

# Anesthesia For Laryngeal Laser Surgery In Developing Countries-Hope Against Odds

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## Abstract

The most morbid complication of laryngeal laser surgery is airway fire. We report a case of fire during such a surgery. A flexo-metallic tube wrapped with aluminum foil and saline soaked cotton pledgets were used. The role of pulse energy and  $\text{FiO}_2$  used are important deciding factors. Though optimal conditions and anesthetic equipment may not be available in developing countries like ours; care should be taken to avoid fire. In the event of fire the management of the same should be known.

## INTRODUCTION

The hazards of fire during laryngeal laser surgery are well documented in literature. Various methods have been suggested for protecting the endotracheal tube and larynx. These include wrapping aluminum tape around the tube, placing neurosurgical cottonoids around the endotracheal tube cuff, placing saline within the cuff using a metal or xomed endotracheal tube and providing ventilation with venturi (jet) method. This case report reviews the safety measures that can be used while conducting these cases in spite of compromised resource in developing countries like ours.

## CASE REPORT

A 22 year old male was posted for laser cordectomy for treatment of squamous cell carcinoma under general anesthesia. Patient had no other illness and all investigations were normal. The patient was adequately premedicated with antisialogogue, Inj.Midazolom IV, Inj.Pentazocine 15 mg. IV. General anesthesia was induced using Inj.Propofol IV & Inj. Succinylcholine was given to aid intubation. Airway was secured using No.26 armoured cuffed tube wrapped with aluminum foil till upper margin of cuff. Cuff was inflated with saline. Anesthesia was maintained using Nitrous oxide (60%) + Oxygen (40%), Propofol infusion, intermittent Atracurium. Intraoperative monitoring was aided by cardio scope and pulse oxymeter. Saline soaked cottonoid pled gets were used around the tube

A  $\text{CO}_2$  contact probe laser was being used at energy level of 20W per 0.6 sec. Intraoperative an airway fire occurred. The

circuit was disconnected from the endotracheal tube to immediately halt the fresh gas flow. The fire was extinguished in seconds using 100 cc of saline. The lungs were ventilated with air using Lardeal bag. As it was almost end of resection the surgery was continued following which a laryngoscopy was performed to visualize the damaged area. A small area of inflammation was seen around the epiglottis and cord. After reversal of neuromuscular blockade, and conforming the reflexes. The endotracheal tube was removed. The tip of endotracheal tube was badly charred (photo 1).

## Figure 1

Photo 1: Flexo-metallic tube with charred end



There was no sign of airway obstruction, steroid was started prophylactically for a week, which was then tapered and stopped. Serial X-ray chest and ABG done in the postoperative period were normal. The patient was

discharged on the 7<sup>th</sup> day. The patient was asymptomatic on first follow-up but he did not follow up later.

### DISCUSSION

The most morbid complication of laryngeal laser is an endotracheal tube fire. Extensive study has been done in this respect. Fontenot R in his work has concluded that saline soaked cottonoid pledgets are effective in preventing laser damage to endotracheal tube cuffs. Filling the cuff with saline provides additional protection in form of heat sink. The time for ignition of endotracheal tube depends upon the laser power, time of exposure and FiO<sub>2</sub> in usage. The performing characteristics of various tubes were also studied in this case. Red tuber, X- med laser shield and siliastic tubes were all resistant to perforation at normal operating power setting unlike the PVC tube. But as O<sub>2</sub> concentration increases, the risk of a major fire increases catastrophically. Regardless of type of endotracheal tube selected, careful attention to detect and an awareness of the hazards of laser surgery will help to minimize the risk of fire<sup>2</sup>. The use of aluminum metal tape provides extra protection of tube. In our case a flexo-metallic tube, wrapped with aluminum foil falling in short of cuff was filled with saline. Intraoperative saline soaked cottonoid pledgets were used.

Another prime concern is the type of fresh gas flow we are providing. In country like ours, most of the operation theater is equipped with Boyle Mark III S machine. We do not have facility to deliver air in these machines. As result, only increasing the concentration of nitrous oxide can reduce the FiO<sub>2</sub>. However Nitrous Oxide can be combustible too. It is said that the lowest acceptable O<sub>2</sub> concentration possible should be used<sup>2</sup>. The risk of laser surgery may outweigh the benefits if a FiO<sub>2</sub> of greater than 50 % is used<sup>1</sup>. Accordingly to the Helium protocol, FiO<sub>2</sub> is kept below 30% by using Helinox (Helium+Oxygen).<sup>3</sup>

The role of pulse energy in laser burns need a special emphasis, heat generated by laser beam should be allowed to dissipate with adequate time spacing between repeated

pulses. If possible, pulse energy should be less than 40 W for a non-contact tip and less than 20 W for a contact tip<sup>1</sup>.

If a fire would occur, the immediate intervention is removal of all combustible material including endotracheal tube, suction catheter<sup>1</sup>. In our case the fire was extinguished in seconds by saline poured into the oral cavity, the tube was not pulled out due to fear of aspiration of oral cavity. A check laryngoscopy performed at the end revealed inflammation of epiglottis and cord. Trachea was extubated after reversal of neuromuscular blockade. No signs of obstruction were noticed. Immediate obstruction of airway is possible because of epiglottic and glottic edema or mucous plugs. The decision to employ a tracheostomy for management of airway complication need to be individualized based on patient's clinical course<sup>1</sup>.

Our patient was started on postoperative antibiotic and steroid cover. Postoperative serial ABG analysis and X-ray chest were normal. A chest roentgenogram should be obtained to rule out the possibility of pneumothorax or pneumomediastinum<sup>1</sup>.

Long-term follow-up of our case is not available but long-term care is required because endotracheal granulation tissue can produce airway compromise.<sup>1</sup>

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