Doppler analysis of the left venting line: an effective and simple technique to control heart deairing

G. Rescigno, H. Riom, P. Hallali R. Nottin* and E. Arnaud-Crozat
*Service de Chirurgie Cardiovasculaire, Clinique Belledonne, 38400 St Martin d'Hères and *Centre Chirurgicale Marie-Lannelongue, 92000 Le Plessis Robinson, France*

Air embolism is still a major risk of open-heart surgery. Different techniques of air removal have been established, even though none is completely effective. Since 1989 the authors have used a new technique to avoid air passage into the left vent line when the left heart cavities are open. A specially designed probe attached to a vascular Doppler analyser is fixed to the left vent tubing. Air passage is detected by a characteristic acoustic signal. Air removal procedures are continued until no audible signals are detected. This technique was carried out in 150 open left heart operations in which there were no clinical signs of air embolism. To validate this procedure, simultaneous assessment of air removal was made using transoesophageal echocardiography (TEE and carotid doppler CD) in six patients. When Doppler signs of air in the left vent disappeared, TEE revealed that a small amount of air was still present in two patients; carotid doppler showed only minimal passage of air bubbles in three patients after left vent removal while the heart was freely ejecting. These results demonstrate that this technique is a reliable method of assessing air removal, which is especially useful when deairing is difficult during reoperation.

Keywords: air embolism, transoesophageal echocardiography, heart deairing

Air embolism into the coronary and cerebral circulation is a serious hazard during cardiac surgery. Several studies[1] have tried to establish an effective method of eliminating entrapped air in the left side of the heart. Transoesophageal echocardiography (TEE) and transcranial Doppler have demonstrated that air embolism still occurs even though the removal technque appears perfect[2,3]. Since 1989 the authors have used a portable Doppler, which is normally employed to assess the peripheral vascular system, to document air passing though the left vent line. Air is detected because it produces a typical high frequency sound. When the noise disappears, the left vent is removed and the heart is allowed to eject freely. This technique has been performed in 150 operations in which the left heart cavities were open. There were no clinical signs of air embolism during the post-operative period.

Correspondence to: Dr G. Rescigno, Service de Chirurgie Cardiovasculaire, Clinique Belledonne, 83, Av. Gabriel Péri, 38400 St Martin d'Hères, France

0967-2109/94/000000–00

The aim of the present study was to assess the efficiency of the described technique using TEE and carotid Doppler (CD) in six patients.

Patients and methods

Left vent Doppler characteristics

A pocket-sized Doppler instrument (Minidop; Echomed, •••, France) is routinely used to monitor air passing through the left venting line during the air removal phase of 'left open heart' cardiac operations. The Doppler unit gives an emission signal of 6 megacycles. The Doppler shift is processed as an audible signal. The general principles of the technique have already been described[4].

A flat probe has been specially designed to allow direct contact with the 6.35-mm vent tubing. The probe and tubing are held in apposition by a metallic support. A thin layer of echographic gel is required to obtain perfect coupling. Air passage is detected as an irregular high frequency audible signal.