REPLY

I wish to thank Dr. Drummond for his kind words and comments. A section in my initial draft was removed from the manuscript, as it soon became apparent that a discussion of brain damage associated with craniotomy as a result of the pathology, surgery and anaesthetic techniques would greatly increase the size of the review. Since reports of good studies on regional cerebral blood flow during deliberate hypotension were scarce, Pinaud et al's. data obtained during cerebral aneurysm surgery were used to show that the normal brain is tolerant of nitroprusside-induced hypotension.

The risks of brain damage from deliberate hypotensive anaesthesia are minimal if the patients are carefully selected, the arterial blood pressure monitored closely and controlled, and the hypotensive agents used properly. Although these principles may be applied to most surgical procedures, they were intended for use in general surgery in my review, and not to endorse the use of hypotensive anaesthesia during aneurysm clipping.

Dr. Drummond's update on the changing practices regarding deliberate hypotension for intracranial aneurysm surgery is most timely. Indeed, cerebral vasospasm is a major cause of neurological morbidity and mortality among patients with ruptured cerebral aneurysm. Cerebral perfusion may be further compromised by a reduction of perfusion pressure. Dramatic improvements in the coma scale are often seen when the perfusion pressure is raised by volume expansion guided by pulmonary pressures.

We are aware of the current concerns regarding the use of deliberate hypotension during aneurysm clipping. Until more clinical data are available, our neurosurgeons still prefer to use deliberate hypotension. However, the degree and duration of controlled hypotension are kept to a minimum. Usually, a mean systemic blood pressure of between 55 and 70 mmHg is adequate. Only rarely is a lower pressure used for a few minutes at the time of clip application on large aneurysms.

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Critical incident report: total airway obstruction secondary to design of a tracheostomy set

To the Editor:

We wish to report an incident involving the use of a Rüsch tracheostomy set. The patient, a 61-yr-old woman requiring prolonged ventilatory support after cardiac surgery, had an elective tracheostomy performed in the operating room with insertion of a Rüsch Ultra Tracheoflex® no 7 tracheostomy cannula. Uneventful mechanical ventilation was resumed in the intensive care unit. Shortly thereafter, the patient was turned to her side and immedi-

FIGURE 1 View of the tracheostomy cannula in normal position in a human adult cadaver specimen of the larynx and trachea. Part of the tracheal rings have been cut away to enable the cannula to be visualized. The oesophagus is to the right, in contact with the soft posterior wall of the trachea.

ately became tachypnoeic. Within minutes, she was cyanosed and ventilation via the tracheostomy cannula was impossible. The cannula was withdrawn completely, the trachea intubated via the oral route and normal ventilation resumed while waiting for surgical reinsertion of another tracheostomy cannula. The patient remained haemodynamically stable throughout the incident and suffered no apparent sequelae.

The Rüsch cannula is composed of two separate parts: (1) a cannula and (2) an adjustable flange to secure the cannula in the neck. The cannula is fixed in position by tightly screwing the metal locking ring (arrow, Figure 1) on the restraining collar of the adjustable flange.

It became rapidly apparent that displacement of the tracheostomy cannula was the cause of the patient's airway obstruction. Turning the patient to her side led to

FIGURE 2 Traction on the connector leads to displacement of the cannula within the flange with subsequent tracheal obstruction and inability to ventilate.

accidental traction on the cannula firmly connected to the breathing tubes of the respirator by the built-in connector. We believe that outward displacement of the cannula (1) led to tracheal obstruction, the cannula being perpendicular to the trachea, and (2) rendered ventilation impossible, the distal orifice of the cannula lying against the posterior tracheal wall (Figure 2). Initially it was thought that the locking ring had been insufficiently tightened, but manipulation of the tracheostomy set after the incident disclosed that while maximal tightening of the screw ring made slipping of the cannula more difficult, it could still be moved within the flange quite easily.

While the Rüsch Ultra Tracheoflex® set presents some interesting characteristics such as a built-in connector and a construction designed to minimize tracheal trauma, we believe the design of the restraining collar should be improved. Fenestration of the cannula may help prevent total respiratory obstruction.

We wish to thank Dr. Tack Ki Leung, Department of Pathology, for his collaboration with the illustrations.

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REPLY (1)

Thank you for the opportunity to reply to the letter from Doctors Hardy, Taillefer and Hébert re their experience with the Rüsch Ultra Tracheoflex®.

Normally it is very difficult to move the adjustable flange on the screw ring once it has been firmly tightened. However, it is possible to do so if the circumference of the cannula is reduced by applying traction to the cannula and stretching it. The softness of the PVC used plus the reinforcing wire in the wall of the tube will permit a small amount of stretching. By applying opposing forces, traction at the machine end (respirator breathing tubes) and pulling on the patient end (the adjustable flange), it is possible to slide the screw ring towards the patient over the reduced circumference of the tube. Continued traction on the collar could allow the cuff to be rotated... "perpendicular rather than parallel to the axis of the trachea."

With a fixed collar model tracheostomy tube it is probable that these forces would have caused either a disconnect or extubation. It is unfortunate that the very features which benefit the patient, the adjustable flange and soft, flexible cannula, might have been involved in a tragedy. However, it is recognized that the application of abnormal forces to connecting parts can produce abnormal results. That a life-threatening situation was the result in this instance is indeed regrettable and we can all be thankful that the patient experienced an uneventful recovery.

In light of their reported experience we have withdrawn the Ultra Tracheoflex® from the market.

H. Greenberg
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REPLY (2)

The clinical incident reported by Hardy, Taillefer and Hébert on the Rüsch Ultra Tracheoflex® Tracheostomy tube was brought to the attention of the Health Protection Branch, Health and Welfare Canada.

As part of our regulatory assessment, we conducted laboratory simulations of the extubation process to determine the force levels causing the flange to slip on the cannula. An Instron Mechanical Tester pulled on the tracheostomy connector (10