to clinicians. In addition, the authors list and discuss five recommendations for clinical practice and manufacture that are suggested by their findings. It is with several of these suggestions that we disagree.

First, the authors propose the use of left-sided tubes whenever possible, and state that "the only time a right-sided tube should be used is when there is a lesion involving the left mainstem bronchus..." During the past 7 years, we have cared for approximately 400 patients using a right-sided double-lumen tube, with an almost complete absence of significant mechanical complications. The decision to use either a right- or left-sided tube must give consideration to the anatomy of each patient and to the mechanical problems that may arise secondary to surgical manipulation. We have encountered situations in which placement of a right-sided tube was mandatory because of the distortion of carinal anatomy by the patient's pulmonary pathology. Use of a left-sided tube would have been contraindicated.

Second, they recommend confirmation of position with the aid of a fiberoptic bronchoscope, citing a report which claims that, when tubes are inserted blindly, "48% may be expected to be malpositioned in some way." The percentage of mechanically significant tube malposition in our hands is much less, and only rarely occurs during initial placement of the tube or during repositioning of the patient into the lateral decubitus position. We seldom encounter problems with ventilation and oxygenation of the patient at these times.

Third, they suggest the use of larger, rather than smaller, sized right- and left-sided tubes, to take advantage of lower flow resistance, since the margin of safety in positioning does not decrease with increasing endobronchial tube diameter. We agree, in general, but the authors ignore the problems that may arise from obstruction to ventilation through the tracheal lumen of a tube that is pushed up against the tracheal wall during the course of surgical manipulation. We observe this to occur more frequently with a larger, as opposed to a smaller, diameter tube.

Fourth, because of the likelihood of the tube being moved during turning of the patient into the lateral decubitus position, the authors highly recommend that tube position be rechecked with the fiberoptic bronchoscope. However, the tube is just as likely to move every time the surgeon manipulates the hilum or carina, or causes other anatomical distortion. These events occur several times during each case. In difficult operations, the tube is likely to be temporarily malpositioned every minute or more during surgical dissection, which renders fiberoptic bronchoscopy impractical. By not mentioning this, the authors suggest that problems with double-lumen tubes are most likely to occur during the beginning of anesthesia, and that using fiberoptic bronchoscopy at this time insures proper placement of the tube as surgery progresses. We strongly disagree.

The use of a fiberoptic bronchoscope is not a substitute for good clinical care, but, rather, is an adjunct that can be used to improve care when required. Therefore, we do not think it appropriate to suggest that use of a fiberoptic bronchoscope is a mandatory standard of care when using any double-lumen tube in what remains a litigious medico-legal environment.

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REFERENCES


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In Reply:—Drs. Burk, Grum, and Porembka raise a number of good points with regard to the management of double-lumen tubes. I fully agree with Dr. Burk that the anesthesiologist should always visualize the nondependent lung; I further recommend that this be done irrespective of which bronchus has been cannulated.

Frequent observation of the operative field is extremely important in thoracic surgery. I also agree with Drs. Grum and Porembka that there are situations when a left-sided double-lumen tube is contraindicated and a right-sided double-lumen tube is indicated (see below). The quote of our writing in their letter completely en-
compasses that concept. I also agree with Drs. Grum and Porembka that a double-lumen tube may move when the surgeon manipulates the hilum or carina. In my experience, decannulation of the bronchus is the most common movement. If the fiberoptic bronchoscope is still in the operating room, then it takes a moment to confirm that the blue endobronchial balloon is above the carina. If the fiberoptic bronchoscope is not in the operating room, we can use clinical signs to determine direction of movement. I never intended to imply an illogical recommendation that initial confirmation of double-lumen tube position with a fiberoptic bronchoscope somehow protects against future migration of the tube.

For several reasons, I disagree with Dr. Burk's recommendation that the bronchial lumen of a double-lumen tube should always be placed in the bronchus of the lung being operated upon, apparently without the aid of a fiberoptic bronchoscope, and apparently without much initial concern about bypassing an upper lobe bronchial orifice. First, some pulmonary lesions contraindicate placing the bronchial lumen in the bronchus of the lung being operated on. For example, exophytic mainstem bronchial lesions that can be torn off or made to bleed and severely stenotic mainstem bronchi are absolute contraindications. Furthermore, left lower lobe lesions that push the left mainstem bronchus up, or left upper lobe lesions that pull the mainstem bronchus up (so that the angle between the left mainstem bronchus and the trachea approaches 90°, preventing the bronchial lumen from entering the left mainstem bronchus), are relative contraindications. Second, it is dangerous to bypass the upper lobe bronchial orifice. The outer diameter of the bronchial lumen of all adult double-lumen tubes either equals or exceeds the internal diameter of the bronchus distal to the upper lobe. Thus, the risk of the bevel tunneling under the mucosa causing tracheobronchial disruption is increased with tube insertions distal to an upper lobe. Third, oxygenation prior to induction of anesthesia will only prevent shunting in a nonventilated lobe for several minutes. In addition, if the upper lobe is bypassed, the middle lobe may also be blocked. In patients who have a significant preexisting shunt (i.e., QL/QT > 15–20%), the addition of another QL/QT of 20–35% may be poorly tolerated. Fourth, when the bronchial lumen bypasses the left upper lobe, the tracheal lumen may enter the left mainstem bronchus. The average left mainstem bronchial length is 55 mm. The average length between the right and left lumen tips is 70 mm. Thus, when the left lumen tip bypasses the left upper lobe, there is less than a 15-mm margin of safety before the right lumen enters the left mainstem bronchus. Ventilation of the dependent lung should always be "visualized" by knowing dependent lung tidal volume, peak inspiratory pressure, end-tidal CO₂, Pao₂, and observing mediastinal movement with respiration.

Dr. Grum and Porembka contend that they do not think that a significant percentage of their double-lumen tubes are malpositioned, and that obstruction of a tracheal lumen by the tracheal wall occurs more often with large, rather than small, double-lumen tubes. With respect to the latter contention, I assume they think the tracheal lumen of a small double-lumen tube is more protected by the increased distance between the tracheal lumen and tracheal wall caused by the tracheal cuff. However, with respect to both contentions, I ask "how do you know?" Without looking, the thoughts are just speculation.

In conclusion, I believe that the use of a fiberoptic bronchoscope to aid in the positioning of a double-lumen tube removes all doubt as to where it is, renders double-lumen tube use a precise and accurate procedure, and after only minimal experience is clinically simple and quick. For left-sided double-lumen tubes (which I recommend using whenever possible because of their greater positioning margin of safety1), all one needs to do is pass the fiberoptic bronchoscope down the tracheal lumen; one should see a clear, straight-ahead view of the tracheal carina, the left lumen going off into the left mainstem bronchus, and the depth of insertion adjusted so that the proximal surface of the blue endobronchial cuff can be visualized just below the tracheal carina. If the proximal surface of the blue endobronchial cuff is just below the tracheal carina, one can be virtually guaranteed that the left upper lobe will be unobstructed. The fact that positioning a double-lumen tube can be a precise and accurate procedure and that the position can be reconfirmed at any time during the case should encourage the routine use of double-lumen tubes, rather than discourage their use.

I thank Drs. Burk, Grum, and Porembka for their comments. This dialogue is important and I am happy to participate in it.

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