Pulmonary Kaposi's sarcoma in patients with acquired immune deficiency syndrome: a clinicopathological study

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ABSTRACT Pulmonary Kaposi's sarcoma may contribute to respiratory dysfunction in patients with acquired immune deficiency syndrome (AIDS) and features of pneumonitis. Opportunistic infections are readily recognised in endoscopic material, but pulmonary Kaposi's sarcoma is easily missed, so that patients are deprived of specific treatment. The clinical and pathological findings from nine cases of pulmonary Kaposi's sarcoma have been reviewed; these were found among 84 patients with AIDS and pneumonitis undergoing fibreoptic bronchoscopy and bronchoalveolar lavage. Diagnosis was established before death in eight patients (in five by bronchial biopsy and in three by open lung biopsy). Examination of lavage fluid showed alveolar haemorrhage in six patients. It is concluded that: (1) fibreoptic bronchoscopy may be useful in the diagnosis of endobronchial lesions of Kaposi's sarcoma; (2) alveolar haemorrhage in patients with AIDS is suggestive of pulmonary Kaposi's sarcoma. Factors that may cause difficulties in diagnosis include the focal nature of some lesions and the pleural or parenchymatous location of others. In addition, in the lung as in the skin, the early stages of Kaposi's sarcoma resemble granulation tissue. Such lesions are far more difficult to recognise than is the late nodular stage.

The epidemic of Kaposi's sarcoma in young homosexual men first described in 1982 is now well established.\(^1\) In patients with AIDS Kaposi's sarcoma is a multicentric neoplastic process that frequently affects lymph nodes and the gastrointestinal tract. Lesions may also occur in the lung\(^2\) and are a cause of pulmonary infiltrates and respiratory failure. Accurate diagnosis is essential because chemotherapy or radiotherapy appears to provide palliation.\(^3\) Bronchopulmonary Kaposi's sarcoma, however, is often diagnosed at necropsy rather than by bronchial or transbronchial biopsy.\(^4\) Since asymptomatic sarcomas\(^7\) are not the sole cause of this discrepancy, there is a need to review the clinical and pathological approach to diagnosis.

During the past five years we have had the opportunity to study nine cases of pulmonary Kaposi's sarcoma. Diagnosis was established before death in eight patients, five of whom were diagnosed by bronchial biopsy and three by open lung biopsy. We report here the clinicopathological features of these cases, with emphasis on the findings obtained by fibreoptic bronchoscopy, and the difficulties encountered in diagnosis.

Methods

During the past five years up to December 1985 eight patients with AIDS and pneumonitis were referred for bronchoscopy. All patients met the diagnostic criteria for AIDS defined by the Centers for Disease Control.\(^8\) During bronchoscopy examination of the tracheobronchial tree was followed by bronchoalveolar lavage and biopsy of suspected lesions.

Pertinent clinical data were obtained from the clinical records. All the material from the selected patients was reviewed, and consisted of 14 specimens of lavage fluid and material from six bronchial biopsies, three pleural biopsies, six open lung biopsies, and one necropsy.

Bronchoalveolar lavage cytocentrifuge slide preparations were stained with Giemsa and methenamine silver for performing differential cell counts and detecting opportunistic infections. In addition, the
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Clinical and pathological features of nine patients with pulmonary Kaposi's sarcoma

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<th>Extrathoracic Kaposi's sarcoma</th>
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*Late stage.
†Early stage.
C—characteristic; UC—uncharacteristic; S—suggestive; N—normal; ND—not done.

Haemosiderin content of alveolar macrophages was estimated on Perls' stained slides on a three point scale as follows: 1+ = faint blue staining; 2+ = medium colour intensity; 3+ = deep blue staining.

The histological sections were studied with haematoxylin-eosin-safran, methenamine-silver, and Perls' stains. Three open lung biopsy specimens were embedded in plastic resin and stained with Giemsa and Masson's trichrome. Samples were also fixed in glutaraldehyde and embedded in Epon for electron microscopy.

Results

Bronchopulmonary Kaposi's sarcoma was diagnosed histologically in nine of the 84 patients, 34 of whom had extrapulmonary sarcomas. In a further three patients with suggestive or characteristic bronchoscopic appearances, the diagnosis could not be confirmed histologically.

Clinical Features

The mean age of the patients was 35.7 (SEM 3.0) years. Eight were homosexual men, and one man, from Zaire, had had frequent sexual contact with African prostitutes.

All but one patient had cutaneous or mucocutaneous Kaposi’s sarcoma and six patients also had sarcoma affecting lymph nodes or gastrointestinal tract or both (table). The mean duration of cutaneous disease before diagnosis of bronchopulmonary Kaposi’s sarcoma was 10.2 (SEM 2.7) months (range 1–23 months). In four patients the cutaneous lesions were stable, but in four others the lesions were rapidly growing. The patient with neither mucocutaneous nor visceral extrathoracic Kaposi’s sarcoma when the lung sample was taken had had Pneumocystis carinii pneumonia 16 months before. One month after presentation, however, a cutaneous biopsy showed the early patch stage of Kaposi’s sarcoma.

Fig 1 Kaposi's sarcoma in bronchial biopsy specimen: nodular stage. Spindle cells in strands and some capillary or slit like vessels are seen.

*Haematoxylin and eosin.*
Respiratory signs and symptoms included cough in five cases, dyspnoea in eight and haemoptysis in one. Radiologically, there was a diffuse infiltrate in seven cases and a localised infiltrate in two. In five patients infiltrates had been present three months before bronchoscopy. Eight patients were afebrile but one, with bacterial pneumonia, had a temperature of more than 38°C. Pleural effusions were present in three patients, two of whom underwent decortication for recurrent effusion. At thoracentesis the fluid was haemorrhagic on each occasion. Pleural biopsies showed no abnormality.

BRONCHOALVEOLAR LAVAGE FLUID
Alveolar haemorrhage was diagnosed in six patients (table) on the basis of numerous (more than 30%) haemosiderin laden macrophages in the lavage fluid. In the fluid from the other 78 patients, of whom three had pathologically documented pulmonary Kaposi sarcoma, iron was either absent or minimal. There was no significant difference in percentage of lymphocytes in the lavage fluid from the nine patients with pulmonary Kaposi's sarcoma and in that from 60 other patients with AIDS. Candida was present in fluid from one patient, and cytomegalovirus and Mycobacterium tuberculosis were cultured from another.

ENDOSCOPIC APPEARANCE AND BRONCHIAL BIOPSIES
Fibreoptic bronchoscopy showed multiple, discrete, raised, violaceous, or bright red tracheobronchial
lesions, which were considered characteristic in six patients and suggestive in one. In one other patient we observed lesions were not suggestive, although biopsy was diagnostic. The tracheobronchial tree was normal in one patient.

Bronchial biopsy was diagnostic in five patients. In two cases lesions were at the late nodular stage (fig 1), the histological appearance varying from fibroblastic lesion to angiomatous lesion with transitional areas. In three other cases the changes were more discrete and consisted of lesions at the early patch or plaque stages (fig 2), on the basis of Ackermann's criteria. Characteristic lesions were found in some sections only. There was an increase in the number of the capillary vessels in the lamina propria, and careful examination showed that some were irregularly shaped with jagged, angular outlines. Such vessels were found near an intact surface epithelium or more deeply situated, sometimes interlaced with the cells of the muscle coat. The capillaries were lined by a single layer of cells showing no nuclear atypia or mitotic activity, and were often wide or filled with crushed endothelial cells. These vessels were surrounded by prominent spindle cells, sometimes forming rudimentary fascicles, or by rounded cells resembling endothelial cells. A few plasma cells were also present; haemosiderin deposits were observed in all three cases and extravasated red cells in one.

**OPEN LUNG BIOPSY**

Kaposi's sarcoma lesions affected the lung parenchyma alone in two cases, predominantly the pleura.
in two, and both parenchyma and pleura in one. In
the parenchyma there was a tendency for spreading to
occur along interlobular septa and bronchovascular
connective tissue, where tumour cells frequently sur-
rounded the outer part of the periarterial adventitia
and invaded the lamina propria of bronchi. In the
distal parenchyma the interstitium was infiltrated,
and type 2 pneumocytes were entrapped in the more
advanced lesions with obliteration of the air spaces.
In addition to fully developed angiomatosus or
fibroblastic tumours, lesions at the early patch stage
were occasionally seen in interlobular septa and periar-
terial fibrous tissue (fig 3).

Associated changes included haemosiderosis in two
cases and exogenous lipid pneumonia with mild cyto-
megalovirus pneumonitis in one (fig 4). In this case,
where there was also a heavy lymphoid infiltrate, the
histological picture was initially misinterpreted as
interstitial pneumonitis. In two other cases there were
focal lymphoid infiltrates in bronchovascular connect-
tive tissue pathways and interlobular septa in areas
unaffected by Kaposi's sarcoma.

Electron microscopy confirmed the differentiation,
at least in part, of lesions at their late stage into capill-
ary vessels lined by a single layer of endothelial cells
and surrounded by spindle shaped cells. Ultra-
structural examination was also helpful in showing
erythrophagocytosis by endothelial or fibroblast-like
cells. This infrequent finding, together with differen-
tiation into capillaries, was observed in periar-
terial adventitia, where numerous extravasated red
blood cells and spindle cells permeating the interstices
between collagen bundles suggested an early stage
Kaposi's sarcoma (fig 5).

TREATMENT
Four patients had been treated previously for extra-
 thoracic lesions. One benefited from successful pleu-
ral decortication. Initial chemotherapy (α interferon
or VP16 (etoposide)) was changed to etoposide or
bleomycin in two patients who did not respond to
their initial treatment, but they died four and seven
months later. One received palliative treatment with
vinblastine and was seen without respiratory symp-
toms seven months later. Among patients who
received treatment for lung lesions, α interferon or
etoposide was effective in reversing the pulmonary
morbidty in two. These patients died of toxo-
 plasmosis or aspiration pneumonia three and 18
months later.

NECROPSY
Diagnosis was made only at necropsy in one case. The
lungs weighed 1250 and 970 g. Violaceous nodules
measuring 0.5 cm in diameter affected the pleura, the
parenchyma, and the tracheobronchial tree. Histolog-
ically, there were mature fibroblastic or angiomatosus
lesions, but no opportunist infection or alveolar
haemorrhage was seen. Lesions were also found in
retroperitoneal and mediastinal lymph nodes, and in
the upper gastrointestinal tract with foci of mural
haemorrhage.

Discussion
The present study shows that pulmonary Kaposi's
sarcoma may be recognised in living patients with
AIDS and pneumonitis. This complication should be
suspected in patients with recurrent pleural effusions
or occult alveolar haemorrhage revealed by bronchial
alveolar lavage. Definite diagnosis of cases with
endobronchial lesions may be established when
adequate tissue samples are obtained during
fibroptic bronchoscopy. Pathologists should be
aware of the existence of early patch or plaque
lesions, which are more difficult to diagnose than the
late nodular stage.

Pulmonary Kaposi's sarcoma is not confined to
terminally ill patients, and there is no relationship
between pulmonary Kaposi's sarcoma and the extent
or pace of progression of cutaneous disease although
a pulmonary presentation without concomi-
tant extrathoracic lesions has seldom been
reported. Although the clinical features and
radiographic changes seen in the various lung disor-
ders associated with AIDS tend to be non-specific,
and although P carinii pneumonia is slowly
progressive in this condition, patients with opportu-
nist infections usually present with fever and with
pulmonary infiltrates of short duration. By contrast
five of our patients were afebrile, and presented with
infiltrates of about three months' duration.

Pleural effusions are an unusual finding in patients
with AIDS, and seem to be associated with the lesions
of pleural Kaposi's sarcoma. Such effusions are blood-
stained and unresponsive to medical treatment.

Pleur effusion in one of our patients without
Kaposi's sarcoma was due to Mycobacterium tubercu-
losis infection. Owing to the patchy nature of
the lesions, pleural Kaposi's sarcoma lesions cannot be
diagnosed reliably by closed pleural biopsy, and the
diagnosis is usually made from tissue obtained during
decortication.

Bronchoalveolar lavage is a safe method of assess-
ing alveolar cell content and may be helpful in
revealing occult alveolar haemorrhage, which is an
important complication of Kaposi's sarcoma in
volving the lung. Severe pulmonary haemorrhage
on the other hand, may be associated with either bac-
terial pneumonia (due to Pseudomonas or Staphy-
llococcus) or Kaposi's sarcoma. Although alveolar
haemorrhage may also occur in thrombocytopenic
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patients, we believe that this finding greatly increases the likelihood of pulmonary Kaposi's sarcoma. In our study alveolar haemorrhage was found only in patients with pulmonary Kaposi's sarcoma, and this should be suspected when alveolar haemorrhage is diagnosed in patients with extrathoracic tumours. Moreover, in cases of known pulmonary Kaposi's sarcoma, alveolar haemorrhage may point to an active and life threatening disease. Absence of alveolar haemorrhage, however, does not exclude pulmonary Kaposi's sarcoma, particularly when the endoscopic appearance is suggestive.

Lavage is also useful in diagnosing opportunistic infections in AIDS. Our failure to demonstrate opportunistic infections in nearly all our patients underlines the contribution of Kaposi's sarcoma to pulmonary dysfunction, and indicates that a nondiagnostic lavage suggests a process other than an opportunistic infection.

Lymphocytosis is observed in lavage fluid from patients with AIDS, whether or not opportunistic infection is present. Since there is no difference in the lymphocyte content of lavage fluid from patients with and without Kaposi's sarcoma, infiltration of the tumour alone cannot explain the presence of the lymphocytes. Such lymphocytosis may be related to the mild lymphoid infiltrates in bronchovascular connective tissue and interlobular septa in two of our patients. A larger and sometimes nodular lymphoid infiltration in these areas has been named pulmonary lymphoid hyperplasia, and we have observed this in the biopsy material from one patient with the AIDS related complex. In this case it was associated with an infiltration of lymphocytes bearing the T8 phenotype into many of the vescera, and with an excess of T8 lymphocytes in lavage returns.

Bright red or violaceous endobronchial lesions are characteristic of Kaposi's sarcoma. To obtain adequate specimens for diagnostic purposes, careful examination of the bronchi is important because Kaposi's sarcoma lesions are focal and discrete, and may easily be overlooked; but also the bronchi may appear normal. Although the vascular appearance of the lesion and of excessive bleeding may cause reluctance to take a sufficiently large sample, excessive bleeding did not occur after biopsy of lesions in any of our patients.

In patients with endobronchial lesions, fully developed nodular lesions can be diagnosed with confidence, but difficulty is encountered in making the diagnosis at earlier stages. As Ackermann pointed out, however, the patch or plaque stage of Kaposi's sarcoma is distinctive, although the recent increased incidence of aggressive Kaposi's sarcoma may cause a tendency toward overdiagnosis. It should be emphasised that there are no specific or unequivocal cytological markers of Kaposi's sarcoma. Granulation tissue may mimic the early stages, and some non-specific scars show a prominent vascular proliferation with a plasma cell infiltrate, erythrocyte extravasation, and haemosiderin pigment. In some instances the histological picture may not be diagnostic because of crush artefacts and the small size of the tissue sample. The earliest changes (patch stage) are characterised by dilated, irregularly shaped, thin walled, jagged vessels lined by endothelial cells. These vessels are surrounded by a sparse mononuclear cell infiltrate, which tends to increase as the lesion progresses. The presence of abnormally shaped vessels, especially those with irregular, jagged outlines, is the best single criterion for diagnosis of Kaposi's sarcoma in its early stage, a clue to diagnosis which may easily be missed.

The patch stage of Kaposi's sarcoma was also recognised in open lung biopsy sections and it was confirmed by the electron microscopic findings. Although open lung biopsy appears to be more effective than transbronchial biopsy in establishing diagnosis, we recommend fibreoptic bronchoscopy as a more useful alternative approach in these patients. Fibreoptic bronchoscopy allows detection of alveolar haemorrhage, and bronchial biopsy of suspected lesions can be successful. Moreover, in cases consistent with pulmonary Kaposi's sarcoma, a highly characteristic endoscopic appearance may make it less crucial to establish a histological diagnosis. Since lavage is extremely effective as a means of detecting opportunistic infections, antimicrobial treatment, which is known to have many serious side effects in patients with AIDS, may be withdrawn. Fibreoptic bronchoscopy with lavage is more easily repeated than open lung biopsy, which should not be considered unless there is some alteration in the clinical picture.

Finally, attempts to reach a diagnosis are justified by the clinical improvement that can be observed after specific treatment. Response to treatment does not represent lasting remission, and a response is unlikely to occur in patients in whom extrathoracic lesions have already been found to be resistant to treatment.

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