

# Referred shoulder pain in a patient with small cell lung cancer

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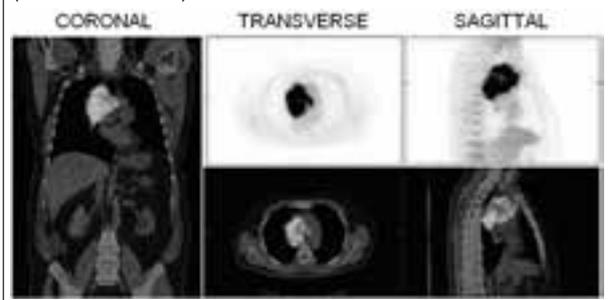
## CASE REPORT

A 60-year-old man with no relevant medical history presented at the respiratory outpatient clinic with shortness of breath. Chest X-ray showed a large mass in the upper mediastinum and the patient was referred for FDG-PET/CT for staging of suspected lung cancer. FDG-PET/CT showed a large central tumour in the right lung attached to a large mediastinal mass (both FDG avid), without distant metastases (*figure 1*). During bronchoscopy a large ulcerating tumour was seen at the carina, partly obstructing the right main bronchus.

Histology revealed small cell lung cancer (SCLC) and the patient was staged as having limited disease, cT4N2Mo (International Association for the Study of Lung Cancer, 7th edition). During the next two months, the patient was treated with chemoradiotherapy plus prophylactic brain radiation. Follow-up CT chest two weeks after completion of therapy showed partial remission of the tumour.

After eight months, the patient complained of fluctuating pain in both shoulders, decreased appetite and weight loss. Diagnostic procedures were repeated (X-rays of shoulders

**Figure 1.** FDG-PET/CT showing a large central tumour in the right lung attached to a large mediastinal mass (both FDG avid), without distant metastases



and lumbar spine and extensive biochemistry) and were considered normal. Chest CT showed further decrease of the thoracic tumour.

## WHAT IS YOUR DIAGNOSIS?

See page 206 for the answer to this photo quiz.

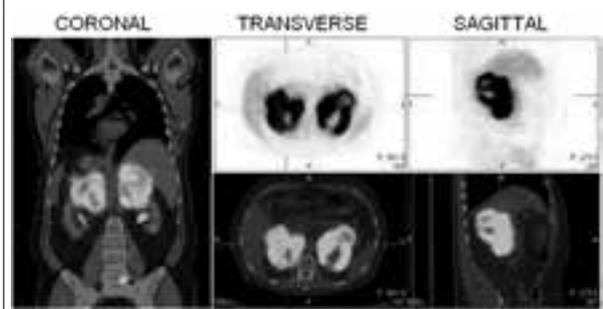
## DIAGNOSIS

Repeated FDG-PET/CT displayed enhanced FDG uptake in extremely enlarged adrenal glands (11 x 11 cm on both sides) and focal FDG uptake in the lumbar spine (L5), consistent with metastases (figure 2). The adrenal glands could not be palpated at physical examination.

Endoscopic ultrasound guided fine-needle aspiration of the left adrenal gland was positive for metastasis of small cell lung cancer. The patient was thus diagnosed with extensive disease and treated with carboplatin/etoposide. Subsequently, the adrenal lesions decreased considerably in size on CT. Simultaneously, the pain in the shoulders disappeared. Both the time relation and the absence of local abnormalities of the shoulders support the hypothesis that the adrenal metastases caused the pain, as a result of excitation of the diaphragm. Thus, the pain in the shoulders is to be considered 'referred pain'.<sup>1</sup>

Shoulder pain can be attributed to a wide array of causes as shown in table 1.<sup>1</sup> Referred shoulder pain has been documented to be due to several aetiologies, one of which is diaphragmatic excitation related to several documented causes as shown in table 2.<sup>1</sup> Viscera abutting against the pleural or peritoneal surface of the diaphragm can cause referred pain to the ipsilateral shoulder. Excitation of the diaphragm or the adjacent areas of pleura or peritoneum will stimulate the roots originating from the phrenic nerves, i.e., the third, fourth, and fifth cervical nerves. Since these nerves innervate the skin of the neck, supraclavicular area, and shoulders, pain may be perceived in these areas.<sup>2</sup>

**Figure 2.** PET/CT displayed enhanced FDG uptake in extremely enlarged adrenal glands (11x11cm on both sides) and focal FDG uptake in the lumbar spine (L5), consistent with metastases



**Table 1.** Causes of shoulder pain

Trauma (contusion, fracture, rupture, AC-joint separation or injuries, rupture of rotator cuff)
Infection and inflammation (arthritis, capsulitis, bursitis, tendinitis)
Impingement syndrome
Anterior and posterior shoulder instability
Shoulder-hand syndrome
Local arterial, venous or lymphatic occlusion
Thoracic outlet syndrome
Hyperabduction syndrome
Costoclavicular syndrome
Myalgias and arthralgias
Psychogenic pain
Sleep dysesthesias
Congenital or developmental abnormalities
<b>Neoplasm, primary or metastatic</b>
<b>Referred pain</b>

**Table 2.** Documented causes of referred shoulder pain

Apical lung cancer (Pancoast's syndrome)
Cervical radiculopathy and brachial neuritis
Angina pectoris / myocardial infarction, or both
Diaphragmatic irritation:
- Biliary disease
- Myocardial infarction
- Blood or gas in peritoneal or pleural cavity
- Subphrenic abscess
- Splenic trauma
• Lower lobe pleuropulmonary inflammation
• Neoplasm
→ <b>Adrenal metastases</b>

To the best of our knowledge this is the first documentation of adrenal gland metastases as a cause of referred shoulder pain. This case exemplifies the potential role of FDG-PET in restaging of lung cancer,<sup>3</sup> as repeated physical examination and diagnostic procedures of the thorax and bones did not reveal a diagnosis. Eventually, the FDG-PET/CT clarified the pain in the shoulders most likely to be referred pain due to diaphragmatic excitation by the adrenal metastases.

## REFERENCES

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3. Vansteenkiste J, Fischer B, Doooms C, Mortensen J. Positron-emission tomography in prognostic and therapeutic assessment of lung cancer: systematic review. Lancet Oncol. 2004;5:531-40.