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Pulmonary arteriovenous malformation in cryptogenic liver cirrhosis

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CASE REPORT

Pulmonary Arteriovenous Malformation in Cryptogenic Liver Cirrhosis

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ABSTRACT

The cause in 10 – 20% cases of liver cirrhosis (LC) cannot be elucidated, and are thus termed cryptogenic. Pulmonary arteriovenous malformations (PAVMs) are relatively rare, but the most common anomaly involving the pulmonary tree. Although the rare correlation between LC and PAVM is well-known, there have been no reports of PAVMs occurring in cryptogenic LC. We report a case of PAVM that occurred in cryptogenic liver cirrhosis in a 3 years old male child. The child presented with complaints of malena, hematemesis and variceal bleed. The examination revealed a child with respiratory distress, irritability, tachycardia, clubbing and abdominal distention. He was worked up for recurrent variceal bleeding secondary to portal hypertension but the oxygen saturation during hospital stay kept deteriorating. The diagnosis of hepatopulmonary syndrome as the cause of persistent hypoxemia in the absence of other cardio-pulmonary causes was then made by enhanced echocardiogram using agitated saline. He improved significantly after liver transplantation performed abroad. At a 6 months follow-up, the child was stable with no evidence of intrapulmonary shunting on repeat echo.

Key Words: *Cryptogenic liver cirrhosis. Pulmonary arteriovenous malformations (PAVMs). Chronic liver disease. Hepatopulmonary syndrome. Clubbing. Cyanosis. Variceal haemorrhage.*

INTRODUCTION

Hypoxemia can be caused by intracardiac or intrapulmonary right to left shunt, respiratory causes and methemoglobinemia. Intrapulmonary right to left shunt is caused by pulmonary arteriovenous malformation (PAVM).[1] Although majority of PAVMs are congenital or associated with hereditary haemorrhagic telangiectasia,[2] acquired lesions are also encountered. Acquired PAVMs have been reported in patients with hepatic cirrhosis, portal vein thrombosis, trauma, schistosomiasis, metastatic thyroid carcinoma and in patients who have undergone bidirectional Glenn shunt for single ventricle physiology.[3,4] Liver diseases are rarely considered in the differential diagnosis of a patient presenting with hypoxia, cyanosis and clubbing.

We report a case of 3 years old male child with PAVM with portal hypertension secondary to cryptogenic liver cirrhosis. This is the first report of PAVM in cryptogenic LC.

CASE REPORT

A 3 years old male child presented with acute history of malena. The history revealed that the child had variceal banding 2 months ago elsewhere due to persistent haematemesis. He was the only child of non-consanguineous parents. Parents denied any previous transfusion, significant medical illness or hospitalization. Examination revealed a young child with obvious respiratory distress; he was irritable with significant pallor and mild jaundice. There was tachycardia, grade II clubbing and oxygen saturation was 85% at room air. Abdominal examination revealed a distended abdomen with prominent veins. There was splenomegaly by 3 cm below subcostal margin, no hepatomegaly, but with evidence of free fluid in the abdomen. Rest of the systemic examination including cardiovascular, respiratory and neurological systems was unremarkable. Working diagnosis of portal hypertension with recurrent variceal bleeding was made.

His initial investigations showed severe anaemia and thrombocytopenia with haemoglobin and platelet count of 4.6 gm% and 95 x 10^9/L, respectively. Chest X-ray was normal. LFT showed raised total bilirubin of 3.5 g/L with predominant direct component, alanine aminotransferase was 62 U/L; serum albumin level was also low 2.7 gm/L with deranged A/G ratio of 0.9:1. Prothrombin time was also prolonged 16.8 second with INR of 1.6. Ultrasound of abdomen showed hypertrophy of left lobe of the liver with shrunken right lobe. Liver parenchyma was coarse with irregular margins and regenerating nodules. Portal vein was compressed consistent with chronic liver disease. He was resuscitated with packed RBCs, transfusion and upper GI endoscopy was performed which revealed grade III varices, requiring band ligation again. Liver biopsy was done after correction of INR which showed moderate inflammation stage IV fibrosis consistent with cirrhosis.

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The patient's saturation levels did not improve throughout the hospital stay and could not be explained by cirrhosis of liver and oesophageal varices alone. Because of persistent desaturation with no response to oxygen inhalation; cardiology consultation was sought and CT angiography was done which only showed cardiomegaly with pulmonary oedema.

2-D echocardiogram did not reveal any abnormality but contrast enhanced echocardiogram using agitated saline showed opacification of the left atrium with microbubbles suggestive of AV malformation with intrapulmonary shunting, confirming the diagnosis of hepatopulmonary syndrome (Figure 1). His liver transplant was done in India and echocardiogram done 6 months after transplant did not show any evidence of intrapulmonary shunting.

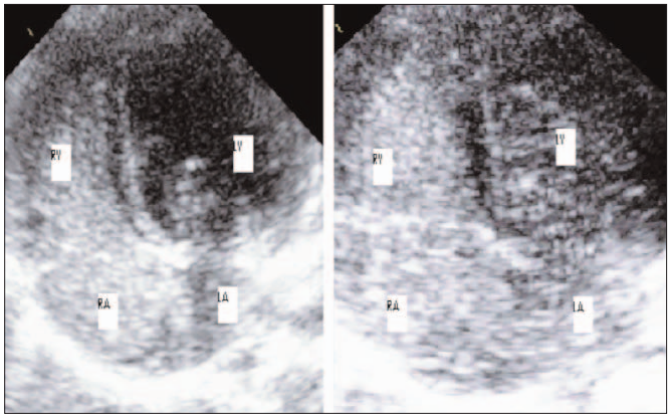

Figure 1: Bubble contrast echocardiogram demonstrating contrast filling the right cardiac chamber initially followed by filling of left sided cardiac chamber 6 cardiac cycles later.

DISCUSSION

Here in, we reported PAVM secondary to cryptogenic cirrhosis of liver as a cause of persistent hypoxemia in a paediatric patient. Hypoxemia in a patient with liver dysfunction can be caused by various mechanisms like hypoventilation due to ascites, pleural effusion and diaphragmatic dysfunction. However, the most severe hypoxemia is caused by hepatopulmonary syndrome, as in this case.[5] The characteristic feature of hepatopulmonary syndrome is hypoxemia in the setting of liver disease.[6] Prevalence of this syndrome in children with liver disease has variably been reported to be upto 27%,[7] but this can affect patients of all age groups. The syndrome has three features: presence of liver disease (portal hypertension with or without cirrhosis), pulmonary vasculature dilatation (positive finding on contrast enhanced echocardiography) and oxygenation defect (partial pressure of oxygen < 80 mmHg or alveolar-arterial oxygen gradient ≥ 15 mmHg on room air) due to pulmonary arteriovenous shunt.[6] This case manifested all three features.

Pathology is characterized by dilatation of pre-capillary and capillary vessels to 15 – 100 µm. Absolute numbers of dilated vessels are also increased. This dilatation leads to passage of mixed venous blood into the pulmonary veins. This results in ventilation perfusion mismatch and defective oxygenation causing respiratory distress and cyanosis.[6]

Cyanosis and dyspnoea on exertion usually are the initial complaints. Examination may reveal cyanosis, clubbing and peripheral stigmata of chronic liver disease.[8] In this case, the examination revealed respiratory distress, irritability, pallor, jaundice, tachycardia, grade II clubbing, distended abdomen and splenomegaly.

The chest radiograph is non-specific and in this subject in fact, was normal. Pulse oximetry and arterial blood gas is necessary to document hypoxia. Severity of disease is graded based on partial pressure of oxygen in arterial blood gas. Polycythemia or low $PaCO_2$ even with a normal PaO_2 should also alert one to the possibility of intrapulmonary right to left shunt.[5]

Pulmonary vasodilatation can be detected most easily by contrast enhanced transthoracic echocardiogram with agitated saline (the “bubble contrast study”) which was used for the diagnosis.[6] Saline is agitated to produce micro-bubbles > 10 µm in diameter. After administration of agitated saline in the peripheral vein, microbubbles will appear in the left atrium after 3 – 6 cardiac cycles if the pulmonary vascular bed is abnormally dilated; it appeared 6 cycles later in this case. Microbubbles do not pass through the normal capillary bed which has a diameter of < 8 – 15 µm. Technetium^{99m}-labeled macroaggregated albumin is an alternative non-invasive modality for detection of intrapulmonary shunts, but it was not needed for this patient. Albumin remains in the intrapulmonary capillaries when the capillary diameter is between 8 and 15 µm. If a pulmonary shunt is present, radionuclide scanning will detect uptake of albumin in the systemic vasculature demonstrating a lack of captured albumin in the pulmonary capillaries.[9] The invasive technique of pulmonary angiography may also be utilized in clinical situations where alternative causes of hypoxemia, such as pulmonary embolism and pulmonary hypertension, need to be excluded. But contrast echocardiography is non-invasive, easily available and the best way to detect intrapulmonary shunts.

Hepatopulmonary syndrome can be a cause of hypoxemia and respiratory distress in a patient and is considered for subjects with chronic liver disease presenting with severe hypoxemia that cannot be explained by thorough diagnostic investigations for intrinsic cardiopulmonary diseases. Hepatopulmonary syndrome has a significant impact on patient survival and needs targeted management, but it notoriously stays underdiagnosed.[10] The disorder is difficult to treat because of profound hypoxemia- a consequence of

intrapulmonary vascular dilatation and arteriovenous malformations.

Currently, no effective medical therapies for hepatopulmonary syndrome exist; except for liver transplantation.[6] However, postoperative mortality is high in patients with severe cases of hepatopulmonary syndrome; this case was stable at a 6 months follow-up.[6]

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