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TRANSITION FROM PORTOPULMONARY HYPERTENSION TO HEPATOPULMONARY SYNDROME IN A PATIENT WITH CIRRHOSIS: A RARE CLINICAL EVOLUTION

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ABSTRACT

Porto-pulmonary hypertension (POPH) and hepatopulmonary syndrome (HPS) are distinct pulmonary vascular complications of chronic liver disease and portal hypertension. Despite sharing a common underlying hepatic pathology, they are characterized by opposing pathophysiological mechanisms. Their coexistence or sequential occurrence in the same patient is uncommon and remains poorly understood. Traditionally, these conditions have been regarded as mutually exclusive because of their contrasting pathophysiological mechanisms. However, rare reports suggest that both disorders may coexist or occur sequentially in the same patient. Such cases provide valuable insights into the complex pulmonary vascular alterations associated with chronic liver disease .We report a rare case of a patient with established Porto-pulmonary hypertension who subsequently developed hepatopulmonary syndrome six years later.

KEYWORDS: Porto-pulmonary Hypertension; Hepatopulmonary Syndrome; Chronic Liver Disease; Portal Hypertension; Pulmonary Vascular Disease; Intrapulmonary Vascular Dilatation; Bubble Contrast Echocardiography; Liver Transplantation.

INTRODUCTION

Porto-pulmonary hypertension (POPH) and hepatopulmonary syndrome (HPS) are important pulmonary vascular complications of chronic liver disease and portal hypertension. POPH is characterized by pulmonary vasoconstriction and elevated pulmonary arterial pressure, whereas HPS results from intrapulmonary vascular dilatation causing hypoxemia. Although both conditions occur in patients with portal hypertension, they are considered pathophysiologically distinct and rarely coexist. Sequential transition from POPH to HPS is exceptionally uncommon and has been reported only in a limited number of cases. Recognition of this phenomenon is clinically important because it has significant implications for prognosis, management, and liver transplantation. We report a rare case of a patient with established Porto-pulmonary hypertension who subsequently developed hepatopulmonary syndrome during follow-up.

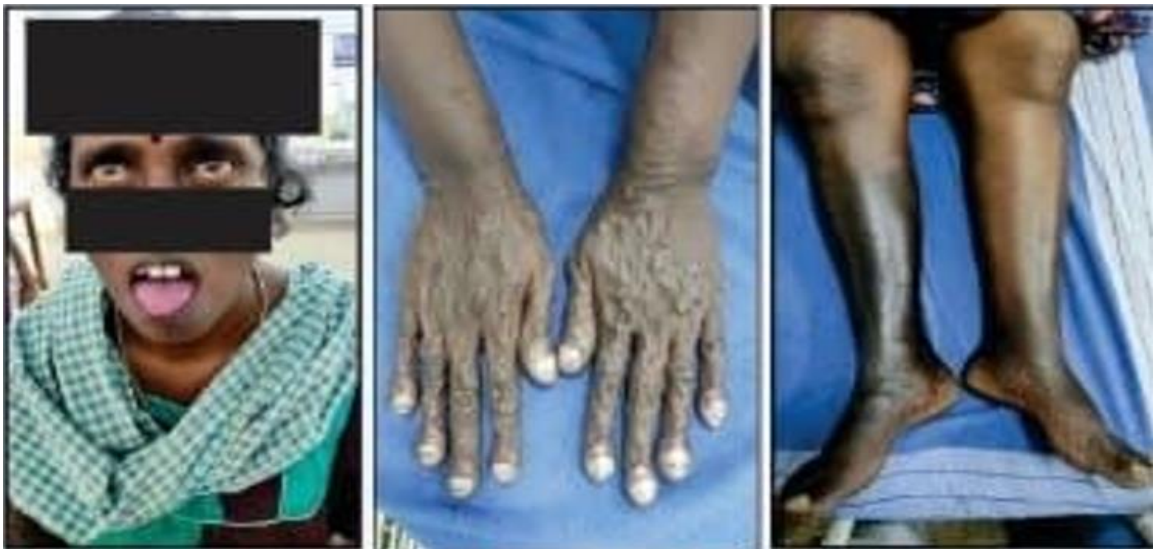
CASE PRESENTATION

A 40-year-old female with chronic liver disease and portal hypertension was initially diagnosed with Porto-pulmonary hypertension in 2017. Echocardiography at that time demonstrated moderate pulmonary hypertension with a tricuspid regurgitant pressure gradient of 42 mmHg. She was subsequently lost to regular follow-up.

Six years later, she presented with generalized tonic-clonic seizures associated with transient loss of consciousness. She also reported progressive platypnea over the preceding four years. Physical examination revealed cyanosis of the lips and fingers, digital clubbing, bilateral pitting pedal edema, and multiple dilated tortuous veins over both lower limbs. Oxygen saturation was 88% in the supine position and 85% in the sitting position.

Abdominal examination revealed splenomegaly consistent with portal hypertension. Cardiovascular examination showed an ejection systolic murmur in the pulmonary area. Respiratory examination was otherwise unremarkable.

Laboratory evaluation demonstrated hyperbilirubinemia, thrombocytopenia, and features consistent with chronic liver disease. Upper gastrointestinal endoscopy revealed grade II oesophageal varices. The clinical picture suggested progression of pulmonary vascular complications associated with portal hypertension.



INVESTIGATIONS
HEMATOLOGICAL AND BIOCHEMICAL EVALUATION

- Hemoglobin: 20 g/dL
- Platelet count: 86,000/mm³
- Total bilirubin: 4.0 mg/dL
- Serum albumin: 3.3 g/dL
- ANA positive (1:100 dilution; nucleoplasmic fine granular pattern)
- Viral markers negative

ARTERIAL BLOOD GAS ANALYSIS

- pH: 7.45
- PaO_2: 58 mmHg
- $PaCO_2$: 28 mmHg
- Alveolar-arterial oxygen gradient: 57 mmHg

IMAGING AND ENDOSCOPY

- Ultrasonography: Chronic liver disease with portal hypertension, splenomegaly, and collateral formation
- Upper GI endoscopy: Grade II esophageal varices
- HRCT chest: Bilateral ground-glass opacities
- MRI brain angiography: Cerebral arteriovenous malformations

CARDIAC EVALUATION
ECHOCARDIOGRAPHY (2017)

- Dilated left atrium
- Moderate pulmonary hypertension
- Tricuspid regurgitation gradient: 42 mmHg
- Preserved left ventricular systolic function

CONTRAST BUBBLE ECHOCARDIOGRAPHY (2022)

- Delayed appearance of microbubbles in the left atrium after more than six cardiac cycles
- Evidence of intrapulmonary vascular dilatation
- Suggestive of hepatopulmonary syndrome
- No evidence of intracardiac shunt

DIAGNOSTIC CRITERIA

The diagnosis of HPS requires the presence of all three of the following:

1. Chronic liver disease and/or portal hypertension

- Cirrhosis or non-cirrhotic portal hypertension
- Present in this patient

2. Impaired oxygenation

- PaO_2 < 80 mmHg on room air **or**
- Alveolar-arterial (A–a) oxygen gradient > 15 mmHg
  - (>20 mmHg if age >65 years)

3. Evidence of intrapulmonary vascular dilatation (IPVD)

Demonstrated by either:

- Contrast-enhanced transthoracic echocardiography (gold standard screening test)
- Lung perfusion scan showing brain uptake >6%

DIFFERENTIAL DIAGNOSES

1. Hepatopulmonary Syndrome

Supporting features

- Chronic liver disease with portal hypertension
- Platypnea and orthodeoxia
- Cyanosis and digital clubbing

- PaO_2 58 mmHg with elevated A–a gradient (57 mmHg)
- Delayed appearance of bubbles in the left atrium (>6 cardiac cycles) on contrast echocardiography, indicating intrapulmonary vascular dilatation

2. Porto-pulmonary Hypertension
Why considered
- Previously diagnosed in 2017
- Pulmonary hypertension is a recognized complication of portal hypertension
- Can present with exertional dyspnea and hypoxemia

Why less likely currently
- Contrast echocardiography demonstrated intrapulmonary shunting rather than pulmonary vascular obstruction
- Clinical features of platypnea and orthodeoxia favor HPS

3. Intracardiac Right-to-Left Shunt (Patent Foramen Ovale/Atrial Septal Defect)
Why considered
- Can cause hypoxemia, cyanosis, and clubbing
- Positive bubble study may occur

Why excluded
- Microbubbles appeared after >6 cardiac cycles rather than within the first 3 cycles
- No structural intracardiac shunt identified on echocardiography

4. Pulmonary Arteriovenous Malformation (PAVM)
Why considered
- Causes right-to-left shunting with hypoxemia and clubbing
- Bubble contrast study may be positive

Why less likely
- Presence of advanced chronic liver disease strongly favors HPS
- Echocardiographic findings consistent with diffuse intrapulmonary vascular dilatation rather than isolated AV malformations

5. Interstitial Lung Disease
Why considered
- HRCT showed bilateral ground-glass opacities
- Can present with hypoxemia and dyspnea

Why less likely
- Presence of platypnea, orthodeoxia, and positive delayed bubble study are more characteristic of HPS
- No significant restrictive respiratory findings

6. Chronic Thromboembolic Pulmonary Hypertension (CTEPH)
Why considered
- May cause pulmonary hypertension and progressive breathlessness

Why excluded
- No history of venous thromboembolism
- Echocardiographic and contrast study findings support intrapulmonary shunting

7. Severe Chronic Obstructive Pulmonary Disease
Why considered
- Can produce hypoxemia and secondary pulmonary hypertension

Why excluded
- No significant smoking-related respiratory symptoms or obstructive findings
- Bubble contrast echocardiography diagnostic of intrapulmonary vascular dilatation

DISCUSSION

Hepatopulmonary syndrome and Porto-pulmonary hypertension represent opposite ends of the pulmonary vascular spectrum in patients with portal hypertension. HPS results from excessive pulmonary vasodilatation mediated by nitric oxide and other vasoactive substances, whereas POPH is characterized by pulmonary vasoconstriction, endothelial dysfunction, and vascular remodeling. The coexistence or sequential development of these entities is uncommon. In our patient, echocardiographic findings in 2017 fulfilled criteria for Porto-pulmonary hypertension. Six years later, the patient developed worsening hypoxemia, platypnea, digital clubbing, and cyanosis. The diagnosis of HPS was confirmed by contrast-enhanced echocardiography demonstrating delayed appearance of microbubbles in the left atrium, indicating intrapulmonary vascular dilatation. The exact mechanism underlying the transition from POPH to HPS remains unclear. It has been hypothesized that progressive hepatic dysfunction, alterations in vasoactive mediators, and changes in pulmonary vascular remodeling may contribute to this evolution. Recognition of this phenomenon is important because management strategies differ significantly between the two conditions. Furthermore, both disorders influence eligibility and outcomes following liver transplantation. While liver transplantation may improve HPS, severe untreated POPH is associated with increased perioperative mortality. Therefore, periodic reassessment of pulmonary vascular status is essential in patients with chronic liver disease.

CONCLUSION

This case highlights the rare transition from Porto-pulmonary hypertension to hepatopulmonary syndrome in a patient with chronic liver disease. Progressive hypoxemia in patients with established Porto-pulmonary hypertension should prompt evaluation for

hepatopulmonary syndrome. Early recognition is crucial because it influences treatment decisions, prognostic assessment, and liver transplantation candidacy.

REFERENCES

1. Krowka MJ, Fallon MB, Kawut SM, et al. International Liver Transplant Society Practice Guidelines: Diagnosis and Management of Hepatopulmonary Syndrome and Portopulmonary Hypertension. Transplantation, 2016; 100(7): 1440–1452.
2. Bosch J, Abraldes JG, Berzigotti A, García-Pagán JC. The clinical use of HVPG measurements in chronic liver disease. Nat Rev Gastroenterol Hepatol, 2009; 6(10): 573–582.
3. Rodríguez-Roisin R, Krowka MJ. Hepatopulmonary Syndrome—A Liver-Induced Lung Vascular Disorder. N Engl J Med., 2008; 358: 2378–2387.
4. Krowka MJ, Mandell MS, Ramsay MAE, et al. Hepatopulmonary Syndrome and Portopulmonary Hypertension: A Report of the Multicenter Liver Transplant Database. Liver Transpl, 2004; 10(2): 174–182.
5. Al-Busafi SA, McNabb-Baltar J, Farag A, Hilzenrat N. Clinical manifestations of portal hypertension. Int J Hepatol, 2012; 2012: 203794.
6. Simonetto DA, Liu M, Kamath PS. Portal Hypertension and Related Complications: Diagnosis and Management. Mayo Clin Proc., 2019; 94(4): 714–726.