

# Anaesthetic Management of a Child with Laryngeal Papillomas

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## Abstract

The excision of laryngeal papillomas poses a great challenge for both the anesthesiologist and the surgeon. Laser surgery offers several advantages to the surgeon and patient; i.e. microscopic precision, a bloodless operative field & complete sterility. Close co-operation and communication between anesthesiologist and surgeon is of paramount importance in managing laryngeal papillomas. We report a 4 year old child with vocal cord papillomas who underwent successful excision by using carbon dioxide (CO<sub>2</sub>) laser under general anaesthesia.

**Keywords:** Vocal cord papillomas; CO<sub>2</sub> laser; General anaesthesia; Anaesthesia technique

## Introduction

Laryngeal papillomatosis (LP) is a relatively rare disease but is still the most common pediatric neoplasm found in the larynx [1]. The etiology of the disease is the human papilloma virus (HPV). The most common types of the virus that have been identified are HPV types 6 and 11 [2,3]. Other less common presenting types include types 16 and 18; these have been associated more closely with malignant transformation [4,5]. Laryngeal Papillomas typically presents as hoarseness, although more advanced cases manifest with stridor and respiratory distress. The disease most commonly occurs on the true vocal folds. Treatment has focused on removal of obstructing lesions, with additional ablation of the root of the papilloma in hope of preventing regrowth. Since the popularization of the carbon dioxide (CO<sub>2</sub>) laser for laryngeal surgery in the 1970s, repeated laser ablation has been the mainstay of therapy; some pediatric patients have undergone suspension microlaryngoscopy with laser treatment monthly or even more frequently. The excision of laryngeal papillomas poses a great challenge for both the anesthesiologist and the surgeon. Airway narrowing and the great variability of the pathological lesions necessitate close communication between the surgeon and anesthesiologist to provide optimal operating conditions and ensure adequate ventilation and oxygenation. We hereby report a 4 year old child with vocal cord papillomas who underwent successful excision by using CO<sub>2</sub> laser under general anaesthesia.

## Case Report

A 4 year male child was referred to our institute with hoarseness of voice and difficulty in breathing. On clinical examination nasal flaring was present. Respiratory rate was 35/min. Noisy breathing was present. Chest retraction was present. On chest auscultation air entry was equal on bilateral side. No rales or rhonchi were present. Oxygen saturation was 84% on room air. High risk consent was obtained from the parents. Child was immediately shifted to operation theatre. On arrival in the operation theatre, all standard monitors (ECG/SpO<sub>2</sub>) and non-invasive blood pressure were placed. His heart rate was 140/min, Blood pressure was 100/64mmHg, and Saturation on 100% oxygen was 92%. Tracheostomy was kept ready. Child was premedicated with inj. glycopyrrolate 0.004mg/kg. On spontaneous ventilation using oxygen and sevoflurane, laryngoscopy was performed which revealed bilateral vocal cord papillomatous lesions. Child was intubated with Rush red rubber cuffed endotracheal tube (ETT) of size 3.5. After confirmation of endotracheal intubation by auscultation and capnography, inj.midazolam 0.03mg/kg, inj. fentanyl 2µg/kg, inj.hydrocortisone 2mg/kg and inj.atracurium 0.5mg/kg was given. Patient was maintained on oxygen, air, sevoflurane and inj. atracurium. After microlaryngoscopic fixation, confirmation of vocal cord papillomas was done by surgeon. Plan was decided to do excision of papillomas using CO<sub>2</sub> laser. Cuff was then inflated with saline. Eyes were padded with wet gauge pieces. Protective goggles were worn by all operating

room personnel. Surgeon first tried to excise the lesion by using CO<sub>2</sub> laser with ETT in place but ETT was occluding the view and thus making access to the papillomas difficult. So decision was taken to excise the papillomas by using apneic ventilation technique during laser surgery. 100% oxygen was given before removal of ETT and again ETT was inserted through microlaryngoscope when the child desaturated. After 3 to 4 repetitions of intermittent removal of the tube and insertion of the ETT during desaturation, papillomas were successfully removed. Bronchoscopic examination was done at the end to know whether any residual fragments of papillomas were present as there are chances of dislodgment of papillomas during endotracheal intubation. Neuromuscular blockage was reversed with inj. neostigmine and inj. atropine after the child attains good muscle power and tone. Child was extubated and shifted to post anesthesia care unit (PACU). With good nebulisation and postoperative intravenous steroid therapy child was maintaining saturation of 98% on ventimask. Child was shifted toward next day and discharged on 4<sup>th</sup> day of surgery (Figure 1 and 2).



## Discussion

Laryngeal papillomatosis (LP) is a rare medication condition, in which benign (non-cancerous) tumors or growths form in the airway and voice box (larynx). They grow rapidly and can obstruct or block the airway, causing breathing difficulties. Once removed, they can grow back, which may need repeated treatments. Laryngeal papillomatosis is also called Recurrent Respiratory Papillomatosis (RRP). LP is recognized as a disease of both children and adults. Lindeberg et al. classified LP into juvenile and adult forms [6]. The juvenile form is most often diagnosed between 3.3 and 4 years of age. Distribution among boys and girls is approximately equal. The adult form peaks in the third decade of life and has a male predilection [7,8].

The most important consideration for anesthesia during laryngeal papillomas is as follows; (1) Mask ventilation may get difficult so emergency tracheostomy should be ready. (2) Gentle tracheal intubation as papillomas are friable so chances of getting papillomas along with ETT into trachea (3) Maintain adequate ventilation, (4) Maintain adequate depth of anesthesia which relaxes the vocal cords. (5) Protection to the patients eyes as well as operating room personnel while using laser. (6) Prevention of cross contamination. Any factors that aggravate laryngeal obstruction should be avoided.

Before the 1970s and the implementation of the CO<sub>2</sub> laser, cold excision of papillomas to debulk disease was the mainstay of treatment. The development of the CO<sub>2</sub> laser in the 1970s was an important milestone for the treatment of RRP. Used with suspension microlaryngoscopy, the CO<sub>2</sub> laser permits precise ablation of lesions and excellent hemostasis. With a wavelength of 10,600 nm, the CO<sub>2</sub> laser converts light into thermal energy, and targets water in treated tissues, which results in tissue destruction by vaporization.

No single modality has been shown to be effective in eradication of LP. The current standard treatment is surgical therapy with the aim of providing optimum relief of symptoms while preserving essential anatomy and function. The CO<sub>2</sub> laser has been favoured over cold instruments in the treatment of LP because it vaporizes the lesions and causes minimal bleeding.

Using the appropriate technique, the damage to vocal folds is small and scarring is limited.

Regardless of the type of laser used, the major risk of this procedure is endotracheal tube ignition, which has been reported to occur in 0.5% to 2.0% of cases [9,10]. The endotracheal tube may be ignited by direct laser illumination, reflected laser ignition, or by ignited particles from the surgical site. Regardless of the cause, if the fire is unrecognized, it may burn through the endotracheal tube and ignite the gas flow, resulting in an airway fire.

An alternative means of limiting the risk of airway fire is to avoid the use of an endotracheal tube during laser use. Several options have been suggested for this technique. One method is to intermittently remove the endotracheal tube during laser use. For this procedure, the patient is anaesthetized with intravenous agents and ventilated with 100% oxygen. The endotracheal tube is removed for brief periods (60-90 seconds) while the patient's oxygen saturation is monitored by pulseoximetry. Laser surgery is performed during the periods of apnea. The tube is then replaced, the patient ventilated, and the procedure repeated as needed. In our patient apneic ventilation technique was used for laser excision of the papillomas.

Other risks during laser surgery relate to inadvertent reflection of the laser, with ocular damage to the patient or operating room personnel. With the carbon dioxide laser, the patient's eyes should be covered with wet gauze pieces, and protective goggles are mandatory for the operating room personnel. Other considerations in this case are cross contamination and environmental pollution from the laser smoke and plume emission. Suctioning under direct vision and post papilloma excision, bronchoscopic examination of airway for detection of blood clots and residual fragments would be useful.

## Conclusion

This case highlights several of the important anesthetic management issues, including the anesthetic management, the mode of ventilation during laser surgery, precautions during laser surgery for excision of papillomas and the infectious disease risk of the papillomavirus to the operating room personnel.

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