



FIG. 2. Lateral view showing retroperitoneal spread of Hypaque® solution.

Antero-posterior and lateral views are taken to confirm the needle position (fig. 1). Two ml of Hypaque® 50% is diluted with 2 ml lidocaine 1%. The solution is divided equally and injected through each needle. Any spread of contrast medium is noted (fig. 2) prior to injection of the final neurolytic solution.

This method is especially useful for record keeping, presentations, lectures, and conferences.

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## Problems Associated with Endotracheal Tubes with Monitoring Lumens in Pediatric Patients

*To the Editor:*—In our institution, we have encountered several potential problems using uncuffed endotracheal tubes (ET) with a monitoring lumen (Malinckrodt, Glens Falls, NY) in neonates and pediatric patients. The monitoring lumen is a separate tube within the ET tube with a port located at the distal tip of the ET tube to sample end-tidal concentrations of gas. This may provide a greater correlation of end-tidal  $\text{CO}_2$  and  $\text{P}_{\text{CO}_2}$  values in patients weighing less than 8.0 kg, de-

pending upon the type of breathing circuit and ventilator utilized.<sup>1</sup>

There are several points that must be taken into account when using this type of endotracheal tube. First, the outside diameter (OD) is larger than the corresponding sized endotracheal tube without the monitoring lumen (table 1). This may affect the tube size used, especially in patients less than 1 yr of age. Also, a larger than expected OD can result in a "tight fit" in the region of the cricoid cartilage with development of ischemia with complications of post-intubation croup and subglottic stenosis.<sup>2</sup> Second, the port of the monitoring lumen can be easily obstructed with mucus, blood, etc., resulting in the loss of end-tidal gas monitoring. Third, ET tubes with monitoring lumens do not have a Murphy eye, and this may increase the risk of complete ET tube obstruction. Finally, proper stabilization of the monitoring lumen and sampling tube is necessary to minimize tension on the tube and avoid either kinking the ET tube or accidentally extubating the patient.

TABLE 1. Outside Diameters (OD) of Endotracheal Tubes With and Without Monitoring Lumens

Inside Diameter Size (mm)	OD Without (mm)	OD With (mm)
2.5	3.6	3.9
3.0	4.3	4.5
3.5	4.9	5.2
4.0	5.6	6.0
4.5	6.2	6.6
5.0	6.9	7.4
5.5	7.5	8.1

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In summary, endotracheal tubes with monitoring lumens are useful, but they are not without hazards. It is important for the anesthesiologist to be aware of these potential problems, along with selecting the appropriate size ET tube to ensure an adequate leak pressure around the tube.<sup>3</sup> The monitoring lumen should be properly stabilized to avoid tension on the ET tube and be completely untethered during patient positioning.

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*In Reply:*—Since the four points listed by Dr. Miller may also represent questions in the minds of others, we would like to provide some additional information:

1. *Outside Diameter.* The American National Standard for tracheal tubes (Z79.14-1983)\* requires that the OD (outside diameter) be marked on pediatric tubes so that clinicians have the information needed in selecting the size tube to be used, and we agree with Dr. Miller that this dimension must be considered carefully. The package insert for this product includes the precaution that "Expert clinical judgement should be exercised in the selection of the appropriate size tracheal tube for each individual patient."

2. *Obstruction of Monitoring Lumen.* The package insert also cautions that "To insure continued patency of the monitoring lumen, a purge of air/oxygen should be applied as required to clear any accumulation of mucus or moisture," and, for this reason, the monitoring system is supplied with an attached three-way stopcock to facilitate the purging.

3. *Absence of Murphy Eye.* When Murphy<sup>1</sup> defined the ideal tracheal tube, he included a lateral eye to provide an alternative pathway in the event of obstruction by mucus. Later, others thought that the Murphy eye had been incorporated to provide aeration in the event of a right main bronchus intubation, and, therefore, inferred that the eye should be on the left side rather than the right side of the tube, contrary to the current practice of all U. S. manufacturers. However, as Fink has noted,<sup>2</sup> this latter role is rarely called into play.

\* American National Standard for anesthetic equipment—Tracheal tubes. ANSI Z79.14-1983, section 3.3:10

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The general issue of tracheal tube obstruction in children has been studied by Redding *et al.*,<sup>3</sup> with the conclusion that "there was no correlation of obstruction with duration of intubation, the presence of a Murphy-eye side hole, or small tube size." Indeed, for patients less than 1 yr old, Gregory<sup>4</sup> has expressed the opinion that a side hole should not be present ". . . because secretions tend to accumulate there and obstruct the tube." Since current medical opinion is divided on the merits of the Murphy eye, we are considering the possibility of offering both styles.

4. *Stabilization of Tracheal Tubes.* We certainly concur with Dr. Miller's final point on the need for stabilizing the tracheal tube and breathing circuit system, as is true for all tracheal tubes, to prevent unintended disconnects and extubations.

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