An approach to anesthesia for the obese patient

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The author discusses the relationship of obesity to anesthesia. Emphasis is placed on identifying and solving the problems that the nurse anesthetist faces with obese patients pre-, intra-, and post-operatively.

Obesity is a term referring to the condition of being overweight in relation to one’s height and body build. This concept, however, is unsatisfactory in that it contains a large degree of error. In 1968, the ponderal index was introduced as a means of more accurately classifying obese patients.

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\text{Ponderal Index} = \frac{\text{Height (inches)}}{\text{Weight (pounds)}}^{3/5}
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Overeating is the source of 95-98% of the obese population. The other 2-3% are obese because they have disturbed function of the thyroid, adrenal, or pancreatic glands or the hypothalamus.

The longer the duration of the obesity and the more obese the patient, the more physiological problems encountered.

**Respiratory problems**

The obese patient tends to hypoventilate. The integrity of the muscles of the thorax and the diaphragm often is weak because of poor physical condition or fatty infiltration. The increased weight of the abdomen panniculus, the fatty infiltration of the abdominal contents, and the heavy breast add to the burden of breathing. This all causes a reduction in lung expansion, a decrease in expiratory reserve volume, an increase in oxygen consumption, and a gradual increase in carbon dioxide. A high incidence of emphysema and bronchitis occurs in these patients.

**Cardiovascular problems**

Pulmonary hypertension is a common problem for several reasons: (1) constriction of the pulmonary vascular bed as a result of increased carbon dioxide levels, (2) cephalad movement of the diaphragm, (3) limited chest expansion, and (4) increased pulmonary blood flow and polycythemia. Arterial hypertension is found secondary to arteriosclerotic disease. However, some cases are diagnosed as hypertensive because of overestimation of the pressure level by the standard cuff method.

Myocardial failure is sometimes found in these patients since there is an increased demand on the left ventricle coupled with an increased work load on the right ventricle. This occurs because the plasma volume and the circulatory blood volume are both increased. Oxygen
consumption is increased and, in turn, the cardiac output is increased.4

Other problems

Diabetes mellitus is the most common pathological condition found in these patients.2 Two percent have other endocrine abnormalities.5 These patients also seem to be susceptible to liver damage which is proportional to the duration of the obesity.6

The Pickwickian syndrome or cardiopulmonary obesity is present in a small group of severely obese patients. These patients have hypoventilation, periodic respirations, somnolence, twitching, cyanosis, polycythemia, hypoxemia, hypercapnia, ventricular hypertrophy, and congestive heart failure.7

Psychological Disturbance. Most patients are obese because they overeat; this overeating is recognized as an emotional problem. The obese continue to utilize food as a means to relieve anxiety.8

Problems associated with anesthesia

Intravenous therapy. Venipuncture is often difficult and dangerous. The patient's arms are fat, and the veins are hard to find. Cut downs are often necessary.

Securing and maintaining the airway. Fitting the mask is difficult because the long edge of the mandible is obliterated. The pressure needed at the angle of the mandible can cause possible transient facial nerve palsy or at least a sore jaw. Large leaks around the mask, as well as the passage of gases into the stomach, often occur because so much pressure is needed to inflate the lungs. The tongue and the oropharyngeal tissue often cause obstruction. Reduced mobility of the cervical spine can interfere with maintaining the patient's airway.9

Intubation is often difficult or impossible. Insertion of the laryngoscope and visualization of the cords in the standard fashion can be troublesome because of the tongue and fatty tissue.

Positioning. In the supine position, the diaphragm cannot descend fully against the weight of the abdominal wall and the abdominal contents, thus the work of breathing is increased.9 In the lithotomy and trendelenberg positions, the work of breathing increases even more and higher pressure is required to inflate the lungs.8

In the prone position, even though efforts are made to support chest and pelvis, serious obstruction to circulation occurs because pressure on the inferior vena cava and the femoral veins often persists. Mechanical obstruction of venous return may cause a shock-like syndrome.10 Maintaining proper ventilation for the patient in the prone position is extremely difficult.

Problems faced by the surgeon

The inability to utilize certain positions causes problems to the surgeon since he or she depends on the manipulations to provide better exposure. He will also be hampered by the fatty infiltrations of the organs and the depth of the abdominal panniculus.1

Anesthetic management

Preoperative preparation. A detailed history of the patient's cardiovascular, renal, hepatic, and pulmonary systems should be acquired. The physical evaluation of the patient is vital. The site of the venous puncture, facial features, and oral structures should be noted. In addition, how the patient ventilates, how much effort is involved, what usual sleeping positions he/she uses, and what his/her exercise tolerance is should be included.

The electrocardiogram, chest X-ray, complete blood count, electrolytes, pulmonary function tests, blood sugar, and blood volume measurement all should be performed preoperatively. The blood pressure, pulse rate, respiration, and temperature must be checked.

Psychological preparation of the patient is probably one of the most important parts of the preoperative visit. A cooperative patient is essential for a successful recovery. The anesthetist should explain to these patients the preparation April/1978 131
involved prior to surgery, what happens in the recovery room, and that there is the possibility that the patient may have to be intubated and placed on a ventilator. Furthermore, the nurse anesthetist should impress upon the patient the importance of deep breathing and early ambulation.

Premedication is given in the same doses customarily administered to persons of normal weight. Because obese individuals tend to produce copious amounts of respiratory tract secretion, drying agents (such as atropine or scopolamine) should be given. Tranquilizers are deemed advisable to allay apprehension. Some experts feel that narcotics should be avoided since they depress respiration and may lead to further build up of carbon dioxide.

Choice of agents. Though there are no perfect agents for obese patients, there are certain considerations to bear in mind. Desirable agents are those which are quickly eliminated or reversed so as to allow earlier mobilization postoperatively. With intravenous medication, it is easy to overdose. Start with the usual dose, then supplement if needed. Neuromuscular blocking agents are used to facilitate relaxation and expedite surgery.

A long-acting muscle relaxant should be used if the patient has to be placed on a ventilator postoperatively or if the procedure is long. Pancuronium should be used if the patient has a history of asthma or cardiovascular instability. Curare may be used if the patient has a history of hypertension. Succinylcholine intravenous infusion can be used if the procedure is short and an early extubation is planned. If the patient has a history of asthma, diazepam can be used to facilitate induction. Meperidine can be used if the procedure is long, and morphine sulfate can be used if the patient has a history of heart disease or asthma. Agents consisting of halogenated hydrocarbons are questionable, since these patients often have abnormal liver studies.

Venipuncture. A no. 16 or 18 plastic cannula should be placed in one of the veins on the patient's arm or hand. Sometimes, a subclavian insertion is necessary if it is impossible to find a vein or if long-term intravenous usage is anticipated. If the anesthetist is unable to find a vein, a cutdown must be done.

Monitoring. Blood pressure monitoring with a cuff is feasible, but the anesthetist must keep in mind that there is a tendency to overestimate the pressure by more than 20 torr of mercury pressure with the standard cuff method. Direct intra-arterial blood pressure monitoring with a 20-gauge cannula in the radial artery may be used in place of the cuff method. Electrocardiogram monitoring should be used on all patients during anesthesia but particularly with obese patients. Since these patients often have kidney disease and they are easy to fluid-overload, urine output should be measured.

If the patient has severe pulmonary problems, arterial blood gases should be checked preoperatively and intraoperatively. A blood sugar and urine clinitest and acetest should also be performed if the patient is diabetic. To prevent the patient from receiving an excessive dose of a neuromuscular blocking agent, a nerve stimulator should be used.

Positioning. Extreme positions such as the lithotomy and trendelenberg should be avoided. For the prone position, the patient should be placed on the table so that the chest and especially the abdomen are free from the contact of the table to permit proper lung expansion. When the patient is in the supine position, the anesthetist should elevate the back of the table slightly to allow some of the weight of the abdomen to be off the chest. Once the patient has been anesthetized, investigate the possibility of nerve compression.

Ventilation. The oral area must be evaluated carefully before induction. If the anesthetist anticipates extreme problems at intubation, an awake nasal intubation may be indicated. Another anesthetist should be there to assist upon induction. Some experts suggest doing a
crash induction on the patient because of the stomach contents.

Adequate spraying of the pharynx with a local anesthetic may help the patient's tolerance to an oropharyngeal airway during light anesthesia. Three to five minutes of preoxygenation should be done in case of problems during induction. Whether to anesthetize a patient by mask or by intubation depends on several factors: the severity of the patient's condition, the type of surgery, the length of surgery and if the ease of airway management permits the mask.

Respiration must be assisted or controlled throughout the procedure. Forty to sixty cm of water pressure may be needed to properly ventilate these patients, but the anesthetist must keep in mind that high inflation pressure and increased volume may decrease pulmonary blood flow.

Diabetic patients. Careful regulation of the diabetic patient before anesthesia with sufficient hydration and insulin is the best approach. Depending on the laboratory work, the anesthetist can administer an intravenous infusion of dextrose 5% to which 10-15 units of regular insulin are added. Potassium chloride may be added to the intravenous infusion if needed. A blood sugar level should be taken during surgery and/or in the recovery room.

Immediate postoperative care

There is a tendency for obese patients to hypoventilate; and with anesthesia still on board, this hypoventilation is even more pronounced.12 The recovery of pulmonary functions is slow, and the site of the surgical procedure may add even further to respiratory problems. Therefore, proper evaluation of the patient's respiratory system is vital during recovery.18

If the patient is intubated, the anesthetist should not extubate until the patient can lift his head off the bed for more than 5 seconds and the minute ventilation is normal. If the patient underwent very serious surgery and has had abnormal respiratory studies, he or she should be kept on a ventilator overnight. In addition, arterial blood gas measurements should be taken. It also is very important during postoperative recovery to obtain accurate information concerning the cardiovascular, metabolic, and central nervous system functions of the patient. The anesthetist must be aware that the major postoperative complication is atelectasis and pulmonary infections.

General versus regional anesthesia

Regional (spinal) anesthesia is preferred over general anesthesia for hernias or surgery of the lower extremities because it eliminates most of the problems which originate with general anesthesia. Epidural analgesia at an adequate level can protect the patient from some of the ventilatory complications which can occur during general anesthesia.6

The anesthetist must secure an intravenous infusion before the lumbar puncture. The puncture should be done with the patient sitting up and oxygen insufflation should be administered. The difficulty in locating boney landmarks is high. The control of the spinal anesthesia level is difficult, and insidious depression of respiration and circulation may follow.2 If the sensory levels from T8 to T2 are blocked, a decrease in the vital capacity may occur.14 Inspiratory assistance may be needed, but it would be very difficult to accomplish with the patient under regional anesthesia. Atelectasis and pneumonia can occur postoperatively because of residual abdominal muscular relaxation from a spinal anesthetic.2

REFERENCES

AUTHOR
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