

ACUUT CORONAIR SYNDROOM

PETER VAN DE BRUAENE

4/11/2014



Cardiologie= opwindend



Cardiologie= uitdagend



Acuut coronair syndroom



DEFINITIE

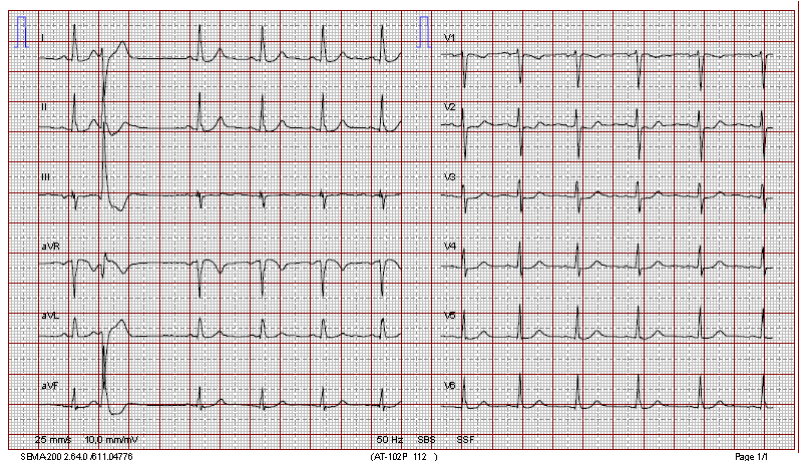
- Evolutieve toestand op coronair vlak, te wijten aan coronaire trombose, stolselvorming
- Angorklachten
 - In rust, eventueel langer dan 20 minuten durend
 - Evolutieve angorklachten, frequenter opkomend, langer durend, bij mindere inspanning
 - De novo angorklachten

case

- Vrouw , 61 jaar
- VG heekunde voor borstCA
- Internistisch blanco
- CRF: AHT, Hypercholesterolemie
- Medicatie : sectral 400 mg 1 /dag , cozaar plus 1 /dag
- geen aspirine

case

- 1/11/2014 : wandelen aan zee, zonder problemen
- Last in de linker arm, toegeschreven aan dragen van tas
- Verergerend, last linker arm, drukking presternaal en linker zijde van borstkas
- Met onwelzijn, zweten en braken



labo

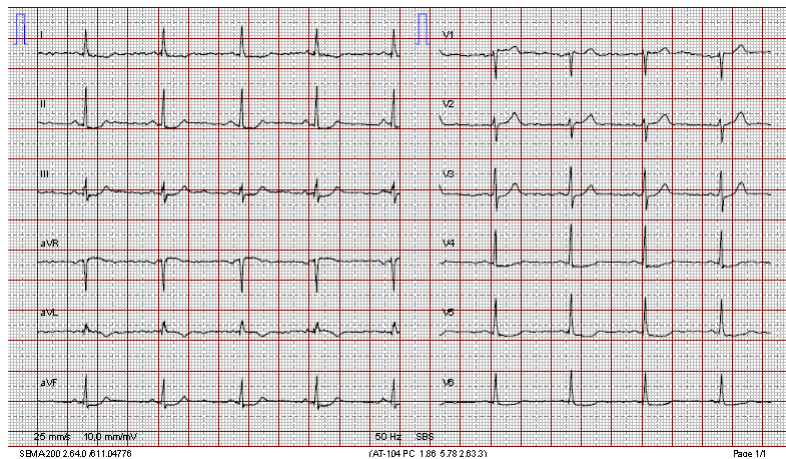
Datum: 01-11-2014			
Rode bloedcellen	4.33 10^6 /mm ³	(4.00-5.20)	
Hematocriet	39 %	(36-44)	
Hemoglobine	13.0 g/dL	(11.7-15.2)	
Witte bloedcellen	(+) $10.4 \cdot 10^3$ /mm ³		(3.9-9.9)
Bloedplaatjes	$228 \cdot 10^3$ /mm ³	(154-327)	
P.T. (Quick)	>100 %	(>70)	
INR	0.9	(<1.1)	
A.P.T.T.	28 sec	(<32)	
D-dimeren	499 ng/mL fib. eq	(<500)	
Glucose	(+) 122 mg/dL	(82-115)	
Ureum	41 mg/dL	(<50)	
Creatinine	(+) 0.98 mg/dL	(0.50-0.90)	
Glom.Filtr.Ratio (MDRD2)	(-) 58 ml/min.	(>60)	
Urinezuur	6.9 mg/dL	(<8.4)	
CRP	(+) 16.4 mg/L	(<5.0)	
Bilirubine Totaal	0.7 mg/dL	(<1.1)	
Bilirubine Direct	(+) 0.24 mg/dL	(<0.20)	
Bilirubine Indirect	0.43 mg/dL	(0.20-0.80)	
SGOT	19 U/L	(<32)	
SGPT	18 U/L	(<34)	
CPK	77 U/L	(<167)	
Troponine T (POCT)	<0.010 ng/mL	(<0.030)	
LDH	354 U/L	(<480)	
Alkalische Fosfatase	84 U/L	(35-104)	
Gamma GT	25 U/L	(5-36)	
Amylase	(-) 28 U/L	(28-100)	
Lipase	30 U/L	(13-60)	

verder

- Dringende transfert voor coronaro
- drietakslijden : gave hoofdstam. LAD in zijn middenste deel 70-90 %, op de circumflex 1e marginaal tak 70-90 %, posterolateraal tak 99 %. RAC 70 %. Primaire PCI met drugeluting stent op posterolateraal en 1e marginaal tak. Mooi resultaat. (PCI van LAD en RAC is voorzien op de 4 december).

labo

• Datum: 01-11-2014			
• Troponine T (POCT)	(+) 0.380 ng/mL		(<0.030)
• Labo Nieuw: Aanvraag A201411A0384			
• Datum: 01-11-2014			
• Totale cholesterol	180 mg/dL		(<190)
• HDL-Cholesterol	56 mg/dL		(>45)
• Risico factor	3.2		
• Triglyceriden	63 mg/dL		(<150)
• LDL-Cholesterol	112 mg/dL		(<115)
• SGOT	31 U/L		(<32)
• SGPT	19 U/L		(<34)
• CPK	(+) 204 U/L		(<167)
• CKMB(massa)	(+) 19.3 ng/mL		(<3.8)
• Labo Nieuw: Aanvraag A201411A0404			
• Datum: 02-11-2014			
• Troponine T (POCT)	(+) 1.400 ng/mL		(<0.030)
• Labo Nieuw: Aanvraag A201411A0494			
• Datum: 02-11-2014			
• Troponine T (POCT)	(+) 0.880 ng/mL		(<0.030)



therapie

- Asaflow 80 mg 1 per dag
- Brilique 90 mg 2 per dag
- Emconcor 5 mg 0,5 co per dag
- Lipitor 80 mg 1 per dag
- Losartan plus 50/12,56 mg 1 per dag

Wees dus waakzaam

INDELING

- STEMI: infarct, op EKG: ST - elevatie
- NSTEMI: infarct, op EKG: geen ST-elevatie
 - ST-T veranderingen
 - Zonder ST-T veranderingen
- INSTABIELE ANGOR
 - Geen myocardnecrose
 - Met of zonder ST-T veranderingen

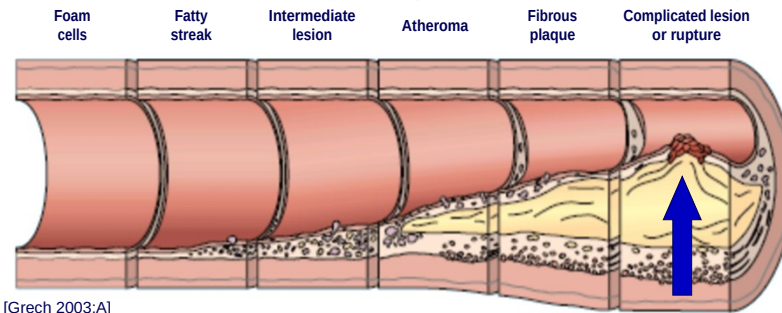
FREQUENTIE EN ERNST

- The lifetime risk of developing CHD after 40 years of age is 49% for men and 32% for women [Lloyd-Jones 2010:B]
- **Cardiovascular disease is the biggest killer** in Belgium causing ~35k deaths per year [WHO mortality report 2004]
- Each year in Belgium, **~19 000 patients are hit by an ACS event** which is a well defined subset of CV disease [hospital database 2009]

PATHOFYSIOLOGIE

- Atherosclerotische plaque
 - Ruptuur van plaque of erosie met vrijstelling van trombogene materiaal of erosie van de plaque (mechanisch)
 - Wisselende intravasculaire trombusvorming/trombolysen – distale embolisatie met myocardschade en trop-stijging
 - Endotheliale dysfunctie en coronair vasospasme
 - Hypoperfusie en schade aan myocard

Atherosclerosis: from plaque to ACS



[Grech 2003:A]

•Progression of coronary atherosclerosis results in plaque, which ruptures, causing arterial thrombus that partially or completely occludes the artery, leading to the clinical manifestations of ACS [Grech 2003:B]

Atherosclerosis to ischemia



- Cardiovascular risk factors can initiate and contribute to the atherosclerotic process [Kumar 2009:A]
- Atherosclerosis is the lifelong process of arterial plaque formation involving inflammation [Kumar 2009:B,C]
- Thrombi form at the sites of ruptured or denuded plaque [Kumar 2009:D]
- ACS refers to a group of clinical symptoms and signs resulting from myocardial ischemia [Kumar 2009:E]

DIAGNOSE: kliniek: ERAAN DENKEN!!

- Kliniek van evolutieve angor/rustangor/decubitus angor
- Cave atypische presentatie
 - Epigastrische pijn, interscapulaire pijn
 - zwaarte, indigestie
 - Dyspnee (angorequivalent)

Speciaal : ouderen

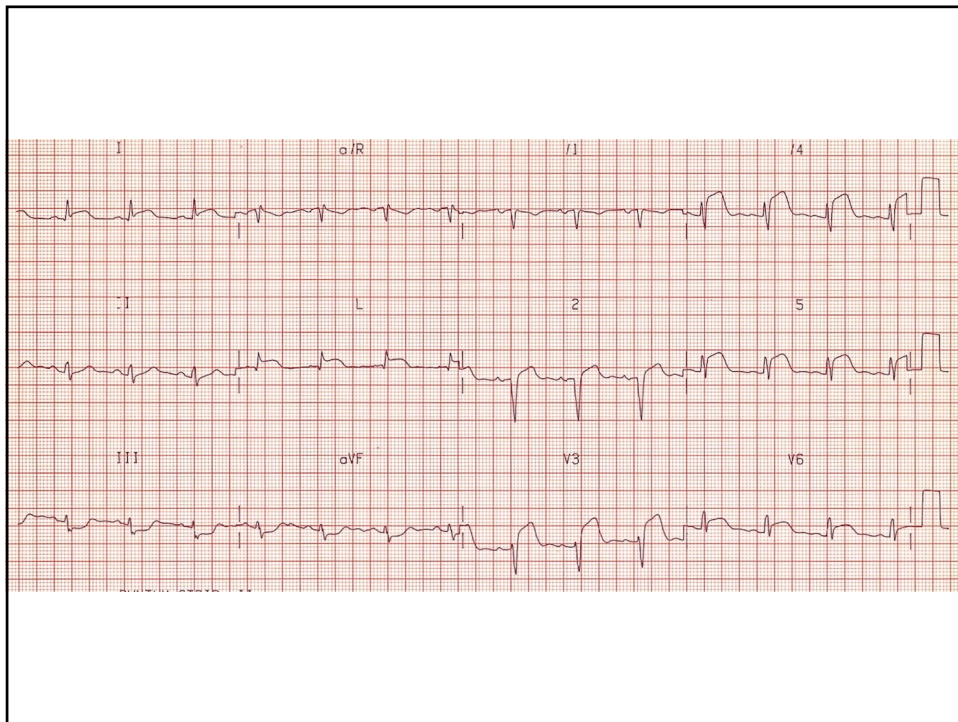
- Voorkomen:
 - 60-65% van MI bij >65j
 - 80% van MI doden bij > 65 jaar
- Meer NSTEMI
- Meer atypische presentatie
- Hogere in-hospital mortaliteit
- Meer hartfalen
- Toch: zelfde therapie, maar rekening houden met
 - Algemene toestand, comorbiditeit, cognitieve status, levensverwachting
 - Pharmacokinetiek, nierfunctie
 - Voldoende monitoring

Speciaal: vrouwen

- Minder typische klachten
- Ouder
- Grotere delay tot presentatie
- Hoger risico op bloeding

DIAGNOSE EKG: STEMI

- ST-elevatie in minstens 2 aanpalende afleidingen (≥ 2 mm in V1-3 of ≥ 1 mm elders : STEMI)
- Minder typisch
 - Nieuw VLBTB
 - Ventriculaire pacing
 - ST stijging in aVR en depressie precordiaal (hoofdstam equivalent)
 - Posterior infarct: precordiale ST depressie (CX)
 - RV infarct : ST elevatie V3R, V4R
 - Persisterende klachten en ST depressie



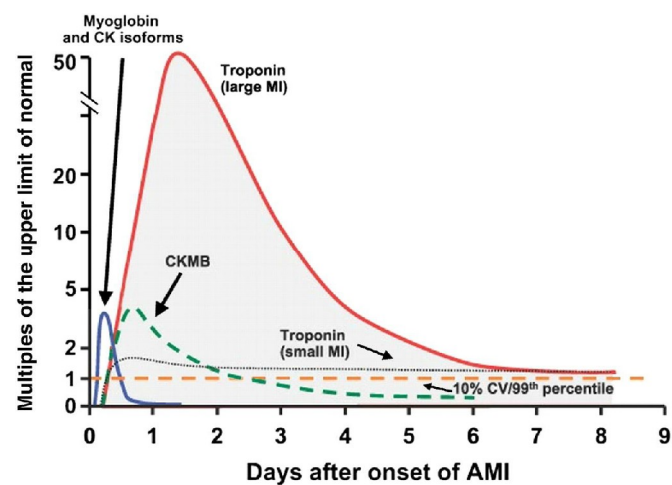
BEHANDELING: STEMI

- Snelle diagnose
 - Kliniek
 - EKG
 - Troponine (cave latentie)

labo

	BEGIN	MAXIMUM	EINDE
SGOT	8 uur	18-36 uur	Dag 3-4
CK-MB	4-12 uur	24 uur	Dag 2-3
LDH	10-12 uur	24-48 uur	Dag 10-14
Myoglobine	1-4 uur	6-8 uur	Dag 5-10
Troponine	3-12 uur	24 uur	Dag 5-15

labo



Oorzaken van gestegen troponine

Causes of elevated troponin

Acute coronary syndrome	Myocardial ischemia		Myocardial injury with no ischemia		
	Other coronary ischemia	Non-coronary ischemia	Comorbidities	Specific identifiable precipitants	Other
STEMI	Arrhythmia: tachy- or brady-	Shock (hypotension)	Renal failure	Extreme exertion	Apical ballooning (Takotsubo)
NSTEMI	Cocaine/methamphetamine use	Hypoxia	Sepsis	Cardiac contusion	Myocarditis
	Coronary intervention (PCI or cardiothoracic surgery)	Hypoperfusion	Infiltrative diseases	Burns >30% BSA	Myopericarditis
	Coronary artery spasm (variant angina)			Cardiotoxic meds: anthracyclines, herceptin	Rhabdomyolysis involving cardiac muscle
	Stable coronary atherosclerotic disease in setting of increased O ₂ demand (eg, tachycardia)	Pulmonary embolism	Acute respiratory failure	Electrical shock	Hypertrophic cardiomyopathy
	Severe hypertension	Global ischemia	Stroke	Carbon monoxide exposure	Peripartum cardiomyopathy
	Coronary embolus	CT surgery	Subarachnoid hemorrhage		Heart failure, malignancy, stress cardiomyopathy
	Aortic dissection				
	Coronary artery vasculitis (SLE, Kawasaki's)				

BSA: burn surface area; CT: computed tomography; NSTEMI: non-ST elevation myocardial infarction; PCI: percutaneous coronary intervention; SLE: Systemic lupus erythematosus; STEMI: ST elevation myocardial infarction.

Copyrights apply

UpToDate®

BEHANDELING: STEMI

- Initieel
 - Continu monitoring
 - Zuurstof: als saturatie minder dan 90%, als respiratoire distress, als andere risicofactoren voor hypoxie
 - IV acces

BEHANDELING: STEMI

- Reperfusiestrategie bepalen aan de hand van een aantal factoren
 - Acute triage
 - CPR condities
 - Cardiogene shock
 - LV falen
 - Ventriculaire aritmieën
 - High risk condities
 - Hoge leeftijd
 - Lage BD, tachycardie
 - Hartfalen
 - Anterior infarct

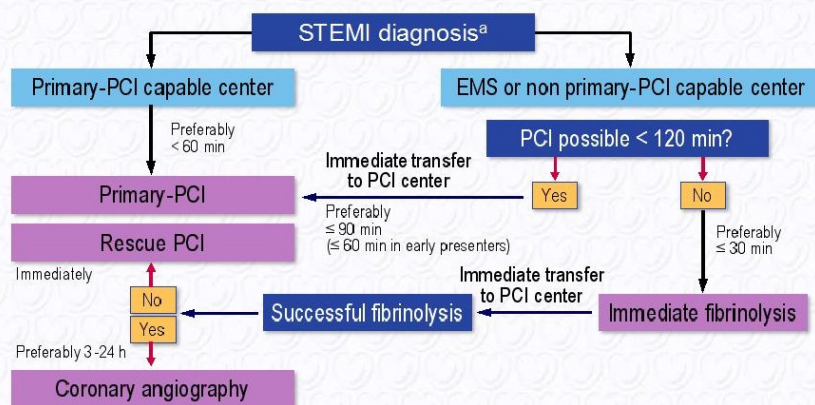
BEHANDELING: STEMI: reperfusie

- PCI primair
 - Betere overleving
 - Lagere frequentie van intracraniële bloeding, recidief MI
 - Dus: primaire PCI op voorwaarde dat men een PCI kan doen binnen 90 minuten als PCI center of 120 minuten als nog secundair transport nodig is
 - Als presentatie 12-24 u na begin van symptomen: PCI is zinvol bij
 - Hartfalen
 - Hemodynamische of elektrische instabiliteit
 - Persistente ischemische symptomen

BEHANDELING: STEMI: reperfusie

- Fibrinolyse
 - Als presentatie binnen 2 u na begin van symptomen (full lytic dose)
 - Als presentatie > 2-3 u: best PCI, tenzij niet mogelijk binnen de 120 minuten – fibrinolyse kan zin hebben tot 12 na start van symptomen
- Toedienen binnen de 30 minuten
- Geen effect als presentatie later dan 12 u; enkel te overwegen als nog ischemische, op en afgaande pijn
- Gefaciliteerde PCI (eerst lysis en dan PCI): NIET aangeraden
- Rescue PCI is wel nuttig

Prehospital and in-hospital management, and reperfusion strategies within 24 h of FMC



^a The time point the diagnosis is confirmed with patient history and ECG ideally within 10 min from the first medical contact (FMC). All delays are related to FMC (first medical contact).

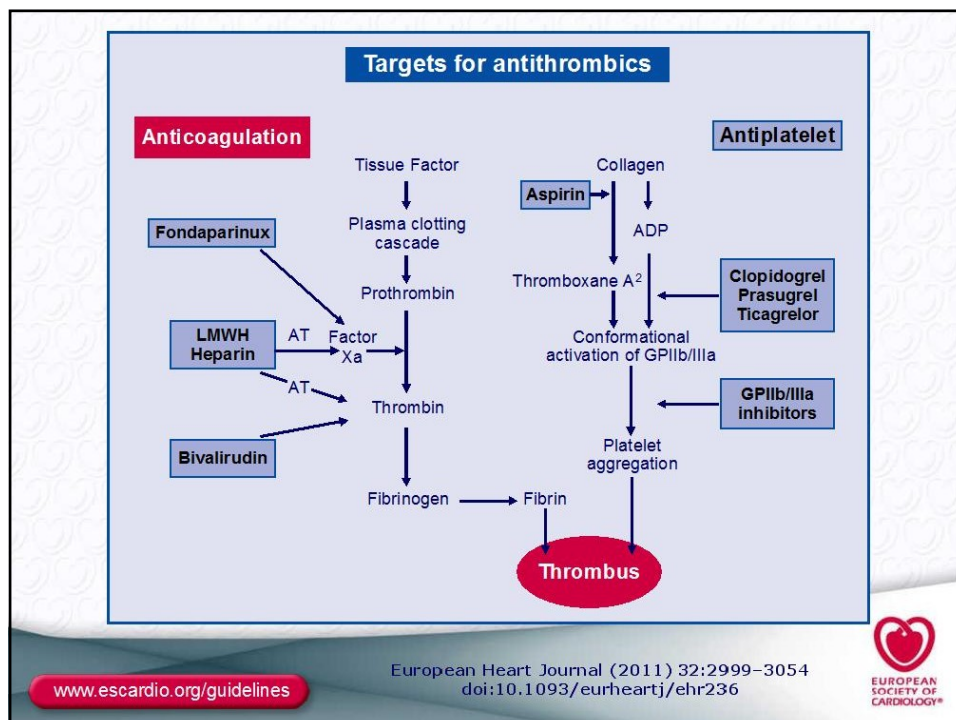
Cath = catheterization laboratory; EMS = emergency medical system; FMC = first medical contact; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines



Medicatie bij STEMI



BEHANDELING: STEMI: medicatie

- Antiplatelet:
 - Aspirine
 - P2Y12 receptor blokker
 - Clopidogrel, Ticagrilor, Prasugrel
- Anticoagulatie
 - Afhankelijk van reperfusie strategie
- Nitraten
 - SL nitraten
 - IV nitraten enkel als persisterende pijn, als AHT, als hartfalen
 - Cave als hypotensie, RV infarct, als Phosphodiesterase inhibitoren in de voorbije 24 uur
- Morfine
 - IV morfine 2-4 mg per 2 mg met 5-15 minuten interval
 - Alleen als onacceptabele pijn
 - Cave mogelijk interactie met de P2Y12 receptor blokkers

BEHANDELING: STEMI: medicatie

- Betablokkers
 - Indicatie
 - Tenzij contraindicaties (hartfalen, low output, cardiogene shock, bradycardie, hart blok, reactieve luchtweg ziekte..)
- Statines
 - Zo vlug als mogelijk
 - Studie met atorvastatine 80 mg (geen graduele therapie)
 - LDL bepalen bij opname, mag nog tot 4 dagen na opname)
 - Herevaluatie van de LDL pas na 2 maand (cave vals laag)

BEHANDELING: STEMI: medicatie

- Antiarritmica
 - Symptomatische therapie
 - Profylactisch BB
 - Lidocaïne : NIET
- NSAID
 - Stoppen wegens verhoogd risico op CV events
- Kalium en magnesium
 - Kalium > 4 meq/L
 - Magnesium >2,4 mg/dl

Classes of recommendations

Classes of recommendations	Definition	Suggested wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/ is indicated.
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
<i>Class IIa</i>	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>	<i>Should be considered.</i>
<i>Class IIb</i>	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>	<i>May be considered.</i>
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines



Levels of evidence

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215



Periprocedural anti thrombotic medication in primary PCI

Recommendations	Class	Level
Antiplatelet therapy		
Aspirin oral or i.v. (if unable to swallow) is recommended	I	B
An ADP-receptor blocker is recommended in addition to aspirin. Options are:	I	A
• Prasugrel in clopidogrel-naïve patients, if no history of prior stroke/TIA, age < 75 years.	I	B
• Ticagrelor.	I	B
• Clopidogrel, preferably when prasugrel or ticagrelor are either not available or contraindicated.	I	C

ADP = adenosine diphosphate.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215



Periprocedural anti thrombotic medication in primary PCI, *con't*

Recommendations	Class	Level
GP IIb/IIIa inhibitors should be considered for bailout therapy if there is angiographic evidence of massive thrombus, slow or no-reflow or a thrombotic complication.	IIa	C
Routine use of a GP IIb/IIIa inhibitor as an adjunct to primary PCI performed with unfractionated heparin may be considered in patients without contraindications.	IIb	B
Upstream use of a GP IIb/IIIa inhibitor (vs. in-lab use) may be considered in high-risk patients undergoing transfer for primary PCI.	IIb	B
Options for GP IIb/IIIa inhibitors are (with LoE for each agent):		
• Abciximab Reopro		A
• Eptifibatide (with double bolus) Integrelin		B
• Tirofiban (with a high bolus dose) Aggrastat		B

GP = glycoprotein; i.v. = intravenous; lab = catheterization laboratory.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines



Periprocedural anti thrombotic medication in primary PCI, *con't*

Recommendations	Class	Level
Anticoagulants		
♥ An injectable anticoagulant must be used in primary PCI.	I	C
Bivalirudin (with use of GP IIb/IIIa blocker restricted to bailout) is recommended over unfractionated heparin and a GP IIb/IIIa blocker.	I	B
Enoxaparin (with or without routine GP IIb/IIIa blocker) may be preferred over unfractionated heparin.	IIb	B
♥ Unfractionated heparin with or without routine GP IIb/IIIa blocker must be used in patients not receiving bivalirudin or enoxaparin.	I	C
Fondaparinux is not recommended for primary PCI.	III	B
The use of fibrinolysis before planned primary PCI is not recommended.	III	A

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

www.escardio.org/guidelines



Doses of anti-platelet co-therapies

Doses of antiplatelet co-therapies

With primary PCI

Aspirin	Loading dose of 150-300 mg orally or of 80-150 mg i.v. if oral ingestion is not possible, followed by a maintenance dose of 75-100 mg/day.
Clopidogrel	Loading dose of 600 mg orally, followed by a maintenance dose of 75 mg/day.
Prasugrel	Loading dose of 60 mg orally, followed by a maintenance dose of 10 mg/day. In patients with body weight <60 kg, a maintenance dose of 5 mg is recommended. In patients > 75 years, prasugrel is generally not recommended, but a dose of 5 mg should be used if treatment is deemed necessary.
Ticagrelor	Loading dose of 180 mg orally, followed by a maintenance dose of 90 mg b.i.d.
Abciximab	Bolus of 0.25 mg/kg i.v. and 0.125 µg/kg/min infusion (maximum 10 µg/min) for 12 h.
Eptifibatide	Double bolus of 180 µg/kg i.v. (given at a 10-min interval) followed by an infusion of 2.0 µg/kg/min for 18 h.
Tirofiban	25 µg/kg over 3 min i.v., followed by a maintenance infusion of 0.15 µg/kg/min for 18 h.

With fibrinolytic therapy

Aspirin	Starting dose 150-500 mg orally or i.v. dose of 250 mg if oral ingestion is not possible.
Clopidogrel	Loading dose of 300 mg orally if aged ≤ 75 years, followed by a maintenance dose of 75 mg/day.

Without reperfusion therapy

Aspirin	Starting dose 150-500 mg orally.
Clopidogrel	75 mg/day orally.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215



Doses of anti-thrombin co-therapies

Doses of antithrombin co-therapies

With primary PCI

Unfractionated heparin	70-100 U/kg i.v. bolus when no GP IIb/IIIa inhibitor is planned. 50-60 U/kg i.v. bolus with GP IIb/IIIa inhibitors.
Enoxaparin	0.5 mg/kg i.v. bolus.
Bivalirudin	0.75 mg/kg i.v. bolus followed by i.v. infusion of 1.75 mg/kg/h for up to 4 h after the procedure as clinically warranted. After cessation of the 1.75 mg/kg/h infusion, a reduced infusion dose of 0.25 mg/kg/h may be continued for 4-12 h as clinically necessary.

With fibrinolytic therapy

Unfractionated heparin	60 U/kg i.v. bolus with a maximum of 4000 U followed by an i.v. infusion of 12 U/kg with a maximum of 1000 U/h for 24-48 h. Target aPTT: 50-70 s or 1.5 to 2.0 times that of control to be monitored at 3, 6, 12 and 24 h.
Enoxaparin	In patients < 75 years of age: 30 mg i.v. bolus followed 15 min later by 1 mg/kg s.c. every 12 h until hospital discharge for a maximum of 8 days. The first two doses should not exceed 100 mg. In patients > 75 years of age: no i.v. bolus; start with first s.c. dose of 0.75 mg/kg with a maximum of 75 mg for the first two s.c. doses. In patients with creatinine clearance of < 30 mL/min, regardless of age, the s.c. doses are given once every 24 h.
Fondaparinux	2.5 mg i.v. bolus followed by a s.c. dose of 2.5 mg once daily up to 8 days or hospital discharge.

Without reperfusion therapy

Unfractionated heparin	Same dose as with fibrinolytic therapy.
Enoxaparin	Same dose as with fibrinolytic therapy.
Fondaparinux	Same dose as with fibrinolytic therapy.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215



Medicatie bij NSTEMI/UA

BEHANDELING: UA / NSTEMI

- Zuurstof
 - Enkel als saturatie minder dan 90%, respiratoire distress
 - Cochrane review: geen significant verschil in mortaliteit
- Nitraten
 - SL nitraten
 - Enkel IV als persisterende pijn na 3 co nitraten, of als hartfalen, AHT
 - Cave bij hypotensie, RV infarct, Aortastenose, als phosphodiësterase inhibitoren

BEHANDELING: UA / NSTEMI

- Morfine
 - Tegen pijn, angst
 - IV 2-4 mg per 2 mg tot max 8 mg per 5-15 minuten
 - Enkel als onacceptabele pijn
 - Cave interactie met P2Y12 receptor blokkers
- Beta blokkers
 - Voor alle patiënten tenzij contraïndicaties
 - IV (niet als hemodynamisch instabiel) /PO
 - Geen directe studies (wel bij STEMI)

BEHANDELING: UA / NSTEMI

- Statines
 - Zo snel mogelijk
 - Atorvastatine 80 mg
 - Geen gradueel optitreren, wel intensief
 - LDL bij opname of max binnen de 2-4 dagen
 - Controle LDL na 2 maand
- Antiplatelet:
 - Aspirine voor allen, tenzij contraïndicaties
 - Platelet P2Y12 receptor blokkers voor allen
- Anticoagulatie
 - Voor allen
 - Cave dosering

BEHANDELING: UA / NSTEMI

- Kalium > 4 meq/L en magnesium > 2,4 mg/dl
- Geen NSAID: best onderbreken
- Antiarritmica
 - Ifv de nood
 - Geen profylactisch lidocaïne
 - Wel betablokker

BEHANDELING: UA / NSTEMI: risicostratificatie

- High risk factors
 - Aanwezigheid en uitgebreidheid van ST-T veranderingen
 - Verhoogd troponine
 - Hemodynamische instabiliteit
 - Persisterende thoracale pijn
- TIMI risk score [0-2 / 3-4 / 5-7]
 - >65 jaar
 - > 3 RF voor coronair lijden
 - Vroegere coronaire stenose van >50%
 - ST T veranderingen
 - > 2 angor episodes de laatste 24 u
 - Verhoogd trop
 - Aspirine gebruik (als marker van coronair lijden)

BEHANDELING: UA / NSTEMI: risicostratificatie voor vroege reperfusie/revascularisatie

- Geen fibrinolyse
- Als high risk: vroeg interventie, binnen de 24 uur

P2Y₁₂ Inhibitors

	Clopidogrel	Prasugrel	Ticagrelor
Class	Thienopyridine	Thienopyridine	Triazolopyrimidine
Reversibility	Irreversible	Irreversible	Reversible
Activation	Prodrug, limited by metabolism	Prodrug, not limited by metabolism	Active drug
Onset of effect	2-4 h	30 min	30 min
Duration of effect	3-10 days	5-10 days	3-4 days
Withdrawal before major surgery	5 days	7 days	5 days

Recommendations for oral antiplatelet agents (1)

Recommendations	Class	Level
Aspirin should be given to all patients without contraindications at an initial loading dose of 150-300 mg, and at a maintenance dose of 75-100 mg daily long-term regardless of treatment strategy.	I	A
A P2Y ₁₂ inhibitor should be added to aspirin as soon as possible and maintained over 12 months, unless there are contraindications such as excessive risk of bleeding.	I	A
A proton pump inhibitor (preferably not omeprazole) in combination with DAPT is recommended in patients with a history of gastrointestinal haemorrhage or peptic ulcer, and appropriate for patients with multiple other risk factors (<i>H. elicobacter pylori</i> infection, age ≥ 65 years, concurrent use of anticoagulants or steroids).	I	A
Prolonged or permanent withdrawal of P2Y ₁₂ inhibitors within 12 months after the index event is discouraged unless clinically indicated.	I	C
Ticagrelor (180 mg loading dose, 90 mg twice daily) is recommended for all patients at moderate-to-high risk of ischaemic events (e.g. elevated troponins), regardless of initial treatment strategy and including those pre-treated with clopidogrel (which should be discontinued when ticagrelor is commenced).	I	B
Prasugrel (60 mg loading dose, 10 mg daily dose) is recommended for P2Y ₁₂ -inhibitor-naïve patients (especially diabetics) in whom coronary anatomy is known and who are proceeding to PCI unless there is a high risk of life-threatening bleeding or other contraindications.	I	B

www.escardio.org/guidelines

European Heart Journal (2011) 32:2999–3054
doi:10.1093/eurheartj/ehr236



Recommendations for oral antiplatelet agents (2)

Recommendations	Class	Level
Clopidogrel (300 mg loading dose, 75 mg daily dose) is recommended for patients who cannot receive ticagrelor or prasugrel.	I	A
A 600 mg loading dose of clopidogrel (or a supplementary 300 mg dose at PCI following an initial 300 mg loading dose) is recommended for patients scheduled for an invasive strategy when ticagrelor or prasugrel is not an option.	I	B
A higher maintenance dose of clopidogrel 150 mg daily should be considered for the first 7 days in patients managed with PCI and without increased risk of bleeding.	IIa	B
Increasing the maintenance dose of clopidogrel based on platelet function testing is not advised as routine, but may be considered in selected cases.	IIb	B
Genotyping and/or platelet function testing may be considered in selected cases when clopidogrel is used.	IIb	B
In patients pre-treated with P2Y ₁₂ inhibitors who need to undergo non-emergent major surgery (including CABG), postponing surgery at least for 5 days after cessation of ticagrelor or clopidogrel, and 7 days for prasugrel, if clinically feasible and unless the patient is at high risk of ischaemic events should be considered.	IIa	C
Ticagrelor or clopidogrel should be considered to be (re-)started after CABG surgery as soon as considered safe.	IIa	B
The combination of aspirin with an NSAID (selective COX-2 inhibitors and non-selective NSAID) is not recommended.	III	C

www.escardio.org/guidelines

European Heart Journal (2011) 32:2999–3054
doi:10.1093/eurheartj/ehr236



Recommendations for GPIIb/IIIa receptor inhibitors

Recommendations	Class	Level
The choice of combination of oral antiplatelet agents, a GPIIb/IIIa receptor inhibitor, and anticoagulants should be made in relation to the risk of ischaemic and bleeding events.	I	C
Among patients who are already treated with DAPT, the addition of a GPIIb/IIIa receptor inhibitor for high-risk PCI (elevated troponin, visible thrombus) is recommended if the risk of bleeding is low.	I	B
Eptifibatide or tirofiban added to aspirin should be considered prior to angiography in high-risk patients not preloaded with P2Y ₁₂ inhibitors.	IIa	C
In high-risk patients eptifibatide or tirofiban may be considered prior to early angiography in addition to DAPT, if there is ongoing ischaemia and the risk of bleeding is low.	IIb	C
GPIIb/IIIa receptor inhibitors are not recommended routinely before angiography in an invasive treatment strategy.	III	A
GPIIb/IIIa receptor inhibitors are not recommended for patients on DAPT who are treated conservatively.	III	A

www.escardio.org/guidelines

European Heart Journal (2011) 32:2999–3054
doi:10.1093/eurheartj/ehr236



Recommendations for anticoagulants

Recommendations	Class	Level
Anticoagulation is recommended for all patients in addition to antiplatelet therapy.	I	A
The anticoagulation should be selected according to both ischaemic and bleeding risks, and according to the efficacy-safety profile of the chosen agent.	I	C
Fondaparinux (2.5 mg subcutaneously daily) is recommended as having the most favourable efficacy-safety profile with respect to anticoagulation.	I	A
If the initial anticoagulant is fondaparinux, a single bolus of UFH (85 IU/kg adapted to ACT, or 60 IU in the case of concomitant use of GPIIb/IIIa receptor inhibitors) should be added at the time of PCI.	I	B
Enoxaparin (1 mg/kg twice daily) is recommended when fondaparinux is not available.	I	B
If fondaparinux or enoxaparin are not available, UFH with a target aPTT of 50–70 s or other LMWHs at the specific recommended doses are indicated.	I	C
Bivalirudin plus provisional GPIIb/IIIa receptor inhibitors are recommended as an alternative to UFH plus GPIIb/IIIa receptor inhibitors in patients with an intended urgent or early invasive strategy, particularly in patients with a high risk of bleeding.	I	B
In a purely conservative strategy, anticoagulation should be maintained up to hospital discharge.	I	A
Discontinuation of anticoagulation should be considered after an invasive procedure unless otherwise indicated.	IIa	C
Crossover of heparins (UFH and LMWH) is not recommended.	III	B

www.escardio.org/guidelines

European Heart Journal (2011) 32:2999–3054
doi:10.1093/eurheartj/ehr236



MI met normale coronairen

- Voorkomen
 - In 7% geen kritische coronaire lesies
 - In 3% normale coronairen
- Vooral jongeren, vrouwen
- Etio?
 - Coronair spasme
 - Coagulatiestoornissen
 - Toxines (cocaïne)
 - Collagene ziektes
 - Embolen
 - Myocarditis
 - Microvasculaire ziekte
- Stress geïnduceerde CMP (TAKOTSUBO)
 - Transiënte systolische dysfunctie van apicaal/midsegmenten van LV
 - Zonder coronaire letsels
 - Vooral vrouwen, vooral in periode van uitgesproken stress

BESLUIT

- ACS is belangrijk
 - Owv frequentie
 - Owv ernst en hoge mortaliteit
- Uitdaging
 - Voor diagnose
 - Tegen de klok werken
 - Diagnose missen kan nefast zijn
 - Techniciteit kan diagnose brengen, maar ook vals gevoel van veiligheid

BESLUIT

- Anamnese is zeer belangrijk
- In licht van het risicoprofiel
- De techniciteit helpt, maar klinisch vermoeden is belangrijkste
- Snelle behandeling starten
- Opname voor stabilisatie – snelle interventie

Dank u voor uw aandacht