Laparoscopic Gastric Bypass in a Morbidly Obese Teen

Nancy L. Glass, M.D., M.B.A.
Erin A. Gottlieb, M.D.
Houston, Texas

Objectives

1. The learner will understand preoperative considerations in the morbidly obese teen and will plan appropriate preoperative evaluations.
2. The learner will understand key issues in airway assessment and management and will individualize his/her plan based on the patient’s exam.
3. The learner will understand anesthetic implications of the surgical procedure being planned and will be able to design an anesthetic that takes surgical issues into account as well as the patient’s underlying condition.
4. The learner will be able to anticipate and recognize common perioperative complications.

Stem Case – Key Questions

The patient is a 14 year old girl, 400 pounds, 5’3” tall, with a Body Mass Index of 70.8. She has been overweight for all of her life and has failed to lose weight on several medically supervised diets. She complains of easy fatigability and shortness of breath walking from the school parking lot to class, and she admits that her family says that she snores. She does no regular exercise because her knees hurt when she walks more than 2 blocks. She has been diagnosed with insulin resistance. Her blood pressures have been borderline “high,” but she has not been placed on any antihypertensives.

What preoperative workup is necessary in this patient?

Are there any “special” airway studies that you need to proceed, in addition to a standard examination? Would you require pulmonary function studies on this patient? Why? Would a sleep study be necessary for this patient? How would the results influence your anesthetic plan?

Would you order an ECG? What would you be looking for? A colleague suggests getting an echocardiogram as well – do you agree? What additional information could you get from this study? How would it influence your anesthetic plan?

Any other necessary preoperative tests? CBC and electrolyte panel are normal, except for a slight elevation of bicarbonate.

Would you premedicate this patient?

On the day of surgery, BP is 145/90 sitting, HR 94, RR 22, T 36.5 C. Room air oxygen saturation is 95%. The patient is mildly anxious.

Would you provide preoperative anxiolysis? How? Do you have special concerns about preoperative anxiolytics in this patient? Is any other premedication necessary?

What would be your plan for induction of anesthesia?

Are there special considerations related to her obesity? Is it necessary or plausible to do an awake fiberoptic intubation on this patient? Are there other predictors of airway accessibility in the obese in addition to the Mallampati classification? How would you position the patient to facilitate laryngoscopy? Would you do a rapid sequence induction in this patient? If not, what would be your plan?
Would you require monitoring beyond the ASA standard monitors? Is invasive arterial blood pressure monitoring indicated? Central venous pressure monitoring? BIS?

What are the possible causes of hypoxemia after insufflation of the abdomen? What would you do to improve oxygenation? Increase FiO₂? Add PEEP? Place the patient in reverse Trendelenburg position? Ask the surgeons to release the pneumoperitoneum?

How would PEEP and reverse Trendelenburg positioning affect cardiac and respiratory function? How would you support the blood pressure if PEEP and reverse Trendelenburg positioning cause a drop in blood pressure? Volume? Vasoconstrictors? Inotropes?

After insufflation, end-tidal CO₂ increases to 47 mmHg from 33 mmHg. What are the possible causes of hypercarbia during this case? Would the mode of ventilation matter? How would obesity and pneumoperitoneum influence peak airway pressures? Do increased airway pressures matter?

Is CO₂ entrainment an issue? How would you diagnose and treat a CO₂ embolus?

What maintenance anesthetic technique would you select for this patient? Does it matter what anesthetic vapor you select? Would TIVA be a better choice? How would you adjust drug dosages in response to obesity? Which drugs would you dose according to lean body mass? Which would you dose by total body weight? Does the length of the case influence your selection of technique?

The surgeon requests controlled hypotension with a MAP of 50-60 mmHg. Do you have concerns doing this in a patient with borderline hypertension? Are your concerns different in this adolescent than in an older patient undergoing the same procedure? What agent or agents would you use to achieve this MAP?

Would you plan to extubate this patient at the end of the procedure? Would your extubation criteria be different in this patient compared to other patients? Would documented obstructive sleep apnea influence your decision? How? After extubation, the patient’s pulse oximeter reading is between 90 and 92% on 2 liters of nasal cannula oxygen. Is this adequate? How would you try to improve oxygenation? CPAP or BiPAP? Why or why not?

What is your plan for the management of postoperative pain? Would you consider placing an epidural catheter preoperatively? Would you use a PCA? What opioid would you select? Would you use demand dosing only or would you add a continuous infusion as well? Is scheduled ketorolac a reasonable adjunct?

On postop day 1, the patient is tachypneic and hypoxemic. What are possible etiologies? Is pulmonary embolus a possibility? How would you rule out a pulmonary embolism? Should this patient have been on deep vein thrombosis prophylaxis? What kind?
Concerned about anastomotic leak, the surgeons want to take a “quick” gastroscopic look at the bedside with sedation.

Would you give some propofol at the bedside to facilitate their exam? What would you tell the surgeons?

Prior to discharge, the patient vomits a large volume of blood.

The surgeons want to take the patient immediately to the OR to perform upper endoscopy, and they anticipate needing to revise her anastomosis. Describe your airway management in the face of an acute upper GI bleed with an unknown amount of intraabdominal bleeding.

Problem Based Learning Discussion—Model Discussion

The application of laparoscopic gastric bypass procedures to adolescent patients is relatively recent. There is not a great deal of literature on this subject, so much of current practice is adapted from adult practices. In this PBLD, we will discuss the literature that is available and discuss alternatives and options for adolescent patient management. For many of these questions, there is not one right answer; the moderators will discuss practices common to several pediatric centers that perform this procedure in a multi-disciplinary approach.

Preoperative Assessment:
We will discuss the rationale for/against performing extensive preoperative workup and testing and emphasize how recommended tests might influence anesthetic management and perioperative care. Baseline laboratory studies should include 2 hour glucose tolerance test, Hgb A-1c, lipid panel, uric acid, liver function tests, CBC with platelet count, PT/PTT, HOMA (test for insulin resistance). Other recommended studies include ECG and echocardiogram, abdominal ultrasound (to rule out cholelithiasis), sleep study and measurement of bone density. In our practice, all hypertensive obese patients undergo echocardiography looking for evidence of left ventricular dysfunction and pulmonary hypertension. Sleep studies are less commonly performed and usually predate consideration for laparoscopic gastric bypass. Bone density studies are being done at our center as part of a research project to look at the long-term implications of dietary restriction on adolescent calcium metabolism. It does not impact anesthetic or perioperative care.

Airway management:
We will discuss airway assessment methods and accuracy of prediction of each, positioning techniques, and various techniques for securing the airway. In addition to Mallampati classification of the airway, neck circumference has also been found to be predictive of difficulty. Despite the recognized risk of a difficult airway in obese patients, the largest series of adolescent bariatric cases to date, 50 patients, performed at Cincinnati Children’s Hospital, no patient required fiberoptic or LMA-assisted intubation; all were intubated with a standard rapid sequence technique and good positioning. (Samuels, P, plenary lecture, Society for Peediatric Anesthesia Winter 2005 Meeting)

Monitoring:
In addition to standard ASA monitors, invasive arterial blood pressure monitoring may be required to accurately measure blood pressure. At our center, an arterial line is routinely placed after induction. Central venous access may aid in fluid management, but is not routinely placed at our center.

Intraoperative hypoxemia:
The deleterious effect of pneumoperitoneum on oxygenation will be considered, as well as possible treatments including the application of PEEP and reverse Trendelenburg position (RTP). In this patient, both PEEP and RTP would be expected to increase oxygenation, but would also decrease venous return to
the heart. Since surgical exposure is facilitated by RTP, that is our first approach. Using both PEEP and RTP would probably require intravenous volume expansion to maintain preload.

Intraoperative hypercarbia:
The insufflation of carbon dioxide to create and maintain pneumoperitoneum can lead to hypercarbia by absorption, entrainment, and as a result of decreased minute ventilation. Absorption is common and is treated by an increased in minute ventilation. Entrainment can be life-threatening as it can precipitate cardiovascular collapse or result in paradoxical embolism. Ventilating the patient in pressure control mode or in volume control with an inappropriately low pop-off pressure can result in inadequate delivered tidal volumes which can manifest as increased end-tidal carbon dioxide, and ventilator setting may need adjustment.

Maintenance techniques:
Most techniques focus on the use of the less soluble volatile agents, desflurane or sevoflurane. A short acting opioid, usually fentanyl, is dosed based on lean body mass, as are non-depolarizing muscle relaxants. Pediatric bariatric centers are not performing epidural anesthesia/analgesia for their patients. Alternative techniques such as TIVA and epidural anesthesia are considered.

Decision to extubate:
The decision to extubate and how to optimize oxygenation in the postoperative period will be discussed. All of our patients have been extubated awake in the operating room at the end of the case having received a moderate dose of fentanyl (250-400 mcg).

Although there is a theoretical concern that application of positive pressure to the airway might cause damage to the anastomosis by forcing air into the stomach, there is little data to support that concern. However, none of our patients who received nocturnal CPAP preoperatively have required it in the early postoperative period. Our patients are placed in a sitting position after extubation and receive nasal cannula to maintain oxygen saturation between 92-95%. We encourage the use of incentive spirometry every hour while awake, and we monitor oxygen saturation on the floor.

Pain management:
The use of opiates in this setting requires that the patient be awake enough to protect her airway, cough and clear secretions while providing sufficient analgesia to prevent splinting and atelectasis. We use a morphine PCA, after titrating morphine to a reasonable comfort level in the OR/early PACU period.

Strategies for success include avoidance of background infusions, local infiltration at port sites, and the encouragement of early ambulation. An alternative is to use intermittent intravenous morphine administered by nursing staff, requiring cooperation with ambulation and respiratory exercises before each dose.

Scheduled ketorolac for 48-72 hours postoperatively is a useful adjunct, but must be negotiated with the surgeons on a case-by-case basis. Appropriate use of ketorolac depends on intraoperative bleeding as well as on DVT prophylaxis. The risk/benefit ratio for the use of ketorolac in this patient population has not been well-studied.

Postoperative endoscopy:
This is a matter of judgment, but the moderators’ opinion is that it would be ill-advised to administer propofol at the patient’s bedside to facilitate gastroscopy. Most practitioners would probably elect to perform anesthesia for this procedure in the controlled environment of the operating room with a secured airway.
Upper GI bleeding:
Again, control of the airway is required here. If the airway was easily visualized the first time, most practitioners would perform a rapid sequence induction and secure the airway with direct laryngoscopy.

If the intubation was not easy the first time, an awake fiberoptic intubation and intubating LMA are certainly considerations.

In addition, it is important to make sure that the patient still has good intravenous access and that she has been adequately volume resuscitated prior to induction. The same considerations for positioning and monitoring also apply to this procedure as repair of an anastomotic leak may take longer than anticipated and could result in an open procedure.

References
General and surgical references


Selective References


Learning Summary

The learner will understand the appropriate preoperative assessment and evaluation of the morbidly obese teen undergoing laparoscopic gastric bypass, the anesthetic implications of the surgical procedure being planned, and be able to recognize and manage common perioperative complications.