

postintubation croup. In their study, the diagnosis of postintubation croup was made in any child who developed hoarseness, stridor, and/or retractions postoperatively. It was not made clear whether any of these children had surgical procedures involving the upper airway, such as laryngoscopy, bronchoscopy, or laryngeal surgery. The authors did, however, note that the incidence of postoperative croup was not increased in patients undergoing operations of the head and neck. In addition, at the time of their report, endotracheal tubes were not subject to current standards and may have been cleaned and reused, and, therefore, more irritating to the airway.

In an attempt to further define the incidence and predictive factors contributing to postintubation croup in healthy children undergoing anesthesia, we undertook a prospective study between August 1990 and June 1991, collecting data on all children who fulfilled our definition of postintubation croup in the postanesthesia care unit. We defined postintubation croup as inspiratory stridor associated with retraction of accessory muscles of respiration of at least 30 min duration and severe enough to warrant therapy either with humidified oxygen under a mist tent and/or nebulized racemic epinephrine. We excluded from study any child with preexisting airway disease and any child undergoing procedures involving surgical instrumentation of the upper airway.

Over the 10-month study period, 5,589 patients had endotracheal tubes placed for administration of anesthesia. This represents 63% of all children anesthetized during that period. Of these patients, only 7 children fulfilled our criteria for postintubation croup, for an incidence of 0.1%. The ages of these children ranged from 7 months to 9 yr. Four of the 7 children had a prior history of croup either with a viral illness or after previous intubation. None of the children had croup severe enough to warrant treatment with nebulized racemic epinephrine, and no day-surgery patient with postintubation croup had to remain overnight for observation. Because of the extremely small percentage of children who developed postintubation croup, no attempt was made to predict causative factors by comparison with a control group.

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## Transparent Dressing Is Useful for the Secure Fixation of the Endotracheal Tube

*To the Editor:*—Accidental tracheal extubation during head and neck surgery in pediatric patients may result when the patient's head is repositioned or because the disinfectant used as part of the surgical preparation reduces the adhesive strength of the tape used to secure the endotracheal tube. We propose the use of sterile polyurethane transparent dressing. After securing the endotracheal tube with adhesive tape, we also apply transparent dressing (Tegaderm® 1626, 3M Medical Products Division, MN) on the skin (fig. 1). We have successfully used this technique without any complications to secure the reinforced silicone rubber endotracheal tube in more than 1,000 cases, including infants, of head, facial, dental, and neck surgery and neurosurgery. This technique possibly may be applied to even neonates. Finally, we believe that the cost for transparent dressing (\$1.79 per one piece of Tegaderm® in the United States) is a small price to pay for the added reassurance that extubation, which could result in life-threatening complications, will not occur during these surgical procedures.

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FIG. 1. Fixation of reinforced silicone endotracheal tube by the combination of adhesive tape and transparent dressing (Tegaderm®) in a young child undergoing otologic surgery.

At our institution the general practice is that all children initially have age-appropriate endotracheal tubes placed, calculated as  $(16 + \text{age})/4$  for children over 2 yr of age and at the discretion of the anesthesiologist for patients less than 2 yr of age. If this results in an air leak at or greater than 40 cm H<sub>2</sub>O, the tube is replaced with the next smallest size.

In summary, our prospective observation of more than 5,000 patients found the incidence of postintubation croup to be 0.1%, far less than previously reported. The present use of standardized nonreactive endotracheal tubes and the practice of assuring that an air leak is present around the endotracheal tube may be important factors in minimizing the occurrence of postintubation croup.

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## Does Systemic Anticoagulation Increase the Risk of Internal Jugular Vein Cannulation?

*To the Editor:*—The known complications of central vein catheter insertion include hemo-, pneumo-, and chylothorax, infection, heart block, dysrhythmias, pulmonary artery rupture, right atrial rupture with tamponade, brachial plexus trauma, and hematoma. The literature addressing the risks of internal jugular vein catheterization in patients anticoagulated with heparin is sparse and contradictory.<sup>1,\*</sup> The purpose of this study was to determine if, in our institution, patients who were anticoagulated preoperatively with heparin are at an increased risk of complications compared to our nonanticoagulated patients when internal jugular catheters are inserted.

From May 1988 to September 1990, 516 consecutive internal jugular cannulations by three anesthesiologists administering anesthesia for cardiac surgery at our institution were studied. The anticoagulated patients had a heparin infusion adjusted according to a protocol used by the cardiologists at our institution, attempting to keep the patient's partial thromboplastin time (PTT) at 1.5 times control. Those patients receiving heparin infusions preoperatively had their infusions discontinued on arrival to the operating room. The catheters were inserted within 15 min of discontinuing the infusions. Each patient's heparin in status and most recent PTT were recorded by the anesthesiologist inserting the catheter, as were any intraoperative complications such as dysrhythmia or carotid cannulation. A nurse clinician blinded to the patient's preoperative heparin status evaluated each patient on arrival to the cardiac care unit immediately after surgery for hematoma and followed each patient's clinical course, recording any other complications potentially related to internal jugular cannulation. This nurse clinician measured the size of any apparent hematoma and followed each patient through resolution of the hematoma.

Each catheter was inserted according to the individual anesthesiologist's preferred technique, which usually involved a 25-G finder needle followed by the placement of an 18-G angiocath, or cannulation with an 18-G needle. If an angiocath was used, it was transduced prior to wire insertion. No attempt was made to control insertion technique. If the anesthesiologist cannulated the carotid artery with either the 18-G angiocath or needle, pressure was held for 1–3 min at each individual's discretion. The data were evaluated using the Mantel-Haenszel odds ratio.

Of the 516 patients studied, 252 (49%) were anticoagulated prior to surgery. Of the 22 hematomas recorded, 13 were in anticoagulated patients, for a rate of 5.2%. The incidence of hematoma in nonanti-

coagulated patients was 9 in 264 (3.4%). The odds of developing a hematoma for a patient who was anticoagulated was 1.54 times greater than for a nonanticoagulated patient (odds ratio 1.54; 95% exact confidence limits: 0.60 < 1.54 < 4.16;  $P = 0.326$ ). No patient's hematoma required drainage or prolonged the time of tracheal intubation. There was a total of 22 arterial punctures—12 in anticoagulated patients and 10 in nonanticoagulated patients. Of the 22 patients in whom carotid puncture occurred, 7 developed hematomas and 15 did not. Of the 7 who developed hematomas, 4 were anticoagulated and 3 were not. Of the 15 patients in whom carotid puncture did not result in hematoma, 8 were anticoagulated and 7 were not.

Although no increased risk of hematoma or other complication was found with regard to preoperative coagulation status, caution should be used in making causal inferences regarding these results. Patient comorbidities (e.g., morbid obesity or previous carotid endarterectomy), PTT status prior to surgery, or other significant variables were not controlled for in this study. Further, whether a patient was anticoagulated or not was dependent on the patient's cardiologist. This could lead to selection bias in this sample.

This study was not blinded from the anesthesiologists' point of view as the coagulation status of each patient was known in advance. However one would think that the higher percentage of urgent/emergent procedures in the anticoagulated patients and the resultant hurried pace of catheter insertion would more than offset any possible increase in caution applied to anticoagulated patients. Furthermore, no attempt was made to randomize patients to one group or another.

In summary, I have found that the internal jugular vein catheterization in anticoagulated patients in our institution carries no increased risk of hematoma formation when performed by one of the anesthesiologists routinely performing cardiac anesthesia. Certainly, future study under more controlled conditions is needed to validate these results.

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