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Case Report

ANAESTHESIA FOR LAPAROSCOPIC BARIATRIC SURGERY: FIRST TIME IN BANGLADESH – A CASE REPORT

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INTRODUCTION

Bariatric surgery encompasses a variety of surgical weight loss procedures used to treat morbid obesity. Obesity is clinically expressed in terms of BMI or Quetelet's index[1], which is derived by dividing weight by the square of height to estimate the degree of obesity. Thus, BMI = body weight (kg)/height^2 (m^2). Morbid obesity is a BMI more than 35 kg/m^2, and super morbid obesity is BMI more than 55 kg/m^2.

The indications for surgical treatment of severe obesity, as outlined in the 1991 National Institutes of Health Consensus Development Conference Panel, include an absolute BMI more than 40 kg/m^2 or BMI more than 35 kg/m^2 in combination with life-threatening cardiopulmonary problems or severe diabetes mellitus[2]. Anaesthetic management of bariatric patient is different due to anatomical, physiological, pharmacological and pathological changes. The anaesthetic burden is increased when surgery is performed with laparoscopic procedure.

Bariatric anaesthesia for non bariatric surgery is not uncommon in our country. But bariatric anaesthesia for bariatric surgery is uncommon. Bangladesh society of laparoscopic surgeons organized a workshop on "Laparoscopic Bariatric surgery" last 20th December, 2008 in BIRDEM. That's why we got the opportunity to be experienced with anaesthesia for Laparoscopic bariatric surgery. As per documentation, it is the first case report in Bangladesh regarding this special field of anaesthesia. Surgery was performed by a renowned surgeon from abroad along with surgical team of BIRDEM and outside BIRDEM.

CASE REPORT

A 55 years old lady was electively scheduled for bariatric surgery. Her anthropometric measurement was- height 157 cm, weight 116 kg and BMI 47. She was coexisted with diabetes mellitus, hypertension and mild sleep apnea syndrome. Her DM was controlled with insulin and there were no visible micro or macrovascular complications. Her HbA_1C and 24 hours blood sugar profile was within normal limit. Hypertension was controlled with single dose amlodipine 5mg. Cardiovascular function was normal except mild diastolic dysfunction. Renal and liver function was within normal limit. Lung function shows mild restrictive disorder. Hormonal assay like thyroid and adrenal functions were within normal range.

Airway assessment, peripheral venous access site selection and counseling regarding extubation in light plane of anesthesia were done properly. Premedication was done with 3mg bromazepam at night before surgery. Low molecular heparin was started day before surgery as prophylactic of DVT. She was fasted for 8 hours prior to surgery and morning dose of insulin was omitted but antihypertensive agent was given. On arrival at preoperative room EMLA was applied over the relevant site of skin. After one hour, an 18G vasofix intravenous cannula was inserted into the left cephalic vein near to wrist for administration of fluid and other medications. The patients were next brought to the operating room where she underwent anesthesia and surgery.

Patient was preoxiginated for 5 minutes. She was inducted with 200 μg fentanyl, 200mg propofol and 150 mg suxamethonium pretreated with 2 mg atracurium. She was intubated with single attempt with an endotracheal tube size 8.5. After fixation of tube, central venous catheter was introduced in the right subclavian vein. 60mg ketorolac with H_2 blocker was given intravenously.

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The anaesthetic protocol was strictly maintained. Anaesthesia was maintained with inhaled O_2/N_2O (1:2) and propofol 50-100 μg/kg/min as required to ensure adequate depth of anaesthesia. Tracurium 20 mg every 20 minutes is continued until 20 minutes before the anticipated end of surgery. Tidal volume 1200ml and respiratory rate 12/min were adjusted in the anaesthesia ventilator. Crab bandage was applied around both lower extremities. General care was taken properly. Pulse, NIBP, SpO_2, continuous ECG, temperature, CVP, $ETCO_2$, sweating and tearing is monitored and recorded. 0.5% bupivacaine was infiltrated all the port site properly after skin closure. After operation the patient was ventilated with 100% O_2 for 10 minutes. Then motor power was assessed with tongue movement during suctioning, spontaneous ventilation and fighting action. Then intravenous Neostigmine 0.05 mg/kg body weight and Atropine 0.02 mg/kg body weight was given and extubated properly. She was propt up positioned on postoperative bed and O_2 at a rate of 5 L/min was given. Postoperative analgesia was maintained with ketorolac 60 mg 8 hourly. Chest physiotherapy and lower limb message given 8 hourly. She was assisted to walk at 6^{th} hour of postoperative period.

DISCUSSION

Attention should focus on issues unique to the obese patient, particularly cardiorespiratory status and the airway. Patients presenting for bariatric surgery should be evaluated for systemic hypertension, pulmonary hypertension, signs of right and/or left ventricular failure, and ischemic heart disease. Signs of cardiac failure—such as increased jugular venous pressure, added heart sounds, pulmonary crackles, hepatomegaly, and peripheral edema—may be difficult to detect.

Peripheral and central venous access and arterial cannulation sites should be evaluated during the preoperative examination and the possibility of invasive monitoring should be discussed with the patient. Baseline arterial blood gas measurements will help evaluate carbon dioxide retention and provide guidelines for perioperative oxygen administration and possible institution of and weaning from postoperative ventilation.

It is recommended that the patient's usual medications, except insulin and oral hypoglycemic agents, be continued until the time of surgery. Antibiotic prophylaxis is important because of increased risk of postoperative wound infection. Published rates of wound infection after gastric operations for obesity are approximately 5%[3], and rates after clean contaminated GI surgery are 2%–3%[4]. Anxiolysis, analgesia, and prophylaxis against both aspiration pneumonitis and DVT should be addressed during premedication. Oral benzodiazepines are reliable for anxiolysis and sedation because they cause little or no respiratory depression. IV midazolam can also be titrated in small doses for anxiolysis during the immediate preoperative period.

Morbid obesity is a major independent risk factor for sudden death from acute postoperative PE[5,6]. Heparin, 5000 IU subcutaneously, administered before surgery and repeated every 12 h until the patient was fully mobile, reduced the risk of DVT[7]. Recently, low molecular weight heparins (LMWH) have gained popularity in thromboembolism prophylaxis because of their bioavailability when injected subcutaneously[8].

Specially designed tables or two regular tables joined together may be required for safe anaesthesia for bariatric surgery. Regular operating room tables have a maximum weight limit of approximately 205 kg, but operating tables capable of holding up to 455 kg, with a little extra width to accommodate the extra girth, are available. Particular care should be paid to protecting pressure areas, because pressure sores and neural injuries are more common in this group, especially in the super obese and the diabetic. Brachial plexus and sciatic nerve palsies have been reported[9].

Pneumoperitoneum causes systemic changes during laparoscopy. The gas most often used for this purpose is carbon dioxide. Positioning, such as Trendelenburg, can worsen the systemic changes of pneumoperitoneum[10]. Systemic vascular resistance is increased with increased intra abdominal pressure (IAP). The degree of IAP determines its effects on venous return and myocardial performance[11]. There is a biphasic cardiovascular response to increases in IAP. At an IAP <10 mm Hg, there is an increase in venous return, probably from a reduction in splanchnic sequestration of blood, with a subsequent increase in cardiac output and arterial pressure. Hypovolemia, however, blunts this response[12]. Compression of the inferior vena cava occurs at an IAP >20 mm Hg, with decreased venous return from

the lower body and consequent decreased cardiac output[13]. Increased renal vascular resistance at an IAP >20 mm Hg decreases renal blood flow and GFR[14]. Femoral venous blood flow can be reduced by both pneumoperitoneum and Trendelenburg positioning, with an increased risk of lower-extremity thrombosis[15]. Abdominal viscera further exert weight on the diaphragm during Trendelenburg positioning, causing a reduction in vital capacity, and placement of surgical packs and retractors in the upper abdomen may worsen the situation[16].

Invasive arterial monitoring should be used for the super morbidly obese with severe cardiopulmonary disease and for those with poor fit of the noninvasive blood pressure cuff because of severe conical shape of the upper arms or unavailability of appropriately sized cuffs. Blood pressure measurements can be falsely increased if a cuff too small for the arm is used[17]. Cuffs with bladders that encircle a minimum of 75% of the upper arm circumference or, preferably, the entire arm, should be used[18]. Comparable and accurate blood pressure readings can be obtained from the wrist[19] or ankle[20] with appropriately sized blood pressure cuffs in situations in which difficulty occurs with upper-arm noninvasive blood pressure measurement. We use central venous catheters in cases in which peripheral IV access cannot be obtained, whereas PA catheters are reserved for serious cardiopulmonary disease. Another strong indication for central venous catheterization is postoperative IV access, which can be problematic in this patient population and is probably more easily performed in the anesthetized patient.

Preparation should be made for the possibility of a difficult intubation, and a surgeon familiar with surgical airways should be readily available. A towel or folded blankets under the shoulders and head can compensate for an exaggerated flexed position from posterior cervical fat[21].

Drugs with weak or moderate lipophilicity can be dosed on the basis of ideal body weight (IBW) or, more accurately, lean body mass (LBM). These values are not identical, because 20%–40% of an obese patient's increase in total body weight can be attributed to an increase in LBM. Adding 20% to the estimated IBW dose of hydrophilic medications is sufficient to include the extra lean mass. Nondepolarizing muscle relaxants can be dosed in this manner. The majority of anesthetic drugs are strongly lipophilic. Increased VD is expected for lipophilic substances, but this is not consistently demonstrated in pharmacological studies because of factors such as end-organ clearance or protein binding.

Desflurane has been suggested as the inhaled anesthetic of choice in this patient population because of its more rapid and consistent recovery profile[22]. Two different studies[23,24] compared sevoflurane with isoflurane for use during bariatric surgery and favored sevoflurane because of its more rapid recovery, good hemodynamic control, and infrequent incidence of nausea and vomiting, prompt regaining of psychological and physical functioning, early discharge from the hospital, and small cost. Rapid elimination and analgesic properties make nitrous oxide a good inhaled choice during bariatric surgery, but high oxygen demand in the obese limits its use.

Complete muscular relaxation is crucial during laparoscopic bariatric procedures to facilitate ventilation and to maintain an adequate working space for visualization and safe manipulation of laparoscopic instruments. Complete relaxation also facilitates the introduction of surgical equipment and extraction of excised tissues. Collapse of pneumoperitoneum may be an early indication that muscle relaxation is inadequate, because muscle tone competes with the pressure limit set for the pneumoperitoneum. Tightening of the musculature around the surgeon's finger palpating the port site may also be a sign of inadequate paralysis.

Combined epidural and general balanced anaesthesia has been advocated to allow better titration of anesthetic drugs, use of a larger oxygen concentration, and optimal muscle relaxation for upper abdominal surgery in the obese[25]. This does not reflect current practice, because most bariatric procedures are performed under a minimally invasive laparoscopic approach, with less depression of postoperative pulmonary function, decreased pain, improved oxygenation, and less atelectasis when compared with laparotomy[26].

Tidal volumes of up to 15–20 mL/kg have been recommended as one method to improve functional residual capacity (FRC) in the anaesthetized obese patient[27]. This has not been shown to improve oxygenation significantly, even though FRC may

be increased above closing volume. Bardoczky et al.[28] evaluated the effects of large tidal volume ventilation on oxygenation and ventilation in morbidly obese patients during anesthesia and found that increasing tidal volumes up to 22 mL/kg increased the peak inspiratory airway pressure, end-expiratory (plateau) airway pressure, and compliance of the lungs without significantly improving arterial oxygen tension, but it resulted in severe hypocapnia. They concluded that tidal volumes >13 mL/kg IBW offer no added advantage during ventilation of morbidly obese patients during anesthesia. Also, in light of evidence that the lung can be injured by excessive expansion (volutrauma) from large tidal volumes leading to pulmonary edema and that positive end-expiratory pressure (PEEP) actually reduced lung water content in this type of edema[29], it seems prudent to use moderate levels of PEEP (enough to preserve hemodynamic stability) rather than large tidal volumes in an attempt to improve oxygenation. We routinely use tidal volumes of 10–12 mL/kg to avoid barotrauma and respiratory rates of up to 12–14 breaths/minute to maintain normocapnia during laparoscopic bariatric surgery with carbon dioxide abdominal inflation. We have also successfully used pressure control ventilation with vigilant monitoring of exhaled tidal volumes to achieve adequate oxygenation and normocapnia.

We have found that intraoperative fluid requirements are usually larger if postoperative acute tubular necrosis is to be prevented. Patients usually require up to 4–5 L of crystalloid for an average 2-h operation. This adds up to twice the calculated maintenance fluid requirement plus the calculated deficit based on a 12-h fasting period for an average 70-kg patient for the first hour by using the 4-2-1 formula (4 mL $\cdot kg^{-1} \cdot h^{-1}$ for the first 10 kg; 2 mL $\cdot kg^{-1} \cdot h^{-1}$ for the next 10 kg; then 1 mL $\cdot kg^{-1} \cdot h^{-1}$ for every kilogram thereafter). The next hour usually requires the same amount of crystalloid, after which the amounts are reduced to approximately twice the calculated maintenance requirement, based on LBM, for the next 12 h (200 mL/h overnight).

Anaesthesiologists help facilitate proper placement of an intragastric balloon and nasogastric (NG) tube during surgery to help the surgeon size the gastric pouch. They also help perform leak tests with saline and methylene blue to ensure anastomotic integrity. Care should be taken during injection of saline or methylene blue through the NG tube to ensure that the endotracheal tube cuff maintains a tight seal; otherwise, aspiration of methylene blue can occur, leading to chemical pneumonitis. It is also important to completely remove all endogastric tubes (not just merely pull them back into the esophagus) before gastric division, to avoid unplanned stapling and transection of these devices.

A 45% incidence of atelectasis has been reported in obese patients after upper abdominal surgery (30), and initiation of continuous positive airway pressure (CPAP) treatment has been advocated, starting in the recovery room and continuing overnight, to prevent postoperative acute airway obstruction[31,32]. Bilevel positive airway pressure (BiPAP) has also been used to combat nocturnal airway obstruction[33].

The pain from an open bariatric surgical procedure can be quite significant. Epidural local anaesthetics and/or narcotics via the thoracic route are a safe and effective form of postoperative analgesia in these patients. Intrathecal narcotics are also a viable option. Potential advantages of thoracic epidural analgesia in the setting of bariatric surgery include prevention of DVT, improved analgesia, and earlier recovery of intestinal motility. Investigators have been unable to document a difference in the incidence of thrombophlebitis and PE with continuous epidural analgesia[34].

Laparoscopic bariatric surgery induces less postoperative pain and is less likely to interfere with pulmonary mechanics[35]. Most laparoscopic bariatric patients do well with local anesthetic wound infiltration and basic parenteral narcotics, such as PCA. In a study of 200 patients who underwent VBG[36], effective postoperative analgesia sufficient to allow mobilization was achieved by IV infusion of opioids or PCA.

CONCLUSION

Bariatric surgery is a safe and viable option in the management of obese patients when nonsurgical treatment options have been unsuccessful. Anaesthetic management of these patients should be taken into consideration. Optimization of the coexisting diseases associated with obesity before surgery is related to better outcome. Anaesthetic management is very much important to prevent life threatening complications. Knowledge and

skillness of anaesthetist, logistic supports and well monitoring facilities play key role for better outcome. A good number of patients go abroad for bariatric surgery every year due to unavailability and poor development of this wing in our country. We can serve our people as well as improve our economy by developing this wing.

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