

Electrocautery- induced fire in the oropharynx

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Case report: A 7-year-old boy, 31 kg was admitted for adenotonsillectomy. The patient was induced with oxygen, N₂O and sevoflurane. An intravenous line was inserted and 75 mcg fentanyl, 40mg propofol were given. The trachea was intubated with a 5.5 uncuffed RAE tube, but a leak at 10 cm H₂O was noted so a 6 uncuffed RAE tube was placed. No leak was noted at that time.

When the surgeon inserted the mouth gag and extended the head of the patient, we noticed a major leak as we were delivering 3 liters of oxygen, and were unable to keep the bellows of the ventilator full. We elected at that time to allow spontaneous ventilation of the patient to minimize the leak. While we were switching to air / oxygen mixture, the surgeon started cauterizing the tonsils using an electrocautery (monopolar pencil, REF E 2515H, Valleylab, Boulder, CO) in the coag mode at 20 watts. We heard a pop and the surgeon noticed a flame at the tip of the cautery with some tonsillar tissues on fire. He immediately took the cautery out of the mouth of the patient. The tip of the cautery touched the lower lip of the patient resulting in a 2-3mm² area of first-degree burn. Once out of the mouth, the fire extinguished promptly. We switched to room air. The endotracheal tube (ETT) was intact but was replaced by a 5.5 cuffed tube, with the cuff of the tube inflated to the point where no leak was heard. The surgery continued uneventfully.

From this case, we recommend to pay special attention to the leak of oxygen during oropharyngeal surgeries. In our opinion, a cuffed endotracheal tube is preferable for the following reasons:

1- The 3 components necessary to create a fire are the ignition source, an oxidizer and fuel. We can control the leak of oxygen, an oxidizer, by inflating the cuff of the ETT. This serves as a barrier to prevent oxygen leaking out to be exposed to the sparks of the electrocautery. The other 2 components of the triangle (1) are uncontrollable, namely, the ignition source (electrocautery) and the fuel (tonsillar tissue).

2-Khine et al demonstrated the safety of using cuffed ETT in children from full term till 8 years old. The incidence of post-op croup was the same as in children intubated with uncuffed ETT. (2)

3-The ambient oxygen concentration at the vocal cords closely approximates the inspired endotracheal oxygen concentration in children with uncuffed tubes. (3)

4-In our case, the fuel source was tonsillar tissue, but several reports in the literature incriminate the ETT as a fuel source. The oxygen index of flammability of the ETT is 0.263; that suggests it is flammable in an environment of oxygen > 25% (4), and almost any air – oxygen combination will have an FiO₂>25%. So only room air should be used to avoid ETT fire. But most anesthesiologist prefer providing an FiO₂> 21% to children because of their high oxygen consumption and rapid desaturation. Moreover, restriction of oxygen supplementation intraoperatively will increase the risk of postoperative nausea and vomiting. (4)

5-In adenotonsillectomy surgeries where hyperextension of the head and insertion of the mouth gag are needed, a leak that was not present before these maneuvers might appear, at that time, when changing the tube to a bigger one would be impractical.

6-Even if we elect to use room air and an uncuffed tube allowing a minimal leak to be present, this leak might create bubbles of air and blood in the surgeon's field that is not desirable.

7- Because N₂O / O₂ combination may support combustion better than 100% O₂ alone (6), therefore, in the presence of leak N₂O should be avoided. Instead high volatile anesthetic concentration should be used but results in excessive operating room contamination.

References:

- 1-Barker, S. J. et al., (2001). *Anesth Analg* **93**(4): 960-5.
- 2-Khine, H. H. et al., (1997). *Anesthesiology* **86**(3): 627-31; discussion 27A.
- 3-Arnold, J. E. et al., (1992). *Arch Otolaryngol Head Neck Surg* **118**(7): 722-4.
- 4-Lim, H. J. et al., (1997). *Anaesth Intensive Care* **25**(2): 150-2.
- 5-Goll, V. et al., (2001). *Anesth Analg* **92**(1): 112-7.
- 6-Simpson, J. I. et al., (1986). *Anesthesiology* **65**(1): 76-7.

