LETTERS TO THE EDITOR

Surgical interruption of the superior vena cava

To the Editor:

We read with interest the article by Gonzales-Fajardo and associates on complications arising from surgical interruption of the superior vena cava (SVC) (J THORAC CARDIOVASC SURG 1994;107:1044-9) and fully support the conclusions regarding the dangers of acute interruption of the SVC.

During the past 18 months we have routinely used the Invos 3100 regional cerebral oximeter (Somanetics Inc., Troy, Mich.) in more than 230 patients having cardiac surgery at our institution. The monitor uses near infrared spectrophotometry to measure regional cerebral oxyhemoglobin saturation (rSO_2) beneath a forehead-mounted sensor. During one such operation (patch closure of a secundum atrial septal defect, carried out by a trainee under consultant supervision), the SVC cannula was pulled back into the right atrium before discontinuation of bypass. Unfortunately, unbeknown to the consultant, the trainee then tightened the vascular tourniquet around the SVC, completely occluding this vessel. Within seconds, the rSO_2 reading had dropped from 63% to 37% and the monitor alarm sounded. Perfusion pressure and pump flow were satisfactory, and the pulse oximeter reading was 100%. A search of the operative field revealed the error and the tourniquet was released after approximately 1½ minutes of complete SVC occlusion. The rSO_2 reading rose to 65% within 1 minute, and no cerebral sequelae resulted.

This case supports the findings of Gonzales-Fajardo and colleagues in their animal studies, which revealed serious cerebral consequences associated with acute SVC occlusion and suggested that rSO_2 monitoring offers a method of detecting such venous obstruction in clinical practice, even though the perfusion/oxygenation side of the cerebral circulation is generally of more immediate concern. Furthermore, we suggest that monitoring rSO_2 allows the surgeon to observe the effect of temporary SVC clamping and thus determine the need for shunting on the basis of whether there is a significant drop in rSO_2.

In clinical practice, shunting will not be necessary in some patients because of the development of collateral vessels. In these, the rSO_2 reading would be expected to remain unchanged during temporary SVC occlusion.

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[*Postscript*] We would like to point out that there is considerable evidence that the Invos 3100 oximeter does measure the oxyhemoglobin saturation of cerebral tissue under the sensor rather than that of superficial tissues. Cerebral saturation is clearly related to both blood flow and oxygen content, but in the case of acute SVC occlusion it is the change in arteriovenous pressure difference in the face of a normal flow that determines the cerebral insult. The Invos machine detected this problem in our patient and allowed speedy remedial action. If applied in situations in which the SVC is to be deliberately clamped, we consider that a significant drop in rSO_2 would indicate the need for shunting, and we believe that our comments are valid.

12/8/61479

One-lung ventilation during surgical procedures on the main bronchus and carina

To the Editor:

In the April issue of the JOURNAL we read the letter by Dr. Inoue[1] concerning the Univent endotracheal tube (Fuji Systems Corporation, Tokyo, Japan) and its clinical conditions of use. In a list of conditions in which the use of this tube is inappropriate, the author includes lung lavage, differential lung ventilation, and suction of tenacious secretions from below the bronchial blocker.

Not mentioned in this list is an important clinical condition in which the use of the Univent tube is also inappropriate, that is, when bronchoplastic procedures in the main bronchus or tracheal carina are required. In fact, with this as well as with all other bronchial blocker–based systems for one-lung ventilation,[2] the bronchial blocker must be positioned in the main bronchus of the "surgical" lung, thus occupying the space where the surgical procedure may be carried out. Through the bronchial blocker, the dependent lung can be simply deflated or inflated but not ventilated and thus the blocker cannot be positioned in the recumbent, "nonsurgical" lung.

The problem may be solved with a standard double-lumen tube or with an endobronchial tube in which the bronchial extremity of the device is large enough to allow lung ventilation and thus can be positioned in the recumbent, "nonsurgical" lung.

We had favorable clinical experience with a method for one-lung ventilation developed in our institution (Fig. 1).[3] The separate ventilation is achieved by means of a cuffed endobronchial tube (Portex Ltd, Hithe, Kent, United Kingdom), whose tip is positioned in a main bronchus after passing through a standard tracheal tube. The tubes assembled in this way define two independent channels, each in communication with one lung. The two channels are sized so that they provide similar resistance to gas flow. The distal end of the right endobronchial tube is fitted with a side branch originating immediately after the cuff, forming a 45-degree angle with the major axis of the tube. This branch is inserted into the right upper lobar bronchus; in this way the advancement of the tube is stopped before its cuff obstructs the origin of the right

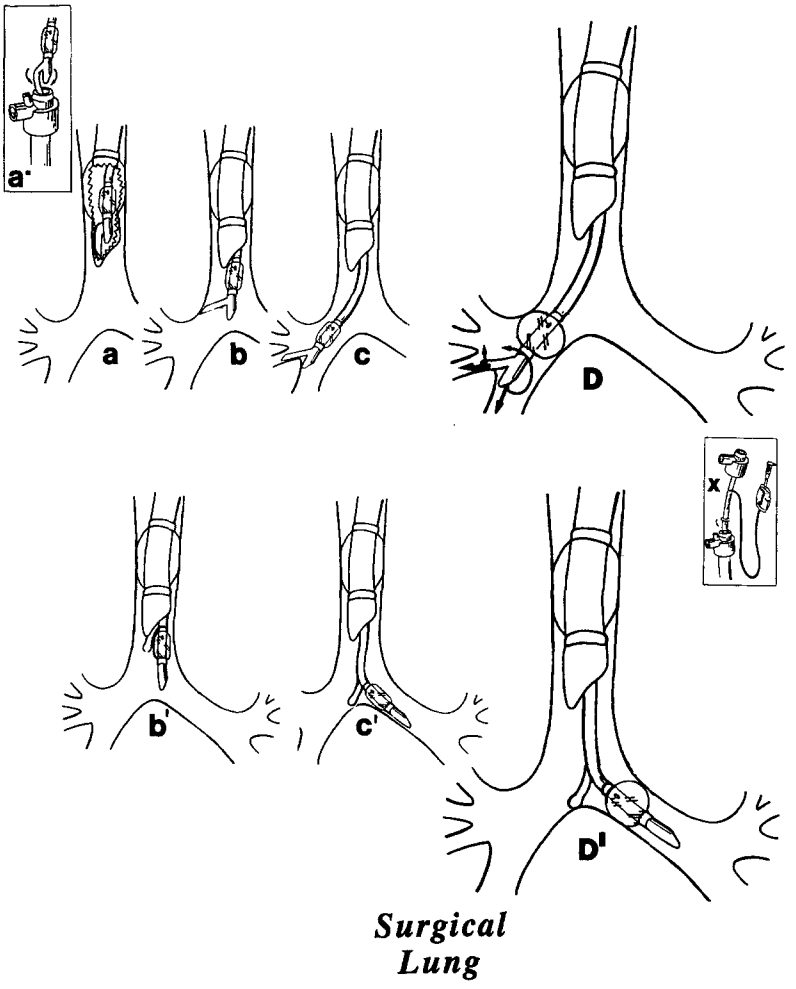

Fig. 1. The endobronchial tube is inserted into a standard tracheal tube and positioned in the nonsurgical stem bronchus, thus allowing space in the event the operation should involve this area. The tubes assembled in this way define two independent channels, each connected with one lung. The right tube is fitted with a lateral branch to compensate for the anatomic variations in length of the right main bronchus.

upper lobar bronchus. The left endobronchial tube is fitted with a carinal hook.

This system has advantages similar to that of Dr. Inoue's device, but it allows the availability of the main bronchus and the carina for surgical maneuvers.

A further advantage of this tube is related to the particular configuration of the right endobronchial tube, whose distal end is fitted with a side branch originating immediately after the cuff, forming a 45-degree angle with the major axis of the tube. This branch is inserted into the right upper lobar bronchus; in this way the advancement of the tube is stopped before its cuff obstructs the origin of the right upper lobar bronchus, compensating for the anatomic variability of the length of the right main bronchus. This configuration solves a common problem in left lung surgery,[4] in which incomplete separation of lung ventilation or poor ventilation of the right upper lobe is a common occurrence with standard double-lumen tubes.

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May 1995

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12/8/59955

Reply to the Editor:

I appreciate the research into the area of bronchial blockade done by Drs. Fontana and Nazari. When I first began to design the Univent tube (Fuji Systems Corporation, Tokyo, Japan), my objectives were to create an endobronchial tube that was easy to place by clinicians not used to such procedures, a device that could ventilate the patient's lungs adequately without adding to gas flow resistance, and a device that could easily support the use of a fiberoptic bronchoscope. I believe the Univent tube has achieved these goals.

My original letter to the Editor[1] explained to surgeons the various ways the Univent tube could make life (in the operating room) easier for them.

The types of cases Drs. Fontana and Nazari describe are not easy, especially when using a new and perhaps unfamiliar device. For these reasons I did not indicate the use of Univent tubes for tracheal, carinal, or main-stem bronchial resections. I have anecdotal reports of these cases being performed with the bronchial lumen of the Univent tube being used as a "jet stylet," ventilating the nonsurgical lung by means of high-frequency jet ventilation with the blocker cuff deflated to allow for escaping gases. These cases were performed by anesthesiologists and surgeons well versed in the use of the Univent tube and advanced surgical ventilation techniques.

For the Univent tube to be used properly, as with all medical devices, it is wise to start on the easier and more routine cases to gain experience. The Univent tube will accept standard-sized fiberoptic bronchoscopes for visualization and placement of the bronchial blocker. If the instruction manual is followed, right-sided placement of the blocker is safe and simple to perform.

I designed the Univent tube to simplify the concept of the endotracheal tube and balloon occlusion catheter technique for lung separation. The tube described by Drs. Fontana and Nazari seems to reintroduce the difficulties of Fogarty catheters for the surgeon/anesthesiologist.

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12/8/61688

Aprotinin and vein graft occlusion after coronary artery bypass

To the Editor:

We were interested to read the article by Havel and colleagues (J THORAC CARDIOVASC SURG 1994;107:807-10), which concluded that aprotinin significantly reduced postoperative bleeding without influencing early vein graft patency in a series of 45 patients undergoing coronary artery bypass. The number of patients in this study is inadequate, however, to make any conclusion regarding the effect aprotinin may have on the early patency of coronary vein grafts.

The most appropriate method of statistical analysis of data concerning vein graft patency has frequently been debated, but it seems clear that comparison of vein graft patency rates by distal anastomoses alone is inadequate. Many factors may influence early graft occlusion, and recent studies that have compared the patency and occlusion of distal anastomoses *within* patients have shown that these are dependent events.[1] It is therefore important when investigating the effect of a single variable on vein graft patency that a comparison be made of the *proportion* of patients with at least one occluded graft. This important point has been made previously, emphasizing the fact that individual grafts within a patient are unlikely to behave independently.[2] Taking this into account, we have calculated that assuming 25% of patients in the control group would have one occluded graft or more (from pooled data), 290 patients per treatment group would be required for a 50% reduction in the risk of occlusion to be detected, specifying an alpha error of 5% (two-sided) and a beta error of 10%. This is in keeping with the statistical estimates of some of the recently published trials regarding the effect of antiplatelet agents on vein graft occlusion.[3, 4]

Another article published recently addressing the issue of aprotinin and vein graft patency found no difference in patency rates between treatment and control groups (as assessed by ultrafast computed tomography) but concluded that despite randomizing 216 patients, the numbers were too small to make firm statistical conclusions.[5] The comparison of occlusion rates in 15 patients per treatment group as performed by Havel and associates is therefore inappropriate. Larger trials will have to be performed before we can be convinced of their conclusion.

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