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Don't forget cardioprotective strategies in high-risk surgical patients!

In a recent editorial [1], Ryan et al. made a cogent argument for focusing future clinical trials on therapeutic interventions for peri-operative myocardial injuries. Application of accurate diagnostic tests of myocardial injury (e.g. ECG changes and troponin levels) has enabled investigators to document peri-operative myocardial infarction (MI) with a wide range of incidences (from < 0.5% to 26%) following non-cardiac surgery, depending on patients' pre-operative condition, the severity of the surgical stress and the implementation of risk-reducing strategies [2–6].

To illustrate such variability and using similar standard definition criteria, we extracted and analysed data from our prospective thoracic and vascular databases (1445 and 843 patients, respectively). We found evidence of peri-operative MI in 0.9% of thoracic and 2.7% of vascular surgical patients (Table 1). In-hospital mortality was largely attributed to cardiovascular events in vascular patients, whereas respiratory complications were more frequently incriminated amongst thoracic surgical patients. The type of surgical procedure, the anaesthetic management (e.g. thoracic epidural block) and the burden of cardiovascular risk factors differ between the two surgical populations. Although these mortality and morbidity rates compare favourably with those reported in the medical literature, there is still potential for lowering the risk of peri-operative cardiac events and reducing the length of hospital stay.

First, beta-blockers, angiotensin-converting inhibitors (or angiotensin II antagonists) and statins were not administered in up to 20% and 35%, respectively, of patients who might benefit from these treatments [7].

Second, a growing body of scientific evidence suggests that goal-directed strategies using non-invasive monitors can reduce major complications by customising fluid administration, cardiovascular drugs and anaesthetic agents in moderate- to high-risk patients [8].

Third, utilisation of 'point of care' devices for monitoring coagulation (e.g. thromboelastography, transmission aggregometry) would be particularly beneficial in patients with coronary stents receiving anti-platelet therapy [9].

Table 1 Early postoperative complications following major thoracic and vascular surgery. Values are mean (SD) or number (proportion).

	Open lung resection 1996 – 2010 (n = 1445)	Abdominal aortic repair 1993 – 2010 (n = 843)
Pre-operative condition		
Age; years	63 (10)	67 (9)
Men	985 (68%)	1229 (85%)
Body mass index; kg.m^{-2}	24.9 (4.7)	25 (3.9)
ASA physical status 3–4	659 (46%)	1301 (90%)
Revised Cardiac Risk Index ≥ 2	205 (14%)	783 (54%)
Drug treatment		
Beta-blockers	121 (8.4%)	497 (34.4%)
ACEI / Ang II antagonists	204 (14.1%)	523 (36.2%)
Statins	224 (15.5%)	695 (48.1%)
Antiplatelets	146 (10.1%)	556 (38.5%)
Type of anaesthesia		
General + thoracic epidural	1144 (79.2%)	153 (10.6%)
General + intrathecal morphine	–	394 (27.3%)
Major postoperative complications		
In-hospital mortality	42 (2.9%)	39 (2.7%)
Primary cause of death		
Cardiovascular complication	338 (23.4%)	653 (5.2%)
Respiratory complication	792 (54.8%)	331 (22.9%)
Other	315 (21.8%)	461 (31.9%)
Cardiovascular complications		
Arrhythmias	176 (12.2%)	64 (4.4%)
Pulmonary oedema	32 (2.2%)	66 (4.6%)
Myocardial infarct	13 (0.9%)	39 (2.7%)
Stroke	19 (1.3%)	7 (0.5%)
Renal dysfunction*	38 (2.6%)	123 (8.5%)
Respiratory complications		
Atelectasis	147 (10.2%)	139 (9.6%)
Pneumonia	104 (7.2%)	77 (5.3%)
ALI/ARDS	48 (3.3%)	7 (0.5%)
Mechanical ventilation > 12 h	71 (4.9%)	36 (2.5%)
Admitted to intensive care	225 (15.6%)	172 (11.9%)

ACEI/Ang II; angiotensin converting enzyme inhibitors/angiotensin II, ALI/ARDS; acute lung injury/acute respiratory distress syndrome.
* defined as > 50% postoperative reduction in estimated glomerular filtration rate.

Finally, collaborative efforts between surgeons and anaesthetists should foster the implementation of clinical pathways involving evidence-based bundles of care to secure and enhance the recovery process while improving clinical outcome [10].

These 'prophylactic' and individualised target approaches should be applied to high-risk patients, but we agree that randomised controlled trials should also be conducted to test the effectiveness and safety of therapeutic approaches in the small number of patients presenting with acute myocardial injuries. Careful attention should be paid to select homogenous groups of high-risk patients (e.g. vascular surgical patients) and defining cut-off criteria for specific therapeutic interventions (e.g. haemodynamic and pharmacologic optimisation vs coronary revascularisation).

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Confirming extravasation from a peripheral venous catheter: another role for ultrasonography

Peripheral venous access can be challenging. Extravasation, the unintentional injection of fluid into the perivascular space, often follows misplaced peripheral intravenous lines and can have serious consequences [1].

Increased access to portable ultrasound machines has had a major impact in peri-operative care including vascular access [2]. The role of sonography for peripheral venous access is often confined to ultrasound-guided cannulation [3]. Here, we describe an additional role for ultrasonography in detecting asymptomatic extravasation from a misplaced intravenous catheter.

A 35-year-old intravenous drug user presented for re-exploration of a right-sided wrist fracture. We inserted a 20-G intravenous cannula into the left antecubital fossa with some difficulty. Initially, we obtained a flashback of blood but noted that free flow of blood into the cannula was absent. We then injected a few millilitres of saline 0.9% through the cannula, which did not cause any pain or tissue swelling. However, we still doubted the correct intravenous location of the peripheral cannula. So using a linear high frequency (5–10 MHz) ultrasound transducer and velocity colour Doppler (SonoSite, Bothell, WA, USA) we scanned the antecubital fossa while slowly injecting a few millilitres of saline through the cannula. This revealed medial/lateral extravasation of saline into the subcutaneous tissue adjacent to the brachial artery (Fig. 1). We then removed the peripheral venous cannula and replaced it in another peripheral vein using ultrasound guidance.

In the peri-operative setting, vasoactive drugs and hyperosmolar/concentrated electrolyte solutions are most often implicated in extravasation injury [1]. Extravasations are often painful but may initially be painless and therefore go undetected for some time until limb oedema and further tissue damage has occurred [4]. This case