PERIOPERATIVE MANAGEMENT OF THE HYPERTENSIVE



ΣΠΥΡΙΔΩΝ ΜΑΡΑΓΚΟΥΔΑΚΗΣ ΕΠΙΜΕΛΗΤΗΣ Β ΚΑΡΔΙΟΛΟΓΙΚΗΣ ΚΛΙΝΙΚΗΣ ΠΑΓΝΗ



MAGNITUDE OF THE PROBLEM

- According to ESC 5.7 million procedures annually are performed in European patients who present with increased risk of cardiovascular complications.
- □ Overall complication rate of 7–11% and a mortality rate of 0.8–1.5%
- In Europe, it is estimated that the number of patients undergoing surgery will increase by 25% by 2020. Over the same time period, the elderly population will increase by 50%.



ESC GUIDELINES 2014

Recommendations on arterial hypertension

Recommendations	Class ^a	Level ^b	Ref. ^c
It is recommended that patients with a new diagnosis of hypertension pre- operatively be screened for end-organ damage and cardiovascular risk factors.	-	c	
Large peri-operative fluctuations in blood pressure in hypertensive patients should be avoided.	lla	в	187
Clinicians may consider <i>not</i> deferring non-cardiac surgery in patients with grade 1 or 2 hypertension (systolic blood pressure <180 mm Hg; diastolic blood pressure <110 mm Hg).	ПР	в	182

^aClass of recommendation.

^bLevel of evidence.

^cReference(s) supporting recommendations.



BP DURING ANASTHESIA

- During the induction of anaesthesia,sympathetic activation can cause an increase in blood pressure of 20-30 mm Hg and heart rate increase of 15-20 bpm in normotensive individuals.
- ❑ As the period of anaesthesia progresses, patients with pre-existing HTN are more likely to experience intraoperative blood pressure lability, which may lead to myocardial ischaemia.

ESH 2010





HYPERTENSION PREOPERATIVE EVALUATION

Patients with well controlled BP are less likely to experience intraoperative BP lability and postoperative complications.

The ideal is to normalize BP several months before an elective surgery



European Society of Hypertension Scientific Newsletter: Update on Hypertension Management

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PERIOPERATIVE SCREENING AND MANAGEMENT OF HYPERTENSIVE PATIENTS

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Numerous studies have shown that stage I and II hypertension is not an independent risk factor for cardiovascular complications

Do not delay

Category	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120-129	and/or	80-84
High normal	130–139	and/or	85-89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	160–179	and/or	100–109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	and	<90



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



Intermediate

Mild angina pectoris (Canadian Class I or III) Previous MI by history or pathological Q waves Compensated or prior heart failure Diabetes mellitus (particularly insulin-dependent) Renal insufficiency

Minor

Advanced age

Abnormal ECG (left ventricular hypertrophy, left bundle-branch block, ST-T abnormalities)

Rhythm other than sinus (e.g., atrial fibrillation)

Low functional capacity (e.g., inability to climb one flight or stairs with a bag of groceries)

History of stroke

Uncontrolled systemic hypertension

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

COMORBIDITIES AND CARDIAC RISK

HYPERTENSION	IS	NOT	3
INCLUDED			5

Iow cardiac risk can be operated on safely without further delay.

Та	ble 1. Revis	ed Cardiac Risk Index
Le	e Variables	
1	High-risk typ	e of surgery
2	Ischemic he of myocard current con secondary electrocard	art disease (includes any of the following: history dial infarction; history of positive exercise test; mplaint of chest pain that is considered to be to myocardial ischemia; use of nitrate therapy; diography with pathologic Q waves)
3	Congestive I	neart failure
4	History of ce	erebrovascular disease
5	Preoperative	treatment with insulin
6	Preoperative	e serum creatinine > 2.0 mg/dL
No Va	o. of riables	Risk of Major Postoperative Cardiac Complication
0		0.4%
1		0.9%
2		7.0%
23	3	11.0% High risk

Adapted from reference 19.

RISK FOR CARDIAC EVENTS



1. TYPE OF SURGERY

- HIGH RISK
- INTERMEDIATE RISK
- LOW RISK

2. SETTING OF SURGERY

- EMERGENT
- URGENT
- ELECTIVE
- 3. CO MORBIDITIES

ESC GUIDELINES 2014

SURGICAL RISK

Table 3Surgical risk estimate according to type of surgery or intervention^{a,b}

Low-risk: < 1%	Intermediate-risk: 1–5%	High-risk: > 5%
 Superficial surgery Breast Dental Endocrine: thyroid Eye Reconstructive Carotid asymptomatic (CEA or CAS) Gynaecology: minor Orthopaedic: minor (meniscectomy) 	 Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy Carotid symptomatic (CEA or CAS) Peripheral arterial angioplasty Endovascular aneurysm repair Head and neck surgery Neurological or orthopaedic: major (hip and spine surgery) Urological or gynaecological: major 	 Aortic and major vascular surgery Open lower limb revascularization or amputation or thromboembolectomy Duodeno-pancreatic surgery Liver resection, bile duct surgery Oesophagectomy Repair of perforated bowel Adrenal resection Total cystectomy
of the prostate)	 Intra-thoracic: non-major 	 Pulmonary or liver transplant

HOW URGENT IS AN OPERATION?

In emergent procedures : major trauma, ruptured aneurysms: cardiac evaluation will not influence the course and the timing of the intervention

□ In urgent procedures : bowel obstruction: cardiac evaluation may influence the perioperative measures taken to reduce the cardiac risk and the type of operation guiding to less invasive treatment <u>but</u> will not influence the decision of performing the intervention.

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PREOPERATIVE EVALUATION OF THE HYPERTENSIVE PATIENT

□ Family history

Clinical examination

LAB exams

 Table 4
 Clinical risk factors according to the revised

 cardiac risk index⁴³

 Ischaemic heart disease (angina pectoris and/or previous myocardial infarction^a)

• Heart failure

Stroke or transient ischaemic attack

 Renal dysfunction (serum creatinine >170 µmol/L or 2 mg/dL or a creatinine clearance of <60 mL/min/1.73 m²)

· Diabetes mellitus requiring insulin therapy

^aAccording to the universal definition of myocardial infarction.⁴⁹

ESH/ESC GUIDELINES 2013

- Should be part of all routine assessment of subjects with high BP in order to detect LVH, patterns of "strain", ischaemia and arrhythmias
- Presence of Q waves or significant ST segment elevation or depression have been associated with increased incidence of perioperative cardiac complications



PREOPERATIVE ECHO

Recommendations on resting echocardiography in asymptomatic patients without signs of cardiac disease or electrocardiographic abnormalities

Recommendations	Class ^a	Level ^b
Rest echocardiography may be considered in patients undergoing high-risk surgery.	ПЬ	с
Routine echocardiography is not recommended in patients undergoing intermediate- or low- risk surgery.	in.	C

PREOPERATIVE EVALUATION OF THE HYPERTENSIVE PATIENT

Assessment of Functional Capacity

4 METs

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

Walk indoors around the house?

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

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

4 METs

1 MET

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

Run a short distance?

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

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

Participate in strenuous sports like swimming,
 Greater than ingles tennis, football, basketball or skiing?
 METS



PREOPERATIVE STRESS ECHO

Recommendations on imaging stress testing before surgery in asymptomatic patients

Recommendations	Class ^a	Level ^b
Imaging stress testing is recommended before high-risk surgery in patients with more than two clinical risk factors and poor functional capacity (<4 METs). ^c	I	c
Imaging stress testing may be considered before high- or intermediate-risk surgery in patients with one or two clinical risk factors and poor functional capacity (<4 METs). ^c	ПР	e
Imaging stress testing is not recommended before low-risk surgery, regardless of the patient's clinical risk.	ш	U

STRESS ECHO

In general, stress echocardiography has a high negative predictive value and a negative test is associated with a very low incidence of cardiac events in patients undergoing surgery

the positive predictive value is relatively low (25%-45%) the postsurgical probability of a cardiac event is low, despite wall motion abnormality detection during stress echocardiography.

ESC GUIDELINES 2014



B-BLOCKERS

□ As a continuation of existing antihypertensive therapy

- Patients treated with β blockers long term should not have them withdrawn before any surgery (cardiovascular and non cardiac
- As a prophylactic treatment to reduce perioperative complications
 - Initiation of beta blockers may be considered in patients scheduled for high-risk surgery and who have 2 clinical risk factors
- As treatment for hypertension in the perioperative period
 - Esmolol for acute BP control
 - Metoprolol, atenolol and labetalol for longer duration of the effect



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

bronchospasm, bradycardia, heart block, delayed hypotension

Rynn KO et al. J Pharm Pract. 2005;18:363 376

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



ESC GUIDELNES 2014

Recommendations on beta-blockers

Recommendations	Class ^a	Level ^b	Ref. ^c
Peri-operative continuation of beta- blockers is recommended in patients currently receiving this medication.	I	в	96–99
Pre-operative initiation of beta- blockers may be considered in patients scheduled for high-risk surgery and who have ≥2 clinical risk factors or ASA status ≥3. ^d	ПЬ	в	86,95, 97
Pre-operative initiation of beta- blockers may be considered in patients who have known IHD or myocardial ischaemia. ^d	ПЬ	в	83,88, 106
When oral beta-blockade is initiated in patients who undergo non-cardiac surgery, the use of atenolol or bisoprolol as a first choice may be considered.	нь	в	97,100 -102
Initiation of peri-operative high- dose beta-blockers without titration is not recommended.	- 111	в	78
Pre-operative initiation of beta- blockers is not recommended in patients scheduled for low-risk surgery.	m	в	86,97



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When β 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



□ META□ANALYSIS 11 STUDIES 1007 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



DIURETICS

Special attention must be paid to the potassium level in patients on diuretics.

Hypokalemia may cause arrhythmias and potentiate the effects of depolarizing and nondepolarizing muscle relaxants

□ 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.

CLONIDINE

□ Has a favorable sympatholytic effect: Alpha2 receptor agonists reduce post-ganglionic noradrenaline output

Has a biphasic response (at lower doses central vasodilatory effect, at higher dose peripheral vasoconstrictive effect)

□ It is only partially effective for the rapid BP control in the perioperative period

□ Can contribute to analgesia and sedation

CLONIDINE



Table 2. Effects of Clonidine on the Outcomes at 30 Days.*				
Outcome	Clonidine (N = 5009)	Placebo (N = 5001)	Hazard Ratio (95% CI)	P Value
Primary outcome: death or nonfatal myocardial infarction 	367 (7.3)	339 (6.8)	1.08 (0.93-1.26)	0.29
Secondary outcome: death, nonfatal myocardial infarction, or nonfatal stroke — no. (%)	380 (7.6)	352 (7.0)	1.08 (0.93-1.25)	0.30
Tertiary outcomes — no. (%)				
Death	64 (1.3)	63 (1.3)	1.01 (0.72-1.44)	0.94
Death from vascular causes	38 (0.8)	32 (0.6)	1.19 (0.74-1.90)	0.48
Myocardial infarction	329 (6.6)	295 (5.9)	1.11 (0.95-1.30)	0.18
Nonfatal cardiac arrest	16 (0.3)	5 (0.1)	3.20 (1.17-8.73)	0.02
Cardiac revascularization	19 (0.4)	11 (0.2)	1.73 (0.82-3.63)	0.15
Pulmonary embolism	32 (0.6)	32 (0.6)	1.00 (0.61-1.63)	0.99
Deep-vein thrombosis	37 (0.7)	23 (0.5)	1.61 (0.96-2.71)	0.07
New, clinically important atrial fibrillation	107 (2.1)	96 (1.9)	1.11 (0.84-1.47)	0.45
Peripheral arterial thrombosis	14 (0.3)	14 (0.3)	1.00 (0.48-2.09)	1.00
Amputation	12 (0.2)	11 (0.2)	1.09 (0.48-2.47)	0.84
Rehospitalization for vascular reasons	66 (1.3)	58 (1.2)	1.14 (0.80-1.62)	0.48
Acute kidney injury with receipt of dialysis†	29 (0.6)	23 (0.5)	1.26 (0.73-2.18)	0.41
Safety outcomes — no. (%)				
Stroke	18 (0.4)	17 (0.3)	1.06 (0.54-2.05)	0.87
Clinically important hypotension	2385 (47.6)	1854 (37.1)	1.32 (1.24-1.40)	<0.001
Clinically important bradycardia	600 (12.0)	403 (8.1)	1.49 (1.32-1.69)	<0.001
Congestive heart failure	48 (1.0)	34 (0.7)	1.41 (0.91-2.19)	0.12
Infection	478 (9.6)	505 (10.1)	0.94 (0.83-1.07)	0.34
Sepsis	233 (4.7)	268 (5.4)	0.86 (0.72-1.03)	0.10

N Engl J Med 2014;370:1504-13

ACE INHIBITORS - ARBS

There is much debate in the literature over the use of ACE-Is or ARBs 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, particularly when discontinued less than 10 hours before surgery

ESH NEWSLATER 2010.



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□ 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.



European Heart Journal (2014) 35, 2383–2431 ESC/ESA GUIDELINES doi:10.1093/eurheartj/ehu282



2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management

Although this remains debatable, ACEIs withdrawal should be considered 24 hours before surgery when they are prescribed for hypertension

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



European Heart Journal (2014) 35, 2383–2431 ESC/ESA GUIDELINES doi:10.1093/eurheartj/ehu282



2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management

Recommendations on use of ACEIs and ARBs

Recommendations	Class ^a	Level ^b
Continuation of ACEIs or ARBs, under close monitoring, should be considered during non-cardiac surgery in stable patients with heart failure and LV systolic dysfunction.	lla	с
Initiation of ACEIs or ARBs should be considered at least I week before surgery in cardiac-stable patients with heart failure and LV systolic dysfunction.	lla	с
Transient discontinuation of ACEIs or ARBs before non-cardiac surgery in hypertensive patients should be considered.	lla	с

HYDRALAZINE

- Hydralazine is a direct-acting arteriolar vasodilator, often chosen as a first-line agent for critically ill patients.
- The onset of action after either IM or IV administration is approximately 5 to 15 minutes followed by a progressive and often precipitous fall in BP that can last up to 12 hours
- Avoid in ISCHEMIA because of reflexible tachycardia (unless already in B BLOCKERS)

Vasc Health Risk Manag. 2008 Jun; 4(3): 615–627

AN ALLY IN DIFFICULT CASES

Na Nitroprusside

- Sodium nitroprusside is an arterial and venous vasodilator that decreases both afterload and preload.
- it has an immediate onset of action and duration of effect of only 2 minutes.
- Nitroprusside decreases cerebral blood flow while increasing intracranial pressure (ICP), effects that are particularly detrimental in patients with hypertensive encephalopathy or following a cerebrovascular accident

Vasc Health Risk Manag. 2008 Jun; 4(3): 615–627

NITROGLYCERINE

- Is the most widely used drug
- lacksquare At lower doses, works primarily by \downarrow preload
- □ Reduces CVP, PCWP
- lacksquare At higher doses, works primarily by \downarrow 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

POST-OPERATION PERIOD

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

If remains without treatment increased risk of ischemia ,MI, Stroke

Intraoperative Blood Pressure

What Patterns Identify Patients at Risk for Postoperative Complications?



ESC Guidelines for preoperative cardiac risk assessment and peroperative cardiac management in non-cardiac surgery

- Hypotension—especially when associated with baroreflex-mediated tachycardia—may be equally detrimental.
- A decrease in blood pressure of >20 mm Hg for >1 hour was found to be a risk factor for complications.
- □ It is recommended that perioperative blood pressure be kept at 70–100% of baseline, avoiding excessive tachycardia.



CONCLUSION

- □ Hypertension is a common preoperative abnormality and a common cause of posponement of an operation
- Preoperative evaluation is an opportunity to control BP
- □ The extent of diagnostic approach depends on
 - Urgency of surgery
 - presence of active condition
 - functional capacity of a patient
- Patients on chronic antihypertensive treatment should take their medication until the time of surgery



"Doctors are men who prescribe medicines of which they know little, to cure diseases of which they know less, in human beings of whom they know nothing."



Voltaire 1694 - 1778

