

Preoperative assessment of the orthopaedic patient

Anil Nanjundeswara Rao

Guy Shinner

Abstract

Preoperative assessment should identify and quantify medical problems so that the anaesthetic plan can be modified to reduce perioperative morbidity and mortality. Orthopaedic surgery presents specific challenges as well as having a high number of elderly patients. Cardiovascular problems are a leading source of mortality. The measurement of the patient's functional capacity (in terms of metabolic equivalents) is a useful tool for assessing his or her ability to meet the increased metabolic demands caused by surgery. Various risk scoring systems are used to quantify the perioperative risk, and predictors of risk have been identified. Further investigation and treatment may need to be considered before surgery, but these may have their own inherent risks. Clinical investigations should be ordered only if the results would change the anaesthetic technique. Patients undergoing surgery for fractured neck of femur have particularly high mortality (as high as 13%). Careful assessment should be undertaken, with attention given to fluid loss and replacement, a cause for the fall and other consequences of the fall. Rheumatoid arthritis poses a number of challenges. Systemic manifestations and side effects of medication can cause multisystem pathology. The condition is associated with difficult intubation. Involvement of the cervical spine can result in instability, and atlantoaxial instability needs to be investigated and discounted.

Keywords anaesthesia; assessment; atlantoaxial; orthopaedic; preoperative; rheumatoid arthritis; risk

Preoperative assessment should identify and quantify medical problems. Orthopaedic patients present a number of challenges, principally those of the elderly and those linked to rheumatoid arthritis. In the 1999 NCEPOD report *Extremes of age*,¹ looking at deaths in the elderly, 60% of patients were under the care of an orthopaedic surgeon at the time of their final operation.

Preoperative assessment is an opportunity to plan the anaesthetic with the patient. Orthopaedic patients present a number of specific risks. For those at high risk whose condition cannot be improved before surgery, the preoperative assessment provides a chance to discuss the risks of surgery and the relative benefits.

Anil Nanjundeswara Rao, MBBS, DNB, MD, FRCA, is a Staff Grade in Anaesthetics at the Royal Orthopaedic Hospital, Birmingham, UK. Conflicts of interest: none declared.

Guy Shinner, MBBS, FRCA, is a Consultant Anaesthetist at the Royal Orthopaedic Hospital, Birmingham, UK. Conflicts of interest: none declared.

Patients may be prepared to take large risks in a bid to rid themselves of pain. It is important that they are fully informed of the risks they are taking before agreeing to proceed.

Cardiovascular assessment

A major source of perioperative morbidity and mortality is cardiac in origin; myocardial infarction is the most common cause of postoperative death in patients over 80 years of age.

The stress response to surgery requires an increase in cardiac output. Functional capacity is a crude way of assessing a patient's ability to maintain this increase in cardiac output. Metabolic equivalents (METs) provide a simple system to assess a patient's functional capacity.

- 1 MET: eating, using the toilet
- 3 METs: light housework, walking on level ground at 2–3 m.p.h. for 100 metres
- 4 METs: climbing two flights of stairs
- 7 METs: heavy housework (e.g. scrubbing floors)
- > 10 METs: strenuous sport.

An inability to meet a demand greater than 4 METs has a positive predictive value of 82% for postoperative pulmonary and cardiac complications.² It is not a predictor of perioperative mortality and may overestimate the risk in orthopaedic patients.

A number of cardiac risk indices have been developed for the vascular surgical population. These have not been validated in orthopaedic patients. The Revised Cardiac Risk Index³ identifies six independent variables:

- 1 high-risk surgery (intraabdominal, intrathoracic, suprainguinal vascular surgery)
- 2 history of ischaemic heart disease (myocardial infarction, positive exercise tolerance test, active angina, nitrate use, Q waves on ECG)
- 3 history of congestive cardiac failure
- 4 history of cerebrovascular disease
- 5 diabetes mellitus requiring insulin therapy
- 6 serum creatinine over 177 µmol/litre.

Patients are classified by the number of variables present: class I patients have no variables; class II, one; class III, two; and class IV, three or more. Class IV patients have an 11% risk of a major cardiac event and class III patients have a 6.6% risk.

The American College of Cardiology (ACC) and American Heart Association (AHA) have identified clinical predictors of perioperative cardiovascular risk⁴ and classified them as major, intermediate or minor (Table 1). Orthopaedic surgery was identified as an intermediate risk procedure carrying a less than 5% reported risk of perioperative cardiac events.

Two questions should be asked when patients are identified as being at increased risk:

- 1 Can the patient's condition be improved before surgery? This may require referral to a cardiologist for further investigation and stabilization before surgery can proceed.
- 2 If the patient's condition cannot be improved, do the risks of surgery outweigh the benefits to the patient? A joint replacement, for example, will reliably relieve pain but will not improve immobility due to dyspnoea.

The ACC/AHA guidelines outline appropriate investigations and the need for prophylactic coronary revascularization. The mainstay of investigation is exercise tolerance testing. Patients

Clinical predictors of increased perioperative risk

Major

Mandate intensive management and possible delay or cancellation of surgery

- Unstable coronary syndromes
 - Acute or recent myocardial infarction (<7 days, <28 days)
 - Unstable or severe angina (Canadian class III or IV)*
- Decompensated heart failure
- Significant arrhythmias
 - Symptomatic ventricular arrhythmias in presence of underlying heart disease
 - High-grade atrioventricular block (second-degree or third-degree heart block needs correction)
 - Supraventricular tachycardia with uncontrolled ventricular rate
- Severe valvular disease

Intermediate

Justify careful assessment

- Mild angina (Canadian class I or II)*
- Previous myocardial infarction by history or pathological Q waves
- Compensated or previous heart failure
- Diabetes mellitus (particularly insulin dependent)
- Renal insufficiency

Minor

Markers for cardiovascular disease not proven to increase risk independently

- Advanced age
- Abnormal ECG (left ventricular hypertrophy, left bundle branch block ST-T abnormalities)
- Rhythm other than sinus
- Low functional capacity
- History of stroke
- Uncontrolled systemic hypertension

Source: American College of Cardiology/American Heart Association Guideline Update.⁴

*Campeau L. Grading of angina pectoris. *Circulation* 1976; **54**: 522–3.

Table 1

are closely monitored through increasing workloads on a treadmill. The modified Bruce Protocol (designed for testing patients after myocardial infarction), which has targets of 70% of age-predicted heart rate or a 5 METs workload, is appropriate. This can be modified in orthopaedic patients with lower limb pathology to use arm cycle ergometry. Thallium scintigraphy or dobutamine stress echocardiography provides an alternative in patients unable to perform an exercise test. The risks and benefits of carrying out investigations must be considered. Each investigation has its own risk profile and the delay involved may result in further deterioration. Tests that will make no difference to the anaesthetic plan should not be requested.

A common finding, especially in the elderly, is hypertension. The ACC/AHA guidelines⁴ recommend that patients with stage 3 hypertension (>180/110 mm Hg) should have their surgery

postponed until their blood pressure is brought under control (Table 2). However, Howell et al.⁵ undertook a meta-analysis of available studies examining hypertension and perioperative complications and found that patients with mild or moderate hypertension, with no evidence of end-organ damage, were at no increased risk. In severely hypertensive (stage 3) patients there was no evidence that treatment reduced the complication rate. These authors state that surgery can proceed with extra care to maintain cardiovascular stability.

The clinical significance of heart murmurs must be assessed. Aortic sclerosis (senile degeneration of the valve not associated with left ventricular outflow tract obstruction) is relatively benign. Aortic stenosis is significant and may warrant valve replacement before alternative surgery. Echocardiography is helpful to determine severity. If the aortic valve area is less than 1 cm² or the gradient across the valve is greater than 40 mm Hg, then valve replacement surgery should be considered. Some valvular lesions (e.g. severe aortic or mitral regurgitation) require antibiotic prophylaxis.

Rhythm disturbances are a sign of underlying cardiac disease. Second-degree (Mobitz type II) or third-degree block must be corrected with pacemaker insertion before surgery.⁴

Some patients with cardiac problems will be taking clopidogrel or anticoagulants; these will have to be stopped preoperatively, especially if central neural blockade is anticipated. Patients may have to be converted to low-molecular-weight heparin for the perioperative period until it is safe to restart long-term anti-coagulant treatment.

Respiratory assessment

Postoperative respiratory complications, including pneumonia, hypoxia, hypoventilation and atelectasis, are a major source of morbidity. The elderly are especially vulnerable because of age-related decreases in compliance, forced expiratory volume in 1 second (FEV₁), muscle power and their ventilatory

British Hypertension Society classification of hypertension

Category	Systolic blood pressure (mm Hg)	Diastolic blood pressure (mm Hg)
Optimal blood pressure	<120	<80
Normal blood pressure	<130	<85
High blood pressure	130–139	80–89
Grade I hypertension (mild)	140–159	90–99
Grade II hypertension (moderate)	160–179	100–109
Grade III hypertension (severe)	>180	>110
Isolated systolic hypertension, grade I	140–159	<90
Isolated systolic hypertension, grade II	>160	<90

Table 2

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