Pulmonary artery dissection: an emerging cardiovascular complication in surviving patients with chronic pulmonary hypertension

R S Khattar, D J Fox, J E Alty, A Arora

Pulmonary arterial dissection is an extremely rare and usually lethal complication of chronic pulmonary hypertension. The condition usually manifests as cardiogenic shock or sudden death and is therefore typically diagnosed at postmortem examination rather than during life. However, recent isolated reports have described pulmonary artery dissection in surviving patients. The first case of pulmonary artery dissection in a surviving patient with cor pulmonale caused by chronic obstructive pulmonary disease is presented. The aetiology, pathophysiology, and clinical presentation of pulmonary artery dissection are reviewed and factors that may aid diagnosis during life are discussed.

Although dissection of the systemic arteries is a well-recognised and often non-fatal consequence of essential hypertension, pulmonary arterial dissection is an extremely rare and usually lethal complication of chronic pulmonary hypertension. Pulmonary artery dissection has most commonly been described in patients with underlying congenital heart disease and in those with primary pulmonary hypertension. The condition usually manifests as cardiogenic shock or sudden death and is therefore typically diagnosed at postmortem examination rather than during life. However, recent isolated reports have described pulmonary artery dissection in surviving patients. Despite the relatively common causal association of chronic obstructive pulmonary disease with pulmonary hypertension, pulmonary artery dissection has rarely been reported in this group of patients. We present the first case of pulmonary artery dissection in a surviving patient with cor pulmonale caused by chronic obstructive pulmonary disease. We also review the aetiology, pathophysiology, and clinical presentation of pulmonary artery dissection and discuss factors that may aid diagnosis during life.

CASE REPORT

A 56 year old woman presented to the emergency department with notable shortness of breath and mild bilateral leg oedema. About 30 years previously, she had had extensive pulmonary tuberculosis treated with streptomycin. Since then she had experienced mild dyspnoea on exertion but over the preceding six months her exercise capacity had reduced greatly to about 50 m. Three weeks before admission, she had developed a productive cough and malaise. She had also noticed an isolated episode of a severe, sharp pain in the upper back radiating to the left anterior chest and arms associated with sweating and lasting for about 10 minutes. At that time she was empirically treated with antibiotics resulting in resolution of the cough, but the dyspnoea continued to worsen and was accompanied by the development of peripheral oedema. She was a longstanding heavy smoker; she did not have any pets, and there was no history of occupational dust exposure. Clinical examination showed a thin body habitus, respiratory rate of 22 breaths/min, resting tremor, peripheral cyanosis, palmar erythema, and mild kyphoscoliosis. She was afebrile, her heart rate was 100 beats/min, and her blood pressure was 145/92 mm Hg. The jugular venous pressure was raised and there was bilateral leg oedema to the knees. A right ventricular heave was palpable and auscultation found a loud pulmonary component of the second heart sound followed by an early diastolic murmur heard loudest over the left sternal edge radiating to the pulmonary area and apex. Chest expansion and breath sounds were greatly reduced bilaterally. A smooth liver edge was palpable below the right costal margin but there was no evidence of ascites.

Full blood count, serum urea and electrolyte concentrations, liver function tests, thyroid function tests, and C reactive protein concentration were all normal. Arterial blood gases on air had a pH of 7.41, PO2 6.5 kPa, PCO2 8.0 kPa, HCO3- 40.3 mmol/l, and O2 saturation of 87%. Chest radiography was reported as showing enlarged pulmonary arteries with loss of lung volume and calcification at the apices consistent with previous tuberculosis. Her 12 lead ECG showed sinus rhythm with ventricular ectopic activity, P pulmonale, right axis deviation, and dominant R waves in V1. Pulmonary function tests showed a severe obstructive respiratory pattern with forced expiratory volume in one second (FEV1) of 0.48 l, forced vital capacity of 1.18 l, and a ratio of 41%. Echocardiography showed a dilated, severely hypokinetic right ventricle with flattening of the interventricular septum suggestive of raised right ventricular pressure. The right atrium was also dilated with mild tricuspid regurgitation and an estimated pulmonary artery systolic pressure of about 75–80 mm Hg. The main pulmonary trunk was greatly dilated at 6 cm and there was mild to moderate pulmonary regurgitation. A dissection flap with bidirectional flow was noted in the main pulmonary trunk originating just above the pulmonary valve and extending to the bifurcation of right and left pulmonary arteries, adjacent to the origin of the left pulmonary artery (figs 1 and 2). Subsequent computed tomography (CT) of the thorax with pulmonary angiography confirmed generalised ectasia of the main pulmonary trunk with the appearance of a linear line consistent with dissection on axial sections and sagittal reconstruction (fig 3). There was no evidence of haematoma formation.

The patient was treated with 28% oxygen and intravenous loop diuretics, which rapidly resolved the peripheral oedema. Her arterial blood gases after overnight 28% oxygen had a pH...
of 7.37, PO2 16.5 kPa, PCO2 8.6 kPa, and O2 saturation of 96%.
In view of the high anaesthetic risk related to the severely
reduced ventilatory reserve, surgical repair of the pulmonary
artery dissection was not considered a viable option. Her
continued treatment is long term domiciliary oxygen,
diuretics, and angiotensin converting enzyme inhibitor and
she remained stable at 12 months’ follow up.

DISCUSSION

This report describes the first case of pulmonary artery
dissection with underlying severe pulmonary hypertension
caused by chronic obstructive pulmonary disease in a
surviving patient. Pulmonary artery dissection was manifest
by the development of chest pain, worsening dyspnoea, and
right heart failure. On the basis of the clinical history,
pulmonary artery dissection may have been precipitated by a
community acquired chest infection leading to worsening
hypoxia, thereby further raising pulmonary artery pressure.
The diagnosis was reliably made by transthoracic echocardi-
ography, providing excellent delineation of the origin and
distribution of the intimal flap; subsequent CT confirmed the
diagnosis. There was generalised dilatation of the main
pulmonary trunk and branch arteries caused by chronic
pulmonary hypertension but no evidence of localised
aneurysm formation.

Over the past two centuries, 63 other cases of pulmonary
artery dissection have been described,1–25 of which only eight
were diagnosed during life.18–25 Consequently, an appreciation
of the anatomical abnormalities and pathological processes
leading to pulmonary artery dissection has mainly arisen
from postmortem findings. The majority of pulmonary artery
dissections occur in the presence of medial degeneration with
fragmentation of elastic fibres and generalised dilatation of
the pulmonary arterial tree caused by chronic pulmonary
hypertension.1–3 23 With medial degeneration, the wall is
weakened, the vessel may dilate, and the raised intravascular
pressure and shear stresses may predispose to the develop-
ment of an intimal tear. Whether medial degeneration causes
the dissection, predisposes to intimal tears, or results from
chronically raised intravascular pressure remains controver-
sial. The main pulmonary trunk is the site of dissection in
about 80% of cases, usually without involvement of the
branches; the remainder of cases are isolated to the right or
left pulmonary arteries and intrapulmonary branches.1–3 23 In
a small proportion of cases, pulmonary artery dissection may
occur at the site of localised aneurysm formation. Aneurysms
are most commonly associated with congenital heart lesions
that have led to sustained high pulmonary flow rates and
pulmonary hypertension, in particular persistent ductus
arteriosus.21 In rare cases, aneurysms are associated with
infection, inflammation, trauma, atherosclerosis, or connec-
tive tissue disorders, often in the absence of pulmonary
hypertension. In contrast to aortic dissection, the false lumen
in pulmonary artery dissection tends to rupture rather than
to extend distally and develop a re-entry site.1–3 23 Rupture
occurs most commonly into the pericardium and rarely into
the lungs, mediastinum, or pleural cavity, leading to sudden
death. Of 50 postmortem examinations in which the
mechanism of death of the patient was stated, rupture
leading to cardiac tamponade was identified in 39.23

Among the 63 previously documented cases of pulmonary
artery dissection, 34 patients had underlying cardiac disease

Figure 1  Two dimensional transthoracic echocardiogram in a modified
short axis view showing a greatly dilated pulmonary trunk (PT) with an
intimal flap in transverse section.

Figure 2 Transthoracic echocardiogram showing longitudinal
distribution of the intimal flap (arrow) originating from just above the
pulmonary valve and extending to the origin of the left pulmonary artery
(LPA). The presence of bidirectional flow on colour flow imaging
confirms the presence of dissection with a true and false lumen. PA,
pulmonary artery; RPA, right pulmonary artery.

Figure 3 Transverse section of a computed tomographic pulmonary
angiogram showing a linear dissection (arrow) of the main pulmonary
trunk.
Pulmonary artery dissection is a rare and life threatening condition that should be suspected in patients with chronic pulmonary hypertension presenting with chest pain, worsening dyspnoea, or haemodynamic compromise. Although pulmonary artery dissection is classically diagnosed at postmortem examination, the advent of high quality non-invasive imaging methods in recent years has had a central role in detecting this condition during life. Moreover, recent reports have described successful surgical repair of pulmonary artery dissection in isolated cases. These findings necessitate an increased awareness of the condition with a view to early diagnosis and corrective intervention in selected cases.

**Authors’ affiliations**

R S Khattar, D J Fox, J E Alty, A Arora, Manchester Heart Centre, Manchester Royal Infirmary, Manchester, UK

Correspondence to: Dr Rajdeep S Khattar, Manchester Heart Centre, Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL, UK; rskhattar@hotmail.com

Accepted 10 August 2004

**REFERENCES**


An unusual case of ventricular tachycardia

A 43 year old man was to receive intravenous chemotherapy for lymphoma. A Hickmann line was inserted via his right internal jugular vein in preparation for this. Ten days later he presented with symptomatic sustained broad QRS complex tachycardia (panel A). After treatment with intravenous amiodarone he reverted to sinus tachycardia (panel B). Subsequently he continued to have very frequent intermittent episodes of identical tachycardia occurring several times per hour, despite continued treatment with amiodarone. Coronary and left ventricular angiography demonstrated normal coronary arteries and left ventricular function. The tip of the Hickmann line could clearly be seen to be wedged in the right ventricular cavity (panel C: to view video footage go to http://www.heartjnl.com/supplemental). The catheter was removed and there were no further episodes of tachycardia despite discontinuation of amiodarone. A 24 hour Holter monitor showed sinus rhythm throughout. The similarity of the heart rates during catheter induced ventricular tachycardia and the underlying sinus tachycardia led to variable degrees of QRS fusion and this explains the changing QRS morphology of the broad QRS tachycardia (panel A).

K Rajappan
D Lefroy
kim@rajappan.freeserve.co.uk

To view video footage visit the Heart website—http://www.heartjnl.com/supplemental