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Case report

Air embolism following bronchoscopy with fine needle aspiration: An unexpected complication

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ABSTRACT

Flexible fibreoptic bronchoscopy with fine needle aspiration is a common procedure, useful in the diagnosis and assessment of lung disease. There are known complications associated with such a procedure that are well documented in the literature. However, there are only four cases of air embolus following fine needle aspiration during bronchoscopy described in the literature. Due to the varying clinical manifestations of the complication, it remains underrecognized by the clinical community and was not described at all by the most recent British Thoracic society 2013 statement on bronchoscopy. The following two case reports describe incidences where air emboli ensued following bronchoscopy with fine needle aspiration. They examine four notable, and arguably avoidable, risk factors that can exacerbate an air embolus and offer guidance on both imaging and treatment for any physician faced with a corresponding clinical picture.

1. Introduction

Flexible fibreoptic bronchoscopy with Fine Needle Aspiration (FNA) of lymph nodes is a widely accepted and safe procedure which is useful in the diagnosis and assessment of lung disease. Minor complications include vasovagal spasm, bleeding and arrhythmias with an incidence of 6.5% [1]. Major complications are much less common but include respiratory arrest, pneumonia, pneumothorax and major bleeding occur at 0.5% [2]. Systemic air embolus is an extremely rare complication of computed topography (CT) guided transthoracic biopsy, reported to be around 0.02%–0.07% [3–6]. In a prospective study of complications following Flexible Fiberoptic Bronchoscopy in 908 patients there were no instances of neurological events [7]. To our knowledge only five cases of air embolus following fibreoptic bronchoscopy have been reported [8–13] (Table 1). Furthermore, in the recent British Thoracic society statement 2013 on bronchoscopy there was no mention of air embolus as a complication of fibreoptic bronchoscopy [14]. We are describing two cases of air embolus causing a cerebral vascular accident because we feel that this complication is under recognised and under reported and can potentially be fatal [10].

2. Case report 1

A 69 year old gentleman was referred to the rapid access unit for recurrent chest infections. It was subsequently noted on CT of the thorax that the patient had an enlarged right hilar lymph node measuring 2.5 × 1.6cm, with multiple mediastinal lymph nodes, as well as evidence of centrilobular and paraseptal emphysema (Fig. 1). He was subsequently referred for bronchoscopic evaluation using a standard (adult size) bronchoscope. FNA was performed using 1.1mm 19-gauge needle.

During the procedure the patient became hypoxemic and unresponsive. Hemiparesis was evident on the left side. A CT brain and CT Intracranial Angiogram, at the time of the event, was reported as no evidence of acute ischaemia or intracranial occlusion. Although, in retrospect, it appears that there was effacement of the cerebral sulcus on the right side, in keeping with acute ischaemia.

The only finding was of air passing through the base of the skull, along the lacerum segment of internal carotid artery (Fig. 2).

AIt was noted that the chest tube was noted to be oscillating with respiration and was no longer bubbling, suggestive of a resolution of the air leak. There was no evidence of bleeding in the chest tube or in the tube site. Moreover, the patient was conversing and had a complete resolution of her shortness of breath and chest pain.

Despite absence of identifiable clot in the middle cerebral artery on the cerebral angiogram the decision was made to thrombolysis the patient based on the severity of the hemiparesis and the identifiable onset of the neurological symptoms. Almost immediately after the thrombolysis was administered haemoptysis ensued. This was further complicated by the patient developing generalised tonic-clonic seizures. Rapid intubation secured the airway.

A repeat CT chest was performed identifying new onset mediastinal haemorrhage (Fig. 3) and evidence of diffuse pneumomediastinum (Fig. 4) which was managed conservatively.

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Abbreviations

CAAE	Cerebral Arterial Air Embolism
COPD	Chronic Obstructive Pulmonary Disease
CT	Computed Topography
FNA	Fine Needle Aspiration
MCA	Middle Cerebral Artery
MRI	Magnetic Resonance Imaging

enable hyperbaric oxygen treatment at this hospital and by the time the patient was stable enough for transfer, their neurological status had improved considerably.

3. Case report 2

69-year-old male with a history of productive cough and recent admission for pneumonia went on to have a CT thorax that reported as a 3 × 2.1 cm soft tissue mass at the right hilum with adjacent hilar

Table 1
Patient profile of who developed CAAE following diagnostic flexible fibreoptic bronchoscopy.

Reference Number	[11]	[10]	[10]	[12]	[13]
Author and year	Dhillon et al., 2004	Azzola et al., 2010	Azzola et al., 2010	Ragey et al., 2013	Goto et al., 2014
Personal Characteristics					
Age	55	60	68	70	69
Sex	Male	Female	Female	Male	Male
Underlying Disease	COPD	N/A	N/A	COPD	N/A
Smoking history (pack years)	N/A	N/A	N/A	30	0
Suspected Disease	Lung Cancer	Lung Cancer	Lung Cancer	Lung Cancer	Lung Cancer
Cavity in the mass	N/A	N/A	N/A	(−)	(−)
Bronchoscopy					
Procedure	TBNA, TBLB	TBNA	TBNA	TBNA	TBNA, TBLB
Bleeding	50ml	N/A	Minor	Little	Middle
Diagnosis, treatment and outcome of CAAE					
Lesion of Infarction	Right frontal	Bilateral	Left-hemi	Right-hemi	Right Postal
Air bubbles in CT images	(+)	(+)	(+)	(−)	(+)
Oxygen delivery	NBO_2	HBO_2	Intubation	HBO_2	HBO_2
Seizure	(+)	N/A	N/A	(+)	(−)
Outcome	100% recovered	Dead	Dead	100% recover	Almost improved

N/A, not available; COPD, chronic obstructive pulmonary disease; IPF, idiopathic pulmonary fibrosis; TBNA, transbronchial needle aspiration, HBO2, hyperbaric oxygen; NBO2, normobaric oxygen.

Haemoptysis resolved within 2 hours spontaneously and seizures ceased in 24 hours after Phenytoin loading. A further 24 hour period saw the patient extubated, regaining full consciousness, with no cognitive impairment and minimal residual left-sided hemiparesis. Repeat CT brain showed some subtle effacement of the gyral pattern in the right cervical hemisphere over the vertex but no low-density change in brain parenchyma. However, subsequent Magnetic Resonance Imaging (MRI) found right cerebral hemisphere watershed ischaemia with foci of acute infarction, consistent with the left-sided hemiparesis demonstrated. It was concluded in retrospect that this was an air embolus (Fig. 5).

Stroke rehabilitation was performed, and full recovery was made within two weeks. A repeat CT thorax showed no progression of his mediastinum lymphadenopathy, thus excluding any possibility of malignant lesion of the node. Unfortunately, there were no facilities to

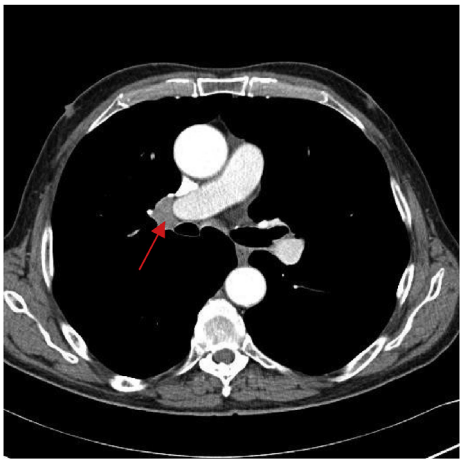

Fig. 1. Enlarged right hilar lymph node measuring 2.5 × 1.6cm.

lymphadenopathy and mild pulmonary fibrosis on CT thorax (Fig. 6). Due to a history of bowel cancer, with sigmoid colectomy two months prior, there was a concern for metastases to the lungs. FNA was performed using 1.1mm 19-gauge needle.

The patient became hypoxemic on the table and became unresponsive. Reversal of Midazolam sedation was attempted with no marked response. Similarly, to the first case, there were no facilities to enable hyperbaric oxygen treatment at this hospital. However, the patient did regain consciousness, but suffered a left-sided hemiparesis.

CT brain and CT angiogram intracranial showed marked evidence of pneumocephalus in the right middle cerebral artery (MCA) and within the extra-axial space on the right side, characteristic of air emboli (Fig. 7).

Similarly to the first case, the patient made a full recovery with the assistance of a physiotherapist and occupational therapist within a week and due to a lack of adequate facilities, the patient was not treated with hyperbaric oxygen therapy but rapid neurological improvement was observed clinically.

4. Discussion

A small number of air emboli cases feature in the literature, but it is said that the number is underreported as asymptomatic patients will go undiagnosed [6,15]. We feel that our two cases are instructive in this respect as they highlight this potential, albeit rare, risk of bronchoscopy. In doing so, physicians will become increasingly aware of it but also aware that a full recovery can be made. There is a wide spectrum of possible presenting symptoms that a patient can manifest with, thus making diagnosis difficult [3,4]. In fact, in our first case we felt that the patient had suffered an acute ischaemic cerebrovascular accident, that was not a direct consequence of the bronchoscopic procedure. The patient was thrombolysed as per acute stroke guidelines as we did not recognise air embolus as aetiology until we reviewed the case retrospectively [16]. Therefore, it is vital that physicians are mindful of and