

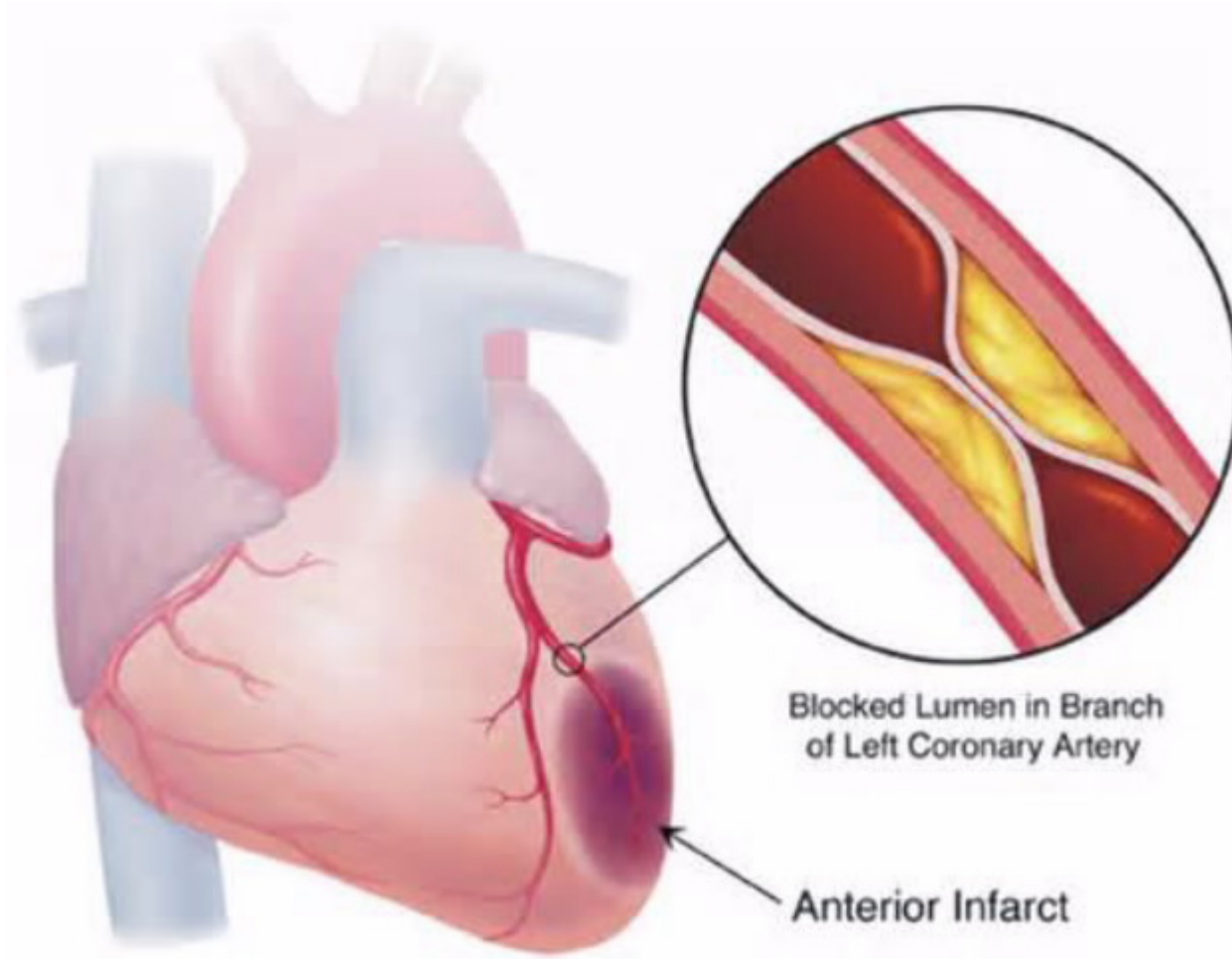


Detection and management of perioperative myocardial ischemia

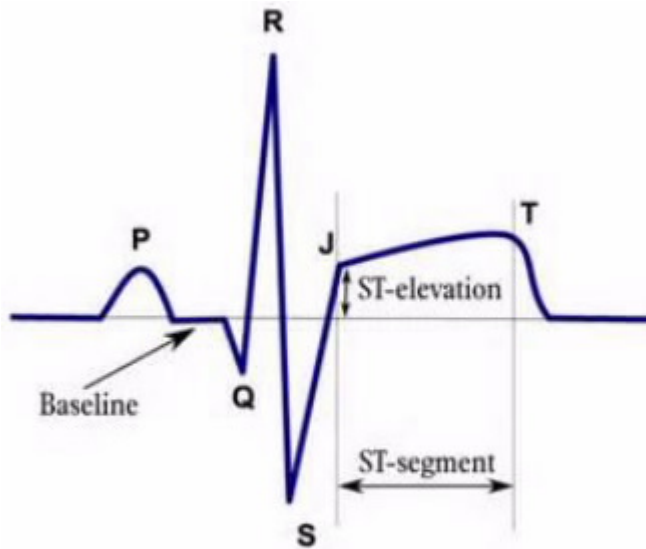
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Lu Rui

Myocardial Infarction



Diagnosis of myocardial infarction



How to measure ST elevation?



Recent cohort studies documenting the symptoms and signs of myocardial ischemia associated with postoperative troponin leak.

	Patient cohort	Postoperative troponin elevation	Symptoms of myocardial ischemia in troponin positive patients	ECG changes in all patients	ECG changes in patients with troponin elevation
VISION [4, 9]	Prospective unselected noncardiac surgery patients at least 45 years of age	11.6%	15.8% [95% CI 13.6-18.3] for chest, arm, jaw pain, dyspnea, or pulmonary edema ^a	NR	34.9% [95% CI 31.9-38.0] ^a
CHASE [10]	Prospective intermediate and high risk noncardiac surgery patients ≥60 years of age	19%	3.2% For typical chest pain	9.5% Myocardial ischemia	3.2% (10/315)
VINO [11]	Prospective patients at risk of coronary artery disease for major noncardiac surgery	13%	NR	NR	NR
Chang et al. [12]	Prospective emergency orthopedic surgery for more than 60 years of age	37.4%	8.6%	18.4%	27.1%
Hietala et al. [13]	Prospective acute hip fracture surgical patients	35.5%	8% Chest pain (of all pre and postoperative troponin positive patients)	53.5%	70.4%
Marston et al. [14]	Retrospective vascular surgical patients with no myocardial ischemia on preoperative perfusion imaging	38.9%	NR	NR	NR
Garcia et al. [15]	Retrospective vascular patients for abdominal aortic surgery	40.1%	NR	6.2% (2/337)	11.1% (15/135)

CHASE, Cardiac Health After Surgery; NR, not reported; VISION, Vascular events In noncardiac Surgery patients cohort evaluation.

Recent cohort studies documenting the symptoms and signs of myocardial ischemia associated with postoperative troponin leak.

	Patient cohort
VISION [4*,9*]	Prospective unselected noncardiac surgery patients at least 45 years of age
CHASE [10*]	Prospective intermediate and high risk noncardiac surgery patients ≥ 60 years of age
VINDO [11]	Prospective patients at risk of coronary artery disease for major noncardiac surgery
Chong <i>et al.</i> [12]	Prospective emergency orthopedic surgery for more than 60 years of age
Hietala <i>et al.</i> [13]	Prospective acute hip fracture surgical patients
Marston <i>et al.</i> [14]	Retrospective vascular surgical patients with no myocardial ischemia on preoperative perfusion imaging
Garcia <i>et al.</i> [15]	Retrospective vascular patients for vascular abdominal aortic surgery
	Troponin-positive patients fulfilling the universal definition of myocardial infarction [2]
	NR
	30-Day mortality
	0.6%
	30-Day mortality
	Only unadjusted analyses conducted
	37%
	Cardiovascular complications
	6.4%
	Not evaluated
	NR
	Long-term mortality
	NR
	1-Year mortality
	NR

CHASE, Cardiac Health After Surgery; NR, not reported; VISION, Vascular events In noncardiac Surgery patients cohort evaluation.

Troponin T

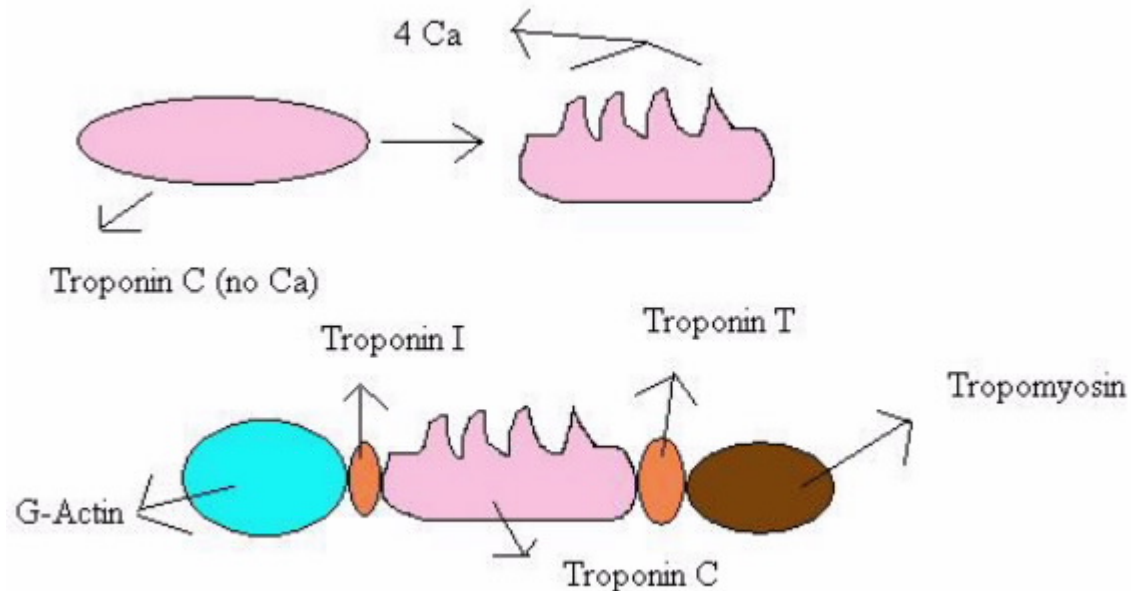


Table 2. The association between peak postoperative troponin T levels and 30-day mortality in unselected noncardiac surgery patients at least 45 years of age

Peak postoperative troponin T level	30-Day mortality (95% confidence interval)	Likelihood ratio (95% confidence interval)
<0.01 $\mu\text{g/l}$	1% (95% CI 0.8–1.2)	0.53 (95% CI 0.47–0.60)
0.02 $\mu\text{g/l}$	4% (95% CI 3.7–4.3)	2.22 (95% CI 1.44–3.42)
0.03–0.29 $\mu\text{g/l}$	9.3% (95% CI 8.8–9.8)	5.39 (95% CI 4.57–6.34)
$\geq 0.30 \mu\text{g/l}$	16.9% (95% CI 16.3–17.5)	10.71 (95% CI 7.02–16.35)

The type of postoperative ECG change

Table 3. Prevalence of ischemic postoperative electrocardiogram changes and potential clinical significance

Type of ECG change	Prevalence	Clinical significance
T wave inversion	23.3% (95% CI 20.7–26.1) [9*]	T wave inversion may be independent of troponin elevation [13]. Clinical significance is debatable.
	36.8% [12]	
	62.6% [13]	
ST depression (≥ 1 mm)	16.4% (95% CI 14.1–18.9) [9*]	
	32.4% [12]	
	37.3% [13]	
	46.7% [10*]	
ST depression (< 1 mm)	50% [10*]	
ST elevation (> 1 mm)	2.3% (95% CI 1.5–3.5) [9*]	Associated with 30-day mortality [9*]
	3.3% [10*]	
	6.5% [13]	
Left bundle branch block	0.5% (95% CI 0.2–1.2) [9*]	Associated with 30-day mortality [9*]
	3.3% [12]	
	7.5% [13]	

The current evidence suggests that myocardial **oxygen supply-demand imbalance** predominates in the early postoperative period. It is likely that **flow stagnation** and **thrombus formation** is an important pathway in the development of a peri-operative myocardial infarction.



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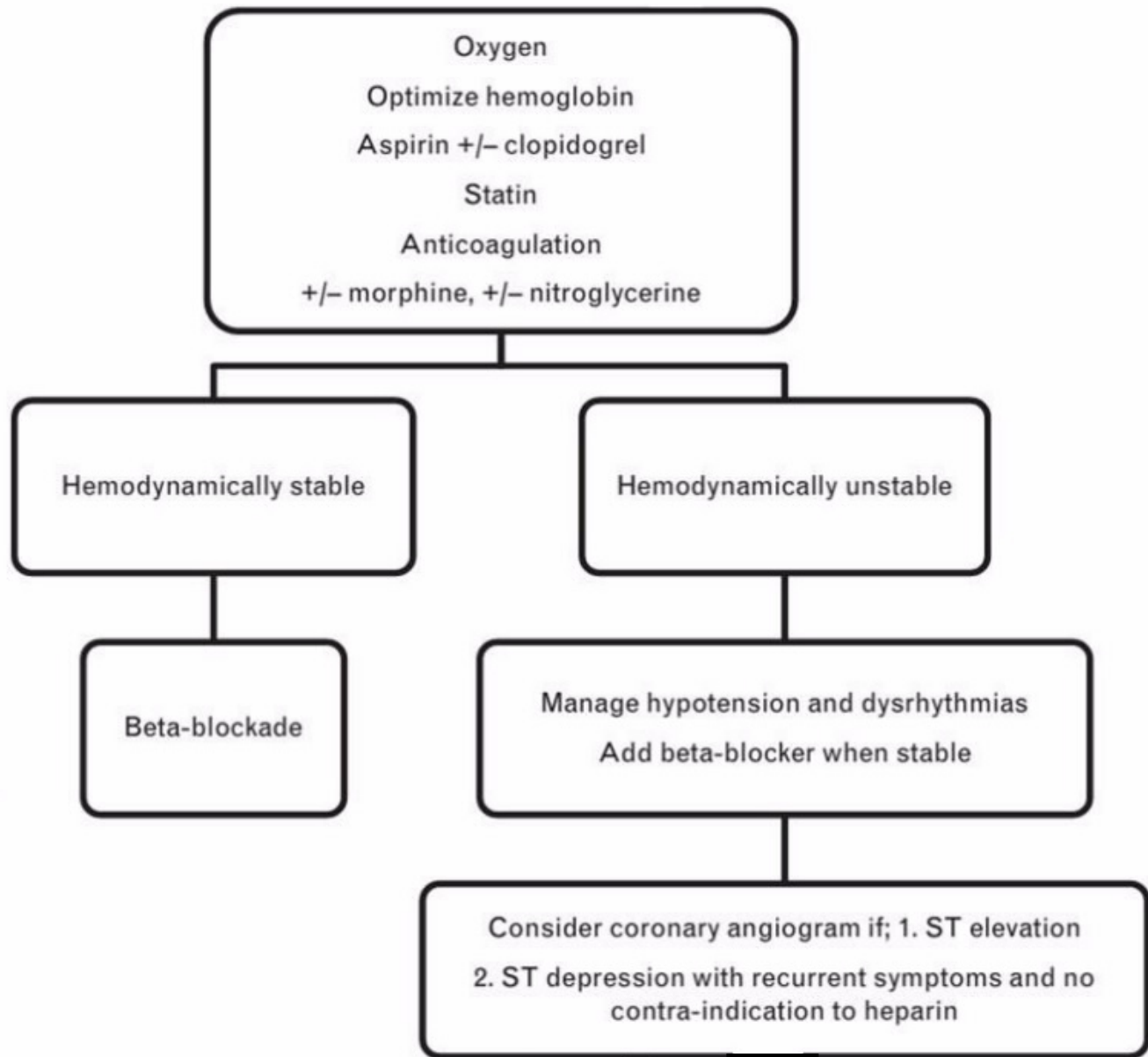
REVIEW ARTICLE

The pathophysiology of peri-operative myocardial infarction

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FIGURE 1. Proposed algorithm for the management of patients with myocardial injury after noncardiac surgery.



KEY POINTS

- A Perioperative troponin leak is independently associated with both short-term and long-term mortality following noncardiac surgery.
- The majority of patients with a troponin leak will be missed if troponin surveillance is guided by clinical symptoms and ECG changes.
- Perioperative physician should adopt the clinical entity of myocardial injury after noncardiac surgery(MINS).
- Simple therapies such as aspirin and statins may improve the outcome.
- Large collaborative trials of therapeutic interventions for myocardial injury after noncardiac surgery are needed.

