

Respiratory Difficulties Encountered During Posterior Fossa Exploration

M Said Maani Takrouri, M Saqer, A Al-Banyan

Citation

M Said Maani Takrouri, M Saqer, A Al-Banyan. *Respiratory Difficulties Encountered During Posterior Fossa Exploration*. The Internet Journal of Anesthesiology. 2007 Volume 16 Number 1.

Abstract

This report describes an unusual case of obstruction of a reinforced endotracheal tube during posterior Fossa exploration to excise glioma tumor. An 11-year-old male child, scheduled for excision of a glioma in the prone position. He was intubated using a 5.0-mm nylon reinforced latex endotracheal tube (ETT). The anesthesiologist ventilated his lungs with a mixture of isoflurane 1.0 MAC in oxygen (35%) and medical air. It was observed that his peak airway pressure (peak) was 21 cm H₂O at the beginning of anesthesia, increased to 26 cm H₂O over three hours. After that and over 30 min, the peak reached 35 cm H₂O, while the end-tidal CO₂ pressure (Petco₂) was 45 mmHg then gradually increased to 80 mmHg. The anesthesiologists suspected partial obstruction of the endotracheal tube. However, the anesthesiologists could not pass a suction catheter through ETT. In the meantime, the peak pressure increased to 80 cm H₂O and Petco₂ to 90 – 100 range mm Hg. The anesthesiologists could not advance a suction catheter beyond 8 cm. Reintubation with a 5.5 mm PVC ETT relieved the airway obstruction.

The termination of surgery allowed to take a chest X-ray which revealed unimpressive marginal pneumothorax which was drained but did not release the difficulties. The recording of Hb-O₂-Saturation and expired isoflurane were consistent with gradual subtotal obstruction which allowed oxygenation, and delivering inhalational agent but retention of Carbon dioxide.

INTRODUCTION

Specific risks of venous air embolism, quadriplegia and peripheral nerve palsies are well feared complications of operating in sitting position in neurosurgery. Prone position during posterior fossa exploration in neurosurgery is adopted to reduce the risk of operating in sitting position [1]. It has inherited problems due to fixed and poorly accessible airway. Reports indicated the occurrence of airway obstruction [2,3,4,5,6], accidental extubation [7] and the rescue with LMA. In this report we describe an unusual incidence of endotracheal tube obstruction complicated by presence of small pneumothorax which was successfully treated. And the documentation of both the end-tidal Carbon dioxide EtCO₂ and end-tidal isoflurane which support that obstruction was more likely the cause not the pneumothorax neither accidental extubation.

CASE REPORT

A 11 years old male patient was presented on Feb 10th 2007, as a case of posterior fossa brain tumor which was the cause of developing hydrocephalus with acute increased in intracranial pressure (ICP) necessitating external ventricular drainage (EVD) under general anesthesia (GA).

Then he was scheduled for excision of the tumor. On pre-operative assessment:

He was found to be diabetics treated with insulin on sliding scale necessitating pediatric intensive care unit admission (PICU). History of previous growth was normal. He has no known drug allergy or blood transfusions previously. On examination he had stable hemodynamic readings as follows: HbSat.99%, Pulse 90 b/min, Blood pressure (BP):110/63 mmHg, Core temperature was T: 36.5 C^o. Auscultation of the chest was negative for abnormalities or added sounds. Blood film was within the normal range: CBC: Hb 11.7 g/dl, Platelet counts: 272.000. His blood sugar was controlled using sliding scale. He was classified as ASA III.

On the day of operation standard monitoring was applied then induction started using intravenous fentanyl: 50 µg. propofol: 100 mg. and cisatracurium 10 mg. Immediate pre-induction vital signs were BP: 120/70 mmHg, HR:78 b/min, RR 22 and Sat 100%, with similar reading post induction.

After intubation, He was intubated using a 5.0-mm nylon reinforced latex endotracheal tube (ETT) (Reinforced

Endotracheal Tube, Jamjoom Medical Industries, Jeddah 21413 Kingdom of Saudi Arabia) and starting artificial ventilation the reading of EtCO₂ was 34 mmHg.

Central venous catheter in the right internal jugular vein for CVP was inserted after second trial, first one suspected to be in an artery.

Arterial line was inserted: successfully. The patient was positioned in prone position and fixed in that position carefully using mayfield pins frame. The chest auscultation revealed bilateral air entry to both lungs, continuous infusions of drugs: fentanyl and cisatracurium at rates of: 20 µg, 5 mg/h respectively. The surgery begun at 10:30.

Frequent samples of blood sugar and ABG's were taken.

The posterior fossa was exposed and the tumor reached. Biopsy was taken and sent for frozen section reading.

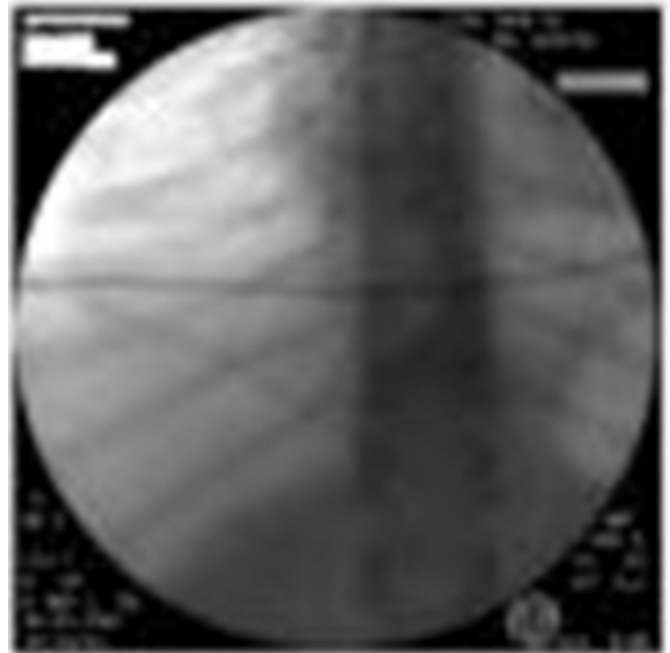
At 13:30 EtCO₂ started to increase from 33,35,40-60 mmHg and reached 100 mmHg.

Airway pressure measurement reached the value 40-45 cm H₂O, with alarms of inadequate delivery of tidal volume, the anesthesiologist decided to ventilate manually then the manual ventilation resumed. While the patient was in prone position auscultation did elicit no air entry. The suctioning from ETT was tried without benefit. Several trials of checking tried, so we suspected pneumothorax or obstruction, dislodgement of tube.

Chest X-ray was done which showed unimpressive marginal pneumothorax on the right side. [Fig 1]

Figure 1

Figure 1: C-arm portable screen X-Ray right chest after turning the patient to supine position showing small marginal pneumothorax



The anesthesiologists informed the surgeon so he decided to stop and stage the surgery. He started closing as the first stage of surgery was already finished. (Closing the wound took 10 min.)

The pediatric surgeon was informed and after turning the patient he inserted a chest tube with slight improvement. In the same time tube dislodgement was suspected and confirmed while another tracheal tube was reintroduced with dramatic improvement.

The older tube was clogged with bloody sputum [Fig 2, 3]. The trend of expired gases is demonstrated in [Fig 4, 5].

Figure 2

Figure 2: Tip of the original ETT showing subtotal diameter occlusion with mucous plug



Figure 3

Figure 3: Length of the original ETT showing the length of subtotal diameter occlusion with mucous plug



Figure 4

Figure 4: Trend of expired isoflurane taken from the monitor of Primus Drager anesthesia workstation showing constant recording supporting the presence of the tube in the trachea till turning the patient to supine position the higher recording was due to increasing [FiIso] for short period.

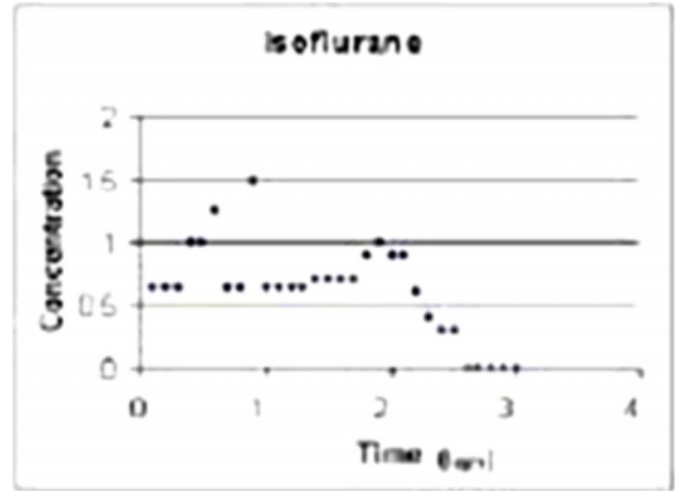
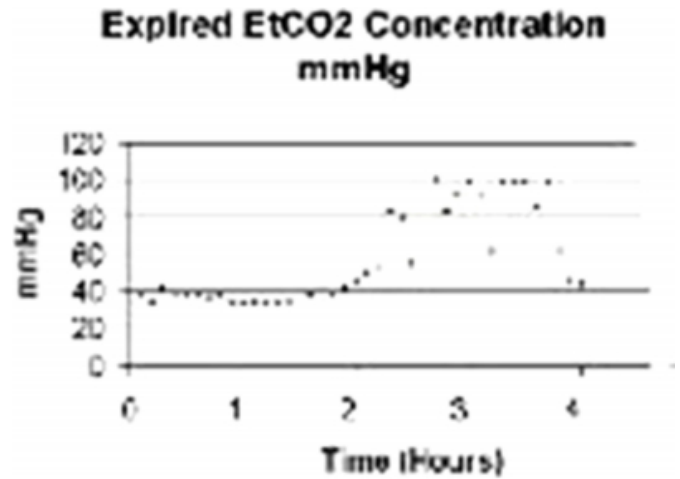


Figure 5

Figure 5: EtCO₂ trend taken from the monitor of Primus Drager anesthesia workstation showing gradual build up of the expired gas ended by changing the tube after turning the patient to supine position



The patient was sent to PICU on mechanical ventilation and brought to OR after few days for completion of surgery. He returned to PICU ventilated and weaned next morning with remarkable recovery.

The patient was discharged home and followed in outpatient neurosurgery and oncology clinic.

DISCUSSION

Ventilatory difficulty in the prone position may become a serious complication leading to death. The differential

diagnosis includes: Airway obstruction due to blood or internal bubble or even corruption of the wall of ETT on the other hand thoracic complications like pneumothorax and bronchospasm, PE may be alternative diagnosis. On the auscultation of both lungs in the reported case evidently there were strange coarse sounds but faint vesicular breathing sounds on manual ventilation,

The introduction of intra tube catheter did not lead to full entry of air into the lungs and it was obvious that the tube has certain obstruction allowing ventilation under high inflating pressure. The anesthesiologists were concerned of the consequences of this incident

So they informed the surgical team of the new development.

This would lead to the fact that during the initial few hours of the procedure, no problems were noted. The electrocardiographic changes observed were only sinus tachycardia and probably due to increased blood carbon dioxide and intrathoracic pressure caused during manual ventilation. It is possible that manual ventilation forced gases into the lungs but that some valve mechanism due to the presence of long sputum plug which prevented complete free expiration. The administration of 100% oxygen, would also explain why the oxygen saturation did not decrease. It is interesting to note that oxygen saturation may not be an indicator of severe airway problems in accordance with similar case of intra-lumen obstruction [3]. To our knowledge, this is the first report of this kind of endotracheal tube obstruction with a disposable armored tube, with added

inhalational and carbon dioxide curves concentration monitored on anesthetic Drager Primus machine. It shows that long operation in prone position in the presence of excessive secretion due to reduced consciousness in neurosurgical patients may lead to snowball of events.

CORRESPONDENCE TO

Mohamad S. M. Takrouri MB. ChB.FRCA (I) Department of Anesthesia King Fahad Medical City Riyadh KSA
mtakrouri@kfmc.med.sa

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Author Information

Mohamad Said Maani Takroui, MB. ChB. FRCA (I)
Department of Anesthesia, King Fahad Medical City

Mohammad Ismail Saqer, MD CJBA.MsA
King Fahad Medical City

Ayman Al-Banyan, MD MBBS, FRCSC
Department of Neuroscience, King Fahad Medical City