Cerebral Infarction Following Wedge Resection of the Lung: Air Embolism or Hypoxia?

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Cerebral infarction, a rare complication, occurred in a patient who underwent a wedge resection of the apex of the right lung. The patient developed haemoptysis and symptoms and signs of acute respiratory distress 4 hours postoperatively and soon lost consciousness. He was resuscitated but remained unconscious and died 2 days later due to extensive cerebral infarction. Postmortem examination of the lung showed a 1-cm long tear in a subsegmental bronchus without any associated major blood vessel lesion. The possible causes of death are discussed.

Case Report
A 40-year-old male retired shipyard worker, cured of chronic alcoholism and drug abuse and treated twice for hepatitis, was referred to the lung clinic for investigation of a rounded opacity in the upper pole of the right lung discovered at a routine X-ray check because of previous exposure to asbestos.

Investigations
Investigations for malignancy made by analysing sputum/bronchial secretion for cytology, bronchoscopy and mediastinoscopy were negative. The patient was then referred to our clinic for exploration. A right thoracotomy was carried out. A large firm lump was palpated in the apex of the right lung and excised by a large wedge resection with application of two clamps. Frozen section revealed inflammatory changes with no malignancy. The resected lung margins were sutured with two rows of continuous non-absorbable sutures. The lung was tested for an air leak and none was present. Haemostasis was secured, the patient drained and the thoracotomy incision closed. The patient was extubated without any problem and his blood gases were normal but 4 h later he suddenly developed severe cough, haemoptysis (about 50 ml blood), began to cramp, became cyanosed and lost consciousness. He was reintubated immediately, a little amount of blood sucked out of his trachea and 100% oxygen was given. The patient regained colour but remained in a deep coma. The blood pressure was maintained and the pulse was palpable during the entire event. His pupils remained dilated and he developed bilateral upgoing plantar responses. A CT scan of the brain on the following day revealed extensive infarcted areas in the right hemisphere. The patient’s neurological status on two separate occasions confirmed brain death and the patient died 2 days following the initial surgery. Postmortem examination revealed an open subsegmental bronchus, 1 cm long, filled
with blood clots and without any open vessel locally. The rest of the respiratory tree was free of blood clots.

The entire brain was considered infarcted and the heart revealed a small area of subendocardial infarction. The histology of the pulmonary lesion was a non-malignant fibrotic healed lesion arising probably from a non-specific infection.

**Discussion**

Cerebral infarction is a rare complication following pulmonary surgical and diagnostic procedures.\(^1\),\(^2\) To the best of our knowledge this is the third published case. The first two cases were reported in 1964 in Russia, and the authors claimed that the cerebral infarction was due to air embolism.\(^2\) However, few reports had been made of air embolism complicating percutaneous needle biopsy\(^1\),\(^3\) and transbronchial biopsy.\(^4\) Air embolism following chest trauma is a well known fatal complication.\(^5\) Air could be introduced into the general circulation via the venous channels as in surgical trauma or decompression.\(^5\) Air emboli may be induced through communications between bronchi and pulmonary veins in association with high intrathoracic pressures due to positive pressure ventilation or coughing which might occur during lung biopsy.\(^3\),\(^4\)

We report a fatal complication of cerebral infarction following a large wedge resection of the upper pole of the right lung. Hypoxia due to airway obstruction by blood clots, was considered as a possible cause of the cerebral anoxia and infarction due to the fact that the complication started as cough and haemoptysis. The bronchial tear discovered at the postmortem examination could have resulted from the high pressure ventilation and was the cause of haemoptysis and the airway obstruction. An alternative possibility is air embolism. However, in the absence of an open pulmonary vein, it is difficult to explain how air entered the pulmonary circulation. Air which leaked out of the bronchial tear might have entered the circulation via the parenchymal capillaries, venules or via an arteriovenous communication under high pressure ventilation.

This patient showed that cerebral infarction can complicate elective pulmonary surgery. It is probably better to avoid a large wedge resection and preferably perform a standard segmentectomy instead. Wedge resection should be confined to superficial pulmonary lesions. In more extensive lesions where local and segmental resection are difficult to perform, lobectomy could be carried out safely. In some instances it is better to avoid using clamps and resect the lesion progressively ligating all vessels and bronchioles as one proceeds. The use of a laser knife in this respect may be practical in achieving instantaneous haemostasis in small parenchymal vessels. A routine bronchoscopy following pulmonary surgery to inspect the airways might also detect active bleeding which then could be managed early. It has been suggested that the avoidance of very high intrathoracic pressures may decrease the occurrence of air embolism following pulmonary diagnostic and surgical procedures.\(^2\) The awareness of the rare possibility of cerebral infarction following pulmonary surgery should mandate the need for extreme care and good technique in sealing all blood vessels and bronchi when doing even a simple procedure such as wedge resection.

**References**