Transesophageal echocardiography (TEE)

Transesophageal echocardiography (TEE) to measure cardiac output (CO)/cardiac index (CI) and stroke volume (SV).

It is the monitoring technique with the highest sensitivity for venous air embolism (VAE) [1].

Bubbles can be seen on the 2D echo display

pros: considered the most sensitive monitoring modality

cons: significant false positive rate, expensive, invasive, requires experience and vigilance.

TEE may be evaluated in the current endovascular era, as a useful tool, providing adequate information, on graft deployment and early endoleaks [2].

A modified semisitting position aiming to create a positive pressure in the transverse and sigmoid sinuses, with lower head and higher legs positioned above the top of the head, decreases the incidence and severity of venous air embolism. Hyperventilation, compromising cerebral blood flow, has to be avoided during a sitting position. Precordial Doppler or transesophageal echocardiography monitoring improves the detection of small venous air embolism enabling its early treatment and diminishing its consequences. Patients with known patent foramen ovale can be operated on in a sitting position, under strict protocol, with few reported clinical venous air embolism and no paradoxical air embolism [3].

There is an ongoing debate about the sitting position (SP) in neurosurgical patients. The SP provides a number of advantages as well as severe complications such as commonly concerning venous air embolism (VAE). The best monitoring system for the detection of VAE is still controversial.

In a retrospective analysis Günther et al compared 208 patients. Transesophageal echocardiography (TEE) or transthoracic Doppler (TTD) were used as monitoring devices to detect VAE; 101 cases were monitored with TEE and 107 with TTD.

The overall incidence of VAE was 23% (TTD: 10%; TEE: 37%), but the incidence of clinically relevant VAE (drop in end-tidal carbon dioxide above 3 mmHg) was higher in the TTD group (9 out of 17 VAE, 53%) compared to the TEE group (19 out of 62 VAE, 31%). None of the patients with recorded VAE had clinically significant sequelae.

In this small sample they found more VAE events in the TEE group, but the incidence of clinically relevant VAE was rare and comparable to other data. There is no consensus in the definition of clinically relevant VAE. [4].

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