

duce right ventricular dysfunction. Patients with pre-existing myocardial dysfunction generally have a large LAP-RAP gradient, so that PEEP would be unlikely to provoke paradoxical movement of air.

Our study addressed only the safety and not the efficacy of PEEP for patients in the supine and seated positions. PEEP should be effective in decreasing venous air embolism during head and neck or pelvic procedures when the operative site is above the right atrium.⁹ It is not yet established whether PEEP is effective in decreasing venous air embolism during neurosurgical procedures in patients in the seated position. We do *not* advocate the routine use of PEEP during procedures with risk for venous air embolism. On the basis of our clinical and experimental studies, we believe that the application of up to 10 cm H₂O of PEEP when venous air embolism does occur is not hazardous. Although data exist that suggest that such application of PEEP may decrease air embolism and aid in detecting its source,^{10,11} additional studies are required to determine the role of PEEP in such situations.

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REFERENCES

1. Zasslow MA, Pearl RG, Larson CP, Silverberg G, Shuer LF: PEEP does not affect left atrial-right atrial pressure difference in neurosurgical patients. *ANESTHESIOLOGY* 68:760-763, 1988
2. Pearl RG, Larson CP Jr: Hemodynamic effects of positive end-

- expiratory pressure during continuous venous air embolism in the dog. *ANESTHESIOLOGY* 64:724-729, 1986
3. Perkins NAK, Bedford RF: Hemodynamic consequences of PEEP in seated neurological patients—Implications for paradoxical air embolism. *Anesth Analg* 63:429-432, 1984
4. Perkins-Pearson NAK, Marshall WK, Bedford RF: Atrial pressures in the seated position: Implication for paradoxical air embolism. *ANESTHESIOLOGY* 57:493-497, 1982
5. Lynch JJ, Schuchard GH, Gross CM, Wann LS: Prevalence of right-to-left atrial shunting in a healthy population: Detection by Valsalva maneuver contrast echocardiography. *Am J Cardiol* 53:1478-1480, 1984
6. Guggiari M, Lechat P, Garen-Colonne C, Fuscuardi J, Viars P: Early detection of patent foramen ovale by two-dimensional contrast echocardiography for prevention of paradoxical air embolism during sitting position. *Anesth Analg* 67:192-194, 1988
7. Cucchiara RF, Seward JB, Nishimura RA, Nugent M, Faust RJ: Identification of patent foramen ovale during sitting position craniotomy by transesophageal echocardiography with positive airway pressure. *ANESTHESIOLOGY* 63:107-109, 1985
8. Luce JM: The cardiovascular effects of mechanical ventilation and positive end-expiratory pressure. *JAMA* 252:807-811, 1984
9. Larson CP: Venous air embolism: Report of four cases. Suggested method of treatment. *Am J Clin Pathol* 21:247-250, 1951
10. Voorhies RM, Fraser RAR, Van Poznak A: Prevention of air embolism with positive end expiratory pressure. *Neurosurgery* 12:503-506, 1983
11. Muravchick S, DeLisser E, Welch F: The use of PEEP to identify the source of cardiopulmonary air embolism. *ANESTHESIOLOGY* 49:294-295, 1978

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Carboxyhemoglobin and P₅₀ in Pregnancy

To the Editor:—We have several comments regarding the report describing elevated carboxyhemoglobin levels as a mechanism for a decrease in P₅₀ in preeclamptic women.¹ First, the authors did not sufficiently specify the two groups of women compared in their study. For example, they did not mention whether these women were from the same geographic area. A national survey in North America found that 1-2% carboxyhemoglobin levels are not unusual in urban nonsmokers as a result of environmental exposure.² In addition, one should consider that even passive smoking can lead to elevated carboxyhemoglobin levels in nonsmokers. Second, and of greater importance, is that a decrease in P₅₀ of 5.7 mmHg in preeclamptic women compared with normal pregnant women can hardly be explained by an increase in carboxyhemoglobin level of 2.1%. The average influence of carboxyhemoglobin on P₅₀ can be estimated using the formula $dP_{50}/dCOHb = -0.27$.³ This would account only for a 0.57 mmHg decrease in P₅₀. In other words, the cause of 90% of the difference in P₅₀ remains unexplained. Finally, when discussing shifts of the oxyhemoglobin dissociation curve during standardized conditions ($pH = 7.4$; $pCO_2 = 40$ mmHg), the concentration of intraerythrocytic 2,3-DPG should always be stated.

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REFERENCES

1. Kambam JR, Entman S, Mouton S, Smith BE: Effect of preeclampsia on carboxyhemoglobin levels: A mechanism for a decrease in P₅₀. *ANESTHESIOLOGY* 68:433-434, 1988
2. Stewart RD, Baretta ED, Platte LR, Steward EB, Kalbfleisch JH, Van Yserloo B, Rimm AA: Carboxyhemoglobin levels in American blood donors. *JAMA* 229:1187-1195, 1974
3. Hlastala MP, McKenna HP, Franada RL, Dettler JC: Influence of carbon monoxide on hemoglobin-oxygen binding. *J Appl Physiol* 41:893-899, 1976

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