NDT Plus (2010) 3: 461–464
doi: 10.1093/ndtplus/sfq091
Advance Access publication 20 May 2010

NDT PLUS
Nephrology Dialysis Transplantation

Case Report

Progressive renal failure in a patient with lung adenocarcinoma

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Abstract

We present an interesting case of a young female smoker who was hospitalized for shortness of breath and acute renal insufficiency (serum creatinine = 2.8 mg/dL). Few weeks prior to admission, she was discovered to have a right lung mass, and a biopsy confirmed lung adenocarcinoma. Her work-up revealed an unremarkable urinalysis quantitatively and on microscopic analysis. Renal ultrasound demonstrated enlarged bilateral unobstructed kidneys, while a nuclear scan showed increased activity in both kidneys. Renal biopsy established the diagnosis of diffuse metastatic infiltration of both kidneys from primary lung adenocarcinoma. Her renal function worsened despite initiation of chemotherapy. Carcinomatous infiltration of the kidneys is an extremely rare and unusual cause of renal injury that must be suspected in a patient with cancer and large kidneys.

Keywords: acute renal failure; lung adenocarcinoma; metastasis

Background

Acute kidney injury in a patient with known malignancy can occur due to pre-renal causes (gastrointestinal losses or capillary leak), immunologic (membranous glomerulopathy, amyloidosis or vasculitis), infiltrative process (lymphoma, metastasis or renal cell carcinoma), toxic (chemotherapy, radiation therapy or nephrotoxic agents), metabolic (tumour lysis syndrome or hypercalcaemia), tubular or extra-renal obstruction (intratubular uric acid deposits or lymphadenopathy) [1]. We present an interesting case of a young female with extensive infiltration of both kidneys due to metastasis from primary lung adenocarcinoma that caused progressive renal failure.

Case report

A 51-year-old female was hospitalized for shortness of breath on exertion for 2 days. She had no prior history or risk factors for kidney disease but was taking daily ibuprofen (1600–2400 mg p.r.n.) over the past 7 months for chronic neck pain. She had been smoking one pack of cigarettes daily for the past 35 years. Four weeks prior to admission, she developed fever and a cough productive of mucoid sputum. At that time, a chest radiograph revealed a 7-cm right middle lobar and hilar mass with right pleural effusion, and her serum creatinine (SCr) was 1.7 mg/dL. After completing a course of cefuroxime, a transbronchial biopsy of the lung mass and mediastinal lymph nodes revealed primary poorly differentiated lung adenocarcinoma with positive immunohistochemical staining for thyroid transcription factor-1 (TTF-1) and presence of the K-ras mutation.

On admission, her physical exam was normal except for decreased breath sounds at the right lung base with dullness to percussion and bilateral pedal oedema. No lymphadenopathy, flank mass or tenderness was appreciated. Laboratory work revealed microcytic anaemia (haemoglobin = 8.3 g/dL), a further elevation in SCr (= 2.8 mg/dL) and unremarkable urinalysis (1+ dipstick albumin, 1 red blood cell/high power field, no casts and spot urine protein:creatinine ratio = 0.88 g/g). Other laboratory results were unremarkable (serum calcium = 8.8 mg/dL, serum uric acid = 7.6 mg/dL, absolute eosinophil count = 800/mm^3, normal complement C3 and C4 levels, urine sodium = 17 mEq/L, anti-nuclear antibody 1:400 speckled, and negative serum immunofixation). Her symptoms improved with blood transfusion and pleural drainage of 1000 mL serous fluid. She had a renal ultrasound (Figure 1) that showed enlarged kidneys (right 15.1 cm and left 15.4 cm), lack of corticomedullary differentiation with no pelvicalyceal dilatation or hydronephrosis.

A positron emission tomography scan (PET, Figure 2) done for staging showed increased tracer uptake in the right middle lobe of the lung (peak standard uptake value, SUV = 8.4), lymphadenopathy (left supraclavicular, paratracheal, mediastinal, subcarinal, retrocrural, paracaval, para-aortic and peripancreatic) and bilateral enlarged kidneys with heterogeneous uptake in the cortices (peak SUV = 8.5). An ultrasound-guided renal biopsy was performed to determine if the renal mass was due to renal cell carcinoma or metastases. We found sheets of tumour cells re-

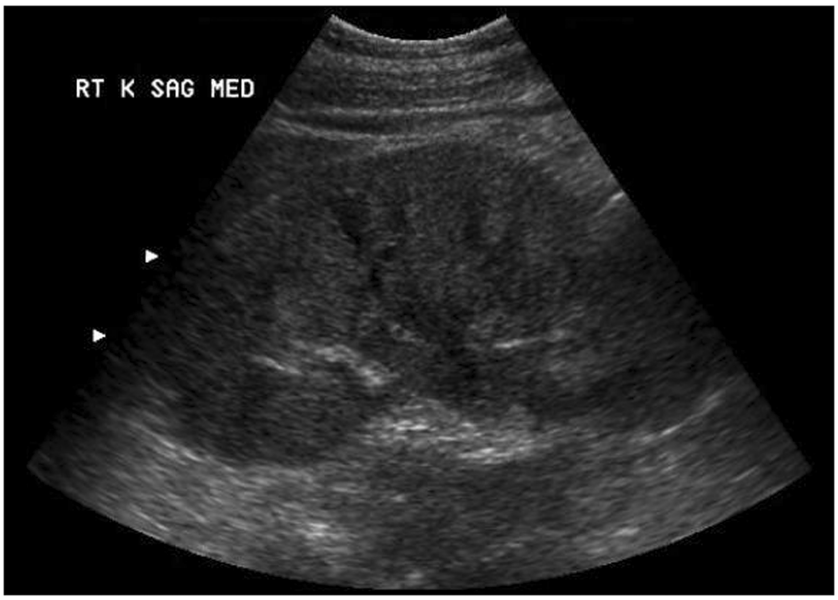

Fig. 1. Ultrasonographic imaging of right kidney showing enlarged size with no evidence of obstruction.

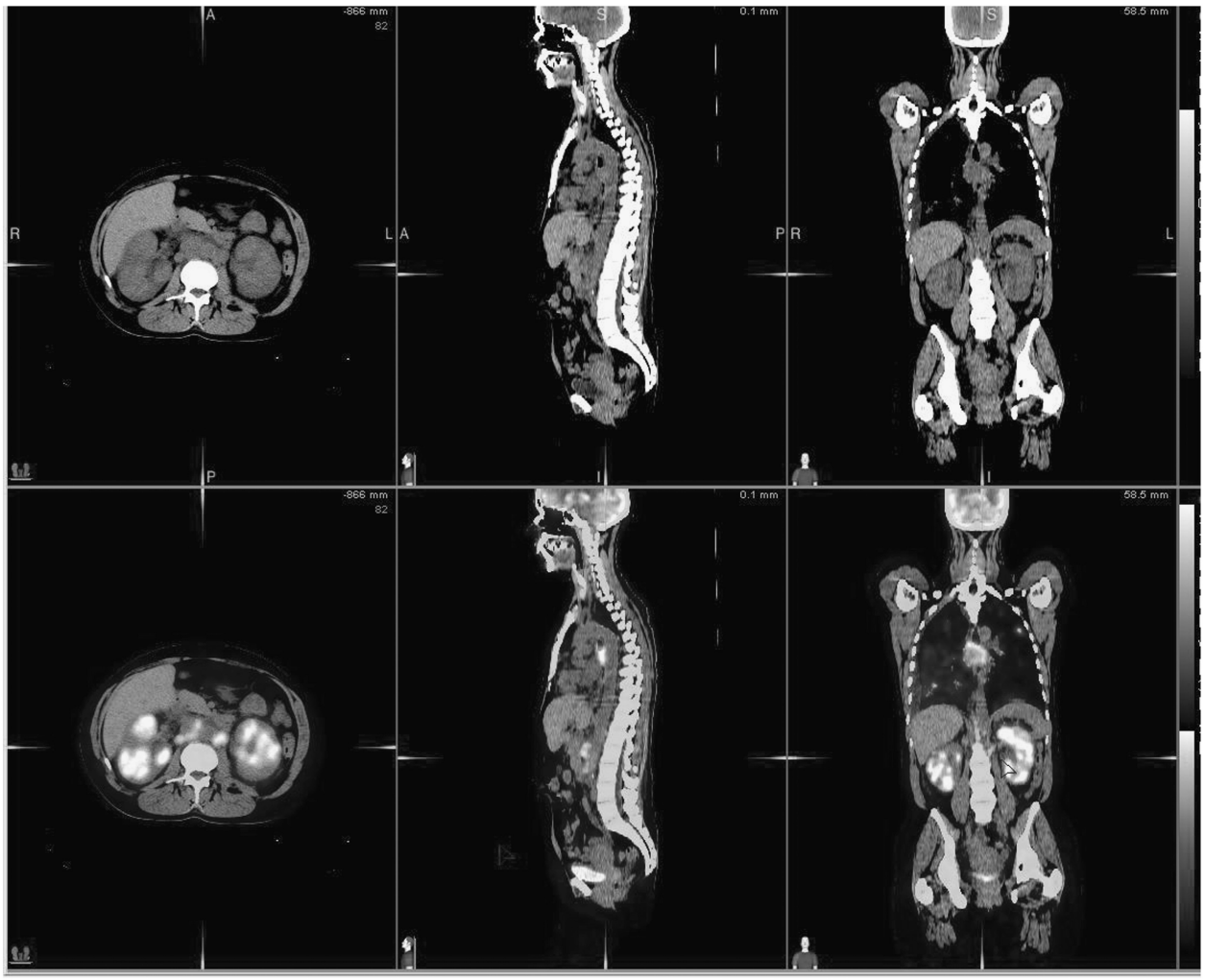

Fig. 2. PET scan showing increased tracer uptake in right lung and diffusely in both kidneys.

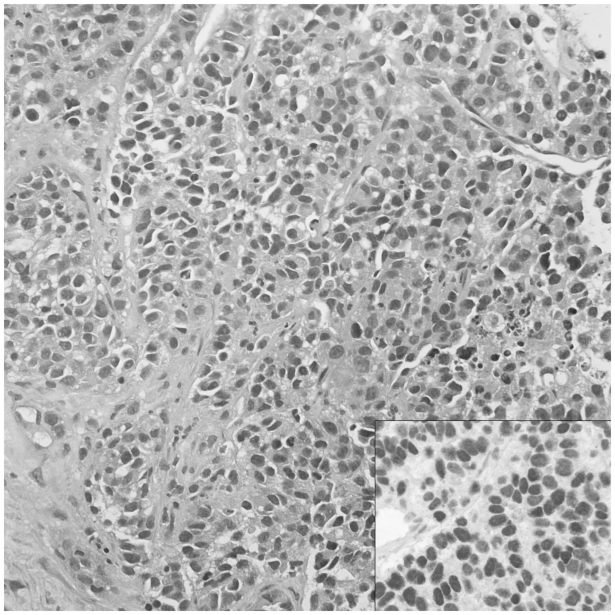

Fig. 3. Light microscopy (×40 magnification) of renal tissue showing extensive infiltration with tumour cells from primary lung adenocarcinoma. Inset shows positive immunohistochemical staining with TTF-1. The glomeruli and tubules are almost indistinguishable due to the extensive tumour infiltration.

placing ~70% of the renal interstitium (Figure 3) with positive TTF-1 staining and presence of intracellular lumina morphology similar to the lung adenocarcinoma. Three glomeruli with atrophic tubules were negative for all immunoreactants (IgG, IgA, IgM, C3, C1q, fibrinogen, albumin, κ and λ). Diffuse metastatic infiltration of both kidneys from primary lung adenocarcinoma (stage IV) was confirmed. She received one cycle of palliative non-nephrotoxic chemotherapy with paclitaxel 175 mg/m^2 and gemcitabine 1000 mg/m^2 (both administered on Day 1 and 8). Two weeks later, she had progression of renal failure (SCr = 4.5 mg/dL) and developed uraemic encephalopathy and pruritus (blood urea nitrogen = 129 mg/dL), and the family requested home hospice care.

Discussion

Malignant neoplasms of the kidney are more likely to be due to metastatic tumour from another site rather than primary renal cell carcinoma, with autopsy studies showing the former in up to 12% of cancer patients [2]. The most common primary sites of malignancy metastasizing to the kidneys include haematologic malignancies (lymphoma or leukaemia); lung, breast or gastrointestinal cancers; or malignant melanoma [2]. Renal metastases usually manifest as bilateral, small, multifocal parenchymal nodules, though single exophytic lesions have also been described [3]. Metastatic disease in the kidneys is frequently seen in the setting of widespread disseminated disease and thus has a poor prognosis [2]. Clinically, these tumours may be asymptomatic, though some cause flank pain, haematuria or proteinuria [2].

Diffuse infiltration of both kidneys with metastatic primary tumour cells causing impairment of renal function is very unusual and rare. This histopathological presentation has been seen in up to 10% of patients with lymphoma with good response to chemotherapy [2]. However, only three earlier case reports in the medical literature describe a similar presentation of renal metastases from primary lung cancer (small cell [4], squamous cell [5] or adenocarcinoma [6]) manifested as bilateral kidney infiltration, progressive renal failure, poor response to chemotherapy and death.

Our case is unusual due to the presence of severe degree of diffuse metastases of the lung carcinoma to both kidneys in the absence of extra-pulmonary metastasis to any other solid organ (other than lymphadenopathy). Thus, we considered other causes for diffuse bilateral renal infiltration such as lymphoma, bilateral renal-cell carcinoma [7], renal sarcoma [8] or benign causes such as acute glomerulonephritis, acute interstitial nephritis, bilateral pyelonephritis, multiple myeloma or amyloidosis [9]. Renal biopsy provided the definitive diagnosis and confirmed the presence of lung metastases. Radiation therapy to the kidneys in this setting would require markedly higher doses (80–90 Gy) than that typically required to treat renal lymphoma (20–30 Gy) which would cause radiation nephritis [10]. Unlike lymphoma, chemotherapy is usually not effective in this stage of lung cancer as in our patient and in other case reports [4–6], and this portends a poor prognosis. In our case, progressive renal failure from lung metastases occurred primarily by parenchymal distortion and tubular destruction by tumour cells, though obstruction from sloughed parenchyma or tumour, vascular invasion and injury with thrombosis, or lymphatic obstruction is also possible [4]. Finally, tubulointerstitial nephritis due to chronic non-steroidal anti-inflammatory drug use may have contributed to her renal injury but was possibly mild or masked by the infiltrative tumour process.

Our case highlights an extremely rare presentation of lung adenocarcinoma with metastasis and invasion of the kidneys causing irreversible renal failure. Renal metastases should be suspected in a patient found to have multiple renal lesions and a history of non-renal primary carcinoma. Diffuse metastatic infiltration is unusual and can be identified by PET scan, while renal biopsy provides pathological confirmation of this process. Chemotherapy or radiation therapy should be considered, as it may reverse the renal injury if the tumour responds to these treatment strategies.

Conflict of interest statement. None declared.

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Received for publication: 24.4.10; Accepted in revised form: 27.4.10