Potential role of transcutaneous carbon dioxide monitoring in nonintubated video-assisted thoracic surgery

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Dear Editor,

We read Dr. Ke and colleagues' article published in the October issue of the *Journal of the Chinese Medical Association* with interest.[1] In their retrospective study, the authors demonstrated that patients who received nonintubated video-assisted thoracic surgery (VATS) lung wedge resection had benefits of shorter anesthesia induction and operative times, shorter postoperative hospital stays, and reduced chest tube retention compared with traditional wedge resection with double-lumen endotracheal tube. However, the nonintubated patients had a higher partial pressure of carbon dioxide ($PaCO_2$) levels in both the pre-one-lung and during one-lung ventilation periods and a lower serum pH levels during one-lung ventilation period as measured in arterial blood gas (ABG). The authors mentioned the technical difficulties in continuous end tidal carbon dioxide ($ETCO_2$) measurement in nonintubated patients because of the obstruction of $ETCO_2$ detector by transnasal humidified rapid-insufflation ventilatory exchange cannula in the nostril. Since ABG could only provide intermittent analysis, the lack of a continuous $ETCO_2$ monitoring could result in undetected hypercapnia. We congratulate the success of the authors' publication, and we would like to suggest using transcutaneous carbon dioxide ($TCCO_2$) monitoring to overcome such difficulties.

$TCCO_2$ monitor provides continuous noninvasive monitoring of $PaCO_2$. The device involves a sensor attached to the earlobe which warms the skin to 42 to 43°C to provide vasodilatation of the capillary bed. This facilitates the diffusion of carbon dioxide from the capillary to the membrane of the detector. $TCCO_2$ readings have been found to correlate well with $PaCO_2$ obtained through ABG.[2] The first commercially available monitor was introduced into clinical practice in 1980. This technology is used commonly in the neonatal intensive care unit population.[2] Even though the use of $TCCO_2$ monitor is currently not a standard of care in the perioperative setting, $TCCO_2$ was found to be an accurate and reliable measurement of $PaCO_2$ during general anesthesia in adults.[3,4] The study of Tobias[5] found that $TCCO_2$ provides good correlation to $PaCO_2$ during one-lung ventilation in thoracic surgery with a difference of 2.7 ± 1.4 mmHg. The use of $TCCO_2$ monitoring in nonintubated VATS has been reported once. Gravino et al studied VATS talc pleurodesis performed under monitored anesthesia care. They used $TCCO_2$ device to monitor efficiency and adequacy of spontaneous ventilation. However, the exact value and trend of $TCCO_2$ data was not reported.[6]

$TCCO_2$ monitoring has particular benefit when $ETCO_2$ monitoring is not applicable. As a result, we believe that its usage may have a potential role in nonintubated VATS. We are looking forward to learning the authors' kind response.

REFERENCES

1. Ke HH, Hsu PK, Tsou MY, Ting CK. Nonintubated video-assisted thoracic surgery with high-flow oxygen therapy shorten hospital stay. *J Chin Med Assoc* 2020;**83**:943–9.
2. Tobias JD. Transcutaneous carbon dioxide monitoring in infants and children. *Paediatr Anaesth* 2009;**19**:434–44.
3. Griffin J, Terry BE, Burton RK, Ray TL, Keller BP, Landrum AL, et al. Comparison of end-tidal and transcutaneous measures of carbon dioxide during general anaesthesia in severely obese adults. *Br J Anaesth* 2003;**91**:498–501.
4. May A, Humston C, Rice J, Nemastil CJ, Salvator A, Tobias J. Noninvasive carbon dioxide monitoring in patients with cystic fibrosis during general anesthesia: end-tidal versus transcutaneous techniques. *J Anesth* 2020;**34**:66–71.
5. Tobias JD. Noninvasive carbon dioxide monitoring during one-lung ventilation: end-tidal versus transcutaneous techniques. *J Cardiothorac Vasc Anesth* 2003;**17**:306–8.
6. Gravino E, Griffo S, Gentile M, Storti M, Grossi N, Gily B. Comparison of two protocols of conscious analgosedation in video-assisted talc pleurodesis. *Minerva Anestesiol* 2005;**71**:157–65.

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