

Technology Insights

for pre-oxygenation and induction of anesthesia in obese patients

Protective ventilation in the OR can pose major challenges for anesthesia workstations. Dräger works closely with clinicians and nursing staff around the world to understand the precise needs and requirements for protective ventilation in the OR.

Below we describe the latest ventilation technologies in our anesthesia workstations regarding protective ventilation strategies.

Technology for Life

INTRODUCTION

Anesthesia care providers face special challenges when treating obese patients. These challenges will become more frequent in the future because the number of obese patients is rising steadily all over the world. In order to provide the best care for obese patients, it is important that the technology used supports the recommended medical procedures and approaches in the best possible way. Below we describe some relevant special characteristics of obese patients and explain some general technical conditions for patient care.

RELEVANT CHARACTERISTICS OF OBESE PATIENTS DURING INDUCTION OF GENERAL ANESTHESIA

The special characteristics of obese patients described below are set out in detail, with references, in our clinical white paper ([click here](#)).

DIFFICULT INTUBATION

Obesity, and in particular morbid obesity, is often associated with difficult intubation. Sufficient time should therefore be allowed for the intubation of these patients, and the patient's oxygen reserves should be filled up in advance to prevent the oxygen saturation from decreasing.

INCREASED WORK OF BREATHING

Some obese patients have markedly increased work of breathing. The main factors responsible for this are the abdominal mass, which presses against the diaphragm in the cranial direction in particular when the patient is supine, thus restricting its movement and the restricted extension

of the thorax owing to the greatly increased amount of fatty tissue. Both of these factors exert adverse effects in particular when the patient is supine and make inspiration more difficult for obese patients. Anesthesia workstations must assist breathing in spontaneously breathing obese patients as early as during pre-oxygenation in order to ensure sufficient oxygen reserves for intubation and the associated apnea phase.



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ATELECTASIS

The risk of atelectasis also rises with increasing obesity. Some morbidly obese patients exhibit clinically relevant atelectasis even when upright, which then increases when the patient is supine. The commonly applied mechanical ventilation encourages the further spread of atelectatic areas of the lungs if it is not adjusted to the needs of obese patients. During induction of general anesthesia, preparations can be made for surgery and even for the postoperative phase - and the risk of complications can be reduced.

INTRINSIC PEEP (PEEP)

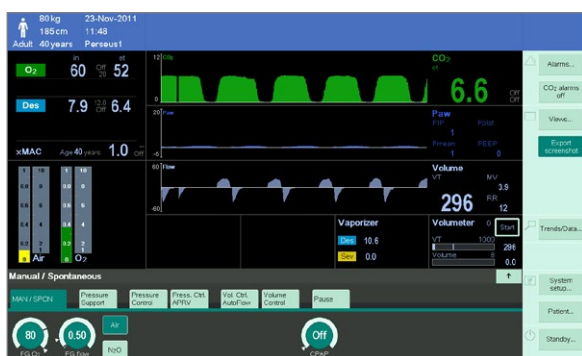
Intrinsic PEEP is frequently a direct consequence of obesity. The constrictions in the airways often found in obese patients increase airway resistance. Coupled with a possibly shortened expiration time, this results in incomplete expiration and thus in a residual pressure in the lung. This residual pressure represents a resistance that initially has to be overcome at the onset of inspiration before an inspiratory flow can be achieved. This should be taken into account during pre-oxygenation to ensure adequate oxygen saturation in the lung.

Below we present some technical solutions that can support you during pre-oxygenation, in particular when treating obese patients.

TECHNICAL SUPPORT FOR ANESTHESIA MANAGEMENT OF OBESE PATIENTS

Active CPAP

In order to help actively counteract the intrinsic PEEP of obese patients during pre-oxygenation, CPAP could be used during induction. A real CPAP supports the patient with a continuous flow that actively counteracts the intrinsic PEEP and thus reduces the work of breathing. In the absence of a real CPAP, attempts are often made in Man./Spon. to simulate a CPAP by setting an APL valve to the desired pressure. However, the pressure set for the APL valve acts primarily as a resistance instead of providing active support. This means that the APL valve does not reduce the work of breathing but merely makes expiration more difficult. Furthermore, the pressure is not maintained at a constant level during spontaneous breathing.



Spontaneous breathing without CPAP



Spontaneous breathing with activated CPAP

The Dräger ventilation unit TurboVent 2 (installed in the Dräger anesthesia machine Perseus® A500) is a blower ventilator that can deliver an active CPAP without any interruptions. The blower delivers a continuous circulation, thus enabling the rapid mixing of gases in the breathing circuit and with it rapid gaseous exchange. The E-Vent plus piston-based ventilator installed in the Apollo® is capable of applying a real, active CPAP in Pressure Support mode. In Pressure Support mode the pressure support is reduced to 0 cmH₂O. If you would like to know more about ventilator technology please [click here](#).

Pressure Support + CPAP

Pure CPAP may also be helpful for moderately obese patients, given that it can facilitate independent spontaneous breathing in the supine position. However in cases of advanced obesity this may not be sufficient, rendering it necessary to support breaths in order to achieve near normal tidal volumes. A very sensitive trigger which can be adjusted to the individual patient, coupled with the fast reactions of the electric ventilators E-Vent/E-Vent plus and especially TurboVent 2, ensure rapid and synchronous pressure support for spontaneously breathing patients. The rate at which the pressure rises can be adapted using slope adjustment to take account for the individual lung mechanics. The PEEP (CPAP) is maintained appropriately during the expiration phases. This option is available with all Dräger anesthesia machines. Synchronization and reaction times of modern ventilator technologies, especially the TurboVent 2 blower, correspond to the performance of intensive care ventilators.

Reducing the resistance in the breathing circuit

In the blower-driven anesthesia machines, the circulation reduces the resistances arising due to the breathing system in order to additionally facilitate spontaneous breathing at the PEEP (CPAP) level and thus to reduce the required work of breathing. During expiration, the E-Vent plus piston-driven ventilators synchronize themselves with the expiration flow and actively support the patient's expiration by means of a controlled ventilator piston return.

Mask fit

During pre-oxygenation and the induction of anesthesia in obese patients, it is important that the CPAP and the pressure for Pressure Support should be delivered to the patient with as little leakage as possible despite non-invasive application. It is therefore essential to select a mask of the correct size. Some obese patients also have a greatly increased amount of fatty tissue in the facial region, which can make it more difficult to achieve a good fit with the ventilation mask. In addition to selecting the correct size, it may be necessary to adjust the way the edge of the mask presses down in order to get a good seal. Obese men should preferably be shaved so that beard hair does not affect the fit of the mask.

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