Venous air embolism risk factors

Several risk factors can contribute to the development of venous air embolism. Here are some of the commonly recognized risk factors:

Invasive medical procedures: VAE can occur during various invasive medical procedures that involve entry into a venous structure, such as central venous catheterization, pacemaker insertion, hemodialysis, and certain surgical procedures.

Surgery: Certain surgical procedures pose a higher risk of VAE, particularly those involving the head and neck, neurosurgery, orthopedic surgeries, and procedures in the sitting or beach chair position. The risk is higher when a large surface area is exposed or when the surgical site is above the heart level.

Central Venous Catheter Placement: Insertion or removal of central venous catheters, particularly when performed in an improper manner, can introduce air into the venous system, leading to VAE.

Trauma: Traumatic injuries, such as chest injuries with disruption of the venous system, can result in VAE. This is especially relevant in cases of penetrating chest injuries or major vessel damage.

Obstetric Procedures: Certain obstetric procedures, such as cesarean section, vaginal hysterectomy, or any procedure involving uterine manipulation, carry a risk of VAE, primarily due to the venous plexus around the uterus.

Endoscopy: Endoscopic procedures that involve insufflation of air into body cavities, such as laparoscopy or hysteroscopy, can potentially introduce air into the venous system, leading to VAE.

Patient Positioning: Patient positioning during surgery or procedures can influence the likelihood of VAE. Positions that involve a steep head-down or head-up tilt, the sitting position, or any position where the surgical site is above the level of the heart can increase the risk.

Positive Pressure Ventilation: Mechanical ventilation using positive pressure can cause air to enter the venous system if there is a communication between the airways and the venous circulation, such as through a patent foramen ovale.

It is important to note that these factors increase the risk of VAE, but the actual occurrence of VAE depends on multiple variables, including the volume and rate of air entry, patient susceptibility, and prompt recognition and management of the condition. Proper precautions, monitoring, and adherence to established guidelines can help mitigate the risk of VAE in high-risk situations.

More recently, venous air embolism has been associated with central venous catheterization, penetrating and blunt chest trauma, high-pressure mechanical ventilation, thoracocentesis, hemodialysis, and several other invasive vascular procedures.

Venous air embolism (VAE) has also been observed during diagnostic studies, such as during radiocontrast injection for computerized tomography. The use of gases such as carbon dioxide and nitrous oxide during medical procedures and exposure to nitrogen during diving accidents can also result in VAE.

Many cases of VAE are subclinical with no adverse outcome and thus go unreported. Usually, when symptoms are present, they are nonspecific, and a high index of clinical suspicion of possible venous air embolism is required to prompt investigations and initiate appropriate therapy.

The entrainment of air typically occurs during bone work, but Spence et al. describe a case in which a venous air embolism (VAE) was recognized while working on the scalp. Monitoring techniques are critical for early treatment of VAE to avoid more serious complications, and our case illustrates the need to implement monitors early and remain vigilant throughout the procedure [1)].

Positioning as a Venous air embolism risk factor

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Spence NZ, Faloba K, Sonabend AM, Bruce JN, Anastasian ZH. Venous air embolus during scalp incision. J Clin Neurosci. 2016 Jan 4. pii: S0967-5868(15)00659-1. doi: 10.1016/j.jocn.2015.11.019. [Epub ahead of print] PubMed PMID: 26765767.