Inhaled nitric oxide for high-altitude pulmonary edema

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BACKGROUND. Pulmonary hypertension is a hallmark of high-altitude pulmonary edema and may contribute to its pathogenesis. When administered by inhalation, nitric oxide, an endothelium-derived relaxing factor, attenuates the pulmonary vasoconstriction produced by short-term hypoxia. METHODS. We studied the effects of inhaled nitric oxide on pulmonary-artery pressure and arterial oxygenation in 18 mountaineers prone to high-altitude pulmonary edema and 18 mountaineers resistant to this condition in a high altitude laboratory (altitude, 4559 m). We also obtained lung-perfusion scans before and during nitric oxide inhalation to gain further insight into the mechanism of action of nitric oxide. RESULTS. In the high-altitude laboratory, subjects prone to high-altitude pulmonary edema had more pronounced pulmonary hypertension and hypoxemia than subjects resistant to high-altitude pulmonary edema. Arterial oxygen saturation was inversely related to the severity of pulmonary hypertension (r=-0.50, P=0.002). In subjects prone to high-altitude pulmonary edema, the inhalation of nitric oxide (40 ppm for 15 minutes) produced a decrease in mean (+/-SD) systolic pulmonary-artery pressure that was three times larger than the decrease in subjects resistant to such edema (25.9 +/- 8.9 vs. 8.7 +/- 4.8 mm Hg, P<0.001). Inhaled nitric oxide improved arterial oxygenation in the 10 subjects who had radiographic evidence of pulmonary edema (arterial oxygen saturation increased from 67 +/- 10 to 73 +/- 12 percent, P=0.047), whereas it worsened oxygenation in subjects resistant to high-altitude pulmonary edema. The nitric oxide-induced improvement in arterial oxygenation in subjects with high-altitude pulmonary edema was accompanied by a shift in blood flow in the lung away from edematous segments and toward nonedematous segments. CONCLUSIONS. The inhalation of nitric oxide improves arterial oxygenation in high-altitude pulmonary edema, and this beneficial effect may be related to its favorable action on the distribution of blood flow in the lungs. A defect in nitric nitric oxide synthesis may contribute to high-altitude pulmonary edema.