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Evaluation of Tracheal Tube Exchangers® for Replacement of Double-lumen Endobronchial Tubes

To the Editor:—Double-lumen endobronchial tubes (DLT) are rarely used for long-term ventilation because they are poorly tolerated, have small lumens, and are associated with a high risk of malposition. Because their use may result in edema of the supraglottic soft tissues, DLT replacement with single-lumen endotracheal tubes (ETT) after major thoracic surgery may be complicated by difficulty to reintubate the trachea or ventilate the lungs by face mask. This is a particular risk if the original intubation was difficult and the edema was severe because of fluid replacement or dependent head position.

Tracheal Tube Exchanger® (TTX) (Sheridan Catheter Corporation, Argyle, NY) is a hollow, semirigid catheter that has been used during extubation of the tracheas of patients in whom subsequent ventilation and/or reintubation may be difficult.[1] TTX was evaluated as an aid for replacement of a DLT with an ETT in a study of ten patients undergoing thoracotomy and in whom postoperative ventilation of the lungs was required. The study was approved by the Institutional Review Board, and patients gave informed consent. The appropriate sized TTX was marked at 38–39 cm because insertion of TTX into a DLT to a depth of 38–39 cm ensures that the catheter tip lies proximal to the carina when the DLT is optimally placed within the tracheobronchial tree (fig. 1). This is important for minimizing the laceration, which has been reported with the use of TTX.[2]

After induction of general anesthesia, the DLT was placed in the usual manner. At the conclusion of surgery, in preparation for DLT replacement, complete neuromuscular blockade was confirmed; patients' stomach and mouth were suctioned; and the lungs were ventilated with 100% oxygen. The well-lubricated TTX was then inserted into the tracheal lumen of the DLT down to the premarked depth of 38–39 cm; the DLT was withdrawn; and a well-lubricated ETT was advanced on the TTX into the trachea. The depth of the catheter was maintained in relation to the angle of the mouth during the tube replacement. The TTX was finally withdrawn, and proper ETT placement was verified.

TTX was found to be a useful tool that helped replacement of DLT with ETT. In most of the patients studied, the ETT slid blindly into the trachea over the TTX with only minor resistance at the level of the larynx, presumably due to impingement of the tip of the tube on the arytenoid cartilage or vocal cord.[3] This was easily overcome by rotating the tube counterclockwise. In one patient the ETT forced the TTX into the esophagus, and direct laryngoscopy was necessary to aid ETT placement in the trachea. Arterial hemoglobin oxygen saturation remained stable during the tube replacement period in all patients. If it were to start to decrease, jet ventilation through the lumen of TTX could be instituted.[4] This, however, could be hazardous in the presence of a newly formed bronchial stump.

The currently available TTX is designed for exchange of ETT. It is not, therefore, ideally suited for replacement of DLT. The catheter is available in three sizes: small, medium, and large, to be used for exchange of ETT size 4.0–6.0 ID, 6.0–8.5 ID, and 7.5–10.0 ID respectively.* However, only the small TTX can be introduced easily down the lumens of most DLTs, with the possible exception of size 41-Fr DLT, with which the medium TTX could be used. The small TTX measures only 78 cm in length, which makes it too short to insert down the bronchial side of DLT and difficult to control when inserted down the shorter tracheal side. In addition, the TTX is marked only to 30 cm on both ends, whereas the optimal depth of its insertion down the lumen of DLT is 38–39 cm. As a result, that depth must be measured and marked on the catheter before use.

There is a need, therefore, for a TTX specifically designed for DLT replacement. It should be at least 100 cm long to allow easy withdrawal of the DLT while maintaining stable position of the catheter in the trachea, whether it is inserted down the tracheal or down the bronchial sides. It should be marked to 50 cm to facilitate determination of the

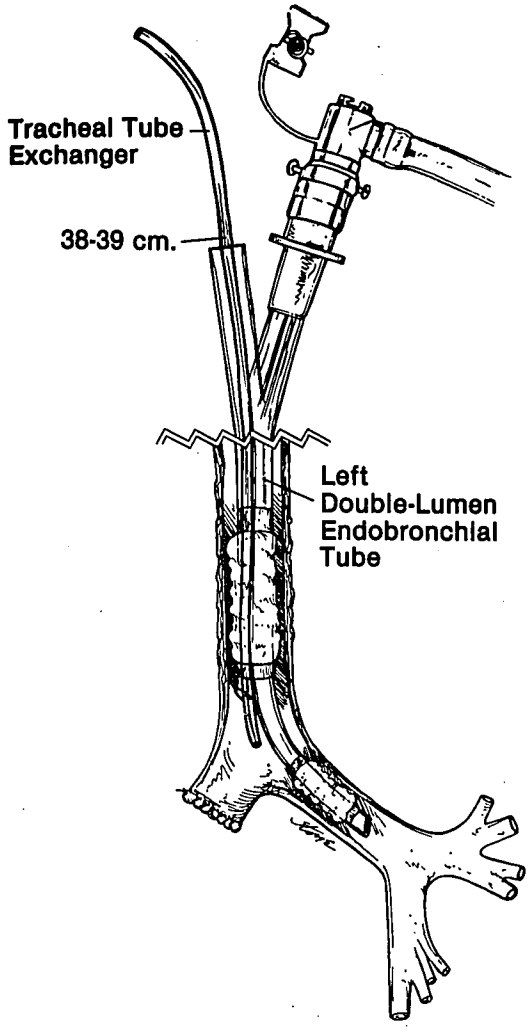

FIG. 1. When a Tracheal Tube Exchanger® is inserted to a depth of 38–39 cm down an optimally placed double-lumen endobronchial tube, its tip will lie proximal to the carina.

* TTX® promotional brochure. Sheridan Catheter Corporation, Route 40, Argyle, NY 12809.

optimal depth of its insertion into the DLT. The modified design needs only be produced in the small and medium sizes.

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Transesophageal Echocardiography in Pediatric Cardiac Surgery

To the Editor:—The recent fine paper by Muhiudeen *et al.*[1] and the accompanying editorial by Weintraub and Sahn[2] admirably outline the complexities as well as the strengths and weaknesses of intraoperative transesophageal *versus* epicardial echocardiography used during surgical repair of congenital heart disease. They rightly point out that transesophageal echocardiography provides accurate assessment of surgical repairs of complex congenital heart defects, with the caveat that assessment of right ventricular outflow tract anatomy and valvular regurgitation is unreliable with currently available pediatric transesophageal echocardiography.

The degree of expertise and technical complexity evident in this report, the multidisciplinary authorship of the paper, and its appearance in an anesthesiology journal all beg the question: is it reasonable to expect that anesthesiologists can realistically do intraoperative transesophageal echocardiography assessments of complex congenital heart disease repairs? Furthermore, who watches the patient during the sometimes prolonged intraoperative transesophageal echocardiography assessment during the period of instability after bypass following a flawed surgical repair?

Intraoperative transesophageal echocardiography assessments that prompt surgical revision of complex congenital repairs during cardiopulmonary bypass should be at least as expert as the original preoperative decision for surgical repair itself. Anything less is unacceptable because the risk of reinstitution of bypass and revision of a complex repair may be substantial, particularly when the original bypass and aortic cross-clamp times have been prolonged. In our own institution, the pediatric cardiac anesthesia staff, who are also board certified in pediatric radiology, do not feel qualified to make such judgments with the degree of expertise necessary to justify such risks; when such decisions are made, full-time echocardiographers are involved. Given that the American Heart Association recognizes 35 forms of congenital heart defects and that there are a number of variants of each form,[3] one must ask: is it reasonable for an anesthesiologist who does not have extensive formal training for and ongoing concentration in echocardiographic diagnosis of congenital heart defects to make such decisions?

While these questions may well be beyond the scope of the study,[1] such questions are important and arise because of the publication of such a paper. These questions were not addressed either by the authors[1] or by the writers of the accompanying editorial.[2] Although similar questions arise in the use of transesophageal echocardiography for assessment of valvular repairs and ventricular function during and after coronary artery bypass graft procedures, in the case of repair of congenital heart disease these issues are considerably more prominent and deserve comment.

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In Reply:—Hickey raises a number of important philosophical issues regarding the anesthesiologists' involvement in intraoperative transesophageal echocardiography. We affirm Hickey's contention that extensive formal training and ongoing involvement in echocardiography is necessary for independent evaluation of transesophageal echocardiograms in patients with congenital heart disease. From our study, we learned that with appropriate training, an anesthesiologist can properly evaluate the repair. The learning curve has required 12 months of training in adult and pediatric transesophageal echocardiography and 2 yr of required full-time experience in echocardiography