Group 2 Pulmonary Hypertension

Pulmonary Venous Hypertension: Epidemiology and Pathophysiology

Craig B. Clark, DO[a], Evelyn M. Horn, MD[b,*]

KEYWORDS

• Pulmonary hypertension • Left heart disease • Valvular disease • Epidemiology • Pathophysiology

KEY POINTS

- Pulmonary hypertension from left heart disease (PH-LHD) is a common form of pulmonary hypertension.
- PH-LHD occurs secondary to left ventricular systolic dysfunction, diastolic dysfunction, and/or left-sided valvular disease, which increases left atrial pressure that is transmitted backward to the pulmonary veins, capillaries, and arteries.
- In addition to the passive transmission of left atrial pressure to the pulmonary circulation, some patients develop superimposed precapillary pulmonary vascular pathology.
- Prognosis in PH-LHD is related to right ventricular function.
- No disease-specific therapies currently exist.

INTRODUCTION

Pulmonary hypertension (PH) induced by left-sided heart disease (PH-LHD) or Group 2 PH is the most prevalent PH form.[1–3] It is seen in heart failure (HF) with reduced ejection fraction (HFrEF), HF with preserved ejection fraction (HFpEF), and significant left-sided valvular disease. PH-LHD remains a major challenge for the clinician when faced with a dyspneic patient who exhibits an elevated pulmonary artery systolic pressure (PASP) (typically discovered on echo) to determine whether their patient has PH-LHD because treatment differs markedly from other forms of PH.

Despite its prevalence, PH-LHD has only recently been a focus for interventions; as yet, effective treatment strategies have not been established beyond addressing the treatment of the underlying left heart disease. We review mechanisms involved in the pathophysiologic development of PH-LHD and its consequences of right ventricular (RV) failure, discuss hemodynamic testing to both aid in diagnosis as well as to better understand the pathophysiology, briefly touch on the limited treatment options, and address future research areas.

DEFINITIONS

In addition to the commonly referred to World Health Organization (WHO) Group 2 classification, PH-LHD has had multiple, sometimes confusing descriptors in the literature, often without clear hemodynamic criteria, making it challenging to characterize, compare, and study. Terminologies that have been used to address PH-LHD include pulmonary venous hypertension, mechanical versus active PH, out-of-proportion PH, passive

No relevant conflict of interests to disclose.

[a] Division of Cardiology, Department of Internal Medicine, Des Moines University, Iowa Heart Center, Des Moines, IA 50312, USA; [b] Division of Cardiology, Perkin Heart Failure Center, Weill Cornell Medical Center, 520 East 70th Street, Starr Pavilion, 4th Floor, New York, NY 10021, USA

* Corresponding author.

E-mail address: horneve@med.cornell.edu

Cardiol Clin 34 (2016) 401–411

http://dx.doi.org/10.1016/j.ccl.2016.04.010

0733-8651/16/$ – see front matter © 2016 Elsevier Inc. All rights reserved.

versus reactive, and mixed PH. This heterogeneity stems from the complex nature of PH-LHD, which begins as an increased left atrial or pulmonary venous pressure that is passively transmitted backward proximal to the pulmonary venous system, that is, pulmonary capillaries and pulmonary arteries. For reasons not fully understood, a segment of patients will go on to develop superimposed pulmonary vascular disease, that is, an elevated transpulmonary gradient (TPG) and/or diastolic pulmonary gradient (DPG) and elevated pulmonary vascular resistance (PVR), exhibiting clinical hemodynamic characteristics of precapillary pulmonary arterial hypertension (PAH), defined as follows.

To bring consistency, the 5th World Symposium on PH (WSPH) endorsed the nomenclature "isolated post-capillary PH" (iso-PH) and "combined post-capillary and precapillary PH" (Cpc-PH) based on characteristic hemodynamic profiles and to abandon the term "out-of-proportion" PH.[4] Thus, PH-LHD is defined as mean pulmonary artery pressure (mPAP) of 25 mm Hg or higher with a pulmonary artery wedge pressure (PAWP) of greater than 15 mm Hg.[5] An elevated DPG is defined as follows: diastolic pulmonary artery pressure (PAP)-PAWP of greater than 7 mm Hg identifies Cpc-PH and separates it from iso-PH,[4] although this classification has not been without controversy.[6] An elevated TPG, defined as mPAP minus PAWP greater than 12 to 15 mm Hg, and elevated PVR, defined as TPG/cardiac output greater than 3 WU, have previously been used to describe "out-of-proportion" PH-LHD,[7] and remain useful parameters in the overall hemodynamic assessment of patients with PH. However, because they are influenced by flow and by left atrial pressure, DPG has been advocated as the metric of choice to differentiate iso-PH from Cpc-PH, as it is relatively unaffected by flow or filling pressures and should therefore more precisely represent the independent contribution of the pulmonary vasculature to PAP.[4,8]

PH-LHD is often initially identified not by invasive pressure measurement at catheterization but by echocardiography, where mPAP is typically not calculated and instead PASP is estimated from tricuspid regurgitation Doppler velocity added to an estimate of right atrial (RA) pressure, typically gleaned from IVC (inferior vena cava) diameter. In this situation, a PASP of 35 to 45 mm Hg is typically considered mildly elevated, whereas 46 to 60 mm Hg and greater than 60 mm Hg are considered moderately elevated and severely elevated, respectively.[9] Although Doppler echocardiography has proven to be an excellent screening tool, cardiac catheterization is required for definitive diagnosis and is mandatory before instituting PH-specific therapies. Furthermore, many echocardiology laboratories fail to report systemic blood pressures to better assess PASP in relation to systemic pressures.

EPIDEMIOLOGY

Due to variabilities in PH definitions with predominant echo-based literature data and referral bias,[10] the true prevalence is likely underappreciated.[11] In 379 consecutive patients with HFrEF undergoing right heart catheterization (RHC), Ghio and colleagues[12] found PH, defined as mPAP greater than 20 mm Hg at catheterization, in 62%. Its presence correlated with more advanced disease manifest by New York Heart Association class III/IV symptoms, lower CO, and lower RV EF. However, the development of PH does not directly correlate with the degree of left ventricular (LV) EF reduction.[13] In fact, HFpEF has been recognized as the predominant cause of PH-LHD.[14] In an echo-Doppler study of patients with HFpEF, PH defined as an estimated PASP greater than 35 mm Hg, was identified in 83%, whereas in a comparative community cohort of patients with hypertension without HF, it was present in only 8%.[10] In a random sample of the general population from Olmsted County, Minnesota, elevated echo-estimated PASP correlated with increasing age, systemic vascular stiffness as assessed by brachial artery pulse pressure, and elevated left heart diastolic pressure inferred from echo-Doppler E/e' ratio.[15] In other studies, elevated echo-estimated PASP was seen more frequently in patients with obesity, atrial arrhythmias, and chronic obstructive pulmonary disease (COPD),[16] all common comorbidities associated with the HFpEF syndrome but that also may be independent pathophysiological causative factors of PH. In patients with PH-LHD, the presence of Cpc-PH has varied depending on the population studied, ranging from 12% to more than 50%, with similar frequencies between HFrEF and HFpEF.[17–19] A recent study by Gerges and colleagues[19] showed that Cpc-PH was present in only 12% of patients: HFpEF and HFrEF in retrospective and prospective cohorts. Risk factors differed in HFpEF and HFrEF for Cpc-PH. Whereas COPD and echo ratio of TAPSE/PASP were associated in the patients with systolic HF, younger age, VHD and TAPSE/PASP were associated with Cpc-PH in the patients with diastolic HF. RV/pulmonary artery (PA) coupling (Ees/Ea) is worse in all patients with Cpc-PH. Given the aging population and increasing burden of HF, particularly that of HFpEF, the incidence of PH-LHD can be expected to rise.[20]

In patients with valvular heart disease, the development of PH is a marker of severity[2] and should

Download English Version:

https://daneshyari.com/en/article/2897717

Download Persian Version:

https://daneshyari.com/article/2897717

Daneshyari.com