

## Double Intubation for Airways Management in a Patient with Double Tracheo-Esophageal Fistula Submitted to Esophagectomy

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### Introduction

Airways management during tracheo-esophageal fistula (TEF) surgical repair has always been challenging for the anesthesiologist, due to concern to avoid enlarging the fistulae by intubation maneuvers. Furthermore, the tracheal tube should not hamper a good exposition of surgical field and finally the risk aspiration, insufflation of stomach, loss of tidal volume and hypoxemia must be prevented.

High Frequency Jet Ventilation (HFJV) may be the best choice for tracheal surgery [1,3]. However, HFJV does not guarantee sufficient lung ventilation during tracheal resection, and it does not prevent aspiration of gastro-esophageal content. Cardiopulmonary bypass (CPB) may be an alternative but too invasive, even if the use of pump-driven and pump-less extracorporeal life support have rapidly expanded and allow apneic prolonged periods for airway surgery, [1,2,4]. Other alternative methods are spontaneous breathing, distal tracheal or bronchial intubation, manual oxygen jet ventilation [1].

Whatever the choice, the main issue is the risk of inhalation of gastric content through the fistula. Selective bilateral bronchial intubation allows for appropriate ventilation, prevents aspiration, and a strict collaboration between surgeon and anesthesiologist makes surgical field easy, [5]. It was our choice in a case of trachea-esophageal fistula underwent esophagectomy.

### Case Report

We describe a case of esophagectomy for esophageal stenosis. Our patient (56 years old, ASA 3, BMI 24.6 kg/m<sup>2</sup> BSA) suffered from esophageal carcinoma and received both chemotherapy and radiotherapy and during repetitive treatment experienced an esophageal stenosis that required stent positioning, but a double trachea-esophageal fistula occurred. The stenosis was at 23 cm from the buccal rima, 1.5 cm above the carina there was the larger fistula (1 cm diameter); the smaller fistula (< 1cm diameter) was sited just on the left side of the carina.

Medical history included hypothyroidism, ischemic cardiomyopathy treated by percutaneous angioplasty+coronary stenting and colon polyposis.

Patient's home therapy included L-tyroxine, statine, bisoprolol and anti-platelet drug.

Preoperative exams showed normal respiratory function (FEV<sub>1</sub>/FVC 0.75), a sufficient cardiac function on echocardiogram (ejection fraction >50%) and all blood sample tests resulted in normal range but C - reactive protein (CRP).

Patient was scheduled for retrosternal esophagectomy and jejunostomy. General anesthesia started with Fentanyl 200 mcg and Propofol 200 mg and after Succinilcholine 75 mg administration, trachea was intubated with a bronchial tube #6.5 inserted just after the cordal plane. Afterwards, by fiberoptic bronchoscopy (FBS), another bronchial tube #5.5 was inserted through the nose and advanced to reach the main right bronchus. Finally, the #6.5 was inserted in the main left bronchus, over the fistula. Finally the tubes were connected to ventilator by "Y"-piece and anesthesia was maintained with a gas mixture of air and oxygen (FiO<sub>2</sub> 0.5) and Sevoflurane 1-2%. Remifentanyl 0.1-0.2 mcg/kg/min was administered intraoperatively. For myorelaxation we used Rocuronium 50 mg and 10 mg/40 minutes; it was finally antagonized by Sugammadex 140 mg (Figure 1).

During operation we monitored electrocardiogram (D2-V5), heart rate (HR), SpO<sub>2</sub>, invasive blood pressure (IBP) by arterial line connected to FloTrack/VigileoTM (Edwards Lifescience, Irvine, CA) for hemodynamic monitoring, EtCO<sub>2</sub>, central venous pressure (CVP) and central venous oxygen concentration (ScvO<sub>2</sub>) by a three-lumen catheter inserted into the right internal jugular vein, body temperature (T°C), blood gas-analysis and diuresis (Table 1). Mechanical ventilation: Tidal Volume 7 ml/kg in a pressure controlled setting, respiratory rate 12 apm and positive end-expiratory pressure (PEEP) 5 cm H<sub>2</sub>O.



**Figure 1:** Double intubation

Parameter	Basal	Start OLV	End OLV	End-operation
Systolic blood pressure (mmHg)	140	75	100	110
Heart rate (bpm)	60	73	75	68
CVP (mmHg)	9	14	11	11
Cardiac Index (L/min/m <sub>2</sub> BSA)	3.1	2.3	2.3	2.5
Stroke volume variation (%)	5	9	9	7
ScvO <sub>2</sub> (%)	78	62	70	68
Peak airways pressure (cmH <sub>2</sub> O)	20	18	20	19
Mean airways pressure (cmH <sub>2</sub> O)	10	9	10	10
EtCO <sub>2</sub> (mmHg)	26	22	26	31
pH	7.4	7.55	7.47	7.41
pCO <sub>2</sub> (mmHg)	38	31	39	39
pO <sub>2</sub> (mmHg)	243	232	118	122
BE (mmol/L)	3.8	4.7	4.7	4.5
Hb (g/dl)	10.7	10.9	8.9	10.5
Lactate (mmol/L)	0.9	1.1	0.9	0.8
Fluid input (ml)	-	-	-	3200
Red cell blood (ml)	-	-	-	270
Bleeding (ml)	-	-	-	300
Diuresis (ml)	-	-	-	460
Fluid balance (ml)	-	-	-	1850

**Table 1:** Intraoperative data

By retrosternal approach, after the resection of proximal esophagus at cervico-mediastinal level and after the stomach tubulized, an esophago-gastric anastomosis was performed.

The operation lasted 172 minutes and after awakening patient was admitted to our ICU for postoperative monitoring.

During one-lung ventilation (OLV) norepinephrine administration (0.02 mcg/kg/min) needed for hemodynamic impairment, but it was stopped before awakening as blood pressure restored.

Post-operative pain was controlled by Ropivacaine 0.2% 5 ml/h administered by epidural catheter inserted at T6-T7 level, preoperatively.

Patient was discharged from ICU 48 hs after the operation in a safe hemodynamic and respiratory setting.

Ten days later patient underwent rigid-bronchoscopy for the treatment of the double fistula with the insertion of two stents. Also such a procedure was uneventful.

## Discussion

We report a challenging case of airways management for esophagectomy in a patient with a double trachea-esophageal fistula.

Our main concern was the lung ventilation management by system that could be the least invasive but the safe as possible. A normal bilumen tracheal tube (that is our usual first choice in thoracic surgery) was contraindicated because its positioning could enlarge both tracheal fistulas. Although we could cautiously position a Robertshaw right-side tube, the tracheal-cuff could damage and enlarge the proximal larger fistula. High Frequency Jet Ventilation (HFJV), might be not suitable due to the potential air leaks through both fistulas and because in our institution at time of surgery we had no ventilators for HFJV.

We considered the positioning of two microlaryngeal tubes to selectively intubate the two main bronchi, but we rejected this choice as the distance between the buccal rima and the tracheal lesions did not permit to insert the tubes distally to the fistulas.

After OLV patient experienced hemodynamic impairment that required norepinephrine administration. It should be due to two main reasons. First, during thoracic operation we usually adopt a fluid management “protocol” a little more restrictive than in other operations (4 ml/kg/h), but after blood pressure falling we had to increase fluid administration to restore a safe hemodynamics. Second, the semi-lateral decubitus diverts blood flow causing hemodynamic instability and shunt increase.

In our opinion, stroke volume variation was not reliable (although it raised compared to basal value) as it is the epiphenomenon of cardiocirculatory system and intra-thoracic surgery interaction, and in this case this relationship was altered by the even “partial opening” of the thorax. Due to the unchanged cardiac index we decided to administer a vasoactive drug instead of an inotrope drug.

For the same reasons, central venous pressure was not reliable, and heart rate did not rise due to the beta-blocking therapy that the patient daily took.

We chose pressure controlled ventilation as it may be sure in thoracic surgery because of a better cardiac performance, particularly of the right ventricle, [6].

Apart from the needing of cardiocirculatory support, no other adverse event occurred during the operation. Blood-gas exchange was always sufficient and final parameters permitted us to extubate the patient as he was able to ventilate by himself sufficiently. After two day of postoperative ICU-observation he returned to the ward in a safe clinical status.

We can conclude that, lacking HFJV availability, the choice of a double selective bronchial intubation in thoracic surgery in a patient with trachea-esophageal fistulas, may be a valid alternative.

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