A new physiological model for studying the effect of chest compression and ventilation during cardiopulmonary resuscitation: The Thiel cadaver

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Résumé en anglais	BACKGROUND: Studying ventilation and intrathoracic pressure (ITP) induced by chest compressions (CC) during Cardio Pulmonary Resuscitation is challenging and important aspects such as airway closure have been mostly ignored. We hypothesized that Thiel Embalmed Cadavers could constitute an appropriate model. METHODS: We assessed respiratory mechanics and ITP during CC in 11 cadavers, and we compared it to measurements obtained in 9 out-of-hospital cardiac arrest patients and to predicted values from a bench model. An oesophageal catheter was inserted to assess chest wall compliance, and ITP variation (ΔITP). Airway pressure variation (ΔPaw) at airway opening and ΔITP generated by CC were measured at decremental positive end expiratory pressure (PEEP) to test its impact on flow and ΔPaw. The patient's data were derived from flow and airway pressure captured via the ventilator during resuscitation. RESULTS: Resistance and Compliance of the respiratory system were comparable to those of the out-of-hospital cardiac arrest patients (C 42 ± 12 vs C 37.3 ± 10.9 mL/cmHO and Res 17.5 ± 7.5 vs Res 20.2 ± 5.3 cmHO/L/sec), and remained stable over time. During CC, ΔITP varied from 32 ± 12 cmHO to 69 ± 14 cmHO with manual and automatic CC respectively. Transmission of ΔITP at the airway opening was significantly affected by PEEP, suggesting dynamic small airway closure at low lung volumes. This phenomenon was similarly observed in patients. CONCLUSION: Respiratory mechanics and dynamic pressures during CC of cadavers behave as predicted by a theoretical model and similarly to patients. The Thiel model is a suitable to assess ITP variations induced by ventilation during CC.
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