

Endoscopic Saphenous Vein Harvest: Severe Hypercarbia

To the Editor,

Although arterial conduits are favoured during coronary artery bypass grafting (CABG), a variable number of venous grafts are used in all patients undergoing the procedure. Endoscopic vein harvesting of the great saphenous vein has multiple advantages over the traditional open vein harvesting technique.

A 40-year-old male patient with critical left main involvement and triple vessel disease was uneventfully anaesthetised for CABG surgery using standard anaesthetic techniques. A baseline arterial blood gas before surgical incision revealed normal values as follows: pH 7.34; partial pressure of carbon dioxide (PaCO₂) 40 mmHg; partial pressure of oxygen (PaO₂) 152 mmHg (fraction of inspired oxygen (FiO₂) 0.35); bicarbonate level 23.7 mmol/L; potassium 4.3 mmol/L.

Endoscopic vessel harvesting (EVH) (Vasoview 7xB, Wayne, NJ, USA) was done through a transverse incision on the medial aspect of the left knee. CO₂ insufflation was initiated at a flow of 2 L/min, resulting in constant pressure of 10 mmHg. The physician-assistant who was harvesting the vein incidentally noted increased bleeding in the field.

Ten minutes after the EVH incision, the end tidal CO₂ (ETCO₂) began to rise progressively and peaked at 88 mmol/L [Figure 1]. Immediate response included checking the ventilation and suctioning the patient. An arterial blood gas (ABG) demonstrated severe respiratory acidosis without impairment of oxygenation (pH 7.13; PaCO₂ 87.9; PaO₂ 201 (FiO₂ 1); single breath counting (SBC) 29.2 mmol/L). The temperature of the patient remained normal. Transesophageal echocardiogram (TEE) depicted no evidence of air in the right atrium (RA) or in the inferior vena cava. Similarly, there was no evidence of rebreathing or hypermetabolic state such as malignant hyperthermia. A repeat arterial blood gas after 30 minutes exhibited a similar picture. Hand ventilation did not result in any significant change in the PaCO₂ levels. The heart rate increased by 12 beats/min. Body temperature, heart rhythm, and blood pressure remained unchanged.

At this point, there was a suspicion that the CO₂ being used for the EVH could contribute to the high ETCO₂. The surgeons were instructed to terminate the EVH.

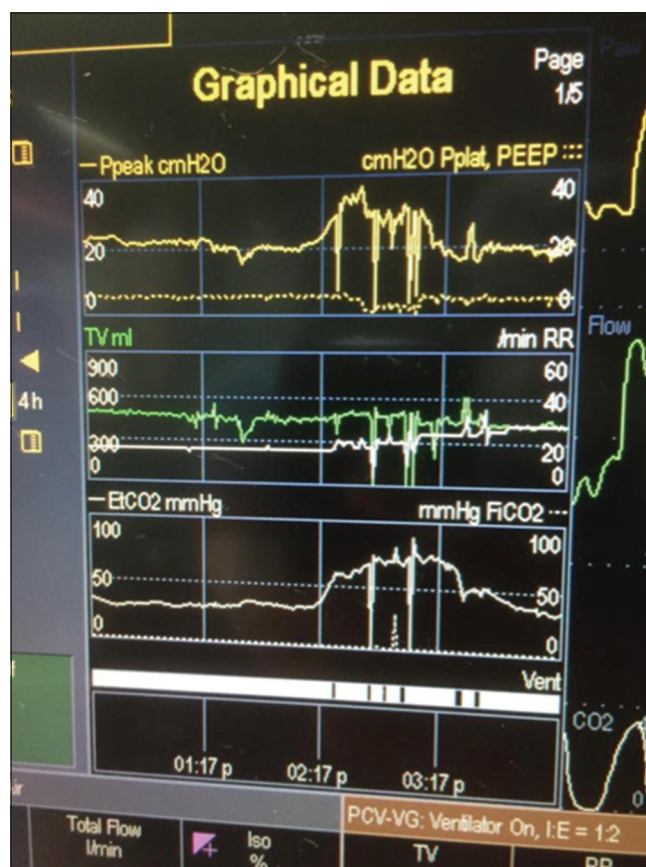


Figure 1: Monitor displaying high ETCO₂. The high airway pressures may be attributed to large tidal volume used during hand ventilation and also when the V_T was increased to 550 mL in an attempt to reduce the ETCO₂

Immediately after the cessation of CO₂ insufflation, there was a remarkable improvement in the ETCO₂. The surgeons abandoned EVH and an open technique was used to harvest the remaining vein. Soon, the ETCO₂ concentration decreased to pre-insufflation levels, and normal ventilation could be resumed. The patient then underwent 3-vessel coronary artery bypass graft surgery without further complications.

A sudden rise in ETCO₂ during surgery can have catastrophic consequences on the patient. Routine causes like ventilation, hyperthermia, or any hyper metabolic state and airway issues are to be immediately ruled out. Hypercarbia during EVH is not well known although there are a few reported cases in the literature.^[1-3] Liu *et al.*^[3] in a study of 405 patients undergoing EVH for CABG or

femoro-popliteal grafting exhibited mild, moderate, and massive amounts of CO₂ embolism in 13.1%, 3.5%, and 0.5% of patients. The author suggested that for detection of CO₂ embolism during EVH, the inferior vena cava should be inspected for air bubbles.

Carbon dioxide can enter the systemic veins either by venous absorption of the gas or by the entry of CO₂ through the open end of injured or cut veins.^[3] In moderate and massive CO₂ embolism, the later mechanism has a predominant role. Hypercarbia is also influenced by the tunnel pressure or the type of system being used for EVH.^[4,5] Higher tunnel pressures and closed EVH systems (which were used in this case) are associated with a higher incidence of hypercarbia.

In summary, we described a case of significant hypercarbia resulting from increased absorption of CO₂ during EVH. Close monitoring of ET_{CO}₂ levels during this process is encouraged for early detection and management of hypercarbia.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Submitted: 17-Feb-2022 **Accepted:** 22-Feb-2022

Published: 05-Jul-2022

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Access this article online	
Quick Response Code:	Website: www.annals.in
	DOI: 10.4103/aca.aca_39_22

How to cite this article: Menon LP, Nair SG, Kurian GV, Abraham J. Endoscopic saphenous vein harvest: Severe hypercarbia. *Ann Card Anaesth* 2022;25:374-5.

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