

# Anesthesia Tips for the Obese Patient

You have asked...

What do I need to consider when formulating an anesthetic plan for an overweight patient?

The expert says...

**O**besity has been defined as a disorder of energy balance that results in a body weight 20% or more above ideal weight. Morbid obesity has been defined as a body weight greater than 30% above ideal weight.

## ANESTHESIA RISKS

In human medicine, obesity and obesity-related disease present unique challenges to anesthesiologists. Obese patients are considered at higher risk for anesthetic-associated complications. To date, risk analysis of anesthesia for obese veterinary patients has not been evaluated, and the true impact of obesity on anesthesia in cats and dogs is unknown.

Conditions associated with obesity in human patients can result in perturbation of the respiratory, cardiovascular, endocrine, gastrointestinal, and musculoskeletal systems. Some of the more serious conditions include obesity hypoventilation syndrome, restrictive lung disease, systemic hypertension, cardiomegaly and congestive heart failure, pulmonary hypertension, pulmonary embolism, diabetes mellitus, Cushing's disease, hypothyroidism, and osteoarthritis of weight-bearing joints.

CONTINUES



## OBESITY PREVALENCE

In a 2007 nationwide study by the Association for Pet Obesity Prevention, 43% of all dogs and 53% of all cats were classified as overweight or obese by a veterinary health care provider. In addition, 10% of dogs and 19% of cats were classified as obese. Although the findings from this study have not been reviewed or published in a scientific journal, they are similar to findings from a prevalence study of obesity in dogs in Australia.<sup>1</sup> In that study, 41% of dogs were considered overweight or obese; of those, 7.6% were obese. Clearly, on the basis of these findings, obese patients can make up a substantial portion of a veterinary hospital caseload.

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**Table. General Anesthesia in Obese Dogs & Cats: Health Issues to Consider**

Condition	Complication
Obesity hypoventilation syndrome	• Respiratory acidemia & polycythemia
Pulmonary & systemic hypertension	• Heart enlargement & subsequent failure
Excessive thoracic & abdominal adipose tissue	• Increased pressure on the diaphragm & lungs • Reduced thoracic volume • Compressed & collapsed alveoli
Compromised endocrine, renal, & hepatic functions (due to obesity)	• Altered drug metabolism • Higher risk for anesthetic drug overdose
Diabetes, hyperadrenocorticism, & hypothyroidism	• Electrolyte abnormalities • Impaired thermoregulation

Of note, obesity hypoventilation syndrome and the effect of excessive thoracic and abdominal adipose tissue on ventilation have not been specifically studied in veterinary patients. However, these or similar conditions probably occur in canine and feline patients.

For the veterinary practitioner, many of these same health issues affect obese dogs and cats and must be accounted for when general anesthesia is considered (See **Table**).

### PREANESTHETIC TESTING

When compared with patients of normal body weight, preanesthetic workup for an obese patient requires additional evaluation and care. A thorough physical examination should be performed, with emphasis on the cardiovascular and respiratory systems. Blood pressure measurement, electrocardiography, thoracic radiography, and arterial blood gas analysis can be used to determine the extent of perturbations of normal function.

Endocrine and renal function, hydration status, and electrolyte imbalances should be assessed with a CBC, serum biochemical profile, and urinalysis, and abnormalities should be corrected before elective procedures. Stabilization may be appropriate for some patients by using IV fluid therapy, antibacterial drugs, cardiovascular medications, insulin or hormone therapy, and, in patients undergoing elective procedures, weight loss.

### ANESTHETIC AGENTS

Selection of analgesic and anesthetic agents for obese patients depends on findings from physical examination and ancillary tests, procedure, length of anesthesia, and the degree of pain that can be expected. Ideally, agents chosen would provide rapid induction and recovery and analgesia, and would have minimal effects on cardiovascular and respiratory function.

Although no specific guidelines can be given (because anesthesia should be tailored to the individual patient), in general obese animals should have drug doses calculated to their estimated lean body weights to avoid possible drug overdose. Animals with body condition scores greater than 6 (scale, 1–9) should have the drug dosages reduced by 20% or more and injectable anesthetics administered “to effect.”

Animals with obesity-related diseases should have drug protocols that address the dysfunction of those specific body systems:

- **Cardiovascular system:** Protocols with opioid drugs, such as butorphanol, buprenorphine, or hydromorphone, can provide sedation and analgesia and reduce induction and

maintenance inhalant agent amounts while minimizing the impact on the cardiovascular system.

- **Respiratory system:** Drugs that depress the respiratory system, such as opioids, barbiturates, and propofol, should be used with caution in animals with respiratory disease. In these patients, close attention should be paid to respiratory function, and respiratory monitoring, such as end-tidal gas and blood gas analysis, and the availability of a mechanical ventilator may be required.
- **Hepatic function:** Patients with elevated liver enzyme levels or documented hepatic dysfunction may be best suited for induction with propofol because of the extrahepatic mechanisms of metabolism.

Alpha-2 agonist drugs are best avoided in obese patients, particularly those that have compromised physiologic functions, because of the significant cardiovascular-depressing effects of these drugs.

## VENTILATION & MONITORING

Control of the airway with an appropriately sized and placed endotracheal tube is essential in obese patients. Many of these patients have difficulty with ventilation, and administration of some analgesic and anesthetic drugs may further

compromise their ventilation status. Adipose deposits in the tissues surrounding the airways can obstruct airflow, particularly in the pharyngeal region.

Obese patients should be continually monitored with electrocardiography, blood pressure testing, pulse oximetry, and end-tidal carbon dioxide measurement during anesthesia. Supplemental oxygen and orotracheal intubation should be continued during recovery until the patient has regained full consciousness and complete airway control.

Although at a higher risk for complications, obese patients can be safely anesthetized as long as potential problems with cardiovascular and respiratory function are recognized and appropriate anesthetic and analgesic drugs and doses are used.

See Aids & Resources, back page, for references and suggested reading.

## OBESITY HYPOVENTILATION SYNDROME

is thought to result from dysregulation of ventilation by the central nervous system, with secondary inability of the respiratory muscles to respond appropriately. Patients often have blunted responses to hypercapnia and hypoxemia. Consequently, chronic respiratory acidemia and polycythemia may occur in response to low arterial oxygen tension.



A study by Scarlett and Donoghue found that obese cats were **3.9 times more likely** to develop diabetes mellitus and **4.9 times more likely** to develop lameness requiring veterinary care than cats of optimal body weight.<sup>2</sup>