

Case Report

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Panendoscopy and Anaesthesia for Debulking of Juvenile Onset Recurrent Respiratory Papillomata (RRP) Using Target control Infusion (TCI) and Manujet 3 for High Pressure Source Ventillation (HPSV)

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Abstract

Laryngeal papilloma can cause respiratory difficulties and obstruction. Diagnosis of laryngeal papillomata is often delayed as other childhood illnesses are excluded. Anaesthesia involving TCI and jet ventilation using (HPSV) for the surgical debulking of laryngeal papillomata is a good technique in procedures involving a shared airway.

**Keywords:** Laryngeal Papillomata, Airway Obstruction, Debridement in shared Airway, Target Control Infusion (TCI), Manujet 3 for jet Ventilation, Apnoeic Oxygenation, Monitoring Post –Surgery, Quarterly Review

Introduction

We describe the anesthetic management, laser excision and micro-dissection of laryngeal papilloma that caused upper airway obstruction with (TCI) and Jet Ventilation (HPSV). Childhood papilloma (juvenile onset) of the airway may occur as a result of exposure to the human papillomavirus (HPV) at birth. The disease is associated with HPV Types 6 and 11; with being a firstborn child; a maternal age 20 or less and a history of genital warts. Children are infected with the virus which may occur during vaginal delivery from an infected mother. Other additional immunological risk factors may also play a role [1].

Diagnosed at a young age, the disease will require more frequent surgical procedures as is often aggressive. Papilloma presents as respiratory difficulties, stridor and voice changes. Delay in diagnosis is not uncommon as other childhood diseases including asthma, bronchiolitis, croup and foreign body aspiration are excluded. Diagnosis is made at direct laryngoscopy or fibre optic bronchoscopy.

Case Study 1

A (6) six-year-old child with known RRP was admitted for review of her airways, having being first diagnosed with papillomata at age five. Recent history was of voice change and shortness of breath on effort. This was her quarterly review. On examination she was comfortable at rest and vital signs were stable. Blood investigations (FBC and Electrolytes) were normal and surgery scheduled electively.

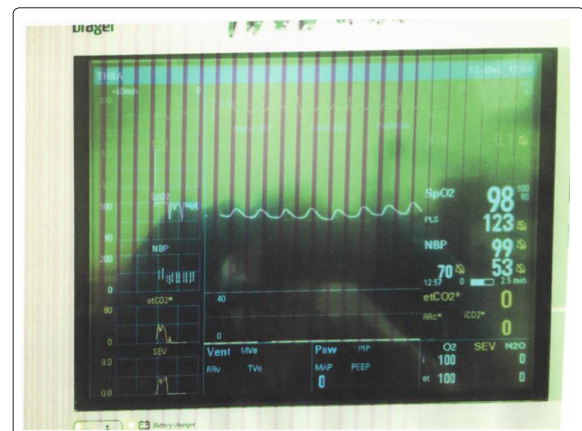
Anesthetic Management

Anaesthesia for debulking of airway papillomata is challenging. Issues relate to a shared airway, unimpeded surgical access, adequate

depth of anesthesia, maintaining ventilation with good oxygenation and overall cardiovascular stability. Upper airway obstruction may be severe, easily compromised with loss of airway control an ever present risk. Timely intervention is life saving.

Standard monitoring included non- invasive blood pressure (NIBP), electrocardiogram (ECG) and pulse oximetry (SaO<sub>2</sub>). End-tidal carbon dioxide (ETCO<sub>2</sub>) monitoring is not done with the open system in use. Blood gas measurement for arterial PH and PCO<sub>2</sub> become mandatory as hypercapnia and a respiratory acidosis can occur. Transcutaneous CO<sub>2</sub> measurement remains an option but is not used. Anaesthesia is induced with sevoflurane and 100 percent oxygen, followed by gentle manual assistance of respiration, observing for chest movements to ensure an uncompromised airway [2].

TCI of propofol (Kataria model) effector sight concentration (Ce) of 2-4 (ug/ml) started and titrated to maintain adequate depth and hemodynamic stability [3-5].



End-Tidal (CO<sub>2</sub>) not measured

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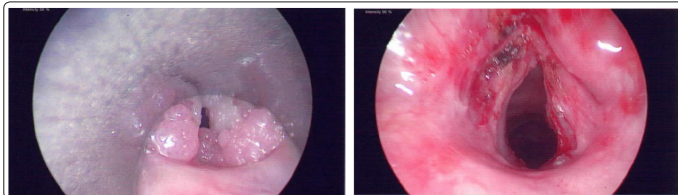
Muscle relaxant atarcurium (0.5mg/kg) and a short acting opiate alfentanil (10-20 u gm/kg) is given as to obtund the stress response at laryngoscopy. Ketamine (0.5mg/kg) is added, as the analgesic and sedation effects of a combination of agents have significant additive clinical benefits. Dexamethasone (0.1mg/kg) is used to reduce swelling of the surgical sight and intravenous paracetamol (15 mg/kg) given for pain relief.

The Manujet 3 is used for ventilation and connected to the side arm of the Surgeons laryngoscope. Jet ventilation is supraglottic and (HPSV) is given intermittently. Pressures vary from 0.5-2.5 Barr.

Lower pressures are used with infants and higher pressures for children. Care is taken that ventilation is temporarily halted when the laser is in use as to minimize fire hazards, but saturation is never allowed to drop below 90%. This is always clearly communicated to the surgeon.

Difficulties relate to measuring tidal volumes, CO<sub>2</sub> detection and monitoring airway pressure [2]. Relaxation is reversed at the end of the procedure, and a blood gas measurement is done to assess acid/ base balance.

### Case Study 1 RRP IN A SIX (6) Year Old



**Figure 1**  
Papillomata at start of procedure

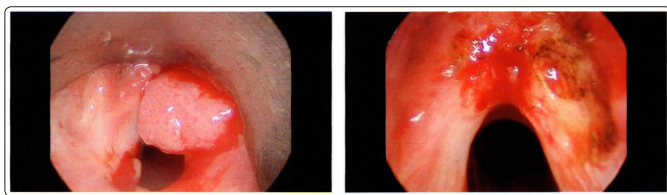
**Figure 2**  
Post-Surgical removal of apilloma

**Blood gas result: PH 7.2, PCO<sub>2</sub> 65, PO<sub>2</sub> 167, Saturation 98%, Base Excess -4.3. at end.**

Post-surgery patients are transferred to the ward or a high care unit if they appear vulnerable post operatively with 4-hourly nebulization of adrenalin and an inhaled steroid (Pulmicort) routinely prescribed to all patients. Monitoring is done over 24 hours. On discharge patients receive a short course of oral steroids (5 days) and maintenance therapy for gastric reflux if indicated.

### Case Study 2

Figures 3 and 4 are RRP of juvenile onset in an adult now 25 years. Patient was seen at a follow up clinic and presented with voice changes and stridor. Indirect laryngoscopy confirmed the presence of recurrent papilloma and surgery was scheduled for laser ablation of papilloma.



**Figure 3**  
Papilloma at start

**Figure 4**  
Post-Surgical removal of papillomata

Preoxygenation with a face mask was started for 3 minutes. A nasal canula at 10 L/m is simultaneously inserted. Apnoeic oxygenation is used as an adjunct to prolong the time to desaturation. The principle being that oxygen is taken up by alveolar without the lung being expanded and so safe apnoeic time can be extended up to 8 minutes without hypoxemia occurring [6].

TCI of propofol (Schneider model) and remifentanil (Minto model) begun, targeting effector site concentrations (Ce) starting at 4 ug/ml and 4ng/ml respectively using the Asena Mark III infusion system. A muscle relaxant mivacron (0.1mg/kg) and Ketamine (0.5mg/kg) given. Propofol is titrated so as to ensure hemodynamic stability. HPSV using manujet 3 was used for ventilation. Surgery was uneventful and the patient discharged the next day following overnight observation in the ward. 4 hourly adrenaline nebulization was prescribed as well as intravenous paracetamol for pain.

### Discussion

TCI of the hypnotic agent Propofol and an opiate Remifentanil are good choices for anesthesia in procedures that involve a shared airway as would TIVA Remifentanil in young children. Ketamine at a sub anesthetic dose (0.5 mg./Kg) prevents tolerance and hyperalgesia associated with Remifentanil. Propofol is a gamma Aminobutyric acid (GABA) agonist and has cardio-respiratory depressant effects. All known opiates cause bradycardia. Ketamine is a N-methyl-D-aspartic acid (NMDA) antagonist with cardio-respiratory stimulatory effects [7]. This is desirable in anesthesia for children and in addition a lesser dose of propofol may be required for cardiovascular stability.

A Propofol /Remifentanil (Schneider/Minto models) combination for infusions of 1-hour duration (2.5ug/ml;4.7ng/ml.) is associated with the fastest recovery from anaesthesia in adults [8].

HPSV with the necessary precautions is safe and gives an uninterrupted view of the surgical field so facilitating surgery. Clinical observation of chest movements during oxygenation and monitoring oxygen saturation is done to ensure a good outcome and safeguards to prevent adverse events and precautions must be observed. Complications would include pneumothorax, pneumo-mediastinum and surgical emphysema. Hypoxia, laryngo-spasm and other adverse events related to barotraumas also impact on morbidity and mortality [9].

HPSV involves a wide variation in clinical practice and best practice guidelines will ensure safe practice [9].

Apnoeic oxygenation is a good modality to utilize when there is a risk of early desaturation due to a difficult airway, in procedures involving the larynx and trachea and in patients who are obese. It is well described in adults [6]. In its simplest form it is having a nasal canula at 15 L/m following preoxygenation with a face mask in adults. Less well described in children it can be utilized to maintain high levels of oxygen saturation during airway management. In children undergoing general anesthesia providing 3 L/minute oxygen by nasal canula after pre-oxygenation contributes to increased patient safety [10].

Regular follow-up for RRP is needed and recurrences of papillomata will require repeat surgery. Education and the serious nature of airway management forms an integral part of the overall treatment strategy. RRP of the juvenile onset form typically regresses around

puberty; however malignant transformation though rare can occur with an incidence of 3% risk of dysplasia [1].

Medical adjuvant therapy to increase time between therapies with acyclovir and cidofovir and the monoclonal antibody bevacizumab and celecoxib are under evaluation and may be part of a wider protocol [11].

The benefits of the HPV vaccination must be recognized. It protects against cervical cancer and the HPV vaccine Gardasil also protects against HPV types 6 and 11 [9]. This combined with good sexual health education will impact on the prevalence of the disease. The resistance to vaccination in some environments remains challenging as a change in the birth and delivery practice of affected mothers with active genital warts. The delay in seeking sound medical advice in relation to airway disease is compounded by other logistical delays that include rudimentary medical services, transport problems and limited access to tertiary hospitals in Southern Africa. Parental education remains a key feature in maintaining a safe airway as the disease is recurring and can cause complete airway obstruction.

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