this patient's CD4+ T-lymphocyte depletion, including HIV infection. Thus, our patient with idiopathic CD4+ T-lymphocytopenia had suffered from miliary tuberculosis with acute respiratory failure.

Acknowledgement

The authors are indebted to Dr N. Yoshihara, Japan National Institute of Health for testing by Western blot and enzyme immunoassay for antibody against HIV-2.

References


Diagnosis of pulmonary veno-occlusive disease: new criteria for biopsy


*Sección de Neumología, Hospital de Conxo
†Servicio de Cardiología, Hospital Xeral de Galicia
‡Servicio de Anatomía Patológica, Hospital Xeral de Galicia, Complexo Hospitalario Universitario de Santiago, Santiago de Compostela, Spain
§Servicio de Neumología, Hospital Universitario La Paz, Madrid, Spain

Introduction

Pulmonary veno-occlusive disease (PVOD) is a rare condition in which the predominant anomaly is the stenosis or occlusion of the lumen of small pulmonary veins due to fibrosis of the intima (1). Its aetiology is unknown, although it is sometimes associated with viral infection, environmental toxins, chemotherapy, autoimmune disease, use of contraceptives, intracardiac shunts or radiation injury, and some cases suggest genetic predisposition (2). In spite of a variety of therapies having been tried, it is usually fatal within a few years; lung transplant is currently the treatment of choice. Its definitive diagnosis requires demonstration of the above-mentioned anatomopathological features in pulmonary biopsy material, although pulmonary biopsy is not always possible. The diagnostic difficulties associated with three cases of PVOD seen in our centre in recent years have led us to examine what clinical criteria constitute sufficient grounds for carrying out pulmonary biopsy to confirm PVOD.

Case Reports

For all three patients, cardiac and pulmonary circulation parameters measured by cardiac catheterization are listed in Table 1, and pulmonary function parameters in Table 2.
TABLE 1. Haemodynamic parameters of three patients with pulmonary veno-occlusive disease

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA (mmHg)</td>
<td>28</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>RV (mmHg)</td>
<td>95</td>
<td>75</td>
<td>68</td>
</tr>
<tr>
<td>Pulmonary artery (mmHg)</td>
<td>94/47/65</td>
<td>75/30/45</td>
<td>68/23/38</td>
</tr>
<tr>
<td>Pulmonary capillary wedge pressure (mmHg)</td>
<td>35</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>LV (mmHg)</td>
<td>135/4</td>
<td>140/5</td>
<td></td>
</tr>
<tr>
<td>CO (l/min)</td>
<td>3.2</td>
<td>6.45</td>
<td></td>
</tr>
<tr>
<td>CI (l/min/m²)</td>
<td>2.38</td>
<td>3.83</td>
<td></td>
</tr>
<tr>
<td>Total pulmonary resistance (dyn s⁻¹ cm⁻⁵)</td>
<td>1625</td>
<td>471</td>
<td></td>
</tr>
</tbody>
</table>

RA, Right atrium; RV, right ventricle; LV, left ventricle. CO, cardiac output; CI, cardiac index.

TABLE 2. Pulmonary function parameters of three patients with pulmonary veno-occlusive disease, with expression as a percentage of the theoretical value in parentheses

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (ml)</td>
<td>2180 (94%)</td>
<td>2050 (62%)</td>
<td>2400 (62%)</td>
</tr>
<tr>
<td>FEV₁ (l)</td>
<td>1600 (98%)</td>
<td>1230 (49%)</td>
<td>1360 (46%)</td>
</tr>
<tr>
<td>FFV₁ (%)</td>
<td>74 (70)</td>
<td>60 (75)</td>
<td>56 (76)</td>
</tr>
<tr>
<td>DlCO (ml/min/mmHg)</td>
<td>86</td>
<td>22</td>
<td>102</td>
</tr>
<tr>
<td>DVA (%)</td>
<td>79</td>
<td>29</td>
<td>127</td>
</tr>
</tbody>
</table>

CASE 1

A 69-year-old woman was admitted for investigation of dyspnoea that had developed over several years, was currently experienced at rest and was accompanied by orthopnoea and swollen lower extremities. Physical examination revealed central and peripheral cyanosis, jugular dilation at 45°, and foveal malleolar oedemas. Blood biochemistry and haematology were normal. Chest radiography and computed tomography (CT) scans showed cardiomegaly and prominent pulmonary hila, and the CT scans also showed smooth interlobular septal thickening and ground glass opacity. Arterial blood gas parameters at admission were as follows: \( \text{PaO}_2 \), 57 mmHg; \( \text{PaCO}_2 \), 31.3 mmHg; and pH 7.46 breathing room air. Enlargement of right heart cavities was suggested by electrocardiography and confirmed by echocardiography, which also showed tricuspid insufficiency and severe pulmonary artery hypertension (PAHT). Left ventricular systolic and diastolic function were normal. Pulmonary perfusion gammagrapy results were normal. Pulmonary angiography showed a poor peripheral vascular tree on both sides, with diffuse stenosis of the pulmonary veins. Lower limb venography results were normal. In lingular biopsy material obtained by minithoracotomy, venous lumina were partially occluded due to fibrosis of the intima and associated recanalized thrombi (Plate 1). PVOD was diagnosed. The biopsy material also showed alterations typical of PAHT (reduced arterial lumina due to fibrosis of the intima).

CASE 2

A 58-year-old man admitted on account of dyspnoea had been hospitalized on numerous occasions since diagnosis of chronic obstructive pulmonary disease (COPD) 4 years previously. Prior to diagnosis of COPD he had smoked 20 cigarettes a day; since then he had suffered dyspnoea in response to mild effort and had had home oxygen treatment. In the days preceding his latest admission he had an irritant cough, dyspnoea at rest, and swollen lower extremities. Physical examination revealed obesity, jugular dilation at 45°, disseminate rhonchi with basal crackle on both sides, and foveal malleolar oedemas. Blood biochemistry and haematology were normal. Chest radiography showed cardiomegaly and bilateral alveolar pattern, which responded to diuretic therapy and oxygen (Plate 2). Chest CT scans showed smooth interlobular septal thickening, ground glass opacity, enlarged central pulmonary arteries and pulmonary veins of normal caliber. Arterial blood gas parameters at admission were as follows: \( \text{PaO}_2 \), 53 mmHg; \( \text{PaCO}_2 \), 40 mmHg; pH 7.34. Enlargement of right heart cavities was suggested by electrocardiography and confirmed by echocardiography, which also showed normal left ventricular structure and systolic and diastolic function. Pulmonary perfusion gammagrapy showed hypoperfused...
CASE REPORTS

PLATE 2. Postero-anterior chest radiographs of the Case 2 patient, showing (a) cardiomegaly and bilateral alveolar pattern, and (b) improvement of same after treatment with diuretics and oxygen.

regions in both lung bases. Pleural fluid biochemistry was typical of a transudate. The apnoea/hypoapnoea rate in a polysomnogram was three per h. In ligular biopsy material obtained by minithoracotomy, pulmonary venous lumina were partially occluded due to fibrosis of the intima and fibrous thickening of the wall. PVOD was diagnosed.

CASE 3

A 51-year-old man who smoked 20 cigarettes a day and had a daily alcohol intake of 120 g was admitted on account of dyspnoea. Bronchial asthma had been diagnosed 5 years previously, and he currently suffered exertional dyspnoea in response to mild effort and had home oxygen treatment. In the days preceding admission he had had dyspnoea at rest, paroxysmal nocturnal dyspnoea, cough and purulent sputum. Physical examination revealed central and peripheral cyanosis and jugular dilatation at 45°; auscultation revealed greatly diminished ventilation and disseminate rhonchi and wheezing. Blood biochemistry and haematology were normal. Chest radiography showed cardiomegaly, Kerley B lines and bilateral pleural effusion, which responded to diuretic therapy and oxygen. Chest CT scans showed smooth interlobular septal thickening, enlarged central pulmonary arteries, pulmonary veins of normal caliber and bilateral pleural effusion. Arterial blood gas parameters at admission were as follows: \( \text{PaO}_2 \), 35 mmHg; \( \text{PaCO}_2 \), 83 mmHg; pH 7.33; bicarbonate 44 mmol l\(^{-1}\); BE 18 mmol l\(^{-1}\); \( \text{SaO}_2 \), 60%. Enlargement of right heart cavities was suggested by electrocardiography and confirmed by echocardiography, which also showed tricuspid insufficiency and normal left ventricular structure and systolic and diastolic function. Pulmonary perfusion gammagraphy results were normal. In pulmonary biopsy material obtained by minithoracotomy, venous lumina were partially occluded due to fibrosis of the intima and fibrous thickening of the wall. PVOD was diagnosed.

Discussion

PVOD is a rare cause of PAHT which usually, although by no means exclusively, affects children or young adults. Its aetiology is unknown. Its definitive diagnosis requires histological proof of extensive occlusion of small pulmonary veins due to fibrosis and proliferation of the intima (1). However, since the clinical situation of patients with this almost invariably fatal disease is generally critical, the performance of biopsy is only justified if clinical findings obtained non-invasively suggest PVOD with high probability.

PVOD patients generally have a history of progressive dyspnoea, which in some cases is associated with orthopnoea, paroxysmal nocturnal dyspnoea or syncope. Clinical signs of right cardiac insufficiency may be present, and inspiratory crackles due to pulmonary congestion are often audible upon auscultation of the chest. Chest radiography shows a prominent right ventricle, dilated pulmonary arteries and Kerley’s B lines. Electrocardiograms suggest enlargement of the right ventricle and/or deviation of the axis to the right, while echocardiography shows increased right ventricular systolic pressure and the absence of left cardiac lesions such as pulmonary vein stenosis, mitral stenosis or cor triatrium. Haemodynamic measurements show PAHT (with increased pressure in both the pulmonary artery and the right ventricle); but pulmonary capillary wedge pressure may be either high or normal (3). Left atrial pressures are normal.

All three of our patients presented the above features. Although older than is usual for reported PVOD patients, their ages did not exclude PVOD; several authors have reported isolated cases of PVOD patients aged more than 50 years (2, 4–7), and all three of the patients described by Palevsky et al. (3) had ages similar to those of our patients. In fact, it seems plausible that PVOD may be considerably more prevalent among mature and elderly adults than is commonly thought, given the ease of misdiagnosis as COPD when advanced age coincides with factors such as smoking.

In view of the characteristics described above, it has been suggested (4) that when pulmonary biopsy is not possible, PVOD may be diagnosed on the basis of the coincidence of severe PAHT, radiologically demonstrated pulmonary
congestion and normal pulmonary capillary wedge pressures. However, these three signs can also coincide in cases of atrial mixoma, in which the patient may have intermittent pulmonary oedema during episodes of mitral obstruction but show normal pulmonary artery wedge pressure when there is no obstruction. Furthermore, as already noted, pulmonary capillary wedge pressure can be normal in some PVOD cases. We have accordingly reconsidered the effects of PVOD in order to define a modified set of criteria which can be determined without resorting to any invasive procedure and whose fulfilment constitutes sufficient grounds for considering it desirable to perform pulmonary biopsy to confirm PVOD.

Absence of PAHT clearly rules out PVOD. PAHT can almost always be detected by Doppler echocardiography; almost all patients with PAHT exhibit tricuspid insufficiency due to the structural and functional alterations of the right ventricle secondary to the increased right ventricular afterload caused by PAHT (8), and continuous wave Doppler measurements of the maximum tricuspid regurgitation velocity allow calculation of the systolic pressure in the pulmonary artery [correlation with values measured by means of pulmonary artery catheterization is excellent (9)]. Furthermore, pulsed Doppler monitoring of pulmonary artery flow velocity clearly differentiates normal pulmonary artery pressures from PAHT; the former produce dome-like velocity profiles with a sharp peak in early systole and decreased acceleration time (10).

The high pressures in the pulmonary veins and capillaries of PVOD patients cause the appearance of radiological signs of postcapillary hypertension and pulmonary congestion, and the absence of these signs rules out PVOD. In their presence, the absence of left atrial dilatation differentiates PVOD from congestive heart failure (11). In addition, PVOD causes no redistribution of blood flow to higher regions of the lung, whereas mitral stenosis causes redistribution of circulation and interstitial and alveolar oedema.

For diagnosis of PVOD, alteration of left cardiac function must be ruled out as a cause of observed pulmonary hypertension. Normal pulmonary capillary wedge pressure is an indirect and imperfect indication of the absence of left cardiac lesions: the wedged catheter senses the pressure in the large pulmonary veins, which are generally unaffected by PVOD (4); but if the large veins are affected, then pulmonary capillary wedge pressure can be above normal, which in the absence of other information would suggest left ventricular alterations rather than PVOD. It is accordingly desirable to rule out alterations of the left heart by a more direct technique such as echocardiography. M mode, two-dimensional and Doppler echocardiography together allow accurate evaluation of the structure and function of both cavities and of the mitral and aortic valves (12,13); in particular, the existence of hypertrophy and/or dilatation can be investigated directly, as can the existence of valvular stenosis and/or regurgitation, and transvalvular pressure drops and valve orifice areas can be quantified.

Another ultrasound technique that might assist diagnosis of PVOD when the large pulmonary veins are affected (although we know of no case in which it has been used for this purpose) is transoesophageal pulsed Doppler echocardiography. Although usually employed for diagnosis of cardiopathies affecting the left heart, this technique has also revealed stenosis of the large pulmonary veins, both by direct visualization of the stenosis and by demonstrating the consequent accelerated flow (14). However, this technique seems unlikely to be of much use if PVOD affects only venules and small veins, in which case it would probably show just non-specific acceleration at the entry to the left atrium.

Greater potential for diagnosis of PVOD appears to be shown by chest CT. Swensen et al. (15) recently found that in seven out of eight PVOD cases CT scans showed thickening of interlobular septa that correlated with biopsy findings of septal fibrosis and associated venous sclerosis, and that in all eight cases the CT scans showed regions of ground glass opacity (possibly due to the thickening of alveolar septa and associated hyperplasia of lining epithelium). Swensen et al. (16) suggest that no disease other than PVOD produces these CT signs in conjunction with CT signs of enlarged central pulmonary arteries, pulmonary veins of normal calibre and pleural effusion. The CT scans of our three patients showed thickened interlobular septa, enlarged central pulmonary arteries and pulmonary veins of normal calibre, but only two showed ground glass opacity and only one pleural effusion. Clearly, consideration of a larger number of cases will be necessary for proper assessment of the diagnostic value of these CT signs. Spiral CT scans and magnetic resonance (MR) images may also prove useful for diagnosis of PVOD, although we know of no case in which these techniques have been used for this purpose.

In conclusion, we suggest that a tentative diagnosis of PVOD sufficiently well-founded to justify confirmatory pulmonary biopsy can be achieved by non-invasive methods (basically chest radiography and conventional and Doppler echocardiography), the relevant diagnostic pattern being the coincidence of severe PAHT, radiological evidence of pulmonary oedema and the absence of any alteration of left cardiac structure or function. Unlike previous criteria (4), these conditions rule out the existence of atrial myxoma. Future studies should establish the value of high resolution CT, spiral CT, MR imaging and transoesophageal echocardiography for noninvasive diagnosis of PVOD.

References

Transient cortical blindness: a complication of bronchial artery embolization

S.-F. Liu*, T.-Y. Lee†, S.-L. Wong*, Y.-F. Lai* AND A.-S. Lin*

*Division of Chest, Department of Internal Medicine and †Division of Radiology, Chang Gung Memorial Hospital, Kaohsiung, Taiwan, R.O.C.

Introduction

Bronchial artery embolization is an effective therapeutic alternative for the treatment of severe haemoptysis, especially when conservative treatments fail or when patients are not good candidates for surgery (1). Some complications of bronchial artery embolization have been reported in the literature including chest pain, ectopic deposition of coil and embolization of other vessels, left main bronchial stenosis or infarction (2), bronchoesophageal fistula (3), spinal cord injury (4), fatal ischaemic colitis (5), and transient pulmonary infarction after complete pulmonary artery and bronchial artery embolization (6). There is even one report in the literature of left bronchial-to-coronary artery communication, seen on a follow-up postembolization angiogram (7), thus the potential for myocardial infarction with bronchial embolization also exists. To our knowledge, this is the first report of cortical blindness following bronchial artery embolization in the English literature.

Case Report

CASE 1

A 29-year-old male was admitted to our hospital emergency room because of persistent haemoptysis for 2 days. He had a history of pulmonary tuberculosis and underwent left lower lobe lobectomy for bronchiectasis in 1990, as well as a bronchial artery embolization for recurrent haemoptysis in 1991. Because of continued haemoptysis after conservative treatments during this hospitalization, a secondary bronchial artery embolization was performed. Angiogram through bilateral bronchial arteries injection via right femoral artery approach revealed dilated and tortuous hypervascularization over the bilateral lung field, with blood supplied from the left inferior and right bronchial artery. [Plate 1(a) and (b)]. Embolization was performed with ivo1on particles (250–590 μm) in 20 ml lipiodol injection in both left inferior artery and right bronchial artery.