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Carbon dioxide embolism induced by endoscopic saphenous vein harvesting during coronary artery bypass grafting

To the Editor:

We read with great interest the article by Dr Kypson¹ reporting a case of carbon dioxide embolism during saphenous vein harvesting for coronary artery bypass grafting (CABG) in a 43-year-old woman. Saphenous venous conduits were harvested by the endoscopic method with carbon dioxide insufflation. On weaning from cardiopulmonary bypass (CPB), the endoscope was reinserted to control hemostasis and a massive gaseous embolism occurred that did not respond to pharmacologic resuscitation, leading to the need for reinstitution of the CPB. Direct inspection revealed a torn saphenofemoral junction that was resected. Finally, air locks in the venous circulation and right side of the heart disappeared and the hemodynamic parameters returned to normal.

Our group^{2,3} has previously reported on 2 cases that have occurred in more than 1000 procedures to date. We would like to raise some issues concerning this observation.

First, although carbon dioxide embolism is clearly due to direct entry into the injured vein, the cause of this lesion was not discussed in the article. Reintroduction of the scope and gas reinsufflation in the operating tunnel at the end of the operation to secure hemostasis when liquid and blood accumulation may have occurred over several hours appear, at best, of little use owing to poor visualization, and they may be potentially dangerous as this maneuver was likely responsible for the tear. Hemostasis is best secured at the time of harvesting and

may be revised by direct visualization of each venous end ligation through the skin incisions. We routinely wrap the tunnel site with circular bandaging immediately after vein extraction and for the duration of the cardiac procedure, after which the bandage is removed, hemostasis double checked by evacuation (if necessary) of liquid from the tunnel, and elastic bandaging for 24 hours postoperatively. Need for direct revision of leg hemostasis is rare in our experience of more than 1000 endoscopic vein harvestings.⁴

Second, although quickly suspected, the diagnosis of carbon dioxide embolism was not made before CPB reinstitution, since at the time of the gaseous reinsufflation, the transesophageal echocardiographic (TEE) monitoring was discontinued. Since it has been shown to be the most effective method for detection of gaseous embolisms,⁵ TEE should always be available during insufflation.

Last, the author states that this complication was "unanticipated."¹ Although massive gaseous embolism with significant clinical implications is anecdotal,⁵ it has now been well described by our group² and other authors. Moreover, since the total incidence of introduction of carbon dioxide in the venous circulation reaches a 17% rate,⁵ physicians should certainly be aware of this risk, search and take into account eventual predisposing factors,² provide TEE monitoring during the whole procedure, and avoid repeated gas insufflations. Endoscopic venous harvesting is a safe procedure so long as the necessary precautions are taken.

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Reply to the Editor:

I thank Drs Mommerot and Perrault for their contributions to the literature regarding endoscopic vein harvesting and for their comments regarding my recent case report. I would also like to point out the following issues in response to their comments.

The cause of the lesion was not discussed in the article; however, injury to the saphenofemoral junction consisted of a partial tear occurring at the time of initial vein harvest and not at the conclusion of the operation, when the scope was reintroduced into the leg. Nevertheless, carbon dioxide entry into the vascular space was the result of reinsufflation at the conclusion of the case. Drs Mommerot and Perrault are correct in stating that hemostasis is best secured at the time of harvesting and reintroduction of the scope should be minimized. However, if necessary, we do re-examine the tunnel after protamine administration, albeit carefully.

Intraoperative transesophageal echocardiography (TEE) has become a valuable tool for patients undergoing cardiac surgery. We use this technique on all such procedures and do not discontinue its use until the patient is ready for transport to the intensive care unit. In this case, TEE monitoring had been discontinued because the sternotomy incision had been closed. Drs Mommerot and Perrault are correct that TEE is the most effective method for detection of gaseous embolisms. Had the probe been in place during reintroduction of the scope, it might have sooner revealed the impending problem.

In conclusion, endoscopic vein harvesting is a safe procedure with a very low complication rate. Although the incidence of introduction of carbon dioxide into the venous circulation reaches 17%, the inci-