Bariatric surgery: risks and recommendations for the prevention of perioperative thromboembolism

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Introduction

Globally the numbers of overweight, obese and severely obese people are increasing rapidly. High incidences of obesity and overweight have been documented for the South African population (Table Ia and Ib). Although polygenetic factors play an important role in obesity, environmental factors should also be considered. A sedentary occupation and lifestyle with easy access to energy dense foods is a major contributor to the obesity epidemic. For patients with a BMI > 40 kg/m^2, who have failed to successfully lose weight, bariatric surgery is a treatment option. This surgical intervention can achieve long-term sustained weight loss and often induces resolution of comorbidities such as diabetes, sleep apnoea, hyperlipidaemia and hypertension (Table II).[1]

Venous thromboembolism (VTE) may occur after bariatric surgery which can cause significant morbidity and mortality. Evidence-based regimens for VTE prophylaxis in bariatric and metabolic surgery have resulted in some controversy. Recently the American College of Chest Physicians (8th edition) published new guidelines on perioperative management of antithrombotic therapy.[2] Both the obese patient and the procedure itself have risks. When looking at VTE rates post major abdominal surgery, bariatric surgery has the lowest rate and splenectomy the highest.[3]

46% of the world's 400 million obese people are from the developing world.[4]

Surgical risk

The positive pressure during laparoscopic inflation has been associated with oxidative stress during surgery which, in turn, will cause endothelial dysfunction and platelet aggregation. The position of the patient, tilted feet down to 15°, as well as the duration of the operation, both contribute to decreased blood flow. The duration is influenced by the type of surgery performed, e.g. laparoscopic gastric banding usually being the quickest and thus with the lowest risk of VTEs.

Table I(a): South African childhood/adolescent obesity (National Representative Study)

Overweight	20.1 % urban children 15.8 % tribal children 10.8% children on farms
Youth risk behaviour study (YRBS)	**Overweight**: 17 % overweight 4 % obese
University students	**Black**: 18.2 % overweight 6.5 % obese **White**: 10 % overweight 1 % obese

Table I(b): Prevalence data in South African population

Economically Active Adult Study		Meta-analysis of studies in South Africa
Overweight/obese		Obese
White men	56.4%	± 20 %
White women	42.2%	± 24 %
Black men	49.3%	± 8 %
Black women	74.6%	± 44 %
Asian men	35.5 %	± 9 %
Asian women	37.0 %	± 22 %
Mixed ancestry men	45.7 %	± 8 %
Mixed ancestry women	66.0 %	± 28 %

Table II: Mean percentages of patients with complete resolution of comorbidities postoperatively

	Operations		
Major comorbidity	Adjustable gastric banding	Gastric bypass	Biliopancreatic bypass
Diabetes	48	84	99
Dyslipidaemia	59	97	99
Hypertension	43	68	83
Sleep apnoea	95	80	92

Patient risk factors

Adipose tissue is one of the main sources of inflammatory mediators, including interleukin-6. This cytokine stimulates platelet-aggregating factor-1(PAF-1). Plasminogen activator inhibitor-1 levels are increased in obesity partly due to increased gene expression in the adipocytes. In addition, levels of circulating antithrombin levels are low. A sedentary lifestyle and right cardiac insufficiency also contribute to decreased venous flow. Overall, obesity is a prothrombotic condition.

There are several other factors that have to be considered when attempting to stratify risk for VTE during bariatric surgery:

Frezza et al[5] indicate that patients are considered high risk if they have:

- Heart failure, a BMI ≥ 50 kg/m^2
- History of a previous thrombotic event or previous pelvic surgery

Gonzalez et al[6] identified a higher risk in patients:

- Older than 50 years
- A history of deep vein thrombosis and/or smoking
- In the presence of an anastamotic leak, revisional or open surgery

No association was documented of increased risk for VTEs with gender, higher BMI, or with comorbidities such as sleep apnoea, hypertension, diabetes and myocardial infarction.

Non-pharmacological prophylaxis

There is no consensus on the best prophylactic regimen for VTEs in bariatric surgery patients. Debated issues include the type of anticoagulant prescribed, use of unfractionated heparin, low-molecular-weight heparin (LMWH) vs. warfarin, as well as dosage and duration of therapy. It is agreed that patients should be mobilised as soon as possible, usually within 10–12 hours after surgery. Most groups will use calf-length pneumatic compression devices which are fitted and started before anaesthesia induction until mobilisation. These devices inflate and compress on average every 40 seconds to stimulate lower limb blood flow. Intermittent pneumatic compression has been found to increase venous velocity and stimulate endogenous fibrinolysis.[7] Its effect appears to be somewhat lower in post-thrombotic veins. Elastic stockings can also be worn for some time after surgery. Clements et al[8] showed that, in patients without a history of VTE, a short operating time (mean 106 minutes), ambulation on day of surgery and calf-length pneumatic compression devices gave adequate prophylaxis with a low rate of bleeding complications.

Pharmacological prophylaxis

Bariatric centres of excellence have an anticoagulation protocol that includes subcutaneous LMWH. Several studies have looked at different heparins and different dosages. The BAFLUX study[9] evaluated the pharmacodynamic parameters of two doses of the LMWH parnaparin. Anti-factor Xa levels were measured on days 0, 4 and 6 postsurgery. A dose of 4 250 IU/day was found adequate to keep anti-Xa levels between 0.1–0.4 IU/mL. Higher doses increased anti-Xa levels and could lead to increased rates of bleeding. Simone et al[10] looked at two doses of enoxaparin, 40 mg and 60 mg, given 12 hourly and the effect was monitored with anti-Xa levels. With 40 mg, 50% of patients failed to meet the therapeutic level and no patient was super-therapeutic. It is, therefore, possible that a dose of 40 mg may not be enough and the LMWH dose should be titrated until anti-Xa levels are in range. The timing of chemoprophylaxis administration varies considerably from three days before surgery until 21 days after, depending on extremes of risk.

Inferior vena cava filters

In the group of super-super morbidly obese patients (BMI > 60), there is an international trend to fit an inferior vena cava (IVC) filter prior to operation.[11] Criteria for IVC filters may vary in different centres to include patients at a BMI > 60 kg/m^2 or, alternatively, at a weight > 250 kg. Patients with BMI < 60 considered at extremely high risk for VTEs may also be advised to have an IVC filter fitted. These would include patients with a previous pulmonary embolus or ileofemoral deep vein thrombosis, a documented hypercoaguable state, significant venous stasis or increased right heart pressures (> 40 mmHg).

Recommendations

Screening

There have been some reports that showed an increase in thrombophilias in the obese patients compared to the non-obese.[12] However, it is not considered cost effective to do a full thrombotic profile in *every* patient. It is important to note on the history if there has been a prior deep vein thrombosis or pulmonary embolism. If there were no obvious precipitating causes for this event, then a thrombophilia screen can be considered. This screen cannot be performed on patients who are on long-term warfarin therapy. Preoperative factor Xa levels should be measured as a baseline marker.

Prophylaxis

Subcutaneous LMWH is the easiest to administer. The dose is usually: enoxaparin 40–60 mg daily or parnaparin 4250 IU/day, with the first dose administered the day before surgery and continuing intra- and postoperatively for a minimum time period of 5–7 days. It is possible that in obese patients a dose of 40 mg will not always be adequate, and 60 mg may be needed. Anti-Xa levels need to be measured to determine the accuracy of the administered dose. A level between 0.1–0.4 IU/mL is considered therapeutic. Anti-Xa can be measured on days 0, 3 and 7 postoperatively. Contraindications to anticoagulation would be allergy to this class of drugs, heparin induced thrombocytopaenia, a coagulation disturbance and excessive bleeding or any clinical concern for high risk of bleeding from other organ sites.

General measures

It is important to review the individual patient's risk profile and minimise it where possible. Contraceptive therapy can be discontinued 10 days prior to surgery and for 10–21 days postoperatively in women at high

risk (i.e. one cycle). Women taking hormone replacement therapy and at low risk for thromboembolism may not have to discontinue for longer than the period of immobilisation. Smokers should be advised to quit smoking at least eight weeks prior to surgery before the operation and advised to stop permanently thereafter.

Conclusion

Bariatric surgery remains the most effective means of treating severe obesity. The number of severely obese patients is increasing and, consequently, more people are seeking bariatric surgery. In the United States between 1998 and 2007, the number of bariatric procedures increased 15-fold. VTE remains the most worrying complication. A full risk profile assessment should be done on history. In patients with a history of VTE not previously investigated, a thrombotic profile should be done.

- It is advised that a baseline anti-Xa level should be measured.
- LMWH can be started the day before surgery and continued intra- and postoperatively.
- Enoxaparin 40 mg daily is most commonly used and can be titrated against anti-Xa levels if indicated .
- Most patients need to continue with anticoagulation for 7–21 days depending of individual risk assessment.
- In patients with a very high risk profile for VTEs, LMWH should be continued for a minimum of three weeks and possibly for up to six weeks.
- Before theatre, elastic stockings and compression devices must be fitted until the patient is fully mobilised.
- Mobilisation should start within 12 hours if no operative complications occur.
- In patients weighing more than 250 kg, an inferior vena cava filter can be fitted.

Available evidence to date suggests that adherence to guidelines and recommendations will improve, but not necessarily eliminate the incidence of VTE.

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