Pre-Operative Optimization of Surgical Patients

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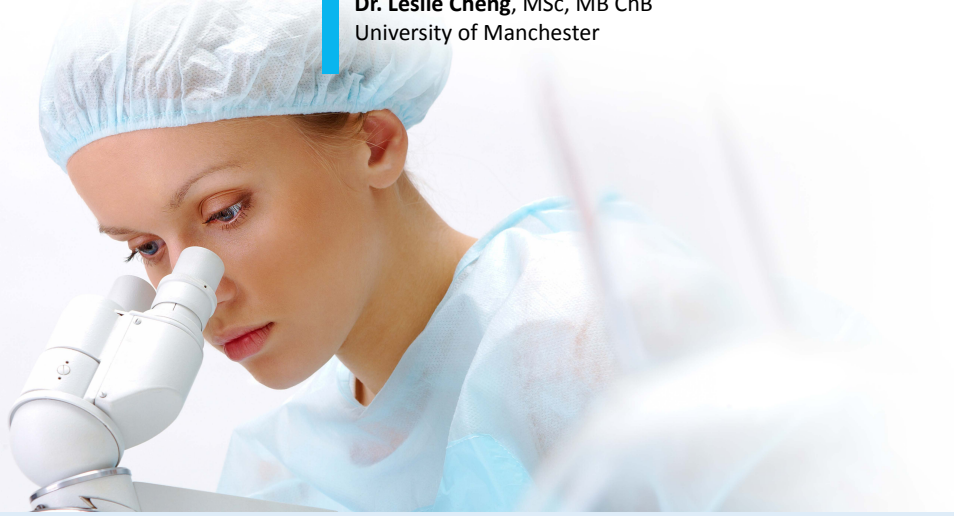

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Pre-Operative Optimization of Surgical Patients

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Introduction

Surgery is a fast-paced, rewarding specialty where patients can make dramatic recoveries as a direct result of the technical skills of the operating surgeon. Conversely, even with the most experienced surgeon, major complications can arise as a result of surgical interventions. This article aims to address the variety of issues that can arise peri-operatively. Some of these drawbacks may be ameliorated if patients were adequately optimised before undergoing surgery.

Pre-operative Assessment

Prior to undergoing operative procedures, patients undergo pre-operative assessment to identify and address issues which may affect the peri-operative phase. Pre-operative assessment includes a consultation, examination, baseline investigations and if necessary, further investigations. Particular attention is paid to patients' co-morbidities, functional state and whether or not they are on any anti-coagulants or anti-platelet agents. Blood tests are performed in the vast majority of patients including full blood count (FBC), renal function tests (U&Es), and a clotting screen. An electrocardiogram (ECG) is performed in patients over 50 years of age or in those with a known cardiac background. Chest radiograph (CXR) is indicated if the patient has chest signs or symptoms detected in pre-operative assessment, is a smoker, known cardiac failure or suffer from respiratory conditions such as Chronic Obstructive Pulmonary Disease (COPD). Additional investigations such as echocardiograms, exercise tolerant test or pulmonary function tests may be required in patients with known or suspected cardiovascular and/or respiratory disease. Not only do these tests provide us with a baseline, it also highlights additional issues which will need addressing or in some cases, even postponing or cancelling the operation until the issues has been attended to.

Pre-operative Optimisation

Various conditions including diabetes mellitus, cardio-respiratory diseases, anticoagulants require a more thorough work-up and are discussed in greater detail below.

Diabetes mellitus

The main concern in the diabetic patient is fluctuations in plasma glucose surrounding the period around the time of surgery. Patients undergoing a general anaesthetic are required to be starved for at least six hours to reduce to the risk of aspiration. During the operation, surgery induces a stress response, where catabolic hormones are triggered causing a state of insulin resistance as well as increased gluconeogenesis process. In addition, the secretion of insulin by beta-islet cells of the pancreas is also reduced as a result of surgical stress. As a result, a state of hyperglycaemia ensues.

In order to minimize the deleterious effects of surgery to these patients, where possible, these patients are prioritized in theatre lists to diminish the period of starvation. For a morning list, patients on oral glycaemic control have the morning dose omitted, whilst those on an afternoon list are allowed an early light breakfast. Patients on metformin, especially if they have an element of renal impairment should have the metformin omitted the morning of surgery, to reduce the risk of lactate acidosis. The use of variable rate intravenous insulin infusion (VRIII), previously known as "sliding scale" may be considered if patients have an erratic blood glucose control, are insulin controlled, or if they are undergoing major surgery. In order to maintain optimal plasma glucose levels, capillary blood glucose (CBG) is checked on an hourly basis and the VRIII adjusted accordingly aiming to achieve optimal blood glucose of 6 - 10 mmol/ L. For diabetic patients on insulin, NICE guidelines suggest to consider use of long acting insulin alongside VRIII in insulin controlled diabetics during the peri-operative process and to manage these patients according to local trust guidelines.[1]

Intraoperatively, the anaesthetist should monitor plasma glucose levels regularly, as optimal glucose control reduces infection and microvascular complications, which can predispose to development of leg ulcers and gangrene.

Post-operatively, patients are encouraged to return to normal eating and drinking as soon as they are able.

Once normal diet is established, patients are returned to their pre-operative diabetes regime.

Patients on anti-platelets and/or anti-coagulants

Antiplatelet therapy (i.e., aspirin, clopidogrel) use is widespread amongst the UK population. Indications include primary or secondary prevention of thrombo-ischaemic events such as cardiac, intracranial or vascular diseases; and for ensuring stent or graft patency e.g., in patients after angioplasty. In the UK, aspirin is usually stopped 5-7 days and clopidogrel 10 days before surgery. Both are restarted 24-48 hours after. This is done to reduce the risk of perioperative haemorrhage. However, evidence exists to show that continuation of aspirin perioperatively may actually decrease incidence of stroke, peripheral arterial disease and myocardial infarction peri- and postoperatively.[2,3]

In the patient taking an anti-coagulant (i.e., warfarin), therapy is usually stopped at least 5 days before surgery. Discontinuation of warfarin is crucial in those surgeries with higher bleeding risks (i.e., open thoracic or abdominal surgery). In procedures where bleeding risk is low (i.e., routine dental procedures or skin procedures) withholding warfarin may not be necessary.

If discontinuing anti-coagulant or anti-platelet therapy increases the risk of thrombotic events significantly (i.e., in patients with pre-existing mechanical valves), bridging therapy may be needed. Bridge therapy is a temporary supplementation of either subcutaneous low molecular weight heparin (LMWH) or intravenous unfractionated heparin (UFH) to reduce risk of thromboembolic events as heparin has a much shorter half-life compared with its counterparts. High risk patients, for example, patients with metallic heart valves, severe thrombophilia or recent large pulmonary embolism will require bridging therapy, but for those at low or moderate risk, for example patients atrial fibrillation and no other risk factors, bridging therapy may not be required. Guidance on VTE risk stratification is available on the American College of Chest Physicians published guidelines.[4]

The INR ratio is always checked prior to surgery. An INR of <1.5 is usually acceptable for low risk surgeries. This must be discussed with the anaesthetist and surgeon prior to surgery. If a patient is on unfractionated heparin, aPTT ratios are monitored every 4-6 hours.

Postoperatively, warfarin is restarted at 24-48 hours after the operation with supplementary heparin therapy. Once INR reaches therapeutic levels, heparin is discontinued.[5]

Respiratory conditions

Patients with respiratory tract infections, even if they are merely suffering from a simple cold, can be a concern as these infections can predispose to secondary bacterial infections, and may even lead to serious complications such as pneumonia or respiratory failure due to the manipulation of the airway during induction of general anaesthetic. In elective cases, these patients are often postponed and re-listed following recovery from their illness.

Smoking also adversely affects the lungs and smokers are advised to abstain for at least 8 weeks prior to surgery if possible. If not, abstinence 24 hours prior to surgery has also shown benefit by minimising mucus secretion and increasing oxygenation in small calibre airways. Patients' immune response has also been shown to be boosted following cessation of smoking.

Patients with chronic obstructive pulmonary disease (COPD) or asthma must be adequately controlled on therapy before being subjected to general anaesthesia, as they are at higher risk of developing bronchospasm during induction, and are at greater risk of contracting atelectasis and pneumonia post-operatively. If asthmatics are symptomatic (widespread wheeze, cough, increased sputum production) then surgery should be delayed or cancelled until adequate control is regained. Similarly, in an acute exacerbation of COPD, surgery should be delayed or cancelled until the patient is asymptomatic for at least 3 months.

Cardiovascular diseases

The cardiovascular system is placed under strain in surgery as a result of pain, increased cardiac demands due to anaesthetic-induced hypotension, haemorrhage and stress response invoked by surgery. Potential cardiac complications, particularly in association with cardiothoracic surgery, include cardiac arrhythmias (secondary to electrolyte disturbances or mechanical stimulation of the heart), thromboembolic events such as myocardial infarction all have severe consequences hence a constant cardiac and blood pressure monitoring is required by the anaesthetist.

Patients who have had a recent myocardial infarction (within the last 6 months) are at higher risks of having a re-infarction. If at all possible to postpone the surgery until six months after the event, this would significantly reduce patient morbidity. If surgery is an emergency and cannot be delayed, then diligent peri-operative monitoring is essential to reduce risk of re-infarction.

Congestive heart failure should be optimized as much as possible prior to surgery as being loaded with intravenous infusions and positioned flat on the operating table can aggravate this condition. Diuretic use, diligent use monitoring of fluid status and inotropic support should be considered in these patients.

Patients with permanent pacemakers necessitate particular attention during the peri-operative stage. Pacemakers are used to maintain the regular heart rate when the cardiac conduction system fails. Although modern-day pacemakers are robust, they still can malfunction during surgery, hence assiduous cardiac

monitoring is required, particularly intra-operatively. In addition, it is important for pacemakers to be converted to the asynchronous or "safe mode". This is because surgical instruments such as unipolar diathermy may interfere with pacemaker function. Electrocautery can potentially increase the rate of capture of the pacemaker and also induce ventricular fibrillation. Where possible the use of bi-polar electrocautery is recommended in these patients, but if uni-polar electrocautery is obligatory, then the diathermy pad should be placed as far away as possible to the pacemaker.

Patients with severe valvular heart diseases, particularly stenotic heart valves, also add challenges to the anaesthetic process. Those with stenotic heart valves have a relatively fixed cardiac output and are unable to compensate for the reduction in systemic vascular resistance caused by the vasodilatation effect of general anaesthetic. Valvular heart diseases also predispose patients to develop endocarditis. However, there is insufficient evidence supporting routine pre-operative antibiotic prophylaxis against endocarditis.[6] NICE guidelines currently recommend that antibiotic prophylaxis is **not** needed in the following cases:

- Those undergoing dental procedures
- Non-dental procedures involving upper and lower GI tract, genitourinary tract (urological, gynaecological, obstetric procedures and childbirth), upper and lower respiratory tract (ear, nose and throat procedures and bronchoscopy).

For other major operations, endocarditis prophylaxis should be considered.

Other medications

Most medications apart from those listed above can be given on the morning of surgery. Cardiac anti-hypertensive drugs need not be omitted prior to surgery unless there is a specific indication. Oral hypoglycaemics, as discussed above, and antidepressants are usually stopped the morning of surgery. Patients on oral steroids may require intravenous hydrocortisone intra-operatively to prevent hypo-adrenal or 'Addisonian' crisis. Oral contraceptive pill (OCP) if possible should be stopped four weeks prior to surgery to reduce the risk of developing venous thromboembolic events occurring.[7]

Conclusion

Although surgery is not without risks, patient morbidity and mortality can be significantly reduced if they undergo thorough preoperative assessment and optimization prior to surgery. With adequate preparation, diligent monitoring, an astute anaesthetist and a well behaved patient, complication rates can be curtailed to a minimum.

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