**Introduction**

High energy surgical tools and light sources are a well recognized risk factor for fires on the operating field. Head and neck region seem to be at high risk for surgical fire, accounting for more than 70% of the external fires and more than 30% of the internal fires [1]. Surgical equipment used close to the endotracheal tube (ETT) may be associated with particular risks and the anesthesiologist must be aware of them (Fig.1) [2]. In this study we used an established physical model to study the fire risk for Ultracision Harmonic Scalpel Generator 300 with Harmonic Ace forceps (Ethicon Endo-Surgery ING) (UC) in a mechanical model of oropharyngeal and laryngeal surgery [3].

*Figure 1: Burned tubus during CO\textsubscript{2} laryngeal surgery*

**Methods**

The tests were carried out in a standard OR. The high-energy ultrasonic dissection system used was UltraCision (Ethicon Endosurgery, Cincinnati, Ohio, USA), which consists of a high-frequency vibration generator (300 series) and a hand piece with cable (Harmonic Ace Shears) at power level 5. The comparator was electrocautery Bovie unit (Valleylab Force 40, Valleylab, Inc. CO), which was operated in monopolar mode with power setting of 20 Watts.

**In the direct test** the PVC-ETTs 3.0 (Beromed GmbH Hospital Products, Berlin, Germany) were connected to a standard anesthesia delivery device and flown with 100% oxygen at 10 L/min. Initially the inflated cuff of the tube was grasped and sectioned with the Harmonic. No signs of ignition were observed. Then the tip of the tube was grasped 2-3 mm back from the distal opening. The device was activated and the ETT was cut through. The device was held into contact with the tube for 2 more minutes.

**In the physical model** the Roy&Smith model for oropharyngeal fire was adopted, which uses an degutted, whole raw chicken with incomplete occlusion of the cranial end, allowing for the insertion of a standard 6.0 PVC-ETT [3]. The cavity of the chicken was preoxygenated for several seconds by flowing oxygen through the ETT. Next tissue section was performed with the Harmonic near the tip of the ETT. Then the ETT was directly attacked with the surgical tool – first the cuff, and then the body of the tube.

**Verification of the physical model:** After negative testing with the Ultracision Harmonic, the chicken was grounded to the electrosurgical device. A new ETT was used. Again 100% oxygen was piped through it with a standard anesthesia delivery device and the electrosurgical device was activated in the preoxygenated cavity of the chicken at tissues close to the tip of the ETT.

**Results**

**In the direct test** no ignition or sustained fire could be produced at any location of the ETT. Only a touch of the activated tool was enough to damage the cuff of the ETT. While cutting the body of the ETT with the Harmonic Ace some visible aerosols developed (Video 1).

**In the physical model** no ignition or sustained fire could be produced neither on the chicken tissue in proximity with the outlet of the ETT, nor at any location of the ETT (Video 1.)

**Verification of the physical model:** A fire was ignited when tissue electrocautery was performed few millimeters from the opening of the ETT. The time to ignition was either 9 or 12 seconds (Video 2).

**Conclusion**

 Harmonic scalpel appears to be a safer tool than electrosurgical devices in the setting of open cavity surgery in oxygen-enriched environments with respect to the presence of flammable medical PVC devices as ETT or catheters.