Evaluation of the Xanas nasal pulse oximetry sensor during robot-assisted laparoscopic prostatectomy

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Robot-assisted laparoscopic prostatectomy (RALP) poses specific problems for the anaesthetist including providing reliable monitoring in steep Trendelenberg position. Patient positioning and pneumoperitoneum increase the likelihood of hypoxaemia secondary to abdominal splinting and endotracheal tube migration; therefore, reliable pulse oximetry (SpO2) is required. Finger pulse oximetry sensors are difficult to maintain with limited patient access and extensive wrapping of the arms and hands. In our institution, standard practice is to use ear sensors so we trialed the *Xanas* nasal ala sensors and conducted a retrospective comparative review of both.

Xanas and ear sensors were used simultaneously in RALPs over a 6 month period. Durations of use and missing recordings were collected. SpO2 was recorded every 15 minutes. Arterial blood gases (ABGs) taken for oximetry (SaO2) were compared to contemporaneous SpO2 readings. Assuming SaO2 as the gold standard measurement, agreement was assessed using a centile non-parametric approach[1]. Agreement : tolerability indices (ATI) were estimated with acceptable, marginal and unacceptable agreement defined as <1, 1 to 2 and >2 respectively[1,2]. The tolerability interval for SaO2 was defined as 92% to 98%, to separate hypoxaemia from potential hyperoxaemia. Data are presented as median [range] and were analysed using Number Cruncher Statistical Systems (NCSS), version 11.0, Kaysville, UT. Significance was defined as $P<0.05$ (two-sided) with degrees of freedom based on patients rather than pooled data as appropriate.

Xanas and ear sensors were used simultaneously in 64 patients for a duration of 262.5 [195 - 390] min. Duration of missing recordings were 30 [0 -190] and 0 [0 - 30] min for the ear and Xanas sensors respectively ($P<0.0001$, Wilcoxon test). ABGs (n=54) were available for analysis from 33 patients, 1 [1 - 7] samples per patient. The oximetry SaO2 measures were 99.3% [90.6 - 99.8]. Friedman test confirmed significant differences between all devices ($P < 0.0001$). Agreements between devices are summarised in the Table. There was no significant change in the bias with the Xanas sensor throughout the duration of use (Spearman rs = 0.10, $P=0.23$).

Our current SpO2 monitoring with ear sensors is not reliable in Trendelenberg position for RALPs and shows unacceptable agreement (ATI > 2) with gold standard arterial oximetry. The Xanas sensor was a superior alternative to the ear sensor, providing almost continuous measurements with acceptable agreement (ATI < 1). The oximetry measurements were all above 90% so interpretation of results can only relate to the range of values being studied. Xanas sensors are single patient use making it expensive for widespread introduction. However, we have identified a specific patient population where it may be beneficial and suggest further prospective studies to evaluate this.

Comparison	**Bias (95% CI) (%)**	**95% Agreement Limits (%)**	**ATI**
Oximetry - Xanas	0.95 (0.53 - 1.50)	-1.00 - 3.60	0.77
Oximetry - Ear	2.78 (1.80 - 3.60)	0.55 - 14.10	2.26
Xanas - Ear	1.50 (0.50 - 2.50)	0.00 - 14.00	2.33

Table. Differences in SaO2 and SpO2 are presented for arterial oximetry, Xanas and ear sensors

References

1. Columb MO. *Current Anaesthesia & Critical Care.* 2008; **19:** 328-9
2. Crossinghan IR, Nethercott DR, Columb MO. *Journal of the Intensive Care Society.* 2016; **17:** 302-313