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Title: Relationship between venous bubbles and hemodynamic responses after decompression in pigs

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Keywords: decompression  
animal  
pig  
pulmonary  
model

Issue Date: 1993

Abstract: We present a new pig model for studying relationships between venous gas bubbles and physiologic effects during and after decompression. Sixteen pigs were anesthetized to allow spontaneous breathing. Eight of them underwent a 30-min exposure to 5 bar (500 kPa) followed by a rapid decompression to 1 bar (2 bar/min); the remaining eight served as controls. The pigs were monitored for intravascular bubbles using a transesophageal echocardiographic transducer, and bubble count in the two-dimensional ultrasound image of the pulmonary artery was used as a measure of the number of venous gas bubbles. Effects on physiologic variables of the pulmonary and the systemic circulations were either measured or estimated. We detected venous bubbles in all pigs after decompression, but the interindividual variation was large. The time course of changes in the mean pulmonary artery pressure, in the pulmonary vascular resistance, in the arterial oxygen tension, and in the pulmonary shunt fraction followed the time course of the bubble count. In contrast, such a relationship to the number of venous gas bubbles was not found for the immediate increase in mean arterial pressure and for the changes in the other variables of the systemic circulation. We conclude that the number of venous gas bubbles, as evaluated by

the bubble count in the ultrasound image of the pulmonary artery, is clearly related to changes in the variables of the pulmonary circulation in this pig model.

Description: Undersea and Hyperbaric Medical Society, Inc. (<http://www.uhms.org> )

URI: [PMID: 8401153](https://pubmed.ncbi.nlm.nih.gov/8401153/)  
<http://archive.rubicon-foundation.org/2146>

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