Case report

Stable pulmonary capillary haemangiomatosis without symptomatic pulmonary hypertension

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Abstract
Pulmonary capillary haemangiomatosis is a rare disorder characterised by multiple angiomatous lesions composed of proliferating capillary vessels in the lung parenchyma that usually progress rapidly to establish fatal pulmonary hypertension. The 29 year old man presented here, however, has been stable for 3.5 years since the diagnosis without symptoms of pulmonary hypertension. High resolution computed tomographic findings of the pulmonary lesions seemed specific to the disease.
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Keywords: pulmonary capillary haemangiomatosis; high resolution computed tomography; pulmonary hypertension

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Pulmonary capillary haemangiomatosis (PCH) has been recognised as a rare cause of pulmonary hypertension.[1] Patients with the disease typically present with pulmonary hypertension and abnormal chest radiographs.[2] The condition usually progresses rapidly until severe pulmonary hypertension and resulting right cardiac failure develop.[2] We report a case who presented with the disease without evident pulmonary hypertension, in whom no progression of symptoms or imaging findings of the pulmonary lesions has been observed over a long period.

Case report
A 29 year old man presented with haemoptysis and was admitted to hospital. He had been in excellent health until about 2 weeks earlier when he developed a sore throat and low grade fever (37.2°C) accompanied by occasional small amounts of haemoptysis. About 10 days before admission the symptoms suggesting an upper respiratory tract infection had disappeared but he continued to cough up small amounts of bright red blood without evident sputum. On admission the physical examination was normal and blood counts, erythrocyte sedimentation rate, C reactive protein, liver and renal function tests including urinalysis were also normal. PaO_2 was 11.6 kPa and $PaCO_2$ was 5.6 kPa. Pulmonary function tests were normal except for a slight decrease in carbon monoxide transfer factor ($TLCO$) to 7.6 mmol/min/kPa (71% of predicted value). Extensive serological examinations failed to find any indications of angiitis, collagen vascular autoimmune disease, or HIV infection. The electrocardiogram and echocardiogram were both normal, without any findings suggestive of pulmonary hypertension such as tricuspid regurgitation. Chest radiography revealed patchy ground glass opacities scattered mainly in the bilateral lower lung field. A computed tomographic (CT) scan of the chest demonstrated 55 lesions in the right lung field and 33 in the left lung field (fig 1A). High resolution CT (HRCT) images showed that each lesion consisted of three layers, with focal nodular opacity at its centre surrounded by ground glass opacity and thickened interlobular septae at its margin (fig 1B). Transbronchial lung biopsy specimens revealed non-specific pulmonary haemosiderosis. The bronchoalveolar lavage fluid was macroscopically normal with normal cell counts.

Open lung biopsy of the right thorax was performed. Inspection of the visceral pleura disclosed numerous dark red subpleural lesions mainly in the middle and lower lobes. Microscopic examination of the biopsy specimens revealed extensive intra-alveolar haemorrhage, both recent and old. The alveolar septae in the areas of old haemorrhage showed mild fibrous thickening accompanied by chronic inflammatory cells. Fibrotic scarring was observed at the centre of the lesions. In the adjacent lung parenchyma there was evidence of proliferation of capillaries within the alveolar septae and inside the pulmonary artery wall. These lesions were sharply demarcated by interlobular septae (fig 1C, D). These findings established the diagnosis of PCH.

The patient refused further invasive examinations including cardiac catheterisation, angiography, and a new treatment approach with interferon α. He has had no symptoms except for an occasional small amount of haemoptysis during the 3.5 years since the first admission. He now swims 600 m several times a week. A recent 6 minute walking distance was 620 m and there was no decrease in SpO_2 during this exertion. The most recent PaO_2 was 11.6 kPa and $PaCO_2$ was 5.2 kPa. Conventional and HRCT scans performed 40 months after initial admission showed no increase in the number of lesions, which remained unaltered in size.
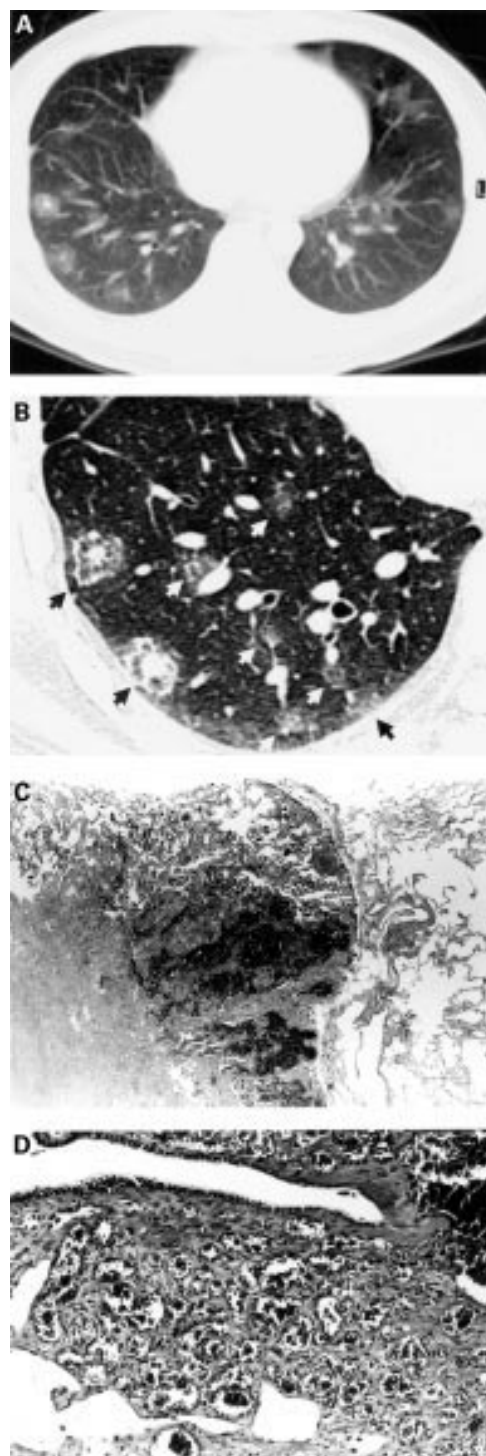
Figure 1 (A) Conventional CT scan (both collimation and interval 10 mm) of the patient revealed multiple pulmonary lesions and HRCT scan (both collimation and interval 1 mm) disclosed detailed structure of the lesions. (B) A section through the HRCT scan showed eight pulmonary lesions (arrows). (C) Microscopic study of a lesion showed fibrosis at its centre surrounded by intra-alveolar haemorrhage (or congestion) and thickened interlobular septae (haematoxylin/eosin, ×12.5). The structure of each lesion seemed to reflect the nodular opacity at its centre, surrounding ground glass opacity, and its thickened margin, respectively, on the HRCT image. (D) High magnification of the lesion revealed proliferation and infiltration of capillaries in the interstitium (haematoxylin/eosin, ×50) and confirmed the diagnosis of pulmonary capillary haemangiomatosis.

Discussion

This case of PCH appears to be unusual in that the condition has remained stable for a long period without symptomatic pulmonary hypertension. Although the lack of clinical signs suggestive of pulmonary hypertension and the patient's high exercise performance preclude the presence of severe pulmonary hypertension, the existence of minor pulmonary hypertension cannot be ruled out because of a lack of cardiac catheterisation data. When considering the nature of PCH, the patient may have—and, indeed, probably does have—increased pulmonary pressure prior to the development of clinical signs of pulmonary hypertension.

PCH was initially described in 1978[3] and Lippert *et al*[4] found only 20 reported cases including their own in approximately 20 years. Al-Fawaz *et al*[2] reviewed 19 cases which appeared in the literature. Briefly, PCH is characterised by the proliferation and infiltration of small vessels, mostly capillary sized, within the peribronchial, perivascular, septal or pleural connective tissues. Involvement of the airways probably leads to haemoptysis. Without effective treatment the condition usually progresses rapidly, causing death from pulmonary hypertension and/or bleeding. Of the 19 cases, four underwent pulmonary (with or without heart) transplantation, one had pneumonectomy, and one was treated with interferon α-2a. These treatments reportedly resulted in improvements in their conditions. Furthermore, one of the cases did, in fact, have a short period of observation.[2] The other 12 cases died within a total clinical course ranging from several months to several years, and all showed progression of dyspnoea, exercise intolerance, cardiac failure, and/or haemoptysis during this period.

In contrast to the active and progressive nature of the disease in the above cases, our case has been followed up for 3.5 years since the diagnosis of PCH during which there has been no clinical deterioration or aggravation of the imaging findings. To our knowledge, this is the first report of a case with stable disease without any treatment for such a long period. Although two cases reported by White *et al*[1] and Vevaina *et al*[5] also had long retrospective clinical courses, before the diagnosis of PCH detailed correlation between PCH and the preceding symptoms was not established; the former had recurrent chest infection for 12 years and the latter had digital clubbing for 4 years. Our case possibly represents an early phase of such cases.

Some reports have discussed the possibility that radiological features may be unreliable in separating PCH from other diseases.[5 6] In our case, however, conventional and HRCT findings differentiated the condition from commonly seen diseases, and this fact urged us to proceed to the open lung biopsy. Three previously reported cases who underwent HRCT scanning had findings similar to ours.[7 8] Two other cases studied solely by conventional CT scanning[2 4] also reported findings that were consistent with ours. As in our case, the HRCT findings of the patient reported by Dufour *et al*[7]

seem to be specific to PCH, demonstrating the usefulness of HRCT scanning for diagnosis of this disease. Other previously reported CT findings of the disease include increased soft tissue density of the mediastinum[1 2] and mediastinal and hilar lymph adenopathies,[7] but such findings were absent in our case.

Possible explanations for the stable condition of our case over a long period are either that it was a chance discovery of an early phase of the disease by HRCT scanning or that PCH has separate subtypes with differing speeds of progression. Wider use of HRCT scanning and more extensive understanding of PCH would resolve this issue in the future.

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LETTERS TO THE EDITOR

Vibration during high frequency ventilation in neonates

Since there is no report quantifying vibration imposed upon neonates, we prospectively studied the vibration produced during high frequency ventilation (HFV) and compared it with that during conventional mechanical ventilation (CMV) of studied patients and weight matched controls (±250 g) receiving CMV or breathing spontaneously. A non-invasive accelerometric sensor (Analog Devices ADXL05, Norwood, MA, USA) was placed at the mid sternum or postauricular cranium to measure the linear vibration transmitted to the body and head, respectively (amplitude in time and frequency domains expressed in units of "*g*").

From April to October 1998 we enrolled seven neonates treated with HFV (mean (SD) weight 2210 (1680) g, gestation 32 (7) weeks) and 14 weight matched controls (CMV group: n=7, 2100 (1730) g, 31 (8) weeks; spontaneous breathing group: n=7, 2230 (1520) g, 32 (7) weeks). The groups were not different with regard to body weight, length, and head circumference. Neonates received HFV at a frequency of 12 Hz, mean airway pressure of 14 (2) cm H_2O, amplitude of 39 (10) cm H_2O, and back up CMV at 6 breaths/min. Higher amplitudes of vibration were detected during HFV than during CMV (0.098 (0.026)g v 0.017 (0.006)g at the chest and 0.011 (0.003)g v 0.007 (0.001)g at the cranium, p<0.05) in six HFV treated neonates. One HFV treated neonate did not tolerate the switch to CMV. The vibrations at the chest and postauricular cranium in seven HFV treated neonates were higher than those of weight matched controls (fig 1, p=0.001), whereas no significant difference was found between the control groups. A higher amplitude of vibration at the chest was found in neonates with an adverse outcome than in normal survivors (0.136 (0.014)g v 0.087 (0.024)g, respectively), while demographic data and the duration and amplitude of HFV were not different. Interestingly, the vibration at the chest exceeded the limit of whole body vibration in adults (0.05g at 12.5 Hz third octave band for 24 hours per ISO 2631).[1]

The significance of our observations is not known. While cardiovascular instability is commonly observed in neonates during HFV and has been related to a high lung volume ventilation strategy, cardiovascular effects of vibration have been reported in animal[2] and clinical studies.[3] We speculate that the vibration during HFV may also contribute to the haemodynamic instability in neonates.
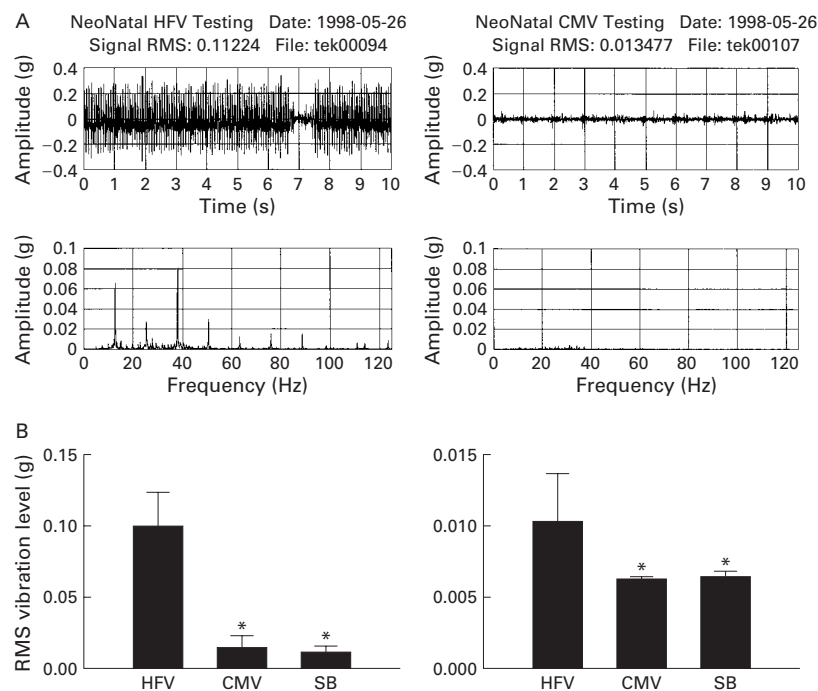

Figure 1   Vibration in neonates during high frequency ventilation (HFV, n = 7), conventional mechanical ventilation (CMV, n = 7), and spontaneous breathing (SB, n = 7). (A) Representative vibration signals at the mid sternum of a neonate during HFV (left) and CMV (right). The upper panel shows the recorded time signal while the bottom panel displays the same information transformed to the frequency domain to display the dominant frequencies present in the signal. (B) Vibration detected at the mid sternum (left panel) and postauricular cranium (right panel). ⋆p = 0.001 v HFV (ANOVA).