Anaesthetic management of a patient with morbid obesity: case report

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Abstract

The purpose of this case report is to describe our experience of the anaesthetic management of a patient with morbid obesity undergoing general surgery. The obese patient is at great risk of problems with endotracheal intubation and developing peri-operative respiratory and cardiovascular complications. The difficulties in moving and positioning the patient and gaining venous access add to the problems. Anaesthesia and surgery on an obese patient should not be undertaken lightly without a full understanding of the potential problems.

Keywords: obesity; morbid obesity; body mass index (BMI); ideal body weight (IBW); peri-operative management; Botswana.

Introduction

The obese patient is at great risk of problems with endotracheal intubation and developing peri-operative respiratory and cardiovascular complications. The difficulties in moving and positioning the patient and gaining venous access add to the problems. Anaesthesia and surgery on an obese patient should not be undertaken lightly without a full understanding of the potential problems. This case report addresses these important key issues.

Case Report

Anaesthesia in the morbidly obese patient presents many challenges. The concern is airway management and in particular difficulties with intubation.[1]

We describe an obese female patient whose weight was 165 kg, height was 163.5 cm and hence Body Mass Index (BMI) was 61.7. (BMI = body weight (in kg)/ height2 (in meters)). She required a ventral hernia repair.

Pre-operative anaesthetic evaluation used the Mallampati classification:

- Class I: Soft palate, uvula, fauces, pillars visible.
- Class II: Soft palate, major part of uvula, fauces visible.
- Class III: Soft palate, base of uvula visible.
- Class IV: Only hard palate visible.

Our patient fell into Class III with an almost absent neck with a limited range of movement of the head and neck. The thyromental distance (TMD) was greater than 6 finger breadths. The thyromental distance is measured from the thyroid notch to the tip of the jaw with the head extended. Anything less than 7.0 cm warns the anaesthetist about possible difficulties with intubation. Our patient had a TMD of greater than 12 cm. All laboratory variables and vital signs were within normal ranges (pulse rate 71 bpm and a BP 100/60 mmHg).

The patient was positioned supine and all monitors were attached, pulse oximetry, non-invasive blood pressure (NIBP) and electrocardiogram (ECG). The patient was pre-oxygenated with 100% O2 via facemask. She was then pre-medicated with metoclopramide 10 mg IV and anaesthetized with propofol 200 mg IV and suxamethonium 100 mg IV. The first intubation attempt was unsuccessful with poor visualization of the vocal cords using the smaller laryngoscope (Macintosh

size 4). Intubation was successful using a Macintosh size 5 laryngoscope and a 7mm endotracheal tube A size 3 oropharyngeal airway was also inserted. The patient was ventilated mechanically using a volume control mode with a tidal volume of 1,000 mls at a rate of 6mls – 8mls/minute. Sevoflurane 0-3.5 % was given. The peak inspiratory pressure was 35 cmH_2O and the Inspiratory Expiratory (I:E) ratio of 1:2. A non-depolarizing muscle relaxant (atracurium 50 mg in total) was used during mechanical ventilation.

The patient remained haemodynamically stable during surgery and the emergence from anaesthesia was uneventful. She was ultimately extubated post-surgery and transferred to Post-Anaesthesia Care Unit (PACU). The whole anaesthesia course was uneventful.

Discussion

We are not aware of any reports of morbidly obese patients being anaesthetized for surgery at Princes Marina Hospital. The anaesthetic management of an obese patient is challenging. A number of factors need to be considered. An operating room with sufficient space is required. Positioning of the patient before induction of anaesthesia is important. Ideally lifting equipment should be available: we did not have this facility. Two operating tables should be placed side by side to accommodate the patient [2] but we had only one available.

All necessary anaesthetic equipment must be immediately available in anticipation of difficulties. An obese patient has high intra-abdominal pressure and decreased functional residual capacity (FRC), end-expiratory lung volume, and total lung capacity (TLC) making mechanical ventilation difficult. Muscle paralysis with muscle relaxants, further reduces lung volumes.

Pharmacokinetics & pharmacodynamics

Obesity affects drug pharmacokinetic and pharmacodynamic profiles. Most of the data on drug dosing are for non-obese patients.[3] The increase in extracellular volume, the larger fat mass and lean body weight all affect drug pharmacokinetics. The volume of distribution of lipophilic drugs is greater than in normal-weight patients, whereas the hydrophilic drugs do not vary as much. The advice on the use of ideal body weight (IBW) or total body weight to calculate drug dosages is not always clear. For example, paralytics are dosed based on IBW and most analgesics are based on lean body weight. Due to the large doses required with the increased distribution volume and the risk of prolonged effects after discontinuation, lipophilic drugs such as barbiturates, benzodiazepines, and volatile inhalation agents, should be used with caution or minimally in obese patients. Anaesthesia can be easily maintained by either intravenous anaesthesia (IV) or inhalation anaesthesia.

The ideal inhalational anaesthetic has a short onset and short, reliable recovery profile. Desflurane is the inhalational agent of choice in obese patients, but sevoflurane can also be used as in our case.

Figure 1. Obese patient with very short neck

Pulmonary System

Obese patients are at increased risk of having difficult to handle airways, as bag mask valve ventilation and intubation can be challenging. While increased BMI does not predict difficulty with laryngoscopy or tracheal intubation, greater neck circumference (>40 cm) and higher Mallampati score (>3) are better predictors of difficult intubation.

Although most patients in a supine position may successfully undergo tracheal intubation, other adjuncts, such as flexible fibreoptic wake-up intubation, video – assisted laryngoscopy and laryngeal mask airway (LMA), should be readily available.

As the FRC in obese patients is diminished, lengthy periods of apnoea are not tolerated and patients easily deoxygenate.[4] It is therefore recommended that preoxygenation be used for denitrogenation using 100% fraction of inspired oxygen (FiO_2).

For the pre-intubation process, it is often suggested that continuous positive airway pressure (CPAP) at 10 cmH_2O is used to reduce the development of atelectasis [4]. A typical intubation position for obese patients, using shoulder towels, is the reverse Trendelenburg or head-up position 25 to 40 degrees.

With the rise in BMI, obese patients with decreased FRC, and expiratory reserve capacity show a restrictive trend during anaesthesia.

Lung volume, and compliance also decrease. For obese patients an increase in oxygen intake, respiratory resistance, and breathing function is observed.

These changes result in gas trapping and hence mismatching of the ventilation-perfusion ratio, hypoxaemia, and atelectasis which becomes worse with anaesthesia and paralysis. Furthermore, there is a higher incidence of obstructive sleep apnoea (OSA). The most common bariatric surgery procedures are gastric bypass, sleeve gastrectomy, adjustable gastric band and biliopancreatic diversion with duodenal switch.

The American Association of Clinical Endocrinologists (AACE), the Obesity Society (TOS) and the American Society for Metabolic and Bariatric Surgery (ASMBS) support polysomnographic preoperative screening and preoperative CPAP in patients at risk.

It has been shown that pre-operative CPAP decreases severe hypoxaemia, pulmonary vasoconstriction, postoperative complications and hospital length of stay. Postoperative CPAP decreases the risk of restrictive pulmonary disease and acute respiratory distress syndrome.[5]

The use of post-operative CPAP is recommended when pulse oximetry falls to 90% while sleeping and IV medications are no longer required for pain relief. There are no specific guidelines on ventilator techniques for obese patients. However, in the anaesthesiology literature recommendations indicate the use of at least 10 cmH_2O of post-end expiratory pressure (PEEP) after induction.[5]

The use of high tidal volumes, PEEP and critical capacity manoeuvres to improve ventilation and oxygenation were recorded, although[5] showed little gain in high tidal volumes in an attempt to sustain FRCs. Extubation should be done after the defensive airway reflexes have been assessed and the recovery of muscle strength has been assessed, the patient is fully awake and able to execute commands and in the reverse Trendelenburg position. Once extubated, continuous pulse oximetry is used to detect subclinical periods of desaturation.

Following major surgery, supplemental oxygen should be given, with some physicians suggesting treatment times of at least 24 to 48 hours. Nasal CPAP was also prescribed postoperatively, in addition to supplemental oxygen.

Cardiovascular System

Obesity is a significant coronary heart disease risk factor. Obese patients must undergo a thorough cardiovascular examination prior to elective surgery. They are at a higher risk for hypertension and hence left ventricular hypertrophy, pulmonary hypertension, and coronary arterial occlusion.[6]

Investigations should include chest X-ray, 12-lead electrocardiography and polysomnography in patients with OSA. Echocardiography, spirometry, are needed in the presence of additional risk factors (e.g. heart diseases and COPD), and arterial blood gases.

Perioperative beta-blockers like labetalol are recommended in healthy or suspected coronary artery disease patients. According to Leonard, Davies and Waibel[6] "Several side effects of beta-blockade, however, such as impaired tolerance to glucose, decreased insulin resistance and other metabolic anomalies, can be dangerous in highly obese patients or patients with metabolic syndrome. Other medicinal products including antihypertensives can be continued preoperatively. Routine intraoperative haemodynamic surveillance should be started using telemetry and controlling blood pressure."

Blood pressure arm cuffs should be long enough to encircle at least 75% of the arm and 40% of the width of the arm.

Conclusion

Obesity is increasing in Botswana especially among female patients. This poses a high risk to patients undergoing anaesthesia and surgery. This is a concern for the whole team (anaesthetists, surgeons and nurses) which should be aware of the potential risks associated with morbidly obese patients. This case report exemplifies the difficulties in management.

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