

Congenital heart disease and air travel

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ABSTRACT

The number of individuals traveling by airplanes is increasing every year. Patients with congenital heart disease and shunts, exposure to high altitude during a flight is important since it causes pulmonary vaso- constriction leading to an increase in right-to-left shunting and a decrease in arterial oxygen saturation. Patients with cyanotic congenital heart disease and Eisenmenger syndrome should be evaluated before the flight, and necessary precautions should be taken.

Keywords: air travel, congenital heart disease, flight

Introduction

The number of individuals traveling by airplanes is increasing every year. The high altitude during flight causes alterations and complications such as tissue hypoxia, reduced oxygen delivery, sympathetic stimulation, and an increase in myocardial demand in patients with cardiovascular disease.

The atmospheric pressure, oxygen pressure, and temperature decrease at high altitudes, and significant alterations occur at a critical height of 8,200 feet (2,500 m) (1, 2). Hypoxia causes vasodilation and pulmonary vasoconstriction. Pulmonary edema caused by high altitude is a serious cardiovascular complication, particularly in older individuals (3, 4).

In patients with congenital heart disease and shunts, exposure to high altitude hypobaric hypoxia causes pulmonary vasoconstriction and, therefore, an increase in right-to-left shunting and a decrease in arterial oxygen saturation (5-8). The duration and altitude of air travel, the patient's previous functional capacity, and the degree of disease severity are the major determinants of hypoxia during a flight. However, most patients with heart disease can travel safely. Commercial airplanes usually fly at an altitude between 6,700 and 13,400 m, and the cabin pressure is kept constant at 8,000 feet or less (1, 3). The partial pressure of oxygen in the arterial blood at this altitude is 60–69 mm Hg, and hypoxia at this level is well tolerated by healthy individuals without any cardiovascular disease, and they can maintain adequate tissue oxygen delivery (9, 10). If a patient's partial pressure of oxygen is less than 72 mm Hg at sea level, supplemental in-flight

oxygen is required. Hypobaric hypoxia due to lowered oxygen partial pressure causes hyperventilation and tachycardia, resulting in increased myocardial oxygen demand. It is known that supplemental oxygen should be available, particularly for patients with Eisenmenger syndrome (ES). Harinck et al. (11) have shown that a flight duration of 2.5 hours did not cause a significant drop in partial pressure of oxygen in patients with cyanosis without any adverse effects. Contrary to the study results, these patients are generally advised by physicians not to fly. This issue is important for patients with ES. ES is described as an intracardiac or great artery shunt with increased pulmonary vascular resistance and bidirectional shunt. Broberg et al. (12) demonstrated that headache and lower extremity edema were more frequent in the case of ES than in cyanotic congenital heart disease during a flight. In this study, one patient with ES had a transient ischemic attack during a transatlantic flight, and the study evaluated 1,157 flights taken by 53 patients. They found patients with ES could travel frequently and safely on commercial airplanes (12). Excessive inactivity and dehydration during air travel may cause severe complications. Dehydration increases the risk of thrombosis in patients with ES (13). Therefore, these patients should be informed about adequate fluid intake and activity during flight.

The US Aerospace Medical Association Medical Guidelines for Airline Travel determined that patients with cyanosis because of congenital heart disease should use supplemental oxygen during commercial airline flights to prevent complications (14, 15). During a flight, oxygen is required for patients in World Health Organization functional classes III and IV and in whom



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the partial pressure of oxygen is <60 mm Hg (16). The guidelines of the British Cardiovascular Society and the Canadian Pediatric Society 2007 in 2016 contraindicated commercial air travel in children with ES (15, 17-19). Naqvi et al. (14) demonstrated that hypoxic challenge testing could predict the requirement for oxygen supplementation during a flight in children with congenital heart disease. The authors suggested this test in patients with a potential right-to-left shunt without palliative or repair surgery before flight (14). A flow rate of 2 L/min will increase the partial pressure of oxygen to the value at sea level.

The results of the study showed that commercial flights are safe for patients with ES, and patients with cyanotic congenital heart disease and ES syndrome should be evaluated before the flight, and necessary precautions should be taken.

Conflict of interest: None declared.

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