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Diagnosing pulmonary hypertension due to left heart disease using diastolic echo markers: The National Echo Database of Australia (NEDA) PH-LHD predictive formula

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Chapter 1. Introduction

1.1. Background

Pulmonary Hypertension (PH) is a condition where there is an abnormally high blood pressure in the pulmonary arterial system. PH can be caused by multiple pathologies ranging from genetics, left heart diseases, lung diseases, toxins, infections to thromboembolic diseases (1). The prognosis and treatment vary greatly depending on the underlying aetiology. Regardless of the underlying pathology, PH can lead to debilitating symptoms and untimely death if left untreated. The true prevalence of PH is poorly understood: however, emerging evidence suggested that it was under-reported previously (2, 3).

Although RHC is the current gold standard for confirming the diagnosis, echocardiography (echo) usually provides first objective evidence of PH. Differentiating pre- and post-capillary PH and measurement of pulmonary vascular resistance (PVR) are the key steps in evaluation of PH patients and currently the RHC is necessary. The advanced therapy or pulmonary vasodilator therapy is costly and only beneficial for patients with PH who have increased PVR. To prescribe PBS (Pharmaceutical Benefit Scheme) subsidised advanced PH therapy in Australia, it is necessary to prove low left atrial pressure represented by pulmonary capillary wedge pressure (PCWP) and elevated PVR by RHC. Unless a patient is being assessed for the heart transplant, group 2 PH patients will not benefit from routine RHC which has rare but potential serious risks. It is also now well known that PH due to left heart disease (PH-LHD) or Group 2 PH is the commonest form of PH(4, 5). With the increasing prevalence of all forms of PH, a reliable non-invasive surrogate to RHC is urgently needed to better evaluate the patients. This will lead to overall improvement in outcomes of PH patients by earlier detection of PH, avoidance of unnecessary procedures and more appropriate use of resources.

In this study, we investigated the performance the echocardiographic pulmonary to left atrial ratio (ePLAR) in differentiating the two major physiologies of PH as a surrogate to invasive haemodynamic parameters obtained with RHC. The chapter 2 of this thesis details the literature review on pathophysiology of different type of PH and various non-

invasive surrogate of PVR. The chapter 3 describes the original research work done at Royal Perth Hospital to investigate the ePLAR in differentiating pre-vs post-capillary PH.

1.2. Study Objectives

Primary Objective

In the setting of pulmonary hypertension, to measure the accuracy of ePLAR (Echocardiographic Pulmonary Artery to Left Atrial Ratio) to differentiate the two major PH physiologies, i.e., pre-and post-capillary PH.

Secondary Objectives

1. To identify other potential echocardiographic markers useful for identifying abnormal pulmonary vascular resistance (PVR) and transpulmonary gradients (TPG) in pulmonary hypertension.
2. To better understand the haemodynamic changes in patients with pulmonary hypertension caused by different pathologies.
3. To identify echocardiographic markers of increased left heart pressure in PH to facilitate diagnosis of PH-LHD

1.3. Hypotheses

Primary Hypothesis:

In the setting of pulmonary hypertension, ePLAR measurement is an accurate method of differentiating pre-and post-capillary PH

Secondary Hypothesis:

ePLAR is superior to previously published methods of estimating PVR.