

An evaluation of transcutaneous carbon dioxide partial pressure monitoring during apnea testing in brain-dead patients

[Vivien B](#), [Marmion F](#), [Roche S](#), [Devilliers C](#), [Langeron O](#), [COriat P](#), [Riou B](#).

Department of Anesthesiology, Centre Hospitalier Universitaire Pitié-Salpêtrière, Assistance Publique-Hôpitaux de Paris, Paris, France.

BACKGROUND: Diagnosis of brain death usually requires an arterial carbon dioxide partial pressure (PaCO₂) of 60 mmHg during the apnea test, but the increase in PaCO₂ is unpredictable. The authors evaluated whether transcutaneous carbon dioxide partial pressure (PtcCO₂) monitoring during apnea test can predict that a PaCO₂ of 60 mmHg has been reached.

METHODS: The authors compared PtcCO₂ measured with a transcutaneous ear sensor (V-Sign Sensor, Sentec Digital Monitoring System; SENTEC-AG, Therwil, Switzerland) and PaCO₂ obtained from arterial blood gas measurements in 32 clinically brain-dead patients.

RESULTS: In the first 20 patients, the mean PaCO₂-PtcCO₂ gradient was 0.7 +/- 3.6 mmHg at baseline and 8.7 +/- 7.1 mmHg after 20 min of apnea. Using receiver operating characteristic curve analysis (area under the curve: 0.983 +/- 0.013), the best threshold value of PtcCO₂ to predict that a PaCO₂ of 60 mmHg had been reached was 60 mmHg (positive predictive value: 1.00 [0.93-1.00]). In the following 12 patients investigated with use of this PtcCO₂ target value of 60 mmHg, the mean duration of the apnea test (11 +/- 4 vs. 20 +/- 0 min; P < 0.001), hypercapnia (74.0 +/- 4.9 vs. 98.3 +/- 20.0 mmHg; P < 0.001), acidosis (pH: 7.18 +/- 0.06 vs. 7.11 +/- 0.08; P < 0.001), and decrease in arterial oxygen partial pressure (-47 +/- 44 vs. -95 +/- 89; P < 0.05) at the end of the test were reduced as compared with the 20-min apnea test group.

CONCLUSION: During the apnea test in brain-dead patients, a PtcCO₂ of 60 mmHg accurately predicts that a PaCO₂ of 60 mmHg has been reached.

This may allow a reduction in the duration of the apnea test and consecutively limit occurrence of complications.