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Perioperative Anaesthesic Concerns for Bariatric Surgeries

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Abstract

As bariatric surgeries is being accepted as safe procedure in India, it demands anesthesiologists to spruce up their knowledge and expertise as they play a vital role in safe perioperative patient management. This would require a thorough understanding of the pathophysiologic changes, surgical procedures and anesthesia case management for morbidly obese patients.

The anesthetic management may be complicated by various comorbidities associated with obesity. Intubation, maintenance of oxygenation, fluid and pain management may be particularly challenging. In our experience, with proper perioperative care and vigilant monitoring, the incidence of intraoperative and postoperative morbidities and mortalities can be reduced.

This study describes the anaesthetic experience in 103 consecutive patients of either sex with average body mass index (BMI) of more than 46.5kg/m^2 who underwent laparoscopic bariatric surgery in the form of gastric bypass, sleeve gastrectomy and mini-gastric bypass at our institution. Data analyzed included demographic profile, comparison of BMI and ASA classification and associated medical problems. There were no incidences of life threatening complications. We conclude that with proper perioperative care and monitoring the outcome of bariatric patients is excellent.

Keywords: Bariatric Surgery; Obesity; BMI; Perioperative Care.

Introduction

According to the National Institutes of Health [1], obesity is defined as a disease because it is a physiological dysfunction of human organism with environmental, genetic and endocrinological causes [3] Surgery performed for the treatment of morbid obesity is commonly referred to as bariatric surgery [2]. Roux-en-Y gastric bypass, and sleeve gastrectomy are considered the gold standard in bariatric surgery, as they result in massive weight reduction (70% or greater) with maintenance of 50% or more excess weight loss beyond 10 years [6]. Laparoscopically performed bariatric surgery offers the advantage of early mobilization, reduced hospital stay and marked reduction in the incidence of incisional hernia and wound infection [13].

Patients seeking surgical weight loss must have proven attempts at medically supervised weight loss. We studied a series of 103 patients who underwent laparoscopic bariatric surgery at our institution from October 2008 to June 2011. The laparoscopic bariatric procedures performed included Roux-en-Y-gastric bypass, sleeve gastrectomy and gastric banding [13]. In our institute the most common surgery performed was sleeve gastrectomy which accounts for 53.39% of the total cases followed by laparoscopic adjustable banding (25.24%) and Roux-en-Y gastric bypass (21.35%).

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Material and Methods

We did a retrospective study on 103 ASA II-IV patients of either sex (age varying between 23- 62 years) who underwent laparoscopic bariatric surgery between October 2008 and October 2011 in our institute.

Preoperative Assessment

Preoperatively the body mass index of each patient was calculated. All the patients were evaluated with complete history (hypertension, coronary artery disease, diabetes mellitus, sleep apnea syndrome or any other co–existing problem), detailed physical examination and baseline laboratory screening that includes blood cytology, blood glucose, routine urine test, serum electrolytes, thyroid, renal and liver function tests, blood gases, chest radiography and ECG. Appropriate consultation and optimization were initiated to ensure that patient was stabilized before surgery.

A systematic airway assessment was done. For each patient, three variables that may predict difficult intubation were collected: (a) modified Mallampati classification without phonation; (b) Range of head and neck motion; (c) width of mouth opening, measured as the interincisor gap in centimeters with the mouth fully opened and neck circumference measured.

Patients were premedicated with Tab Ondanseteron 4mg, Tab Ranitidine 150 mg and Tab Alprazolam 0.25 mg night before and on morning of the surgery. Sedative premedication was avoided in patients with obstructive sleep apnea. The patients were then wheeled into the theatre on a special trolley accommodating > 220kg. Graduated compression stockings were applied on calves of the patient.

Monitoring

Central venous and radial artery cannulation was done for intraoperative continuous monitoring. Intraoperative monitors included pulse oximeter, non-invasive blood pressure (using large size BP cuff which encircled ¾ of the upper arm), $EtCO_2$, electrocardiogram (ECG), bispectral index (BIS) monitor, peripheral neuromuscular monitor (TOF guard) and temperature probe. Oesophageal probe was used to monitor the core temperature. The temperature was maintained with the use of Baer-Hager body warmers and warmed (to body temperature) intravenous fluids.

Anaesthesia Technique

Difficult airway cart was kept ready for each case. Pre-oxygenation was done with 100% oxygen for 5-7 minutes. Positioning of patient was done with folded blankets under the shoulders (Ramp position) so that the tip of the chin was at a higher level than the chest to facilitate intubation. Anaesthesia was induced with injection Thiopentone (3-4.5mg/kg). Fentanyl citrate (1-2µg/kg) was given for intraoperative analgesia followed by succinylcholine 2mg/kg. Trachea was intubated with appropriate sized endotracheal tube. After securing the airway, a loading dose of Atracurium besylate 0.5mg/kg was given for muscle relaxation. Infusion Dexmedetomidine was started at 0.5µg/kg and was titrated to maintain heart rate of 60 to 70 beats/min throughout the duration of surgery. After intubation an esophageal calibration tube was inserted to decompress the stomach and urinary bladder catheterized to empty the bladder.

Anaesthesia was maintained with Desflurane + O_2 + Air titrated to maintain a BIS value of 40-60. Atracurium boluses were given intraoperatively to maintain a single response to train of four stimuli.

Ventilatory settings were adjusted to maintain minute ventilation by keeping the $EtCO_2$ between 35-40 mmHg and SpO_2 between 95-100%. Positive end-expiratory pressure (PEEP) of 5-7cm H_2O was given to all patients. All pressure points were adequately padded to prevent peripheral nerve injury. Carboperitoneum was initiated and the intra abdominal pressure was maintained between 15 to 20 mmHg. The surgery was carried out in modified Lloyd Davis position (steep reverse Trendelenberg position with legs spread apart).

At the end of the procedure, desflurane and dexmedetomidine infusion were discontinued. When the neuromuscular monitor showed 50% response to train-of-four stimuli, the residual neuromuscular block was reversed with inj. neostigmine methylsulphate 0.04 mg/kg and inj. glycopyrrolate sulphate 0.01 mg/kg intravenously. Tracheal extubation was performed when the patients showed adequate clinical signs of reversal of neuromuscular block (spontaneous eye opening and response to verbal commands) and train-of-four response had returned to 90% of control. The patients were then shifted postoperatively to the post anesthesia care unit (PACU).

Postoperative

Postoperative pain relief was provided with local anaesthetic wound infiltration of port sites with

0.2% Ropivacaine and inj. Paracetamol 1 gm intravenously eight hourly. Inj. Dexmedetomidine infusion was restarted in the PACU. DVT prophylaxis in the form of low molecular weight heparin 40 mg s/c was given 6 hours after the surgery. The patients were made ambulatory on 1st postoperative day and were discharged from the hospital between 3rd to 5th postoperative day.

Statistical Analysis

In the present study, the data collected was analyzed by computing percentages, proportions, mean and standard deviation when appropriate.

Results

The mean age of our patients was 42.83±9.80 years (range 23 – 62 years). The female patients out numbered in this series and the ratio was 61:42 (F:M). The mean body weight was 123.12±23.16 (range 88 – 182kg). The mean BMI was 44.86±6.83 (range 35-70kg/m^2). Mean MPS score was 2.70±0.50 (range 2-4)

Table 1 and Table 2 depicts the demographic profile and comparison of BMI and ASA classification respectively.

Figure 2 depicts the associated medical problems. The most prevalent associated co-morbidity in our patient was obstructive sleep apnea syndrome which was present in 59.6% of our patients. Of these patients who had OSA few of them used continuous positive airway pressure (CPAP) therapy preoperatively. These patients were electively set on CPAP on the night of surgery. Other concomitant diseases found were systemic arterial hypertension in 51.9%, diabetes mellitus in 30.8%, bronchial asthma in 9.6%, hypothyroidism in 5.77% and coronary artery disease in 1.8% of the patients.

The complications associated with anesthesia and surgical procedures were: failure of arterial cannulation in six patients, desaturation which is defined as fall in SpO_2 below 85% in five patients, difficulty to ventilate in two patients and metabolic acidosis which is defined as pH<7.1, pCO_2<35 and HCO_3 <22mmHg occurred in one patient.

The mean dose of thiopentone which was used as an induction agent in our study was 313.75 (range 120-500mg). We used atracurium as muscle relaxant and mean dose was 206.97(range 125-275mg).We kept fentanyl as analgesic of choice and mean dose was 152.12 (range 100-300µg). Infusion of dexmedetomidine (0.1microgram/kg) was started in all the patients at the rate of 5ml/hr. The mean duration of surgery was 211.11±48.99 (range120-360mins).

Table 1: Demographic Profile

Demographic Profile	N = 103
Age (years)	42.83 ± 9.80
Sex (M /F)	41 : 62
Weight (kg)	123.12 ± 23.16
BMI (kg/m^2)	44.86 ± 6.83

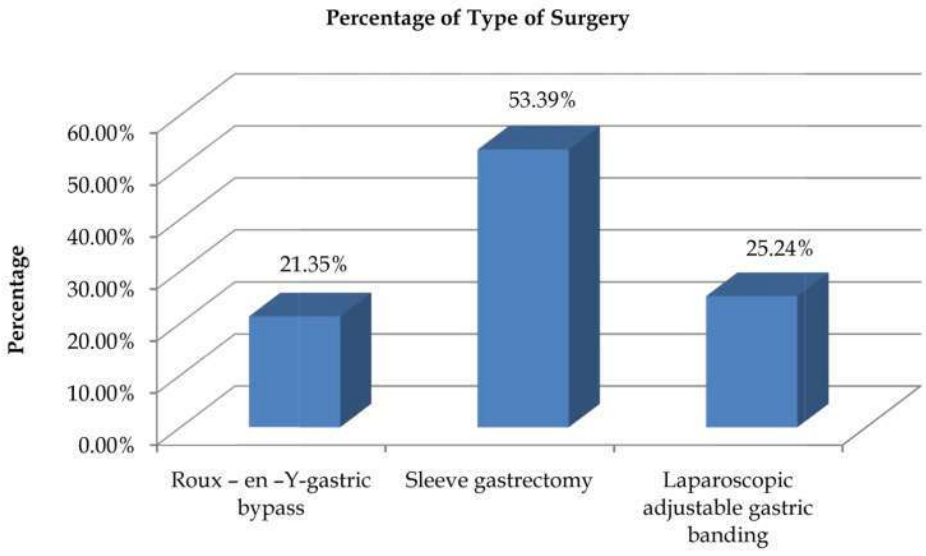

Fig. 1: Type of Surgery

Table 2: Comparison of BMI and ASA classification

	Comparison of BMI and ASA classification Percentage over Ideal body weight	BMI	ASA Class
Ideal Body Weight	0	20 -25	I
Minimally Obese	1 – 19	26 – 29	II
Morbid Obese	20 – 100	30 -35	III
Super Morbid Obese	200	> 35	IV

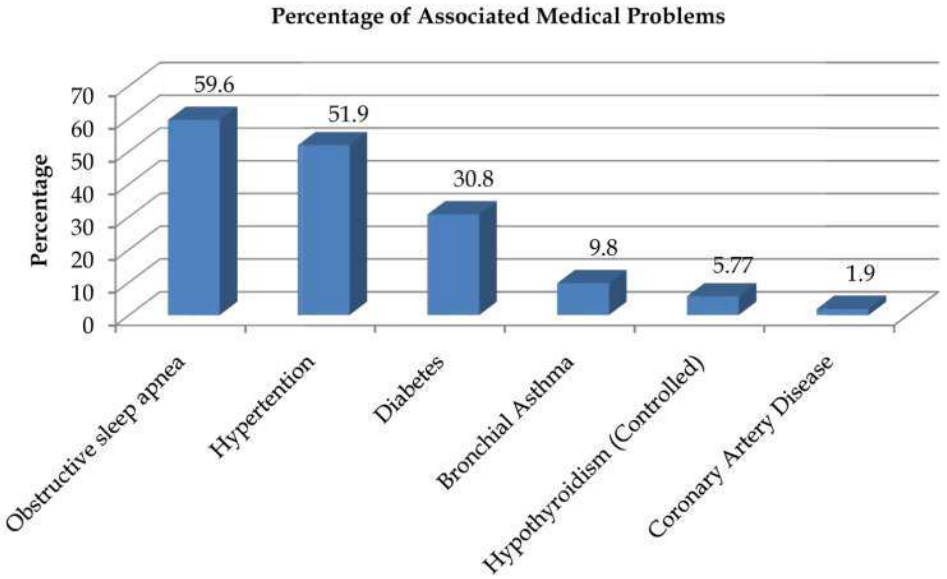

Fig. 2: Associated Medical Problems

Discussion

We did this retrospective study to know the peioperative outcome of our patients who underwent laparoscopic bariatric surgery. We found that a multidisciplinary approach is required to make perioperative outcome favourable. One aspect of paramount importance is evaluation of airway, whose management is critical [7,10] . A high Mallampati score (>3) and large neck circumference (>40cm) will increase potential for difficult laryngoscopy and intubation [4,8]. We found that patients with neck circumference >44cm and limited neck mobility are the most difficult candidates for mask ventilation and intubation. It is worthwhile to emphasize the need to have appropriate equipment to manage a difficult airway: special laryngoscopes, laryngeal masks, fiberoptic bronchoscope and even instruments for a surgical access in case of a difficult intubation. We were not able to ventilate two of our patients which may be because of their large tongue size, cervical pad of fat or due to the altered relation between mouth opening and cavity. Hence, positioning plays an important role in these patients [5].

Thiopentone is our standard induction agent and administered judiciously to prevent accidental hypotension. Then the patient was maintained on intermittent boluses of injection atracurium 0.1mg/ Kg body weight to provide good relaxation before pneumoperitoneum. For intraoperative analgesia we started with infusion dexmedetomedine as it has favorable pharmacokinetic properties minimally altered by extremes of age or renal or hepatic dysfunction, enable easy titration and rapid dissipation of clinical effect even after prolonged infusion. Anaesthesia was maintained with desflurane(2-6%). We prefer desflurane as it has more rapid and consistent recovery profile. According to Strum et al morbidly obese adult patients who underwent major abdominal surgery awoke significantly faster after desflurane than after sevoflurane anaesthesia [15].

Drug pharmacokinetics is altered in obese patients and it depends on changes in volume of distribution, protein binding properties, increased renal clearance and changes in liver clearance [9]. It is recommended that drugs with a short half-life be used to guarantee spontaneous ventilation once the medication is stopped [14]. It is also essential to

monitor the degree of neuromuscular block to ensure that there is no residual effect on completion of surgery. Hence we used neuromuscular monitoring in all our patients.

We stress the importance of close monitoring of respiratory function with emphasis on airway pressure, tidal volume, capnography and pulse oximetry. All obese patients should have their ventilation controlled with a minute volume of 70-80 ml/kg. This large volume coupled with low chest wall compliance and elevation of the diaphragm means that high peak inspiratory pressures are often necessary. Ventilation with large tidal volumes aims at moving tidal ventilation above the closing volume and consequently increasing arterial oxygen tension. Application of moderate positive end expiratory pressure can improve oxygenation and prevents atelectasis [9].

Intraoperative fluid management is very important in obese patients [16]. Liberal fluid management can lead to congestive heart failure and a positive fluid balance while a more restrictive fluid can increase the risk of acute tubular necrosis and rhabdomyolysis [11]. We used 2-3litres of crystalloids for an average 2hour long surgery.

We extubated all our patients in a semi-upright position to avoid airway complications like basal atelectasis or negative pressure pulmonary oedema or aspiration pneumonia. Atelectasis can be associated with fever and tachycardia during the initial 24 hours. Treatment options include incentive spirometry, continuous positive airway pressure and pulmonary toilet [12].

No life threatening complications were noted in our study. There was no case of aspiration, infection or deep vein thrombosis probably because we restricted our data collection only for first 24 hours postoperatively.

Conclusion

Anesthesia for bariatric surgery requires special understanding of the dosages of different anesthetic agents and proper knowledge of pulmonary pathophysiology of these patients. Proper preparation of these patients along with thorough coordination of services by all the disciplines involved in patient care makes anesthesia very safe for these patients and minimizes the risk of post-operative complications during and after the patient's hospital stay.

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