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Room Room 124

Desflurane Usage With Two Different Automated Target Controlled Low Flow Anesthesia Machines.

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Introduction

Automated low flow anesthesia (ALFA) has brought low flow anesthesia within the realm of everyday practice. Currently 2 ALFA machines are in clinical use, the Zeus® (Dräger, Lubeck, Germany) and the Aisys® (GE, Madison, Wisconsin). The Zeus uses closed circuit anesthesia, the Aisys minimal flow anesthesia (= 500 mL/min fresh gas flow [FGF]). The use of these machines obviates the need for frequent vaporizer and FGF adjustments that may distract the busy clinician, especially during the induction period. First, the anesthesiologist selects a target alveolar concentration (F_At) of inhaled anesthetic and a target O₂ %, either inspired (FIO₂, the Zeus) or end-expired (FAO₂, the Aisys). Next, proprietary software algorithms steer agent and carrier gas administration to attain the targets with the lowest waste. Because these algorithms as well as the maintenance FGF differs (closed versus 500 mL/min FGF), these machines are likely to differ in their agent use. We therefore compared desflurane usage in O₂/air between the two ALFA machines when used under similar conditions.

Methods and Materials

After IRB approval and informed consent, 24 ASA I-III patients presenting for abdominal surgery under general endotracheal anesthesia received desflurane (F_At = 6%) in O₂/air with either the Zeus (n = 13, FIO₂ target = 50%) or the Aisys (n = 11, FAO₂ target = 45%). Ventilation was controlled mechanically to maintain normocapnia. F_At desflurane, FIO₂ and FAO₂ were downloaded in a spreadsheet q10 sec. The vaporizer (DIVA cassette of the Zeus, Aladin cassette of the Aisys) were weighed with a high precision weighing scale (XP10002, Mettler-Toledo, Columbus, Ohio) before and after exactly 60 min of desflurane administration. Because removing and replacing the vaporizer chambers consumed a small amount of agent, a correction was applied (0.81±0.10 g for the DIVA cassette, and 0.23±0.02g for the Aladin cassette; determined by inserting and removing the cassette 10 times). Weight was converted into mL liquid agent using the density of desflurane (1.4651g/mL). A t-test was used to compare demographics data and agent usage, and data are expressed as average (±standard deviation).

Results

Age, height, and weight did not differ between the groups, but agent usage did (P<0.001). Desflurane usage was 14.2±2.2 and 21.6±1.9 mL with the Zeus and the Aisys, respectively. The course of the desflurane and O₂ concentrations during the first 30 min are presented in figure 1 and 2, respectively.

Discussion

Desflurane usage was 52% higher with the Aisys than with the Zeus (or vice versa, the Zeus used only 66% the amount the Aisys used). Two factors that contribute to higher desflurane usage by the Aisys are (1) the higher initial FGF required to more aggressively attain the target FIO₂ after induction of anesthesia (Figure 2) and (2) the higher maintenance FGF.

Figure 1

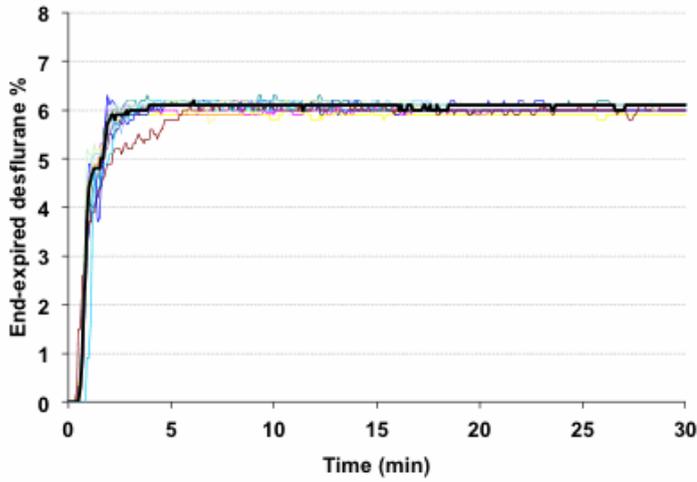


Figure 1A. End-expired desflurane % with the Zeus (first 30 min). Thick black line = median.

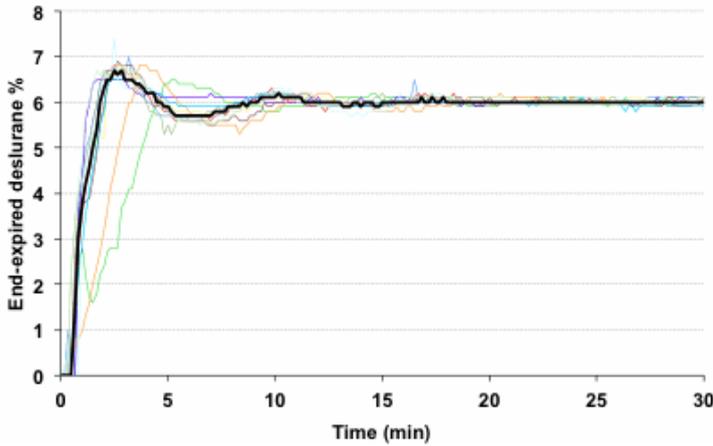


Figure 1B. End-expired desflurane % with the Aisys (first 30 min). Thick black line = median.

Figure 2

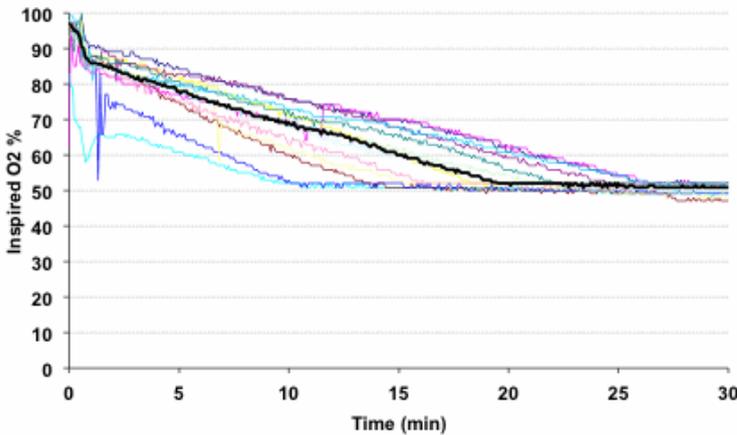


Figure 2A. Inspired O₂ % with the Zeus (first 30 min). Thick black line = median.

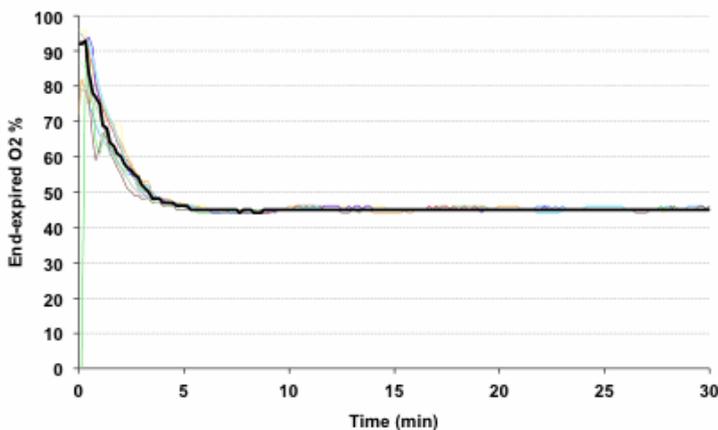


Figure 1B. End-expired O₂ % with the Aisys (first 30 min). Thick black line = median.