Anaesthesia for the cardiac patient for non-cardiac surgery
Preoperative assessment

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The role of the anaesthesiologist (1846-2013)

Consequences of incorrect preoperative risk assessment

- 6x increase in mortality!
- Australian Incident Monitoring Study (AIMS-2000)
  - Inadequate risk stratification 11,6% (478/6271)
  - Complications 3,1 % (197)
  - Major morbidity 23, death 7
  - >50% definitely, further 21% probably avoidable

Mosaics of the lecture

- Cardiac risk stratification
- Screening tools
- Preoperative PCI???
- Problems with patients with stents
- Pharmacological risk reduction
- Patients with PM/ICD

Risks of anaesthesia of cardiac patients in non-cardiac surgery

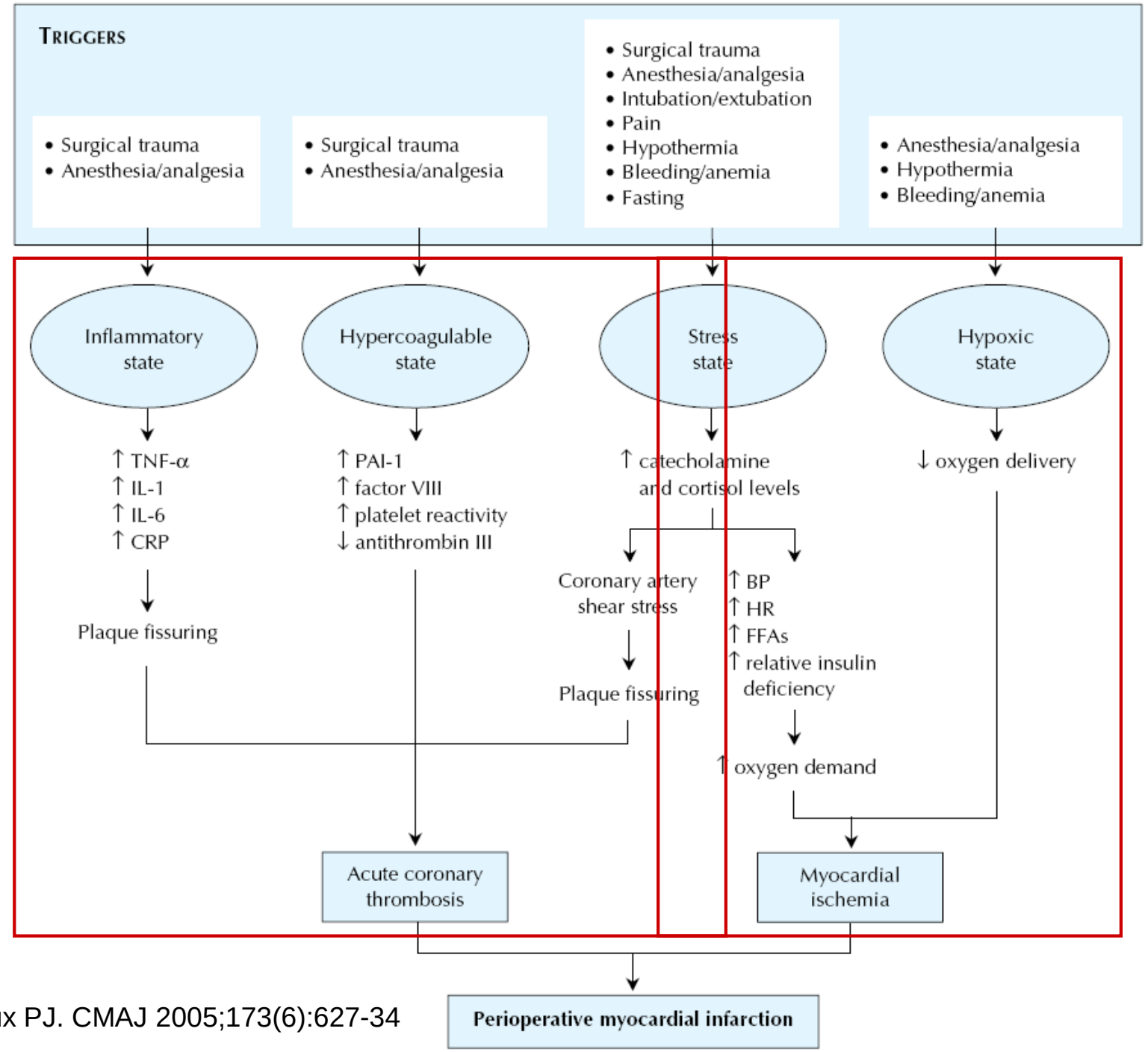
- 60% of patients due to anesthesia has some kind of heart disease (80% above age of 60)
- Periop. cardiac complication develops in 4%
- 17-74% of coronary disease patients suffers myocardial ischemia

Mangano DT. Anesthesiology 1990; 72: 153-184

Risks of anaesthesia of cardiac patients in non-cardiac surgery

- Myocardial infarction accounts for 10–40% of postoperative fatalities, it is the major determinant of perioperative mortality associated with non-cardiac surgery
- Nonfatal MI in the periop. period is associated with a 20-fold increased risk of late mortality

Landesberg G. J Cardiothorac Vasc Anesth 2003; 17:90–100
Raby K. N Engl J Med 1989; 321:1296–300



Devereaux PJ. CMAJ 2005;173(6):627-34

Cardiac risk stratification

- Lee's revised Cardiac risk index
- MET (metabolic equivalent)
- Risk of surgical procedure
- Localization of operation
- Further perioperative tests if needed
  - Myocardial perfusion scintigraphy
  - Dobutamine stress echocardiography

Flood C. Am Fam Physician 2007;75:656-65

Lee's Revised Cardiac Risk Index

Clinical variable	*Points*
High-risk surgery (i.e., intraperitoneal, intrathoracic, or suprainguinal vascular surgery)	1
Coronary artery disease	1
Congestive heart failure	1
History of cerebrovascular disease	1
Insulin treatment for diabetes mellitus	1
Preoperative serum creatinine level greater than 2.0 mg per dL (180 µmol per L)	1
Total:	_____

Interpretation of Risk Score

Risk class	*Points*	*Risk of complications*(%)*
I. Very low	0	0.4
II. Low	1	0.9
III. Moderate	2	6.6
IV. High	3 +	11.0

Flood C. Am Fam Physician 2007;75:656-65

Metabolic equivalent

TABLE 4. **Estimated Energy Requirements for Various Activities, Based on Duke Activity Status Index**[a]

1 MET	Can you… take care of yourself? eat, dress, or use the toilet? walk indoors around the house? walk 1 or 2 blocks on level ground at 2-3 mph (3.2-4.8 kph)?
<4 METs	Can you… do light work around the house, such as dusting or washing dishes?
≥4 METs	Can you… climb a flight of stairs or walk up a hill? walk on level ground at 4 mph (6.4 kph)? run a short distance? do heavy work around the house, such as scrubbing floors or lifting or moving heavy furniture? participate in moderate recreational activities, such as golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
≥10 METs	Can you… participate in strenuous sports, such as swimming, singles tennis, football, basketball, or skiing?

[a] MET = metabolic equivalent.
Adapted from *J Am Coll Cardiol,*[3] with permission from Elsevier.

Freeman WK. Mayo Clin Proc. 2009;84(1):79:90

The surgical procedure

Cardiac Risk* Stratification for Noncardiac Surgical Procedures

High (reported cardiac risk often >5 percent)

Emergent major operations, particularly in patients older than 75 years

Aortic and other major vascular surgery

Peripheral vascular surgery

Anticipated prolonged surgical procedure associated with large fluid shifts and/or blood loss

Intermediate (reported cardiac risk generally 1 to 5 percent)

Carotid endarterectomy

Head and neck surgery

Intraperitoneal and intrathoracic surgery

Orthopedic surgery

Prostate surgery

Low† (reported cardiac risk generally <1 percent)

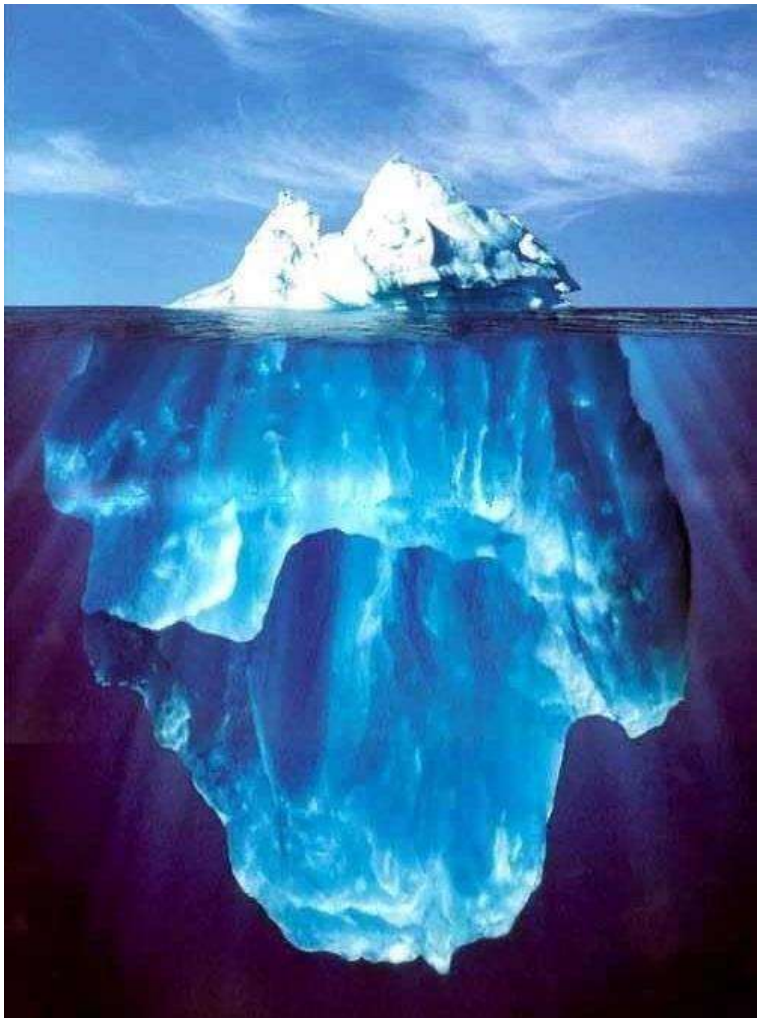
Endoscopic procedures

Superficial procedures

Cataract surgery

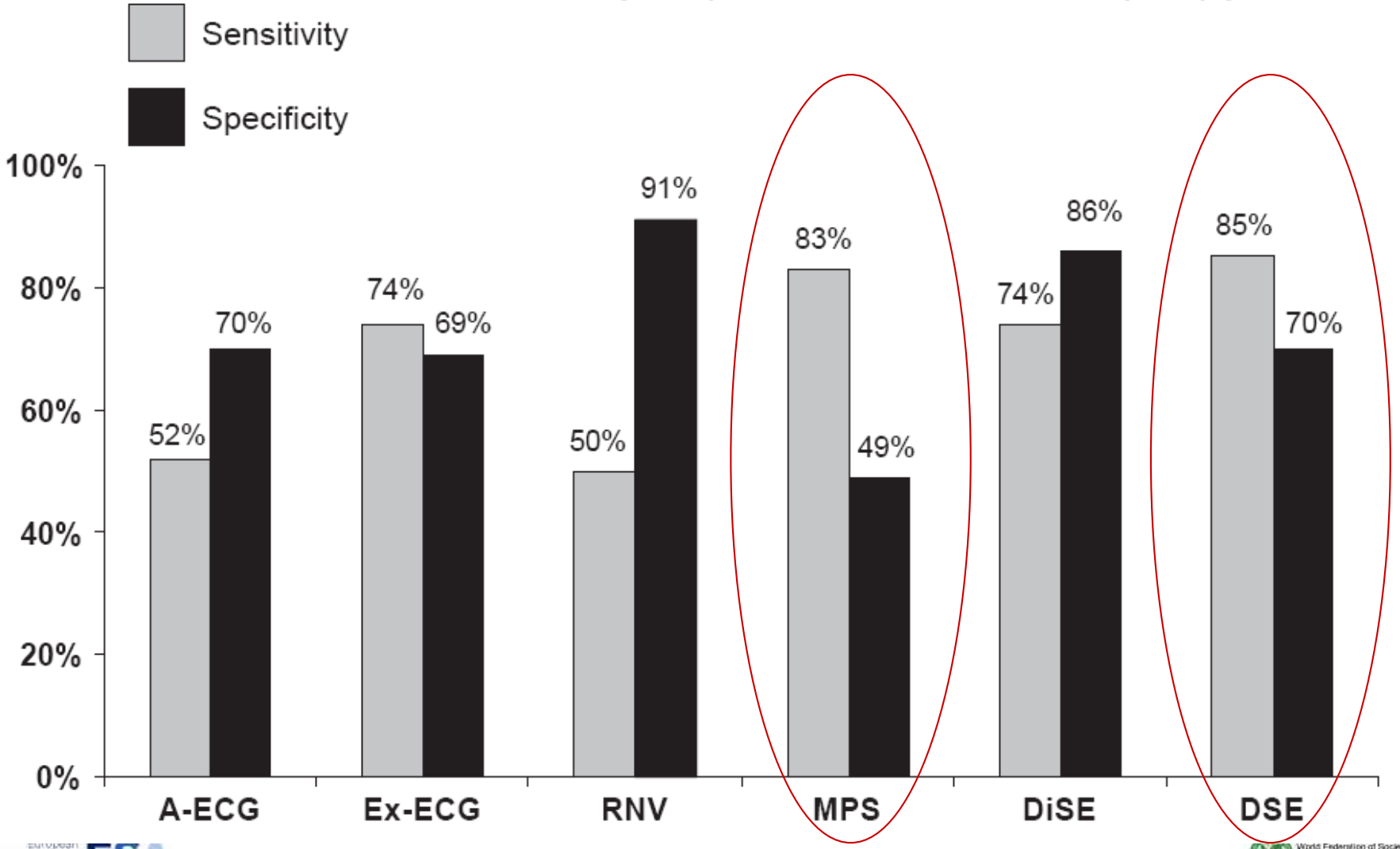
Breast surgery

*—Combined incidence of cardiac death and nonfatal myocardial infarction.



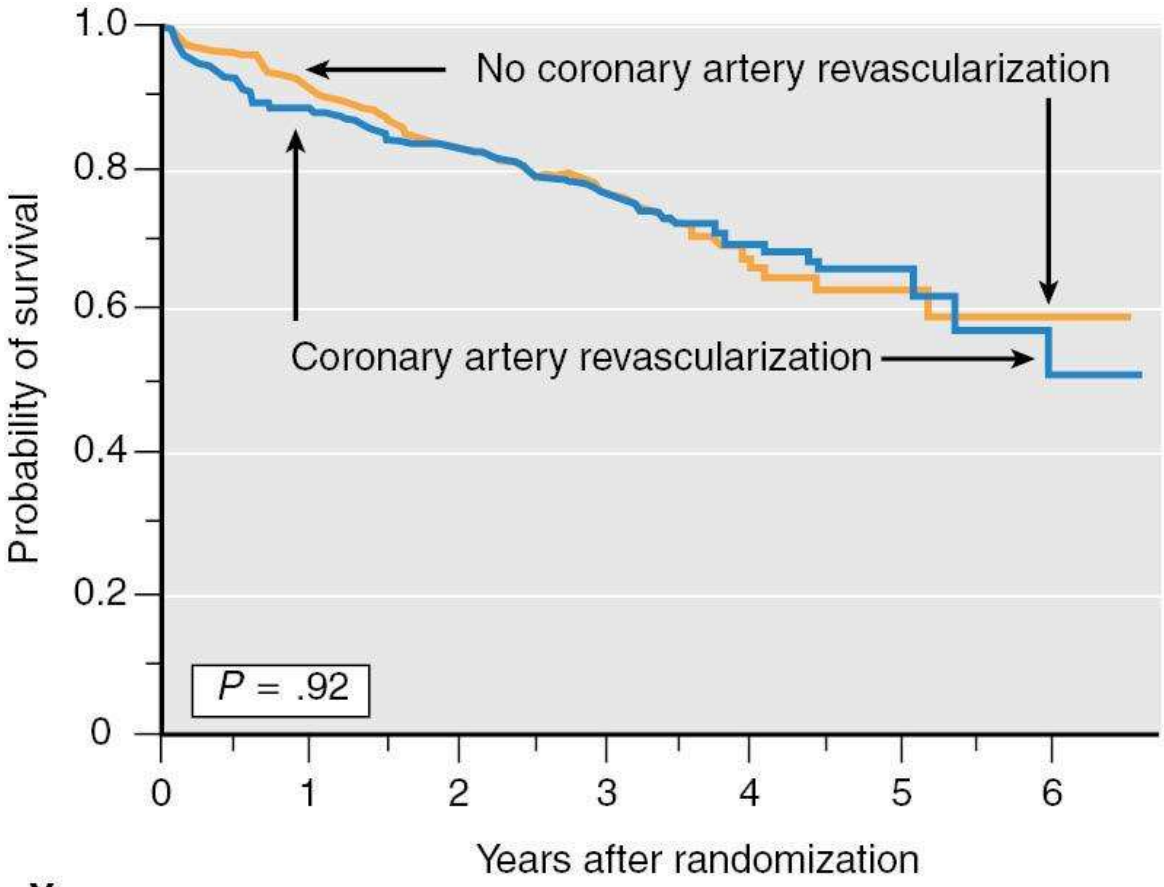
Flood C. Am Fam Physician 2007;75:656-65

Sensitivity of preoperative tests regarding cardiac death and non-fatal MI (major vascular surgery)



Kertai MD. Progress in Cardiovascular Diseases 2005;47(4):240-257

Effect on survival of elective preoperative coronary revascularisation



Years	1	2	3	4	5	6
No. at risk						
Revascularization	226	175	113	65	18	7
No revascularization	229	172	108	55	17	12

McFalls EO. N Engl J Med 2004;351:2795-2804

Perioperative management of patients with stent (PCI, BMS, DES)

- 1990': increasing periop. morbidity/mortality in patients with PCI going for non-cardiac surgery
- 90% of patients going for PCI get one or several stent/s
- 5% will have non-cardiosurgical intervention within **1 year!**
- Periop. dilemma: bleeding or coagulation?
- **63% of anesthesiologists do not know the guideline!**

Vicenzi MN et al. Br J Anaesth 2006;96:686-93

Patterson L et al. Can J Anesthesiol 2005;52:440-1

Overview: prevention of periop.stent thrombosis

- Avoid preop. coronary stenting
- Stent selection (BMS-DES)
- Delay surgery
- There is no bridge therapy for PCI patients, **timing is crucial**
- Education, interdisciplinary teamwork
- Surgery only where PCI is available

Brilakis et al. JACC 2007;49,22:2145-50

Preoperative pharmacological risk reduction

- β-blockers
- Statins
- Remember there is indirect β-blocking
  - Choose proper mode of anaesthesia, EDA
  - Avoiding hypothermia
  - Avoiding anaemia
  - PM, ICD (switch off frequency enhancing and antitachycadia programs temporarily)

Gal J et al. EJA 2006, 23(8):641-648.

Targets: blood pressure, pulse, endothel

- Elective operation BP <180/110 mmHg, P<70/min
- Effective by evidence: β-blocker and statins
- Effective risk reduction takes 6-8 weeks!
  - Vascular/endothel changes/pleiotropic effect
  - Risk/benefit
- Intraop. low BP is more dangerous than hypertension!
- diuretics?, Ca channel blockers, (ACEI ?)

Howel SJ. Br J Anaesth 2004;92:570-583

Effects of statins

Lipid lowering effects

- decrease cholesterol
- increase HDL

It takes time! ~ 30 days

Pleiotropic effects

- increase endothelial NO synthetase
- generation of ROS
- decrease endothelin-1 production
- improve thrombogenic profile
- decrease Inflammation (decrease isoprenoid production)
- decrease CRP levels
- inhibition of atherosclerosis

Abberviations: CRP, C-reactive protein; HDL, high-density lipoprotein; NO, nitric oxide; ROS, reactive oxygen species.

Effect of haematocrit on major postoperative cardiac events

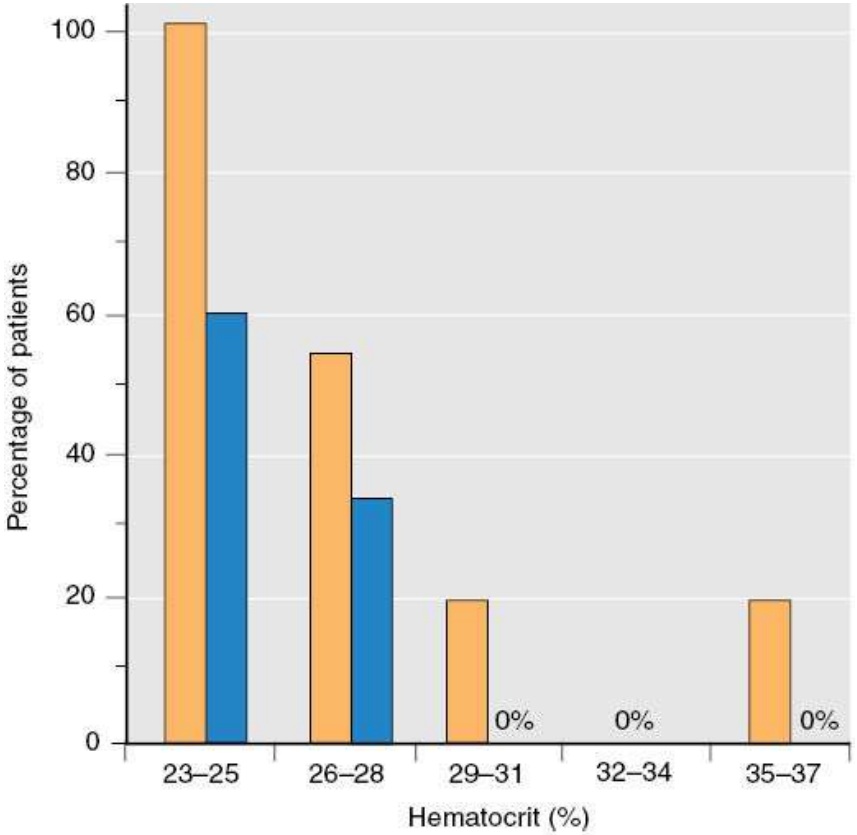


Figure 35-7 Relationship of postoperative myocardial ischemia *(yellow bars)* and morbid cardiac events *(blue bars)* to hematocrit for 27 high-risk patients undergoing infrainguinal arterial bypass.

(Data from Nelson AH, Fleisher LA, Rosenbaum SH: The relationship between postoperative anemia and cardiac morbidity in high risk vascular patients in the ICU. Crit Care Med 21:860, 1993.)

PM, ICD: preoperative management

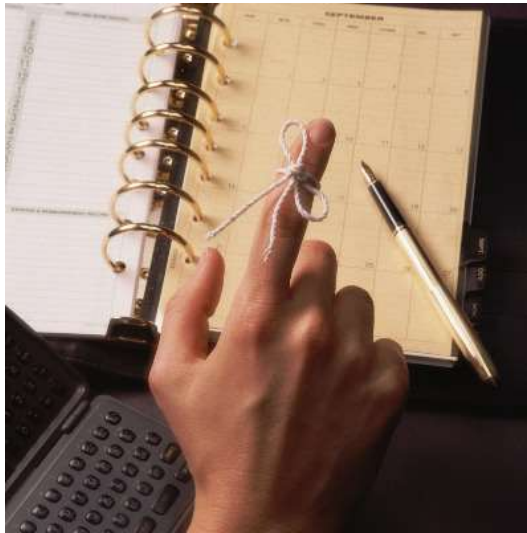
- Consider the underlying disease
- Check the setting and the memory of the device-specialist!
- Switch off frequency enhancer programs
- Optimizing DO_2 : frequency adaptation
- Switch off ICD anti-tachycardia therapy

PM, ICD: intraoperative management

- Caution: Magnet???
  - Different effects: depending on the type of the device
- Bipolar>monopolar electrocauter
- Current must not flow through the generator-heart circuit
- Pulse wave monitoring

PM, ICD: postoperative management

- Postoperative check/modification
- Frequency setting (CO, DO_2)
- Antitachycardia therapy must be enabled, until then close monitoring!
- Frequency enhancer programs should be enabled



Summary

- Plaque fissure plays an important role in perioperative MI
- Risk stratification is important
- Indication of preoperative PCI is limited
- Beta-blockers, statins, mode of anaesthesia may improve outcome
- Stent, PM, ICD patients need special management