Review Article

Gastrointestinal Endoscopy in the Overweight and Obese Patients

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Overweight and obesity are increasingly common problems not only in the Western countries but worldwide including Asia. Various factors have been implicated in obesity, including genetic, metabolic, biochemical, cultural, and psychosocial components. The main etiology in Asian population may be an alteration in dietary life style[1]. The indirect factors are the economic development and urbanization on nutrition and dietary changes in Asia. We, Asian physicians, therefore have to get acquainted to management of the obesity related medical conditions.

The impact of obesity to gastrointestinal system can be recalled as many disorders including cirrhosis from fatty liver, esophageal reflux disease, gallstone, colonic diverticulitis and cancer[2,3]. Some of these patients ultimately require endoscopy. Many of them are at high risk for the procedures; hence special preparation may be essential for them.

Body mass index and sedation

The main problem for endoscopy in the obese is sedation. The obese has reduced functional residual capacity (FRC), vital capacity and total lung volume. These decreases in lung volume decrease exponentially with the higher body mass index (BMI)[4]. In addition, the ventilation/perfusion mismatches can develop more easily in these patients. Moreover, asthma and obstructive sleep apnea are commonly detected during deep sleep in fatty adults[5]. Thus selecting the appropriate setting for endoscopy is mandatory. Generally, there are three levels of the severity degree of obesity; overweight: BMI >25, obese: BMI >30, morbidly obese BMI >35.

Endoscopy in the overweight patients requires a special airway protection whereas endotracheal intubation is mandatory before considering endoscopy in the morbidly obese one. However, the obese patient who need endoscopy, the decision whether to perform endoscopy with endotracheal intubation is debatable. It has been advice that the technique to sedate these obese patients requires a trough consideration and the the judgment is according to the individual airway and respiratory risks[6].

Positioning of the obese while undergo endoscopy is also important. The worse position is supine position, it decreases FRC tremendously and desaturation may occur. The recommendation positions for these patients are Semi-Fowler's or reverse Trendelenberg. These positions are claimed to protect airway and support respiration the best.

However, the endoscopic retrogradecholangiopancreatography (ERCP) only lateral decubitus and prone positions can be used. Therefore, in the high risk patients, preemptive endotracheal intubation may be appropriate prior to performing an ERCP.

Special equipments and preparation

Generally, there is no need for hardware adjustment in endoscopy for the obese. The scope, light source, processor and accessories for normal patient are compatible with endoscopy in the obese. However, many items including examination table, blood pressure cuff, airway protector and monitoring equipments have to be optimized for the larger size specimens. The maximum limit of the weight of the standard endoscopy table can take 250 kg patient easily.

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For patient who is heavier than this limit, there are many special table made for them (Figure 1). The C-Max surgical table (steris, Mentor OH) can take 500 kg. The Bariatric bed (Magnum II, Hill-Rom, Batesville, IN) can take 350 kg and adapt as a chair and can be transported.

Due to the large circumferential size of the obese arm, therefore the blood pressure cuff needs to be enlarged otherwise the reading may be falsely elevated. It has been recommended that the cuff width has to be greater than 1/3 of the circumference of the limb to prevent high reading[7]. Apart form standard oxygen saturation monitoring, the capnography monitoring system is very helpful to detect apnea in patient who is at risk for sleep apnea. Prophylaxis against upper airway obstruction can be done by placing oro-,naso-, and laryngo-pharyngeal airways protectors (Figure 2-4). The benefits of these airway protectors include; no need for airway dead space and resistance, well tolerated, highly successful, and allows simultaneous use of oxygen prongs[8,9]. Moreover, these airway devices diminish the need for tracheal intubation and related complication form this procedure.

Pharmacologic considerations

As a general concept for pharmacodynamic alteration in fatty subject, it is conceivable that fat redistributed of lipid-soluble medication will be stored for a longer time. In addition, many drugs have more specific adverse effect to the obese. Opiods decrease responsiveness to the ventilatory stimulant of CO_2 especially in obstructive sleep apnea patients. The specific agent like fentanyl can be the cause of stiff chest syndrome that may potentiate the degree of hypoxia[10,11]. Benzodiazepines have a routine enterohepatic recirculation, this inturn leads to the prolonged recovery phase especially in the fatty patient who generally requires

Figure 1 Special adjustable endoscopy bed for the obese.

Figure 2 Oropharyngeal airway

Figure 3 Nasopharyngeal airway

Figure 4 Laryngopharyngeal airway

Table 1 Weight based dosing for IV anesthetics

Drug	Dosing	Implications
Propofol	IBW	Increased absolute dose, reduced dose per unit body weight; high affinity for excess fat (IBW bolus followed by TBW infusion)
Midazolam Diazepam	TBW	Prolonged sedation because larger initial doses are needed to achieve the effect
Fentanyl, Sufentanil	TBW	Increased volume of distribution and elimination half-time correlates positively with the degree of obesity; distributes as extensively in excess body tissue as in lean tissue

higher dose of benzodiazepines than usual. Therefore, the short acting benzodiazepines such as midazolam and lorazepam are safer to be used in the obese. However, when overdosing occurs, there is a need for reversal agents including flumazenil for benzodiazepines and naloxone for opiods.

Unique condition developed form drug interaction requires special consideration and management. Many endoscopists are unaware of current medication that taken by the obese, hence drug interaction may occur when ignorance of the current drug list happens. Sibutramine is one of the agents used for weight reduction. Drug interaction between meperidine and this appetite suppressant sibutramine can cause serotonin syndrome. Serotonin syndrome is often demonstrated as a clinical triad of alteration in consciousness, autonomic hyperactivity, and neuromuscular abnormalities[12]. Signs of excess serotonin range from tremor and diarrhea in mild cases to delirium, neuromuscular rigidity, and hyperthermia in life-threatening conditions.

Recently, propofol has been used more often for out patient GI endoscopy[13-15]. The main advantage of propofol is a rapid recovery time after stopping medication. Propofol has an unusual pharmacokinetic because of its high lipid solubility. Because of the simultaneous increase in the volume of distribution and clearance, propofol elimination half-life in obese is similar to lean patient[16]. According to these pharmacokinetic data, the dose regimen of propofol for both induction and maintenance of general anesthesia in obese patients should be based on actual body weight, as in lean subjects. In addition, it has been claimed that patients who received propofol also expressed greater overall mean satisfaction[17]. Moreover, at discharge, the propofol group had better scores on tests reflective of learning, memory, working memory span, and mental speed[17]. Presumably, it can conclude that, the main benefit of propofol when given to the obese is significant safer amount of the initial bolus dose which calculated by an ideal body weight. Hence, the dose reduction is dramatically lower when compare with other agents for sedation (Table 1).

Specific complications of endoscopy in the obese

Aspiration of the gastric content and chemical pneumonia are the main risks for upper endoscopy in these patients. There are many factors that can explain the increased risk in the obese such as higher residual gastric volume, increase intraabdominal pressure, lower intragastric PH (2) and hiatal hernia.

ERCP in the obese contains a significant risk of severe acute pancreatitis and poor prognosis[18]. Android fat distribution is a predictor of severity in acute pancreatitis[19]. Therefore, performing ERCP in the obese requires special considerations, hence obese patient who come for ERCP needs to have a strong indication for the procedure.

CONCLUSIONS

Endoscopy in the obese is feasible but special equipments may be required in some individuals. The overall risk is greater with the higher BMI. Sedation and respiratory related complications are the main concern for endoscopy in the obese. Hence, careful selection with sedative agent is mandatory. In many circumstances, elective intubation is preferred. In addition, drug distribution and interaction are different from normal weight patients.

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