Journal of Liver Transplantation 7 (2022) 100090

Contents lists available at ScienceDirect

Journal of Liver Transplantation

journal homepage: www.elsevier.com

Letter to the editor

Transthoracic echocardiographic predictive probability of pulmonary hypertension in liver transplant candidates: Implications for clinical practice

ARTICLE INFO

Article history:
Received 27 March 2022
Accepted 31 March 2022
Available online 6 April 2022

Assessment for pulmonary hypertension (PH) is critical in liver transplant (LT) candidates given the significant therapeutic and prognostic implications of elevated pulmonary pressures [1,2]. Currently, transthoracic echocardiography (TTE) is recommended as the screening tool for PH in all LT candidates by the American Association for the Study of Liver Diseases (AASLD) [3]. While there have been extensive research examining the role of TTE in PH assessment, these studies mainly investigated TTE-estimated pulmonary arterial systolic pressures (PASP) as the main surrogate for pulmonary hypertension [4,5,6]. The validity of other echocardiographic markers in PH screening is not well established. We evaluated the utility of TTE in detecting PH among liver transplant candidates from three perspectives: (1) TTE-estimated PASP (2) tricuspid regurgitant (TRV) alone (3) probability-based approach using TRV in conjunction with other echocardiographic markers of PH according to recent guideline [7].

We retrospectively assessed the pre-operative screening TTE of all liver transplant patients from the South Australian Liver Transplant Unit at Flinders Medical Centre over a 5-year period (n=117). Haemodynamic parameters recorded using right heart catherization (RHC) at the time of LT were used as the reference. PASP was calculated when TRV measurement was possible using the Bernoulli equation. Linear regression analysis and Bland-Altman plot were used to examine the agreement between TTE- and RHC-derived PASP. Accuracy of TTE was pre-defined as PASP estimates within ±10 mmHg of that derived from RHC. Using the current guideline, patients were stratified as having low, intermediate, or high PH echocardiographic probability based on TRV and seven other echocardiographic parameters [7]. The significance of echocardiographic predictive probability of PH was examined using the Chi-square test and multivariate logistic regression.

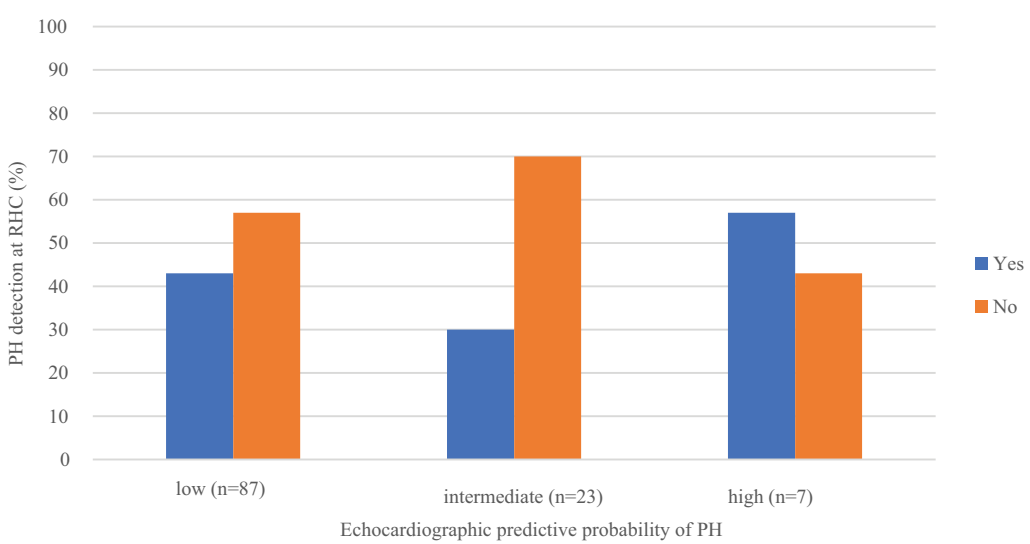

Fig. 1. Probability of having PH detected by RHC according to echocardiographic risk stratification.

https://doi.org/10.1016/j.liver.2022.100090

The mean time interval between the pre-operative TTE and intra-operative RHC was 150 days. When TRV could be measured reliably for PASP calculation (52.9%), our initial data analyses demonstrated a positive moderate correlation between PASP estimated by TTE and PASP measured directly from RHC (r = 0.40, $P < 0.05$), similar to those in the prior studies [4–6]. However, further analysis revealed a large 95% limits of agreement ranging from -23.3 to +25.50 mmHg, which was considered as clinically significant. Interestingly, Chi-square analysis showed a statistically significant relationship between Child-Pugh classification and accuracy of TTE estimates of PASP. TTE-derived PASP of patients within class A had the highest accuracy (91.7%); follow by class B (69.2%) and class C (50%).

Given the potential for great variability in the estimation of PASP, the current PH guideline places a greater emphasis on using TRV as the main variable to grade the echocardiographic probability of PH [7]. In that regard, our data are in concordant with the guidelines' suggestion, of which the binary logistic regression analysis demonstrated that the probability of having pulmonary hypertension increases as TRV increases (odds ratio (OR) = 3.012, 95% confidence interval (CI) 0.85—10.61). However, when combining other echocardiographic variables together with TRV as suggested by the guidelines, no significant relationship was found between the predictive echocardiographic probability of PH and elevated pulmonary pressures detected by RHC [Chi-square = 1.90, $P = 0.387$). The multivariate analysis also suggested that having an intermediate or high PH risk predicted by TTE was not associated with pulmonary hypertension as per RHC (OR = 0.78, 95% CI 0.33-1.85, $P = 0.574$). Fig. 1 illustrates the rates of pulmonary hypertension as measured by RHC in each echocardiographic probability group. Within the low-risk group, 42.5% of patients were considered to have PH. Interestingly, this is almost same rate of patients (42.8%) who were not considered as having PH within the high-risk group.

The present study has found that the utility of TTE in detecting pulmonary hypertension is inadequate in liver transplant candidates. While TRV appears to be a good predictive factor, there are limitations associated with obtaining its precise measurement. When other echocardiographic PH markers are used in conjunction with TRV, there appears to be a poor correlation, both under- and over-estimating PH probability in this cohort. The role of this probability-based approach in the diagnosis of PH requires further evidence from prospective studies. In addition, the accuracy of TTE-estimated PASP was influenced by degree of liver disease as based on the Child-Pugh classification. This may be due to increased haemodynamic variability associated with hyperdynamic state in more advanced liver disease making TTE less reliable. Hence, we believe that the pre-operative process of PH assessment should not be based on echocardiography alone. Clinicians should consider echocardiographic findings in context of other parameters such as clinical signs, 6-minute walking test, cardiopulmonary exercise testing, and further tests to better evaluate for this significant disease in liver transplant candidates.

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Update

Journal of Liver Transplantation
Volume 14, Issue , May 2024, Page

DOI: https://doi.org/10.1016/j.liver.2024.100217

Journal of Liver Transplantation 14 (2024) 100217

Contents lists available at ScienceDirect

Journal of Liver Transplantation

journal homepage: www.elsevier.com/locate/liver

Erratum

Erratum regarding previously published articles

The publisher would like to point out that the Conflicts of Interest, or Ethical Statements, were missing from some articles. They have been updated below.

Erratum to Influenza and SARS-CoV-2 vaccinations adherence after liver transplantation during the second year of the COVID-19 pandemic (results of a patients' survey)

Journal of Liver Transplantation, Volume 8, October–December 2022, 100111

The authors declare having no conflicts of interest.

Erratum to Cellulitis as the first manifestation of disseminated cryptococcosis in a patient with HCV-related cirrhosis: A case report

Journal of Liver Transplantation, Volume 9, February 2023, 100136

The authors declare having no conflicts of interest.

Erratum to Incidental detection of neurovasular bundle compression by dampening of radial artery waveform in pediatric live donor liver transplantation

Journal of Liver Transplantation, Volume 10, May 2023, 100143

The authors declare having no conflicts of interest.

Erratum to Transthoracic Echocardiographic Predictive Probability of Pulmonary Hypertension in Liver Transplant candidates: Implications for Clinical Practice

Journal of Liver Transplantation, Volume 7, July–September 2022, 100090

The authors did not declare conflicts of interest.

Erratum to What's in a name? Higher risks with donation after cardiac death than public health service increased risk livers

Journal of Liver Transplantation, Volume 9, February 2023, 100133

The authors did not declare conflicts of interest.

Erratum to Invasive coronary angiography as a tool in cardiac evaluation for liver transplant candidates

Journal of Liver Transplantation, Volume 7, July–September 2022, 100100

The authors declare that the work described has been carried out in accordance with the Declaration of Helsinki of the World Medical Association revised in 2013 for experiments involving humans as well as in accordance with the EU Directive 2010/63/EU for animal experiments.

The authors declare that this report does not contain any personal information that could lead to the identification of the patient(s) and/or volunteers.

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship. Individual author contributions are as follows:

JSN, JR, MAH: conception and design of the study.

All authors: generation, collection, assembly, analysis and/or interpretation of data.

JSN, BN, SB, MAH: drafting or revision of the manuscript.

Erratum to Strong influence of donor and recipient CYP3A5 genotype on tacrolimus disposition leading to difficult dose adjustment in a pediatric liver transplantation

Journal of Liver Transplantation, Volume 8, October–December 2022, 100132

The authors declare that the work described has not involved experimentation on humans or animals.

The authors declare that this report does not contain any personal information that could lead to the identification of the patient(s) and/or volunteers.

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.

DOIs of original article: https://doi.org/10.1016/j.liver.2022.100090, https://doi.org/10.1016/j.liver.2022.100133, https://doi.org/10.1016/j.liver.2022.100132, https://doi.org/10.1016/j.liver.2022.100136, https://doi.org/10.1016/j.liver.2022.100111, https://doi.org/10.1016/j.liver.2022.100100, https://doi.org/10.1016/j.liver.2023.100143.

https://doi.org/10.1016/j.liver.2024.100217

Available online 28 March 2024