Monitoring Respiration in Upper GI Endoscopy Anesthesia.

Goudra B.G., Penugonda L. *Proceedings of the 2011 Annual Meeting of the American Society of Anesthesiologists*. A246.

Background

Outside the OR, half of all adverse events in anesthetized patients are in the gastrointestinal suite, and half of these are airway related (1). Upper GI endoscopy, in particular, poses significant difficulties, and lacks a reliable respiratory monitor. Current standard methods of measuring respiratory rate, such as EtCO2 and impedance pneumography are subject to frequent false alarms. Thus, we rely on the anesthesia providers' observational skills to monitor chest rise to assure ventilation, a practice not uniformly followed and subject to error. Therefore, a more reliable respiratory monitor is needed. In this study, we investigated if a novel acoustic respiratory monitor can result in reduction of false alarms and show better accuracy during these procedures.

Methods

After obtaining institutional review board approval, 29 consenting patients scheduled for advance upper GI endoscopy anesthesia procedures lasting around 30 minutes were studied. Respiratory monitoring was done with three methods; ETCO2 (Microsteam Smart CapnoLine (R), Oridion), Impedance Pneumography (Nihon Koden Bedside Monitor, AG-920RA) and Rainbow Acoustic Monitoring (RAM) with a RAD 87 Pulse CO-Oximeter (Masimo Corp, Software ver. 1402, Rev C.) A research scholar observed the RAD 87, while an anesthesia provider observed the EtCO2 and Impedance Pneumogram for the occurrence of apnea (i.e., zero respiratory rate for at least 30 seconds). Apnea events detected by any method were confirmed by visual inspection of chest wall movements by the anesthesia provider. A false alarm was defined as a situation where a device reported zero respiration while the other 2 devices and manual observation showed valid respiratory rates and breathing. Baseline readings before and during the cases were used to calculate the bias and precision of each methods' respiratory rate (breaths per minute, bpm) compared to the manual count of chest movements in a 30 second period.

Results

Out of 29 cases, there were 53 presumed apneic events, in which at least 1 device reported zero respiration. Of these, 52 were false alarms - not corroborated by the manual method or the other 2 devices. The EtCO2 monitor showed the highest incidence of false alarms (45) compared to impedance pneumogram (4) and RAD 87 (3.) There were too few true apneic events (1) to determine the ability of each method to detect a true apnea. In comparison to the manual count, the results show that RAM had the best accuracy and precision (-0.3 +/- 1.0 bpm) of monitoring respiratory rate, compared to the manual method, while the EtCO2 and impedance showed a bias and precision of -0.6 +/- 6.1 bpm and 0.2 +/- 4.3 bpm, respectively (table 1).

Conclusion

In upper GI endoscopy procedures, the RAD 87 with Rainbow Acoustic Monitoring had the lowest rate of false alarms and showed the best accuracy and precision compared to the manual method of recording chest wall movement in a defined time period.

1 Metzner, et al., Current Opinion in Anesthesiology 2009,22:502-508.

	Respiratory Rate vs. Manual Count Breaths Per Minute (bpm)		
	RAM RAD 87	**EtCO2 Capnography**	**Impedance Pneumography**
Bias (bpm)	-0.3	-0.6	0.2
Precision (bpm)	1.0	6.1	4.3
Paired samples	25	24	25

Table 1