

Pulmonary hemorrhage in an outpatient ophthalmic anesthesia setting – it's never “just a cataract”

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Abstract

A 48-year-old man, with end stage renal disease and a history of recreational drug abuse, presented for elective cataract surgery. Patient underwent the procedure with a general endotracheal anesthesia with a balanced anesthetic. After an uneventful intra-operative period, he had a sudden onset large volume hemoptysis just prior to extubation. Poor oxygenation and hemodynamic instability necessitated emergent reintubation in the immediate post-extubation period. Emergent bronchoscopy did not show active airway bleeding or obstructive mucous plugs, and a diagnosis of diffuse alveolar hemorrhage was made. The patient was gradually weaned off the ventilator and made a slow recovery over a one - week period.

Key words: Alveolar, anesthesia, diffuse, hemorrhage, ophthalmic, outpatient, pulmonary

Introduction

The turn of the century has witnessed an ever-increasing trend towards outpatient anesthesia.^[1] Pressure from insurance providers for a higher patient turnover has fueled more and more interest in out patient or office based anesthesia and surgery. However, increasing numbers of geriatric patients have meant that more patients with increasingly complex medical problems are presenting for the outpatient procedures.^[1] Patient selection for outpatient surgery is a delicate balance between surgical complexity and the patient's current medical condition. Although commonly presenting with comorbidities, patients presenting for cataract surgery can typically undergo surgery safely. At times, however, these patients present with a myriad of perioperative comorbidities that may result in life threatening consequences. Diffuse

alveolar hemorrhage (DAH) is one such life-threatening syndrome involving intraalveolar hemorrhagic diathesis due to pulmonary capillaritis. We report a rare and as yet unreported presentation of DAH in the outpatient ophthalmic anesthesia setting, and discuss emergent management and airway protection along with underlying pathophysiological mechanisms.

Case Report

A 48-year-old man, of American Society of Anesthesiologists physical status III, presented for elective cataract removal with intraocular lens placement. Comorbidities included end stage renal disease (ESRD) on regular hemodialysis, type 2 diabetes mellitus, hypertension, hyperlipidemia, gastroesophageal reflux disease, chronic obstructive pulmonary disease, and a history of cocaine abuse. Preoperative laboratory investigations were all unremarkable except for a serum creatinine of 9.8 mg/dl. The patient was on regular dialysis and he was scheduled for another session on the day of surgery after the surgical procedure. In the preoperative period, he was very anxious and refused all the methods of a topical or regional anesthetics offered to him. A decision was thus made to proceed under general anesthesia with a balanced anesthetic.

After adequate preoxygenation, he was induced with intravenous midazolam and titrated increments of propofol. After obtaining adequate muscle relaxation, the trachea was intubated in an atraumatic fashion (MAC 4 Blade; grade

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l view) with a size 7.5mm ID oral Ring Adair Elwyn (RAE) endotracheal tube (Covidien, Mansfield, MA). Intraoperatively, anesthesia was maintained with air-oxygen (1:1) and sevoflurane titrated, to maintain a minimum alveolar concentration (MAC) of 0.7-1. The intraoperative period was short (15-20 minutes) and uneventful. Just prior to the tracheal extubation, the patient had good neuromuscular function and was breathing spontaneously. At this time, there was a sudden onset large volume hemoptysis, and the patient coughed up about 100 cc of frank blood into the endotracheal tube and breathing circuit. A gentle suction was done, and after ensuring that there was no more active hemoptysis, the trachea was gently extubated under watchful conditions.

Immediately after extubation, his oxygen saturation dropped into the low 80's despite 100% oxygen via a tight sealing facemask. Along with this, his blood pressure increased, ranging between 225 - 250 mmHg systolic. Poor oxygenation and hemodynamic instability necessitated emergent reintubation. A video laryngoscope was now used which showed a heavily congested oropharyngeal and laryngeal space; however, there was no evidence of active bleeding. Because our ophthalmologic operating rooms are free-standing, he was emergently transferred to the emergency department where he continued to deteriorate hemodynamically and had poor oxygenation. Chest roentgenograms showed bilateral upper and mid predominant air space consolidation and air bronchograms [Figures 1a and b]. Laboratory studies

revealed a significant drop in the hematocrit compared with baseline along with normal coagulation parameters [Table 1]. However, an emergent bronchoscopy did not show active airway bleeding or obstructive mucous plugs. A diagnosis of diffuse alveolar hemorrhage was made and the patient was transferred to the medical intensive care unit. A bedside echo in the emergency department and a formal transthoracic echo in the medical intensive care unit were unremarkable, and the suspicion of this being a cardiac event was also thus ruled out. In addition, there was no evidence of ischemia on the Electrocardiography (EKG) or with serial cardiac enzymes. Further management was similar to treatment for adult respiratory distress syndrome including high positive end expiratory pressure (PEEP) and permissive hypercapnea. His chest radiology showed a slow improvement, and he oxygenated better over the course of the next one week in the ICU. [Figure 2a-c]. Patient was successfully weaned off the ventilator and made a complete recovery at the end of this period.

Discussion

A straightforward procedure does not always equate with straightforward anesthesia. Ophthalmic anesthesia in the adult age group is typically outpatient and based on regional blocks in combination with some titrated intravenous (IV) anesthetics for light sedation.^[2,3] The goals of anesthesia for such a case are analgesia, akinesia and hypotonia of the eyeball in varying degrees. The advent of numerous adjuvants to the available local

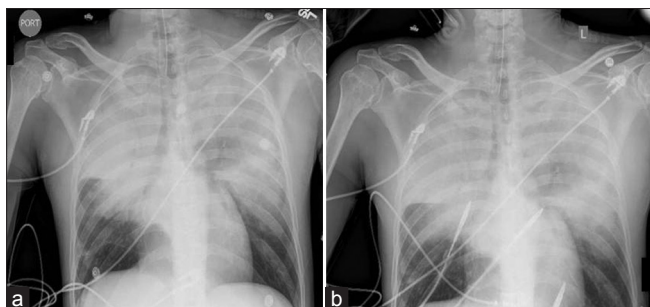


Figure 1: Serial chest roentgenograms with bilateral upper and mid predominant air space consolidation and air bronchograms. (a) Immediate post-reintubation (b) One hour post-reintubation

Table 1: Post-hemoptysis lab parameters compared with baseline as seen in the patient with DAH

Parameter	Baseline	Post-hemoptysis
WBC K/ul	6.09	2.63
Hemoglobin g/dl	9.4	7.4
Hematocrit %	29.6	22.8
Platelet K/ul	210	208
INR	1.1	1.1
APTT	30.6	30.8

WBC = White blood cells; INR = International normalized ratio; APTT = Activated partial thromboplastin time

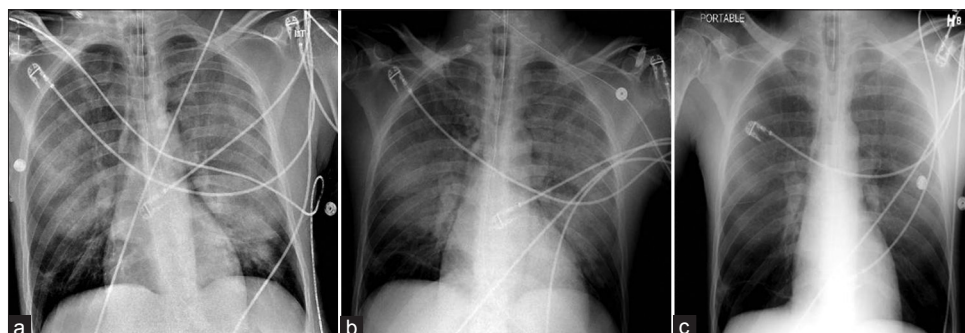


Figure 2: Serial chest roentgenograms in the Intensive Care Unit (ICU) with gradual resolution of changes. (a) ICU Day 1 (b) ICU Day 3 (c): ICU Day 5

anesthetics for ocular surgery has given the anesthesiologist and the surgeon flexibility of choices, as well reliability of anesthesia for these procedures.^[4] This might suffice for most patients, however, those who suffer from comorbidities which prevent them from lying flat, or suffer from additional anxiety, tremor and restlessness, may have to be considered for general anesthesia. Cataract surgery is generally associated with minimal systemic effects and a low risk of major morbidity or mortality.^[4] However, patients presenting for this type of procedure are usually elderly and have multiple comorbidities. The stress response of surgery combined with the immunomodulatory responses of a general anesthetic might complicate some of these relatively benign coexisting disease states, and present the anesthesiologist with problems postoperatively.^[5]

Hemoptysis is a life-threatening emergency and it is of paramount importance that the anesthesiologist recognizes and controls the problem as early as possible. Management consists of airway control, hemodynamic stabilization and early localization of the nature and source of the bleeding. The latter may need bronchoscopic visualization, and if needed surgical or interventional radiology guided intervention.^[6] Pulmonary hemorrhage is further classified into that arising from the bronchial vessels, the pulmonary vessels, or the microcirculation of the lung. The most common form of pulmonary hemorrhage is bronchial vascular in origin, and presents with bleeding into the airway, and is usually caused by tumors/mass lesions and/or bronchiectasis/structural lesions of the airway.^[6,7] Another common cause of hemoptysis in an intubated patient after a general anesthesia is a traumatic laryngoscopy and intubation. We had a patient with ESRD with an increased susceptibility to platelet dysfunction and tendency to bleed with only minimal trauma.^[8] We emergently performed a bronchoscopic evaluation of the airway which showed some airway congestion; however, there was no active bleeding or obstructive mucous plugs. An examination of the upper airways and cords also showed no indication of any bleeding from the laryngeal inlet or the upper laryngopharynx.

A rare type of pulmonary hemorrhage originating from the small, medium, and large pulmonary vessels is most commonly due to systemic vasculitis, which often involves the microvasculature and is known as pulmonary capillaritis.^[7] Diffuse alveolar hemorrhage (DAH) is the clinic-pathological presentation of pulmonary capillaritis which was our diagnosis of exclusion in this case. DAH presents with a constellation of findings including hemoptysis, anemia, diffuse radiographic pulmonary infiltrates, and hypoxemic respiratory failure, which were consistent with this patient's clinical presentation.^[7] Histologically, DAH is seen as an accumulation of intra-alveolar erythrocytes originating from pulmonary capillaries. The usual causes for DAH are immune mediated systemic

vasculitides and other connective tissue disorders.^[7] Wegner's granulomatosis, systemic lupus erythematosus, microscopic polyangiitis and Sjögren's syndrome have all been reported to have resulted in DAH as a presenting or a primary pulmonary manifestation.^[9-12] These were ruled out in this case and an extensive immune based testing panel was negative throughout. The other etiologies for DAH are non-immune and include a myriad of causes.^[7,8] One of these is idiopathic pulmonary hemorrhage (also called bland pulmonary hemorrhage). The other possibilities to consider in our patient would have been coagulopathy and platelet dysfunction as a consequence of ESRD and cocaine abuse, both of which, are known causes of DAH.^[7] ESRD is associated with coagulation derangements, principally because of platelet dysfunction and alterations to the fibrinolytic pathway. In addition, the end-product accumulation as a result of uremia also contributes to the increased bleeding tendency and mucosal friability seen in these patients.^[8] Although we established the airway in an atraumatic manner, the increased bleeding tendency in this setting could have by itself triggered the pulmonary bleeding event independent of the airway instrumentation.

Typically, cocaine abuse (which was documented in our patient) is associated with a vast spectrum of pulmonary complications. One of the well described problems associated with the use of this drug are pulmonary vascular inflammatory states and microvascular bleeding leading to DAH.^[7,13,14] These are seen more commonly when cocaine use is added on to a background of marijuana and tobacco use.^[15,16] Drug induced DAH syndromes with amiodarone, valproate, anti-platelet drugs and chemotherapeutic agents, namely cytotoxic drugs, have been reported.^[17-20] On retrospective analysis, none of the drugs our patient was on preoperatively had been ever associated with DAH. Pulmonary hemorrhage was also not associated with any of the anesthetic agents that were used.

DAH has a mixed prognosis with mortality rates cited between 20-100%.^[13] Coexisting cardiovascular disease and renal failure requiring dialysis are two factors which have been shown to be predictors of poor outcomes.^[3] Bronchoalveolar lavage is confirmatory for the diagnosis, and a surgical lung biopsy may be required to confirm the underlying histology (usually if the serology is negative). Treatment includes corticosteroids, immunosuppressive agents and plasmapheresis in some cases.^[7] Refractory bleeding in some DAH patients has recently been managed with recombinant factor VIIa (rFVIIa). The drug was administered from the air side as an intra-alveolar technique, and it stops bleeding in a life-threatening DAH syndrome. The recommended dose is 50 mcg/kg per dose, and the limited case series studies have reported adequate hemostasis with one or two doses with good improvement in the oxygen transport.^[21] Our patient

was seronegative, and was managed on the lines of adult respiratory syndrome/acute lung injury on the ventilator. He responded dramatically and could be weaned off mechanical ventilation in a week's time.

It is worth mentioning that DAH has not been reported in the outpatient anesthesia setting. There is a reflex tendency to think about common causes of hemoptysis first, and we reacted in a similar manner by thinking about airway trauma and mucosal friability in the setting of ESRD as a cause. Another issue germane to this case is whether or not this patient should have undergone an outpatient surgical procedure. Cataract surgeries almost as a rule are done as outpatient procedures at our institution. While this is advantageous from the financial standpoint and is attractive to patients and insurance providers alike, we might in the future, look at more perioperative optimization of very complicated cases as inpatients before they go for surgery.

DAH is a rare cause of pulmonary hemorrhage and is certainly not commonplace for the outpatient ophthalmic anesthesia setting. Securing the airway without any delay and diagnosing and managing the underlying cause of the pulmonary bleed is all part of the practice of good perioperative medicine, which is in no way different in the outpatient anesthesia setting. The anesthesiologist must be aware of the full spectrum of possible etiologies of hemoptysis in order to effectively deal with this emergency when it does arise.

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