- The usefulness of  $\beta$ -blockers is also **uncertain** in patients undergoing **lower-risk surgery**



# POISE

- starting higher doses of  $\beta$ -blockers acutely on the day of surgery is associated with risk. When  $\beta$ -blockade is started preoperatively, it should be started well in advance of surgery at low dose, which can be titrated up as blood pressure and heart rate allow. The guidelines recommend careful patient selection, dose adjustment, and monitoring throughout the perioperative period





CCB's



- META-ANALYSIS 11 STUDIES 1000 PTS

calcium channel blockers significantly reduced ischemia, and supraventricular tachycardia . The majority of these benefits were attributable to **diltiazem**. Dihydropyridines and verapamil did not decrease the incidence of myocardial ischemia, although **verapamil** did decrease the incidence of supraventricular tachycardia



# *no s.l. nifedipine*

stroke

MI

DEATH



# DIURETICS

- Special attention must be paid to the potassium level in patients on diuretics. Diuretics **not be administered on the day of surgery** should because of the potential adverse interaction of diuretic- induced volume depletion and hypokalemia and the use of anesthetic agents. **Hypokalemia** may cause arrhythmias and potentiate the effects of depolarizing and nondepolarizing muscle relaxants



# Clonidine

- Has a favorable sympatholytic effect
- Has a **biphasic response** (at lower doses central vasodilatory effect, at higher dose peripheral vasoconstrictive effect)
- Significantly reduces the rate of perioperative CV complication in patients at risk of CHD
- It is only partially effective for the rapid BP control in the perioperative period
- Can contribute to analgesia and sedation
- **TRANSERMAL PATCH**

*Fenek R et al, Drugs, 2007*



# ARB s ACE

- there is a debate in the literature over the use of ACE-I's or ARB's in the perioperative period due to their potential **central vagotonic effects**. These agents alone or in combination have been associated with moderate hypotension and bradycardia. In some patients this may be related to a **decrease in intravascular volume**. The continuation of ACE-I therapy in the morning is not associated with a better control of blood pressure and heart rate but causes a more pronounced hypotension which has required therapeutic intervention.



# ARB's ACE inhibitors

- Patients chronically treated with ACE-I's and ARB's should receive them last on the day prior to the operation and **not with the premedication in the morning**. There is mixed evidence that prophylaxis with glycopyrrolate can attenuate this effect.



- Restart ACE-I in the postoperative period only after the patient is **euvolemic**, in order to decrease the risk of perioperative renal dysfunction





# HYDRALAZINE iv

- Avoid in ISCHEMIA because of reflexible tachycardia ( unless already in B-BLOCKERS)



# WHEN IT COMES TO DIFFICULT

- SODIUM                      NITROPRUSSIDE



# Nitroglycerin

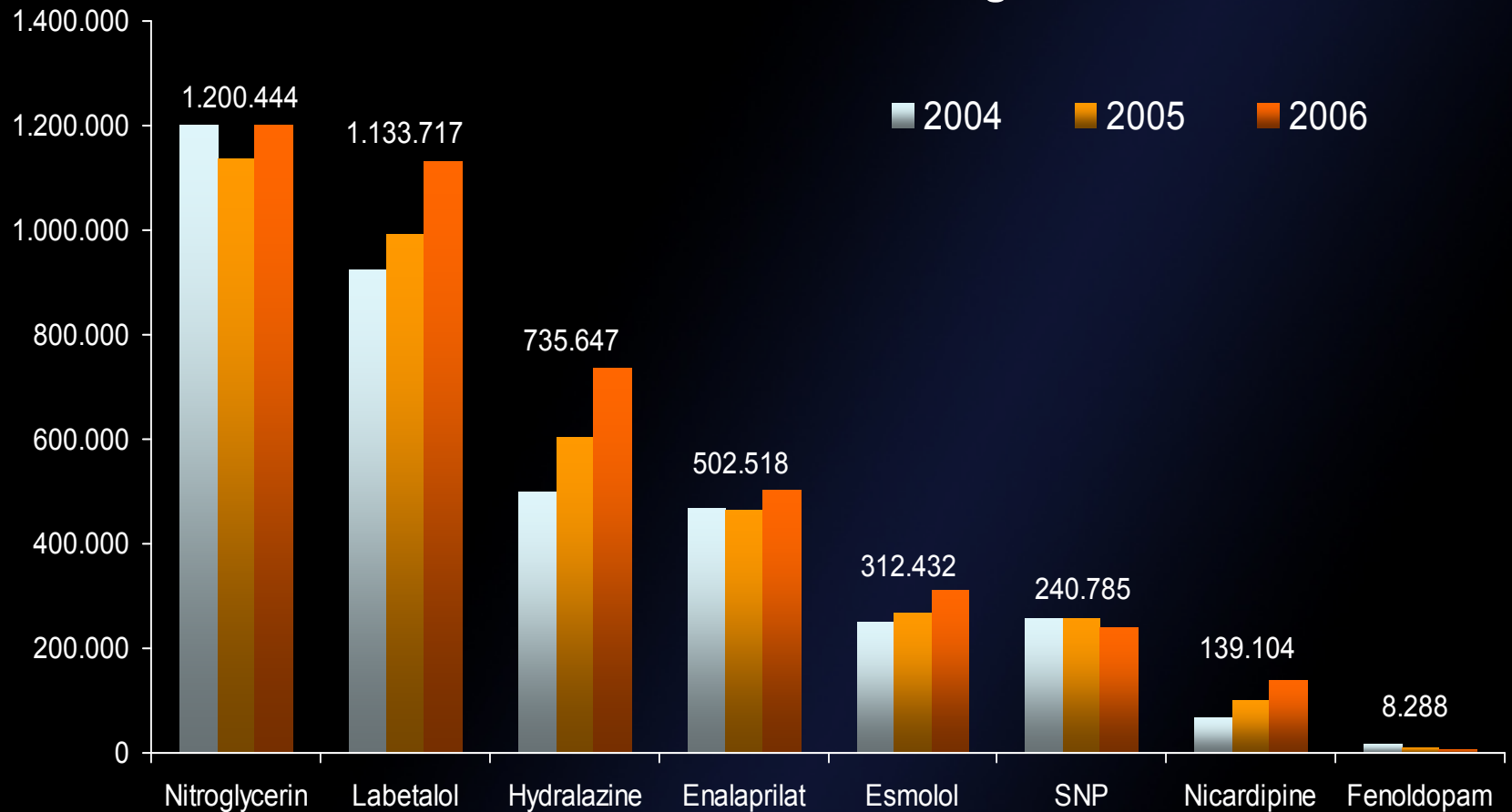
Is the most widely used drug

- At lower doses, works primarily by ↓ preload
  - Reduces CVP, PCWP
- At higher doses, works primarily by ↓ afterload
  - Some reduction in SVR, further reduction PCWP
  - Increase HR
- Administered as continuous infusion; onset of action 2-5 min; duration of action 5-10 min
- Drug of choice when perioperative HBP is associated with:
  - Angina patients: improved coronary blood flow
  - Pulmonary edema/heart failure: ↓ preload



# Antihypertensive Utilization Trends

All Patients Treated with Drug





# POST SURGERY

- As the patient emerges from surgery, **anticholinesterase or anticholinergic** agents are frequently given to reverse the neuromuscular blockade used during anesthesia. Postanesthesia blood pressure elevation is frequently caused by **sympathetic activation** due to patient **anxiety and pain** upon awakening, along with withdrawal from continuous infusion of narcotics. **Intravenous agents** of any class can be used during the immediate postoperative period; however agents with slightly longer duration of action may be preferable



# hypotension

- Profound decrease of BP to  $<50\%$  of pre op or  $> 33\%$  for 10 minutes is associated with adverse effects possible through baroreflex tachycardia
- BP 70-100% pre-op avoiding tachycardia



*“Doctors pour drugs of which they know little  
for disorders of which they know less into  
patients of which they know nothing”*

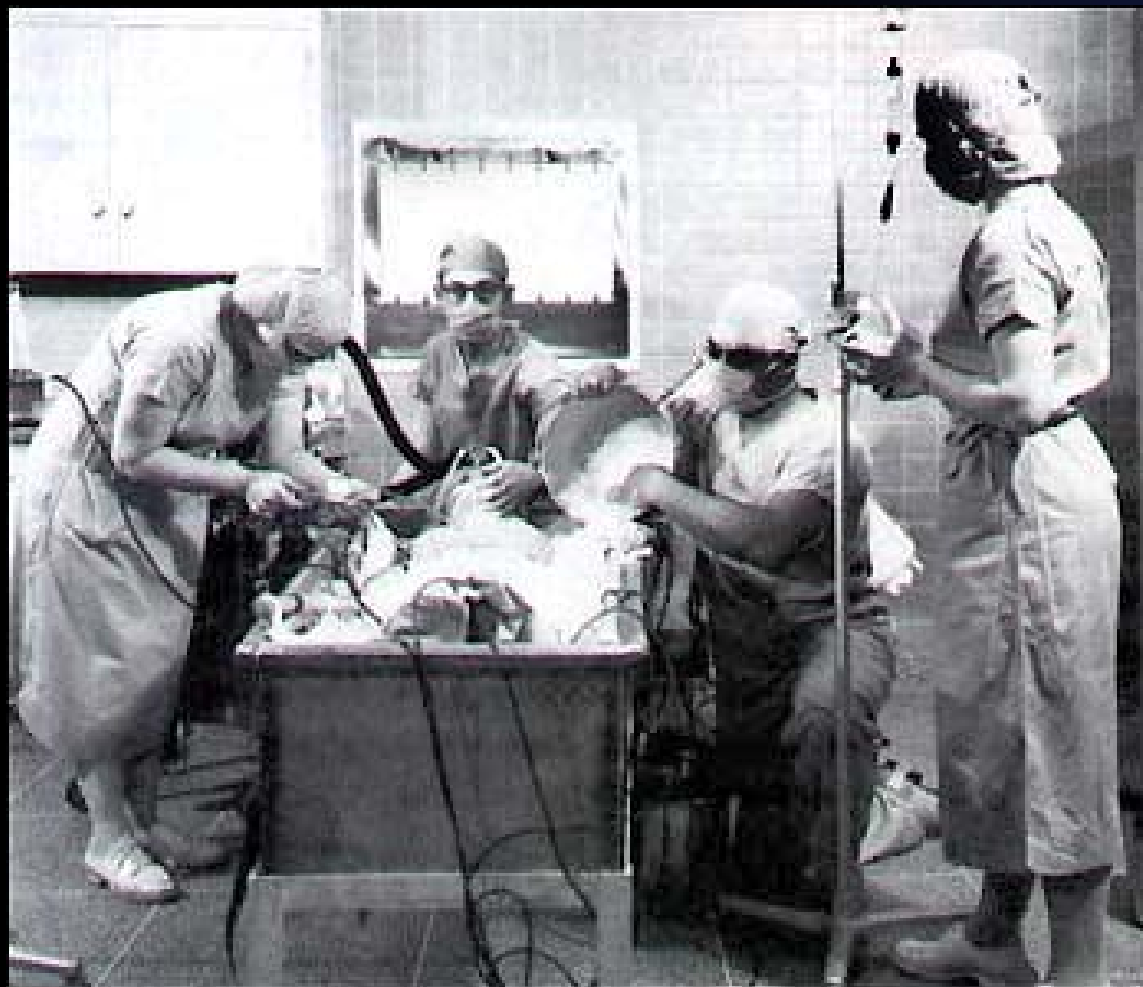
Voltaire







Ảnh: Dương Thanh Phong





Thank you for your attention