Management of massive haemoptysis

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Introduction

Massive haemoptysis is defined as volume of more than 600 ml of expectorated blood in 24 hours or more than 150 ml in 1 hour. There are many causes of massive haemoptysis such as bronchiectasis, lung neoplasm, pulmonary infection including tuberculosis or vascular abnormalities [(1)]. The most critical features that have implication in the clinical outcomes of massive haemoptysis include the volume and the rate of bleeding, haemodynamic stability, and the effects on gas exchange through the bronchial obstruction. In fact, it is the effect on the airway compromise, which can lead to asphyxiation, which is of more importance. In patients with limited cardiopulmonary reserve smaller amount of haemoptysis may be of life-threatening nature [(2)]. There are three aspects of importance when managing patients with massive haemoptysis including airway stabilisation, haemodynamic support and rapid identification of the bleeding source, and subsequent control of the bleeding, and management of the underlying condition leading to the bleeding.

In this report we describe a case of massive haemoptysis, its management and outcome together with a review of the modern approach to managing massive haemoptysis.

Case

An 18-year-old female patient was admitted with a history of haemoptysis. She never smoked and was otherwise fit and well. At the age of 8 years, she underwent a bronchoscopy in a different institution, which showed a very small lesion in the right main bronchus, which at that time did not require any further investigations. She remained asymptomatic from the respiratory aspect for 10 years. There was no history of previous infection. The patient developed a massive haemoptysis around 500 ml of blood over a period of 2 hours. The computed tomography (CT) of the thorax revealed extensive ground glass nodular opacities affecting the right upper and the right lower lobes. The patient required a blood transfusion. Unfortunately, the haemoptysis persisted and decision was made to intubate the patient and initiate mechanical ventilation on the Intensive Care Unit. The patient was intubated with left sided double lumen tube to protect the healthy lung, as there was a suspected bleed from the right lung. Whilst the patient was intubated and ventilated a bronchoscopy was performed, this was difficult as the double lumen tube has a very narrow lumen allowing only the smallest bronchoscope to be used, which has a very narrow suction channel, which made it difficult to evacuate blood and clots. For this reason, the double lumen tube was replaced with a size 9 standard endotracheal tube. This allowed for insertion of a large bronchoscope. The bronchoscopy confirmed blood in all bronchial tree and a pulsatile bleeding point in the right lower lobe bronchus. As there was further bleeding from the right bronchus the patient

remained intubated, and a bronchial blocker was inserted with a balloon inflated against the bleeding lesion. Interventional vascular radiology team assessed the patient and performed embolization of the right bronchial artery. Despite the embolization of the right bronchial artery the haemoptysis persisted, unfortunately further interventional radiology procedure was felt likely to present high risk of complications. Given this, the significant decision to proceed with formal surgical intervention was made by the multidisciplinary team with salvage right lower lobectomy. At operation there was the finding of a completely engorged right lower lobe. The hilum was extremely inflamed, densely adherent with abnormal appearing anatomy with multiple small vessels and some heavy bleeding from adjacent to the lower lobe bronchus. After the lobectomy, post operative bronchoscopy demonstrated no ongoing bleeding. The patient recovered well from her surgery and the haemoptysis has not re-occurred. Histology from the right lower lobectomy showed diffuse intra alveolar haemorrhage.

Discussion

We described a case of a patient presenting with a massive haemoptysis. The management of this patient required a multidisciplinary approach including pulmonologists, critical care team, interventional radiology and thoracic surgeons. The patient required intubation to protect the airways. Anatomically, 150 mL of blood occluding tracheal dead space is sufficient to result in a rapid death by asphyxiation [1]. As this was a life-threatening haemoptysis the patient required intubation and ventilation on the Intensive Care Unit. Different approaches to control bleeding were undertaken including bronchoscopy, endobronchial blocker and

mechanical ventilation. The use of flexible bronchoscopy allows for evaluation of the bronchial tree for any potential causes of massive haemoptysis such as malignancy, infection or foreign bodies. From technical aspects the use of radiological test including computed tomography and interventional radiology techniques such as angiography and bronchial artery embolization form an important aspect of managing patients with massive haemoptysis. Computed tomography has been shown to have similar rate of identifying the site of bleeding of around 70% compared with bronchoscopy. However, CT has been found to be more efficient than bronchoscopy in identifying the cause of bleeding in close to 80% of cases [3]. These techniques and interventions were employed in our case, but the haemoptysis persisted. Finally thoracic surgical intervention was required with surgical resection, which resulted in a caseation of haemoptysis.

Haemoptysis is relatively common reason for pulmonary clinics referrals reported to form around 7% of referrals [4, 5]. Approximately 11% of referrals to hospital respiratory departments are due to haemoptysis. However, massive haemoptysis is very rare with around 5 to 14% of patients presenting with haemoptysis having massive haemoptysis with tuberculosis, bronchiectasis, cystic fibrosis, lung abscess and mycetoma and lung cancer being reported as the main causes [6, 7]. Massive haemoptysis describes a large amount of expectorated blood or rapid rate of bleeding associated with serious risk of mortality. However, there is no uniform agreement on the volume of haemoptysis, varying between 100 ml to 1000 ml over 24 hours, that is defined as massive haemoptysis [6, 7, 8]. Therefore, there are suggestions that a term massive haemoptysis magnitude of effect is used, which describes

the main clinical consequences of haemoptysis. Massive haemoptysis magnitude is defined as the volume of expectorated blood that is life-threatening by virtue of airway obstruction, hypotension or blood loss [8, 9]. The consequences of massive haemoptysis are described as requirement of blood transfusion, hospitalization, intubation, aspiration of blood to the contralateral lung, airway obstruction, hypoxemia requiring mechanical ventilation. The main factor affecting the risk of death is the rate of bleeding. Earlier studies reported that patients who had haemoptysis with a rate of bleeding of greater than 600 ml in 16 hours and deemed to be inoperable had mortality rated over 75% [9, 10]. Implementing modern diagnostic and interventional therapeutic techniques reported mortality rates have decreased, with recent studies quoting mortality rates ranging from 6.5 - 38% [2, 11, 12].

The main aim of managing massive haemoptysis is to stop the bleeding and hemodynamical stabilisation of the patient [2]. Medications that can affect coagulation or platelets activity should be stopped. Coagulation abnormalities and thrombocytopenia should be corrected. The nonbleeding lung should be protected, which can be achieved by turning the patient to the bleeding side. If this is not sufficient the airways stabilisation may be required [1, 2]. There are different approaches that can be used to achieve this. Large single lumen endotracheal tube has disadvantages as it will not allow for endobronchial intervention. Double lumen endotracheal tube's main disadvantage may be related to the requirements for an experienced operator and the fact that it can be blocked [2, 6]. A rigid bronchoscopy may also be applied and may allow for ventilation and assessment of the bronchial tree as well as intervention to stabilise the bleeding [2, 3, 4, 6, 13]. Once airways are secured a flexible

bronchoscopy can be undertaken. Flexible bronchoscopy allows for clearing the airways of blood, which helps maintaining good ventilation. Bronchoscopy also allows to visualise the bleeding site and guide insertion of a bronchial blocker [2, 6, 13]. The bronchial blockers prevent the aspiration and blood crossing to the contralateral lung as well as stabilisation of the patient so interventional radiological or surgical procedures can be undertaken.

Interventional radiology techniques involve bronchial artery embolization. Whilst immediate rates of stopping bleeding for bronchial artery embolization are very high around 90%, the recurrence of re-bleeding within 30 days was reported around 11% with lung cancer and bronchiectasis having the highest risk. Bronchial artery embolization caries risk of complications including transverse myelitis from non-target embolization to the spinal artery [14, 15]. In a small proportion of patients' surgery may be required. Since improvements in interventional radiological procedures such as bronchial artery embolization, surgery for massive haemoptysis have become less common [2, 14, 15, 16]. Mortality for an emergency surgery in the context of massive haemoptysis still remains high, quoted around 30% [2, 6, 16]. In contrast in scheduled surgery where bleeding was controlled prior to surgery mortality was reported around 4% stressing the importance of non-surgical approaches to stabilize bleeding prior to surgery [17]. Surgery is of a particular importance in the context of chest trauma, rupture to the pulmonary artery, tuberculosis and aspergilloma. Factors that may be associated with poor surgical outcomes include presence of bronchiectasis, pleural adhesions, advanced age and the need for a pneumonectomy. In our case, the patients underwent a

lobectomy, which resulted in cessation of haemoptysis. The patient was young and showed a rapid recovery post-surgery.

In conclusion patients with massive haemoptysis should be managed in a multidisciplinary team setting. Airway management in life threatening haemoptysis is of a great importance. The management should have a systematic approach and utilisation of expertise from pulmonologists, intensive care team, interventional radiologists and thoracic surgeons

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