

## CASE REPORT

## An unusual cause of a fall: an unusual presentation of lung carcinoma

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**SUMMARY**

An 80-year-old gentleman presented with a fall and subtle symptoms suggestive of a cerebellar lesion, on a background of hemiparesis due to a previous cerebral vascular accident. On admission it was thought that changes on a chest radiograph were consistent with a community-acquired pneumonia. A CT of the head showed a space-occupying lesion in the right cerebellum with surrounding oedema. A previous MRI of the brain performed 8 months earlier for investigation of dementia showed evidence of this lesion although it was significantly smaller and without midline shift; however, this had not been discussed on the MRI report. A subsequent CT of the thorax confirmed a thick-walled cavitating mass in the left upper lobe, with biopsy of this lesion and bronchial washings showing metaplastic and atypical cells suggestive of adenocarcinoma. This report highlights both the importance of accurate imaging reporting, even of incidental findings, and the insidious nature of lung malignancy and its broad clinical presentation.

**BACKGROUND**

- ▶ Highlights the insidious nature of lung malignancy, and its broad presentation in clinical practice.
- ▶ Highlighted the importance of accurate radiology reporting and awareness of the importance of incidental findings on radiological investigations.
- ▶ Differential diagnoses of falls in the elderly.
- ▶ Differentials of a cavitating mass in the lung.

**CASE PRESENTATION**

An 80-year-old gentleman presented following a fall to the floor, which had occurred from a sitting position while the patient was at prayer. Witnesses to the fall report that the patient did not lose consciousness, and did not have convulsive activity although they believed that the patient did lightly hit his head on the floor. The patient had complained of headaches and a sensation of 'fullness in the head' over the preceding week. He did not feel nauseous, and his headache seemed to be a dull ache that was constant and independent of position or movement. The patient denied any visual disturbance, denied dizziness or vertigo, and had not noted any limb weakness or problems in mobilising himself in comparison to normal. However, his family had noted that he was becoming increasingly unsteady on his feet and that his gait had deteriorated, with a tendency to fall to the right. In addition, the family had also observed that over the

preceding few weeks the patient had intermittently been unable to fully open his left eye. The patient had also experienced a cough with yellow sputum production in the week before admission, but denied fevers or sweats. Neither he nor his family had noticed any weight loss. On systems review no notable cardiovascular, urinary or abdominal symptoms were discovered.

The patient's medical history included a right-sided cerebrovascular accident leaving a mild left side residual weakness. There was also a history of Alzheimer's dementia, along with bilateral deafness. The patient also suffered from hypertension, hypercholesterolaemia, benign prostatic hypertrophy and glaucoma. There was no history of tuberculosis. The patient currently lives with his family at home, who had noticed a general deterioration in his level of independence over the month prior to admission. They felt that he was beginning to require some assistance with the activities of daily living, and now required a stick to mobilise. The patient had never consumed alcohol, had a 50-pack-year history of smoking but had stopped smoking about 10 years previously. He had previously worked in an industrial factory, although it was unclear as to whether he may have been exposed to asbestos.

On examination of the patient, his respiratory rate was 17 and his saturations were 96% on room air. His pulse was 78 bpm, with a blood pressure of 138/68 mm Hg and he was afebrile. He was noted to have coarse crackles in the left lung in the lower and mid-zones. Cardiovascular examination revealed an ejection systolic murmur. His abdominal examination was unremarkable and there was no palpable cervical, axillary or inguinal lymphadenopathy.

Examination of the cranial nerves revealed horizontal nystagmus to the right and his left eyelid was reported as droopy. Other than his known hearing impairment, there was no other cranial nerve lesion. His upper limb examination revealed evidence of mild proximal weakness (4/5) consistent with the patient's previous cerebral vascular accident (CVA). There was no noted sensory deficit or loss of joint position sense. There was some evidence of dysmetria in the upper as well as lower limbs, worse on the right than the left. He was noted to have an unsteady gait on mobilisation which was difficult to classify, and was positive for Romberg's sign to the right side.

**INVESTIGATIONS AND TREATMENT**

Admission blood tests showed a normocytic anaemia (haemoglobin 10.9 g/dL, mean corpuscular volume 85 fL), raised white cell count



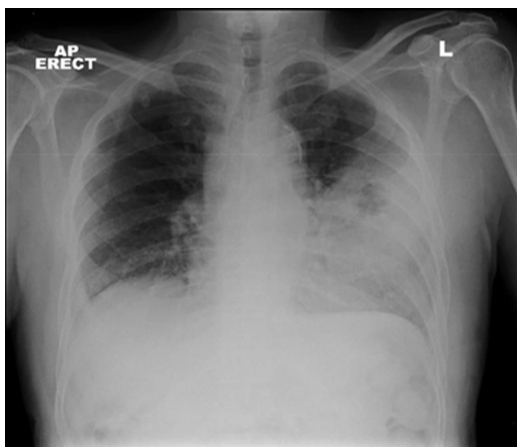
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( $12.2 \times 10^9/L$ ) with predominant neutrophilia ( $9.2 \times 10^9/L$ ). His C reactive protein was mildly elevated (38.2 mg/L). His renal function was at baseline, with creatinine 165 mg/dL, urea 8.3 g/dL and calculated epidermal growth factor receptor 37 mL/min/ $1.73 \text{ m}^2$ . Liver function tests showed bilirubin 7 mg/dL, alkaline phosphatase 101 mg/dL, alanine transaminase 9 units/L, albumin 29 g/dL. A bone profile was normal with corrected calcium of 2.26 mg/dL and phosphate 1.1 mg/dL.

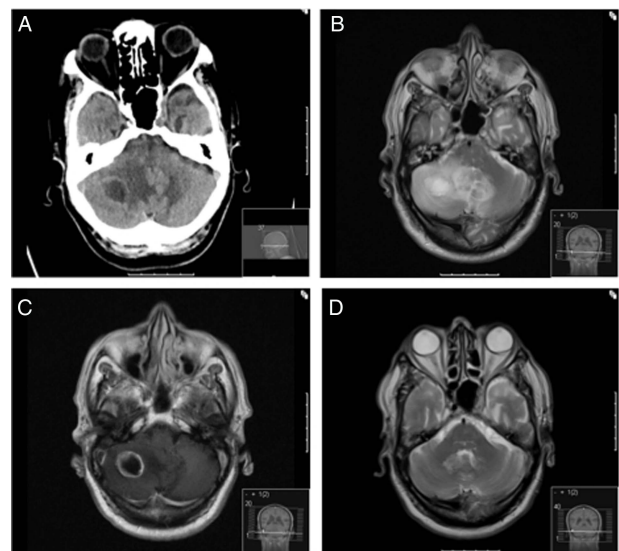
A urine dipstick test had some evidence of mild proteinuria (protein 1+) but did not reveal any evidence of infection. His admission chest radiograph (figure 1) was interpreted as showing consolidation in the left mid and lower zones, in keeping with a diagnosis of community-acquired pneumonia. The patient was empirically started on co-amoxiclav and clarithromycin, in keeping with local hospital and BTS guidelines.

The patient's new onset nystagmus and gait instability was investigated using a non-contrast CT of the head. This revealed an ill-defined, low-density lesion within the right cerebellar hemisphere measuring approximately 2.5 cm in diameter (figure 2A). There was evidence of midline shift of the cerebellum, and surrounding oedema, but no evidence of hydrocephalus was seen. Old lacunar infarcts were noted in the basal ganglia and there was evidence of periventricular change. There was no evidence of intracranial haemorrhage, collection or cerebral infarct.

Following neurosurgical advice MRI of the brain was obtained (figure 2B, C), and the patient was started on high-dose dexamethasone to reduce oedema and decrease the risk of occlusion of the fourth ventricle. T1-weighted postgadolinium MRI of the head showed a 2.5×2 cm ring-enhancing lesion at a similar level. There was extensive vasogenic oedema, midline shift of the medulla oblongata and some compression on the fourth ventricle. Old areas of ischaemia and generalised cerebral atrophy were identified in keeping with previous imaging. Retrieval of archived radiological images revealed MRI of the brain that had been performed 8 months previously, for investigation of the patient's dementia. An ill-defined 15 mm slightly hyperintense lesion involving the right superior cerebellar peduncle could clearly be seen on MRI of the brain taken at this time (figure 2D), however it was not commented on in the formal radiology report and was not noted by the clinicians reviewing MRI of the brain imaging. Hence the lesion was noted to have significantly expanded in the interceding 8 months, during which time the patient had not undergone further investigation or treatment.



**Figure 1** Anteroposterior chest radiograph taken on admission in August 2013, showing extensive left basal consolidation.



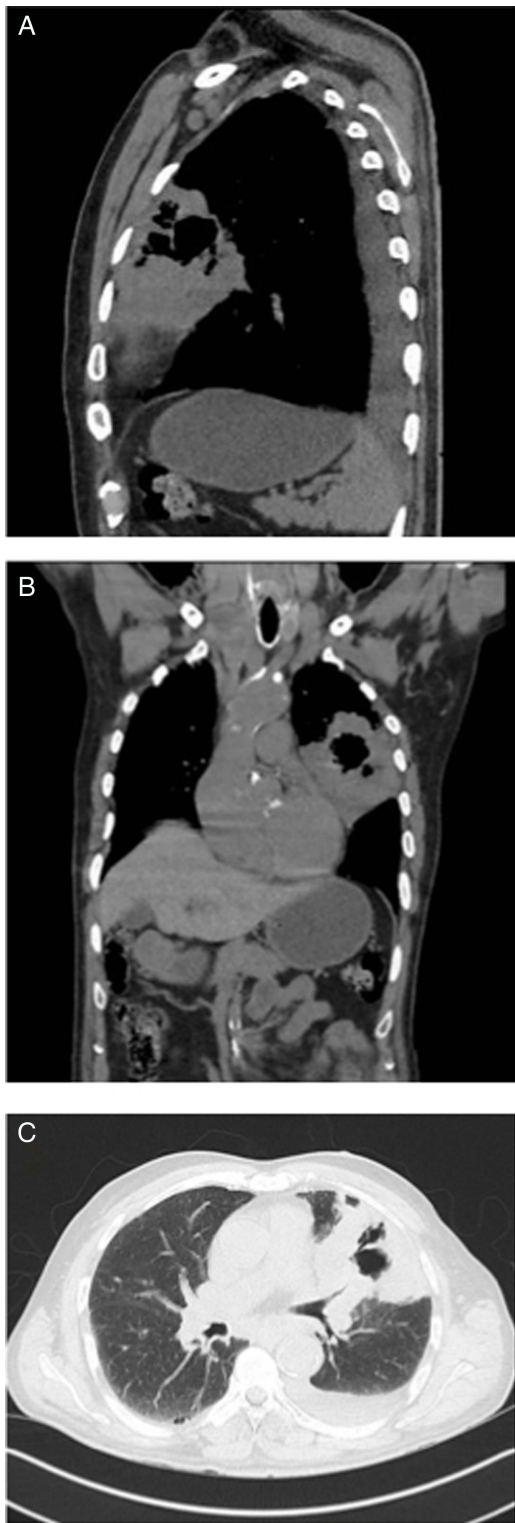
**Figure 2** (A) A non-contrast CT of the head obtained in August 2013, showing a large ill-defined low-density lesion involving the right cerebellar hemisphere with extensive vasogenic oedema and midline shift of the medulla oblongata. (B) Axial T2-weighted (T2W) MRI of the brain at the level of the posterior fossa showing a large ill-defined right cerebellar mass with surrounding vasogenic oedema and midline shift, obtained in August 2013. Compared to the previous MRI, the lesion is occupying a larger volume and there is an increase in the surrounding oedema. (C) Axial T1W postgadolinium MRI of the brain at the level of the posterior fossa showing a ring-enhancing 2.5 cm lesion with surrounding vasogenic oedema causing mild midline shift, also obtained in August 2013. (D) Axial T2W image through the posterior fossa showing an ill-defined 15 mm slightly hyperintense lesion involving the right superior cerebellar peduncle, taken in January 2013.

Given the range of differential diagnoses, the patient underwent a CT of the thorax, abdomen and pelvis. CT of the thorax revealed a cavitating lesion measuring 7×5 cm in the left upper lobe (figure 3A–C) with the presence of mediastinal lymphadenopathy. There was also a moderate left-sided pleural effusion. The patient underwent a bronchoscopy under the respiratory physicians for grading of the presumed malignancy. Bronchial washings revealed large atypical cells suggestive of adenocarcinoma with accompanying neutrophil polymorphs. Bronchial biopsies showed focal squamous metaplasia but no granulomatous inflammation, dysplasia or malignancy.

### DIFFERENTIAL DIAGNOSIS

The potential differential diagnosis for the brain imaging in isolation includes a primary brain lesion such as an astrocytoma, glioma, haemangioblastoma or lymphoma or a secondary brain tumour with an unknown primary.<sup>1</sup> A tuberculoma or brain abscess are also possible differentials,<sup>2, 3</sup> although are less likely given the appearance of the mass on radiological investigations. In addition, toxoplasmosis can occasionally cause a single lesion<sup>4</sup> and is found in the context of the late phase of HIV infection.

The differential diagnosis of a cavitating lesion in the lung alongside a ring-enhancing lesion in the cerebellum includes malignancy, tuberculosis and abscesses that have seeded to multiple sites.<sup>5</sup> Furthermore, there is the possibility of dual pathology, with no histopathology sample available from the cerebellar lesion. However, given the radiological imaging,



**Figure 3** (A) Axial, (B) coronal and (C) sagittal sections of CT of the thorax (August 2013) showing a 7×5 cm thick-walled cavitating mass in the left-upper lobe and a moderate-sized left pleural effusion.

histopathology specimens and patient's significant smoking history as well as possible asbestos exposure, it was felt that the findings were most likely to represent a primary lung malignancy with metastasis to the cerebellum. Ziehl-Nielsen staining was negative, and there was no growth in blood or sputum cultures for *Mycobacterium*.

#### OUTCOME AND FOLLOW-UP

Following discussion at a respiratory multi-disciplinary team (MDT), the patient was diagnosed as having stage III lung cancer with a radiological staging T3N3M1. It was felt that this malignancy was most likely an adenocarcinoma, and given the patient's comorbidities that a palliative approach was most suitable. The patient responded to the high-dose dexamethasone treatment from a neurological point of view, and did not undergo palliative radiotherapy. He was discharged home once medically fit to the on-going care of his family, with regular oncology and palliative care follow-up.

#### DISCUSSION

One in three people over 65 years old falls each year,<sup>6</sup> and falls remain the leading cause of fatal and non-fatal injury in this population of patients.<sup>7</sup> Elderly patients frequently present to hospital following a fall, and it is recognised that there are a large number of conditions that can precipitate such events, including pathology such as stroke, epileptic activity, vasovagal syncope, musculoskeletal disease and the side effect of medication as a consequence of polypharmacy.<sup>8,9</sup> Elderly patients are particularly susceptible to deterioration or delirium following infection,<sup>10</sup> and this accounts for a large proportion of geriatric patients seen by acute medical teams.<sup>11</sup> Often the precise cause for a patient's fall may remain elusive, and thorough investigation is needed to try to determine the underlying pathology. Investigation of patients who have fallen should include postural blood pressure measurements, 12-lead ECG, blood tests including full blood count, renal profile, bone profile, blood sugar measurement and septic screen.<sup>12</sup> Further investigations may include an echocardiogram, ambulatory blood pressure and ECG recording, brain imaging, tilt table testing and may follow on from the results of initial investigation results. It is important to ensure that elderly patients have their medication rationalised to try to reduce the risks associated with polypharmacy.<sup>13</sup>

This case highlights how a fall can be caused by an unusual and unsuspected pathology. Furthermore, new neurological disease can be difficult to diagnose on the background of previous or underlying known disease. Hence it is important that every patient presenting with a fall should undergo a complete neurological examination by the responsible clinicians.<sup>12</sup> In this instance, the patient's previous CVA and dementia possibly delayed diagnosis of his underlying condition, as the family had attributed his deterioration to his existing conditions.

Lung malignancy is frequently insidious in nature, and this case report highlights the incidental presentation of such patients to clinicians. Hence lung malignancy is often diagnosed late in its course,<sup>14</sup> with such patients having a worse prognosis than if they were diagnosed at a less advanced stage. As such, clinicians should be aware of the importance of early diagnosis and remain vigilant against this disease. BTS guidelines reinforce the importance of repeated investigation to confirm that consolidation on chest radiographs is attributable solely to an infective process,<sup>15</sup> and does not represent underlying malignancy. In this patient, the chest radiograph was initially interpreted as representing a community acquired pneumonia, and only subsequent CT imaging confirmed the presence of a cavitating lung mass with pleural effusion. Diagnosis of lung malignancy is also complicated by difficulties in obtaining a tissue diagnosis, with some patients being too unwell to undergo invasive procedures. Samples obtained during bronchoscopy are also not necessarily diagnostic, with brushing and biopsy samples having a diagnostic rate of above 80%.<sup>16</sup>

Previous case reports and published literature illustrate that lung cancer can present as a brain metastases, with only neurological symptoms and no evidence of pulmonary disease.<sup>17</sup> Other case reports in the literature highlight that lung carcinoma can present with unusual radiological features.<sup>18–20</sup> Lung malignancy frequently metastasises to the brain, and although the cortex is predominant as the site for metastatic disease it is known that metastases can involve the cerebellum.<sup>21 22</sup> This can occur as a single metastatic lesion, or as one of a number of sites of metastatic disease. In this case, the opportunity for an earlier diagnosis was missed. MRI of the brain from early 2013 did not report on the presence of the cerebellum lesion, and was undertaken for investigation of the patient's dementia. Clinicians reviewing the imaging in an outpatient setting did not recognise the abnormal appearance of the cerebellum, and therefore further investigation at an earlier time was not undertaken. It is difficult to determine whether the patient's clinical course and outcome was affected by the delay in diagnosis. Given the presence of the patient's concurrent medical comorbidities and the metastases that had already occurred on the earlier MRI, it is likely that this patient would have received similar management. However, this is not always the case and as such it remains crucial that radiological images are reviewed thoroughly and not solely in the context of the current clinical condition. These findings should be communicated to and acted upon quickly by the responsible clinical teams. Furthermore, clinicians should review radiology imaging and be familiar with interpretation of gross abnormalities on complex imaging within their specialty. As such, radiology teaching at undergraduate and postgraduate level remains invaluable with modern medical practice utilising radiological techniques more frequently.

### Learning points

- ▶ Falls in the elderly should be thoroughly investigated especially if presenting with sinister symptoms.
- ▶ Chest malignancies may be relatively asymptomatic until an advanced stage, and clinicians should be vigilant for extrapulmonary signs and symptoms.
- ▶ Incidental lesions consistent with malignancy should be investigated quickly and thoroughly, as per the 2-week wait guidelines.
- ▶ Malignancies may have a delayed presentation especially in patients with cognitive impairment(s) and sensory deficit(s) due to the difficulty in verbalising symptoms.

**Contributors** X-YK carried out the literature review and wrote the original submitted article. CH edited the original manuscript and obtained consent for the publication of the manuscript. X-YK and CH obtained radiological images for publication. MF aided in the collection of radiology images and provided specialist advice on the radiological findings. SL was the Consultant responsible for the care of the patient and edited the manuscript.

**Competing interests** None.

**Patient consent** Obtained.

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