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Study: Overblown Cuffs Common During Surgery UK Analysis Finds Averages Well Above Recommended Limit

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Cuff pressures for endotracheal tubes may be too high during surgery, according to a new study by British investigators who are calling for routine monitoring of the devices in the operating room.

The study, by anesthesiologists at University College London, found that endotracheal tube (ETT) cuff pressures averaged 41 cm H₂O—16 cm H₂O greater than the recommended maximum level of 25 cm H₂O in the United Kingdom. Pressures that high could increase patients' risk for sore throat, hoarseness and difficulty swallowing, they said.

The researchers reported their findings at the 2009 annual meeting of the European Society of Anaesthesiology, in Milan, Italy (abstract 3AP1-1).

In the United Kingdom, cuff pressures of ETTs are measured routinely in the intensive care unit but not in the operating room. Led by Roman Cregg, MD, the investigators assessed end-expiratory cuff pressures in 119 surgery patients at three London-area hospitals to see if values varied from institution to institution. The researchers also looked at whether cuff pressures depended on other factors, such as the size and placement of the cuffs, how patients were positioned, the use of nitrous oxide and whether the procedure was laparoscopic.

Median pressures during surgery were higher than recommended at all three hospitals—ranging from 31 to 53 cm. No other variables were associated with increased cuff pressures, the researchers reported.

Many clinicians focus on the most severe, and quite rare, complications of overinflated cuffs: tracheal rupture, stenosis and necrosis. The new findings suggest that much of what has been considered the minor trauma caused by direct manipulation of the airway during intubation—the sore throats and dysphagia—may result from overinflation. "I'm certain that most [trauma] is attributable to hyperinflated cuffs," Dr. Cregg said.

The researchers hope their work prompts the incorporation of cuff pressure monitoring into standard practice in the United Kingdom, Dr. Cregg said.

Trial Finds Cuffed Tubes Safe in Young Children

In a second, unrelated study, Swiss researchers performed a prospective, randomized controlled trial comparing cuffed and uncuffed ETTs in children under the age of 5 years (abstract AP2-5). The 24-center trial, of nearly 2,250 patients, found that tube exchange was much less likely in children who received cuffed ETTs (Microcuff, Kimberly-Clark) than in those who received uncuffed ETTs (2% vs. 30%, respectively). The risk for developing postextubation stridor was similar for children in each group, 4.38% versus 4.69%, respectively, a statistically insignificant

difference, the researchers said.

Markus Weiss, MD, anesthesiologist-in-chief at University Children's Hospital in Zurich, who led the study, said the findings were not particularly surprising. However, said Dr. Weiss, who helped develop the Microcuff device, the magnitude of the difference in risk for tube exchange was greater than he had expected. "It was 15 times more common with uncuffed than cuffed tubes, and with the cuffed tubes all airways had almost 100% sealing."

Preventing unnecessary tube exchanges avoids complications from repeated laryngoscopies and saves time in the operating room and other clinical settings.

The results do raise an interesting question about the study. Tube exchange is a "major" risk factor for postextubation stridor, Dr. Weiss said. Given the much greater rate of exchange with uncuffed tubes in the trial, the researchers should have observed a higher incidence of stridor in those patients than they did. Why they didn't see this trend is not clear.

Dr. Weiss' study did touch on the issue of cuff pressure. The Microcuff has a valve that can be set to release pressure when it tops a ceiling, in this case 20 cm H₂O, a figure Dr. Weiss said is the upper end of safe. In most cases, he said, pressures kept at a constant level are too high—and clinicians have trouble noticing.

"Anesthetists and intensivists are not able to feel the cuff pressure [in the cuff pilot balloon]," he said. Indeed, one study by researchers in France found that nearly 40% of the time a physician estimated the tube pressure at 20 cm H₂O it was in fact higher, a finding that underscores the need for either a manometer to gauge pressure or a release valve, he said.

Outdated Texts

The use of cuffed tubes in young children has been a topic of some confusion among anesthesiologists since the late 1990s.

Lynne G. Maxwell, MD, associate director of general anesthesia at Children's Hospital of Philadelphia, said that most anesthesiology textbooks still call for uncuffed tubes in children younger than 8 years old, although clinicians have moved away from that dogma over the last decade or so.

The driver of change was a 1997 article in *Anesthesiology* (86:627-631) by researchers in Delaware who reported that, using a formula they had developed, cuffed tubes appeared to be appropriate in 99% of pediatric patients from birth through age 8.

Advantages of cuffed tubes, the authors said, included avoiding repeat laryngoscopy, lower flow of fresh gas and reducing the concentration of ambient anesthetics in the operating room. "We conclude that cuffed endotracheal tubes may be used routinely during controlled ventilation in full-term newborns and children during anesthesia," they wrote.

Some anesthesiologists have questioned whether the findings of the 1997 study apply to patients undergoing prolonged surgeries or extended time in the intensive care unit, Dr. Maxwell said. But in general, "practice has evolved in the United States to use cuffed tubes in younger children having anesthesia for surgery in the operating room," she said. "What disturbs me is that, even in newer textbooks, they continue to publish old rules on not using cuffed tubes in children. But the practice is evolving."

Suggested Reading

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