Cardiac Complications Do Occur During Rigid Bronchoscopy Even Under General Anesthesia: Case Report

Genel Anestezi ile Yapılsa da Rijid Bronkoskopi Sırasında Kardiyak Komplikasyonlar Gelişmektedir

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ABSTRACT Although cardiovascular complications, including myocardial ischemia, have only rarely been reported during interventional bronchoscopy performed under general anesthesia, from the standpoint of anesthesiologist it is associated with significant risk. Here we report a case of a 71 year-old male patient with esophagobronchial fistula. He was referred to our bronchoscopy unit for stent placement through rigid bronchoscopy under general anesthesia. The patient had no history of ischemic heart disease. Twenty minutes after the begining of the procedure, a sudden ST-segment elevation was developed in the patient. Lateral ischemia was demonstrated by 12-lead ECG. In the operating room early administration of IV nitroglycerin, morphine and heparine was effective in treating this episode. About 40 minutes later ST segment returned to baseline. This case should alert the clinicians that despite the lack of evident hemodynamic disturbances myocardial ischemia may be developed in elderly patients undergoing bronchoscopy with general anesthesia and by an experienced team. Particularly in the absence of an anesthesiologist and if the patient is not in an fully- equipped operating room, an immediate diagnose and treatment of such complications can only be managed if the patient is fully monitored and if the operator pay attention to the monitor.

Key Words: Bronchoscopy; myocardial ischemia; anesthesia, general

ÖZET Genel anestezi altında yapılan girişimsel bronkoskopi sırasında miyokard iskemisi gibi kardiyovasküler komplikasyonlar nadiren bildirilmekle beraber anesteziyologlar açısından son derece riskli olgulardır. Bu olguda özofagobronşiyal fistülü olan 71 yaşındaki erkek hasta sunulmaktadır. Hasta genel anestezi altında rijid bronkoskopi ile bronşiyal stent uygulanmak üzere kliniğimize refere edildi. Tanımlanmış iskemik kalp hastalığı hikayesi yoktu. Girişimin başlamasından 20 dakika sonra hastada ani ST segment elevasyonu gelişti. 12 lead elektrokardiyografide lateral iskemi teşhis edildi. Ameliyathanede hızla uygulanan nitrogliserin, morfin ve heparin tedavisi bu iskemik epizodun tedavisinde etkili oldu. Yaklaşık 40 dakika sonra ST segmenti izoelektrik hatta döndü. Bu olgu, genel anestezi altında ve deneyimli bir ekip tarafından uygulanıyor olsa da yaşlı hastalarda bronkoskopi sırasında belirgin bir hemodinamik bozukluk gözlenmeden de miyokardiyal iskeminin gelişebileceğini göstermesi açısından uyarıcıdır. Özellikle ameliyathane şartlarında ve anesteziyolog gözetiminde yapılmayan olgularda bu tür komplikasyonların hızlı tanı ve tedavisi, hastaların hemodinamik olarak tam monitörize edilmesi ve monitörün izlenmesi ile başarılabilir.

Anahtar Kelimeler: Bronkoskopi; miyokard iskemisi; anestezi, genel

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Manipulation of the upper and lower respiratory tract leads to intense stress for the patient. The stress of airway irritation and /or hypoxia during bronchoscopy causes release of cathecolamines, hence tachycardia and vasoconstriction increase the possibility of myocardial stress in some patients.[1,2] During fiberoptic

bronchoscopy electrocardiographic evidence of myocardial ischemia has been observed in patients manupulated under various sedation techniques at rates up to 21%.[3,4] However myocardial ischemia have only rarely been observed during interventional bronchoscopy performed under general anesthesia in which the symphatetic response and the risk of hypoxemia were diminished. We describe a case in which myocardial ischemia developed during rigid bronchoscopy under general anesthesia.

CASE REPORT

A 71-year-old man with esophagobronchial fistula was referred to our bronchoscopy unit for stent placement through rigid bronchoscopy. Five years ago he had undergone right superior lobectomy for lung cancer and he also had an esophageal stent placed eight months previously for malignant dysphagia. He had productive cough provoked particularly after swallowing liquid or solid foods. Prior to this hospitalization he had undergone a fiberoptic bronchoscopy that revealed a right sided esophagobronchial fistula. The patient had no history of ischemic heart disease, hypertension or diabetes mellitus. Preoperative medications included various bronchodilators and antibiotics.Vital signs were normal except for a respiratory rate of 20-22 breaths/min. Physical examination showed that the patient was in mild respiratory distress. The heart examination revealed regular rate and rhythm without S3 or murmurs. Initial laboratory findings included Hb of 11.1 g/dL, and normal levels of WBC, electrolytes, BUN, creatinine, glucose, and liver function tests. The prebronchoscopy resting ECG showed a normal sinus rhythm and no abnormalities. On arrival in the anesthetic room the patient had a sinus rhythm at 90 beats/min, a supine blood pressure (BP) of 145/85 mmHg, and SpO_2 of %95 while breathing room air. He was premedicated with iv midazolam (2 mg) and supplemental oxygen at 4 L/min was given via nasal cannula. Monitoring during the procedure included continuous ECG, pulse oximetry, automated noninvasive blood pressure and end-tidal carbon dioxide. Topical anesthesia was achieved using 10% lidocaine spray to the oropharynx. Anesthesia was induced with intravenous propofol (2 mg /kg) and fentanyl (100 μg) and muscle relaxation was achieved with atracurium (0,6 mg/kg). After the pulmonologist introduced the rigid bronchoscope in to the trachea the lungs were ventilated with a mixture of oxygen and air (FiO_2= 0.8- 1) via the ventilating sidearm of the rigid bronchoscope. Anesthesia was maintained with propofol infusion started immediately after the induction of anesthesia. Bolus doses of propofol were administrated during the procedure as required. Prior to bronchoscopy, the patient had a sinus rhythm at 75 beats/min, a BP of 135/80 mm Hg, and a SpO_2 of 98%. During the first 20 minutes of precedure hemodynamia of the patient was stable and no additional fentanyl was required. After 20 minutes of uneventful procedure a sudden ST elevation (≈ 5 mm) was observed on the ECG monitor (lead V5). At this time, the patient had a heart rate of 65 beats/min, a SpO_2 of 98%, and a BP of 110/70 mm Hg. The bronchoscopy was discontinued immediately and the patient was intubated with a tracheal tube followed by a ventilation with 100% oxygen. Hemodynamia of the patient did not worsened however with the persisting ST elevation the patient received morphine 5mg, heparine 5000 IU, nitroglycerin 0.3 mg bolus followed by an infusion of 0.2 μg/kg/min.

Lateral ischemia was demonstrated by 12-lead electrocardiography in the operation room while the patient was still under general anesthesia. With a BP of 110/50 mm Hg, a heart rate of 60 to 65 beats/min, and an SpO_2 of 98%, the patient was admitted to the ICU.

Arterial blood gas analysis revealed a pH of 7.39, $PaCO_2$ of 41.9 mm Hg, PaO_2 of 123 mmHg and Lactat of 1.2 mmol/L while the patient was mechanically ventilated with a FiO_2 of 40%. Intravenous nitroglycerin (0.2 to 0.5 μg/kg/min) was the only medication in the ICU. About 40 minutes after the start of ST elevation, the ST segment returned to baseline. Three and a half hours after admission to the ICU the patient was

extubated. He was fully awake with normal hemodynamic and respiratory parameters. Although an increase in Troponin I (4.2 ng/mL) occured he did not experience anginal pain and no ST-segment changes were noticed in the daily 12-lead ECG recordings. Coronary angiography was not planned because of the progressive malignity of the patient. On the second day he was discharged to the ward with aspirin and coumadine. Anticoagulant therapy was recommended to continue for at least 3 months without interruption. So rebronchoscopy was posponded. Although no serious respiratory problems were occured for 6 months of follow-up, the patient died due to the metastasis to the brain.

DISCUSSION

Therapeutic interventional bronchoscopy, included rigid bronchoscopy, laser resection and stent placement are indicated for palliation of malignant disease and relief of benign central airway obstruction and are shown to improve survival, quality of life and pulmonary function while producing symptom relief. Such procedures are usually well tolerated but may be uncommonly life threatening.[5]

The pressor response to rigid bronchoscopy has been shown to be qualitatively similar to that of laryngoscopy and intubation, but is often greater and of longer duration. The intense sympatomimetic response together with episodes of oxygen desaturation may lead to an imbalance between myocardial oxygen demand and delivery which could result in myocardial ischemia especially in patients with clinical or silent coronary artery disease, hypertension and in elderly patients with accompanying lung disease.[6] Many methods for attenuating these responses have been previously described, including high-dose opioids, ß-adrenoreceptor blocking drugs, opioid-benzodiazepine sedation, α_2-adrenergic agonists or deep levels of anesthesia. However these techniques all could not totally eliminate the risk of life-threatening cardiac complications in the elderly patient population. Previous studies reported that cardiovascular events such as atrial and ventricular arrhythmias and myocardial ischemia are potential complications of bronchoscopy.[1,7] Indeed electrocardiographic evidences of myocardial ischemia were reported at rates of between 17-21% in patients undergoing bronchoscopy either with sedation or without sedation[3]. Although myocardial ischemia would less likely be anticipated during bronchoscopy performed under general anesthesia in which the symphatetic response and the risk of hypoxemia is diminished, in the early reports ST segment changes were noticed in 10-18% of patients.[8,9]

The anesthetic agents that provide reduced airway and circulatory reflexes have been appropriate options for this brief procedure.The short –acting benzodiazepine midazolam is most often used in combination with different opiates for sedation.[10] We used midazolam which has sedative and amnestic features and fentanyl to reduce procedure related cathecolamine relaese , pain and cough. Propofol, a powerful short-acting hypnotic with the features of upper airway reflexes depression was used for the induction and the maintenance of anesthesia similar to those reported in the literature.[11,12] However, sedation induced by the combination of drugs is supposedly associated with a greater extent of deoxygenation and carbon dioxide retention, particularly in patients with pre-existing respiratory failure.[13]

Rigid bronchoscopic examination also requires special attention because of the potential risk of impaired ventilation and the difficulty in the management of airway, which is naturally occupied both by anesthesiologist and the pulmonologist. Therefore controlled ventilation was applied to the patient in order not to cause hypoxia. With the anesthesia technique used in this case hemodynamic responses seems to be controlled without any episodes of oxygen desaturation however, we might be unaware of some hypertansive episodes because noninvasive arterial pressure were recorded at 5 min intervals . Intense sympathetic stimulation, a common response to bronchoscopy might lead to coronary spasm.

Previous studies show that during bronchoscopy ST-segment elevation, the classic ECG marker of acute coronary occlussion is a rare event but can be observed in patients who do not have risk factors.[3] So many interventional rigid or fiberoptic bronchoscopies were performed by the same experienced anesthesiologist and the pulmonologist however this was the first-bronchoscopy related myocardial ischemia-case experienced in our operating room.

There are various reports in which opioids such as fentanyl, remifentanil or alfentanil [14,15] were used to attenuate the hemodynamic response while ß-blockers such as labetalol[16] or α_2-adrenergic agonists such as clonidine[17] were used in some other studies for the same purpose. Indeed cardiovascular stability or ST segment changes seem to be similar with each drug.

In a survey which aimed to assess the current national flexible fiberoptic practice for bronchoscopy in adults and the sedation, analgesia and anesthesia used therein, systemic level of monitoring was found to be poor. It was also shown that 27% of operators performed unsedated bronchoscopies and only 3% of others who sedate, used formal sedation scores.[18] In this sense some of the myocardial stress can be undiagnosed and may be much more than reported.

Overall, sedation or anesthetic techniques for bronchoscopy are variable across different centers and countries, and this will undoubtedly contribute to varying levels of sympathetic response to bronchoscopy.[19-21] Although bronchoscopy is well tolerated by most of the patients with limited pulmonary reserve and with comorbidities such as coronary artery disease, the rarity of complications should not hide the fact that life-threating complications do occure.[22] The crucial point is to provide adequate monitorization, sedation and to choose the accurate anesthetic technique considering clinical status of each patient. In the absence of an anesthesiologist an immediate and an accurate diagnose/treatment of such complications can only be managed if the patient is fully monitored and if the operator pay attention to the monitor.

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