

Images in Cardiovascular Medicine

High-Altitude–Induced Right-Heart Failure

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Rapid ascent to high altitudes may be a cause of acute mountain sickness and its malignant complications, cerebral edema and/or pulmonary edema.¹ A previously healthy 58-year-old mountaineer presented with echocardiographic signs of right-heart failure within the first 24 hours of arrival in La Paz, Bolivia, at the altitude of 3700 m. His only complaints were of a moderate headache, which improved after intake of paracetamol, and somewhat more fatigue and exertional dyspnea than was usual at similar altitudes. His clinical examination was unremarkable except for an increased pulmonic component of the second heart sound, a questionable systolic murmur, and moderate jugular distension.

The patient underwent an echocardiographic examination with a portable Vivid i ultrasound system (GE Ultrasound, Norway) equipped with pulsed-tissue Doppler technology. The maximum velocity of tricuspid regurgitant jet was markedly increased, allowing for the calculation of a transtricuspid pressure gradient of 69 mm Hg. The inferior vena cava was dilated to 2.7 cm at expiration and loss of inspiratory decrease in diameter. Therefore, systolic pulmonary artery pressure was estimated to be approximately 80 mm Hg (corresponding to a mean of approximately 45 mm Hg). The pulmonary flow pattern showed a midsystolic deceleration typical of severe pulmonary hypertension, with an acceleration time decreased to 90 ms, corresponding to a mean pulmonary artery pressure of 35 mm Hg (Figure). The right ventricle was dilated with an increased end-diastolic area to 21 cm², a right-on-left ventricular end-diastolic area ratio of 67%, and a flattened interventricular septum with a tendency toward paradoxical motion. The right atrium was dilated, and the interauricular septum bulged toward left cavities, confirming an increased right atrial pressure (see Movies). Tissue Doppler imaging along the right ventricular wall showed a decreased ejection wave and a large positive wave during the

isovolumic relaxation time after the pulmonary valve closure, which was particularly prominent at the apex (Figure). This abnormal postsystolic shortening has been reported in ischemic left ventricles.² A control echocardiographic examination performed after the patient had returned to his usual residence at sea level was entirely normal.

In summary, this case illustrates an echocardiographic diagnosis of right ventricular failure, the severity of which, not unexpectedly,³ contrasts a paucity of clinical findings. High-altitude right-heart failure should be added to the list of acute medical complications of high-altitude exposure.

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Disclosures

None.

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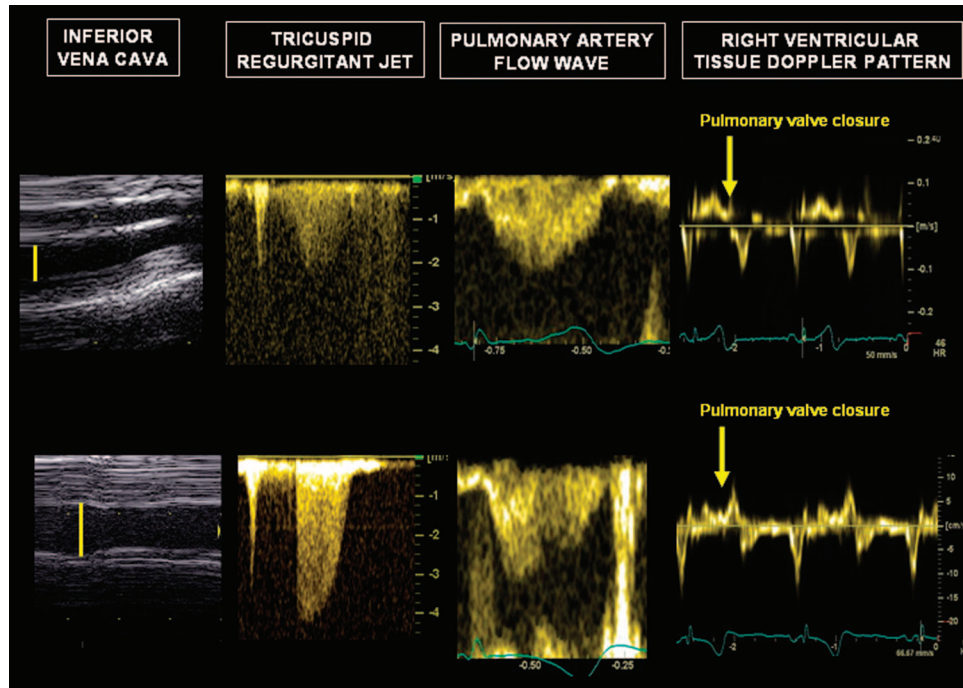
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Echocardiographic recordings at sea level (top) and within the first hours of arrival at 3700 m (bottom). From left to the right: the inferior vena cava (M mode), the tricuspid regurgitant jet, the pulmonary artery flow wave, and right ventricular apex tissue Doppler imaging.