

Continuous Surveillance of Oxygen Saturation and Respirations after Bariatric Surgery

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Introduction

Continuous, ventilatory, post-operative patient monitoring provides health care workers with earlier warning signs of patient deterioration. The Masimo Pulse CO-Oximeter (Masimo Corporation, Irvine, CA) with acoustic monitoring technology measures respiratory rate based on analysis of acoustic signals generated across the upper airway during turbulent flow with breathing. As an additional safety measure for a randomized drug trial, we continuously monitored respiratory rate (RR) and oxygen saturation (SpO2) in patients who underwent laparoscopic Roux-en-Y gastric bypass (RYGB). The secondary objective was to assess incidence of decreased RR (< 10 rpm), respiratory pauses and desaturation (< 90%) in a patient population that was at higher risk for hypoventilation.

Methods

After IRB approval, twenty subjects patients aged 18-65 with a BMI between 40 kg/m2 and 60 kg/m2 who received primary laparoscopic Roux-en-Y gastric bypass surgery (RYGB) by the same surgeon were randomized to receive intraoperative intravenous infusions of lidocaine or placebo (saline) in addition to IV PCA dilaudid as an adjunct for post-operative pain management. Respiratory rate and oxygen saturation were continuously monitored from the time of PACU arrival and for the following 24 hours. The pulse-ox was set with an oxygen desaturation alarm setting at 90% and respiratory pause alarm at 30 seconds to ensure a rapid response. Most patients were placed on CPAP for the first few hours post-operatively, if they used CPAP at home. Data for SpO2 and RR were graphed verses time for the 24 hour period for each patient (**Figure 1A & 1B**). A subset of data was extracted at 5 minute intervals (to reduce the volume of data). The data were then sorted from least to greatest and graphed verses time to yield a graph representing cumulative time spent at each SpO2 level or respiratory rate. These data were categorized into two ranges for SpO2 (SpO2 ≥ 90% and < 90%) and three ranges for RR (RR > 30, between 30 and 10, and < 10 breaths per minute). The percentage of time that the patient spent in each range was calculated. Median and range were calculated for each category.

Results

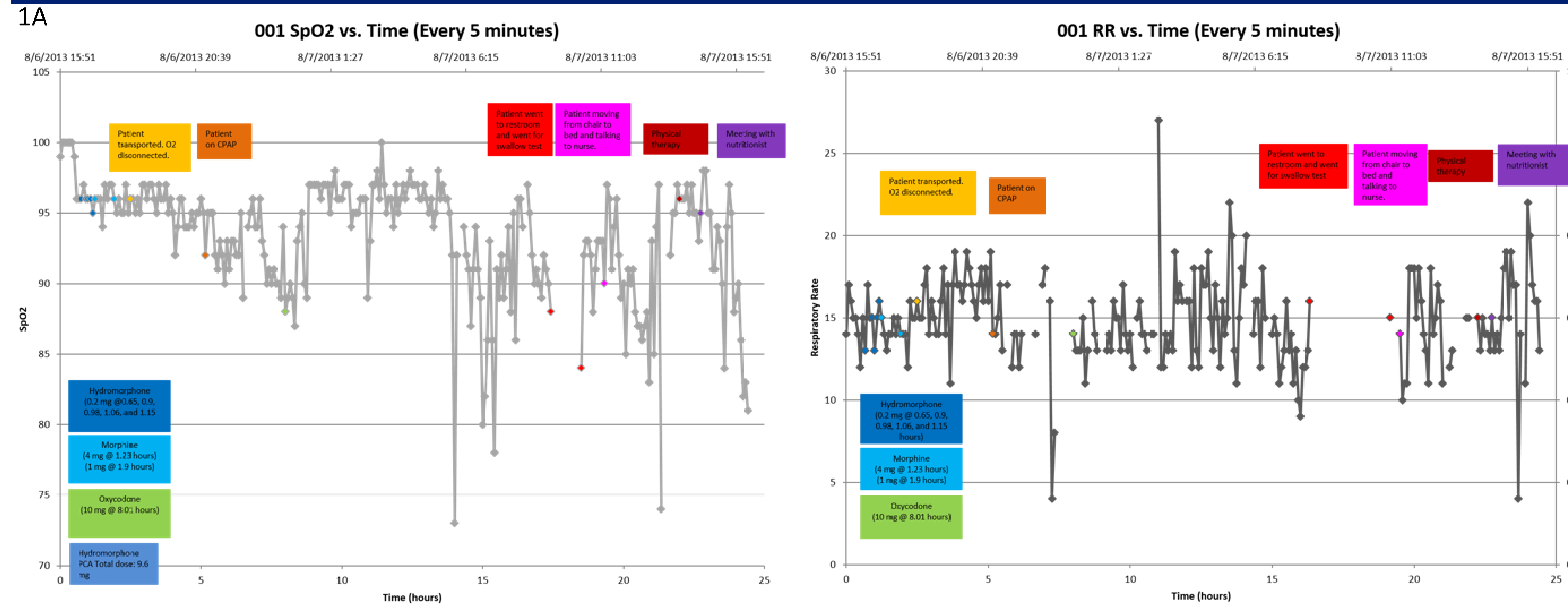


Figure 1: A) Averaged SpO2 value for each 5 minute epoch for 25 hours postoperatively. B) Averaged Respiratory rate value for each 5 minute epoch for 25 hours postoperatively.

Of the 20 patients enrolled in the trial, the datasets from 3 of the patients were incomplete and were not included in the final analysis. The remaining 17 enrolled subjects had an average BMI of 47.3 kg/m2, an average age of 47.4 years; 3 males and 14 females; 5 patients had a history of asthma; 13 had a history of sleep apnea, 12 of which used CPAP.

Data for SpO2 and RR were graphed verses time for the 24 hour period for each patient (**Figure 1A & 1B**). During the 24 hour monitored period, the median percentage of time spent with an SpO2 below 90% was 5.4% (**Table 1**). The median percentage of time that a subject had a respiratory rate of less than 10 resp/min was 0.0%. There was no correlation between SpO2 and respiratory rate. There was no correlation between the use of CPAP and oxygen saturation or respiratory rate. There were no apnea periods longer than 30 seconds.

Table 1. Outcomes Data Collected from 17 Subjects after 24 Hours of Continuous Monitoring of Respiratory Rate and Oxygen Saturation

	# of Incidences with an SpO2 <90%	Percentage of Total Time with an SpO2 <90%	# of Incidences with an SpO2 ≥ 90%	Percentage of Total Time with an SpO2 ≥ 90%	# of Incidences with a RR ≤ 10	Percentage of Total Time with a RR ≤ 10	Percentage of Total Time			
							# of Incidences with a RR > 30	Percentage of Total Time with a RR > 30	# of Incidences with a RR between 10-30	Percentage of Total Time with a RR between 10-30
Median	14.0	5.4	228.0	94.6	0.0	0.0	234.0	97.9	0.0	0.0
Range		0-39.7		60.3-100		0-39		57.4-100		0-22

Conclusions

In this small group of obese patients, a low respiratory rate was not encountered. The Masimo Radical 7 Pulse CO-Oximeter provided effective surveillance of respiratory rate and oxygen saturation in a population of patients at higher risk for respiratory distress.