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Recommended Citation

Samad, K., Shamim, F., Awan, M. S., Hoda, M. Q. (2008). Anaesthetic management of tracheal reconstruction using Jet Ventilation. *Journal of Anaesthesiology Clinical Pharmacology*, 24(1), 79-82.

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Anaesthetic Management of Tracheal Reconstruction Using Jet Ventilation (JV)

Khalid Samad, Faisal Shamim, Muhammad Sohail Awan, Muhammad Qamarul Hoda

Approximately 90% of all cases of acquired chronic subglottic stenosis in children and adults result from endotracheal intubation or tracheostomy. In US, tracheal stenosis affects 4-13% of adults and occurs in 1-8% of neonates after prolonged intubation¹.

Airway management in a patient with tracheal stenosis undergoing tracheal resection and reconstruction poses a challenge to anaesthesiologist who has to ensure adequate ventilation and oxygenation and at the same time provides non obstructed field for surgeon. We are reporting our experience of anaesthetic management in patient having tracheal stenosis presenting for high tracheal resection followed by tracheotracheal reconstruction.

CASE REPORT

A 30 - year old female, previously healthy, sustained a road traffic accident one year back and required tracheal intubation and ventilatory assistance in a district hospital. After two weeks of mechanical ventilation, tracheostomy was done. An attempt to decannulate the tracheostomy tube after one month was failed due to excessive bleeding.

Following this, she was referred from the district hospital to our ENT department. On examination at indirect laryngoscopy, both vocal cords were normal and mobile. Fiberoptic bronchoscopy revealed complete tracheal stenosis below first tracheal ring. Computerized Axial Tomography was carried out and it showed that there was a diffuse thickening and narrowing of proximal trachea for about 4 cm which results in complete obstruction below the first tracheal ring up to tracheo-

stomy stoma. A tracheostomy defect was noted below the fourth tracheal ring and rest of the visualized trachea and bronchi were unremarkable. She was scheduled for tracheal reconstruction which includes resection of stenosed part and reconstruction by end to end anastomosis.

The presence of pre-operative lung disease and other comorbid conditions were ruled out during pre-operative anaesthetic evaluation by history, physical examination, hematological indices, baseline arterial blood gases and x-ray chest.

After application of routine monitors including three lead electrocardiography, pulse oximetry and non-invasive blood pressure measurement, preoxygenation was done with 100% O₂ at 8 Lmin⁻¹ via tracheostomy tube for five minutes. Anaesthetic induction consisted of Propofol 100 mg followed by neuromuscular blockade with atracurium 30 mg. The tracheostomy tube was replaced with a cuffed reinforced (7.0 mm I.D) endotracheal tube. Another reinforced (7.0 mm I.D) endotracheal tube was inserted under direct laryngoscopy through the vocal cords and was advanced in the trachea until resistance at the site of the stenosis was encountered (Fig 1). After induction of anaesthesia, an arterial line was placed for invasive blood pressure monitoring in left radial artery and urinary catheter was passed to monitor urine output.

The patient was ventilated with the lower endotracheal tube placed through tracheostomy stoma. Anaesthesia was maintained with isoflurane 1% in a mixture of O₂ and Air (50:50). Intraoperative analgesia was achieved with Pethidine 1 mgkg⁻¹. Following surgical



Figure 1

Two endotracheal tubes: one through tracheostomy stoma and other orotracheal by direct laryngoscopy.

exposure of the trachea, 4 cm of the stenosed tracheal part was resected. The reconstruction was accomplished in two parts: First posterior and lateral wall of trachea was repaired and then anterior wall.

For repair of posterior wall, the lower endotracheal tube was pulled out and a large bore suction catheter (size 10 Fr) inserted through tracheostomy stoma (Fig 2). The catheter was connected to Sander's injector (Instrumentation Industries Inc, Bethel Park, PA) and intermittent oxygen jets at a pressure of 50 psi and at a rate of 15 min⁻¹ with an inspiratory: expiratory time (I:E) ratio of 1:3 were used to ventilate the patient (Fig 3). Intermittent oxygen jet ventilation was continued throughout the repair of posterior and lateral wall of trachea



Figure 2

Large bore (size 10 Fr) suction catheter inserted through tracheostomy stoma



Figure 3

Sander's injector connected to suction catheter

which took 30 minutes. During jet ventilation, no significant alterations in the oxygen saturation were noted; saturation was maintained above 95% before, during and after the tracheal reconstruction using 100% FiO₂. A propofol infusion was maintained at 2 mgkg⁻¹ ohr⁻¹ during period of jet ventilation. After repair of the posterior and lateral wall, the jet ventilation was removed and the orally passed endotracheal tube was advanced in the reconstructed segment and anterior wall was repaired over this tube (Fig 4). The first reading of end tidal carbon dioxide (EtCO₂) after connection of ventilator to orally passed endotracheal tube was 35 mmHg.

Patient remained hemodynamically stable throughout the surgical repair which took three hours. At the end of surgery, anaesthesia was terminated and muscle



Figure 4

Orotracheally placed ETT advanced in the constructed trachea and anterior wall is repaired over this tube

relaxation was reversed by neostigmine 2.5mg and glycopyrrolate 0.5 mg. Following recovery of consciousness and resumption of adequate spontaneous breathing, patient was extubated and shifted to recovery room. Postoperatively the patient was kept in a position of head flexion by taking a mentum stitch to the sternum in order to reduce tension on the suture line.

Patient remained hemodynamically stable in the recovery room and O₂ saturations was maintained between 98-100 % on 5 Lmin⁻¹ of O₂. Postoperative analgesia was provided with Pethidine infusion (10 mg hr⁻¹) and intravenous Ketorolac 20 mg every 6 hours.

DISCUSSION

The indications for tracheal resections are patients who have a tracheal obstruction due to a prior tracheal trauma (stenosis), primary tracheal tumor, congenital anomalies and vascular lesions. Technical limitations to the performance of tracheal surgery can now be overcome by careful preoperative delineation of the site and degree of obstruction², close intraoperative communication amongst the anaesthesiologist and surgeon, improved anaesthetic management techniques and meticulous postoperative care. Current management of tracheal stenosis includes balloon dilatation, laser ablation, stent placement or surgical resection³.

The principle anaesthetic concerns for tracheal reconstruction are loss of airway control, oxygenation and ventilation whereas surgical concerns are unobstructed, immobile operative field and better exposure. Following anesthesia induction, airway control and ventilation can be achieved with various kinds of endotracheal tubes (ETT's) and jet ventilation catheters, a tracheostomy tube, rigid bronchoscope, or laryngeal mask airway (LMA)⁴ and during resection ventilation can be controlled in several ways including manual ventilation, jet ventilation⁵, high frequency jet ventilation⁶, distal tracheal intubation and ventilation, and cardiopulmonary bypass.⁷

Beyer and Wilson⁸ reported on various combinations of right thoracotomy, cervical incision and median sternotomy approach using the orotracheal tube technique. Boyan and Privitera⁹ preferred median sternotomy technique but used a cuffed endotracheal tube into distal tracheal stump. It is apparent that the conventional techniques of airway management for tracheal resec-

tion are fraught with hazards. Cardiopulmonary bypass⁷ is usually preferred in airway management approaches for tracheal resection techniques in neonates.

Intermittent oxygen jets technique have been used previously for ventilation of patients with tracheal stenosis undergoing tracheal reconstruction¹⁰, as well as in patients having tracheal or bronchial tumors¹¹. In our case, we used the technique of manual low frequency intermittent oxygen jet ventilation during the period of reconstruction. This was achieved by the suction catheter which was passed through tracheostomy stoma and was connected to Sander's injector. The advantages of this over previously used techniques are excellent surgical access, ability of continuous anastomosis inspection, prevention of intermittent positive pressure ventilation (IPPV) associated submucosal emphysema in the anastomosis vicinity, and maintenance of low peak airway pressure. Possible limitations of manual jet ventilation included high oxygen flow induced blood spraying across the surgical field, difficulty with endobronchial jet catheter stabilization, hypoventilation, carbon dioxide-re-entrainment-induced hypercapnia, barotrauma, and hyperinflation-associated postoperative pulmonary edema.⁴ There was no significant complication occurred in our case. During operation a slight head down tilt helped to minimize aspiration of blood and secretions.

The present report shows that, in patient with tracheal stenosis, intermittent oxygen jet ventilation at 50 psi via a Sander's injector adapted to the proximal end of the jet ventilation catheter not only provide adequate ventilation during general anesthesia, as well as a non-obstructed field for surgical repair and anastomosis.

REFERENCES

1. McCaffrey TV. Classification of laryngotracheal stenosis. *Laryngoscope* 1992; 102: 1335-40
2. Baraka AS, Siddik SS, Taha SK, Jalbout MI, Massouh FM. Low frequency jet ventilation for stent insertion in a patient with tracheal stenosis. *Can J Anaesth* 2001; 48: 701-4
3. Mentzelopoulos SD, Tzoufi MJ. Anesthesia for tracheal and endobronchial interventions. *Curr Opin Anaesthesiol.* 2002; 15: 85-94
4. Lee P, English ICW. Management of anaesthesia during tracheal resection. *Anaesthesia* 1974; 29: 305-306

5. Eriksson I, Nilsson LG, Nordstrom S. High frequency positive pressure ventilation during transthoracic resection of tracheal stenosis and during preoperative bronchoscopic examination. *Acta Anaesthesiol Scand* 1975; 19: 113-19
6. Benca JF, Hickey PR, Dornbusch JN, Koka BV, McGill TJ, Jonas R. Ventilatory management assisted by cardiopulmonary bypass for distal tracheal reconstruction in a neonate. *Anesthesiology* 1988; 68: 270-1
7. Beyer PY, Wilson RS. Anesthetic management of tracheal resection and reconstruction. *Journal Cardiol Anesth* 1988; 2: 821
8. Boyan CP, Privitera PA. Resection of stenotic trachea, a case presentation. *Anesthesia Analgesia* 1976; 55: 191-4
9. Baraka A. Oxygen jet ventilation during tracheal reconstruction in patients with tracheal stenosis. *Anesthesia Analgesia* 1977; 56: 429-32
10. Baraka A, Mansour R, Abu Jaoude C, Muallem M, Hatem J, Jaraki K. Entrainment of oxygen and halothane during jet ventilation in patients undergoing excision of tracheal and bronchial tumors. *Anesth Analg* 1986; 65: 191-4