



Incidental Right Ventricular Dilation Detected by Artificial Intelligence as a Possible Screening Tool for Pulmonary Hypertension

E. Oskar¹, J. Nathan¹, S. Pettigrew², G. Cohen³, P Rali²

¹ Department of Internal Medicine, Temple University Hospital, Philadelphia, PA, United States, ² Department of Thoracic Medicine and Surgery , Temple University Hospital, Philadelphia, PA, United States, ³Department of Radiology, Temple University Hospital, Philadelphia, PA, United States

Abstract

Methods

Results

Introduction

Pulmonary embolism (PE) is a life-threatening condition associated with significant morbidity and mortality. Right ventricular (RV) strain is a frequent consequence of PE and the most important predictor of adverse outcomes. Artificial intelligence (AI) technologies are rapidly emerging and may assist with faster and more accurate detection of PE and associated RV strain. Here we examined patients which an artificial intelligence app flagged as having an elevated RV/LV ratio on a CT scan, but did not ultimately have a pulmonary embolism. These patients may have other underlying pathology causing RV dilation and likely merit further workup. We propose AI as a potential screening tool to expedite further workup in these patients.

Methods

Patients flagged by the AI app as high risk (RV/LV ratio >1) over a period of four months were collected. Only patients without pulmonary embolism were included. The average RV/LV ratio for these patients was calculated. Follow up echocardiograms were examined to determine the presence or absence of true underlying RV dysfunction and/ or pulmonary hypertension.

Results

Of the 70 patients collected who were flagged by the app as having RV/LV ratio >1, 5 ultimately did not have a pulmonary embolism. This represents 7% of scans. Of these patients, the average RV/LV ratio was 1.38. Only one was greater than 2. Only two of these five patients ever had follow up echocardiograms. One showed no RV dysfunction, the other showed moderate to severe RV dysfunction. The RV function of the other three remains unclear.

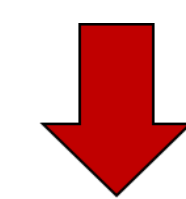
Conclusion

Patients found to have elevated RV/LV ratio by AI, but no pulmonary embolism, likely need further workup to explain this finding. We have identified a subset of patients that is at risk for pathology and is easily flagged by artificial intelligence. However, most of them have not had follow up testing to confirm or rule out the presence of pulmonary hypertension. This represents a path to optimize/expedite screening in this population. The rapid introduction of artificial intelligence screening tools into medicine may speed various response and diagnosis times. However, it also increases the number of incidental findings that may need clinical follow-up. It is unknown what the incidence of pulmonary hypertension in this group is, as we have very little follow up data thus far. However, RV dilation that is not explained by PE is likely to be due to pulmonary hypertension until proven otherwise. Further study is required to elucidate this. We hope to be able to eventually use AI to expedite further workup in this patient population.

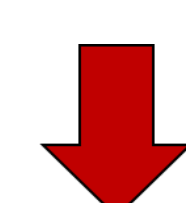
All patients flagged by the AI app as high risk (RV/LV ratio >1) over a period of four months were collected.



Only patients without pulmonary embolism were included.



The average RV/LV ratio for these patients was calculated.



Follow up echocardiograms were examined to determine the presence or absence of true underlying RV dysfunction and/ or pulmonary hypertension

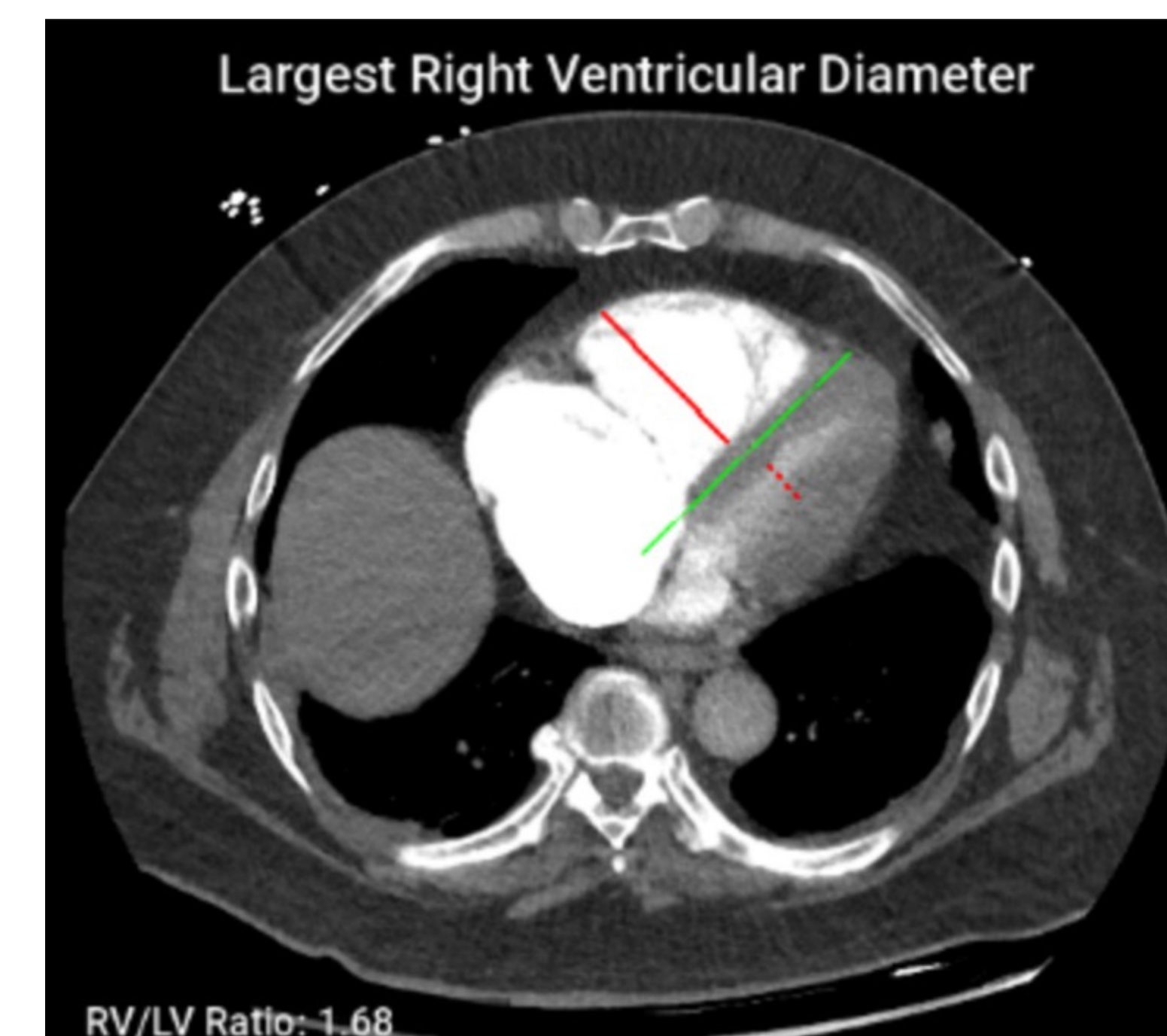


Figure 1: Software automatically measures maximum RV/LV ratio.

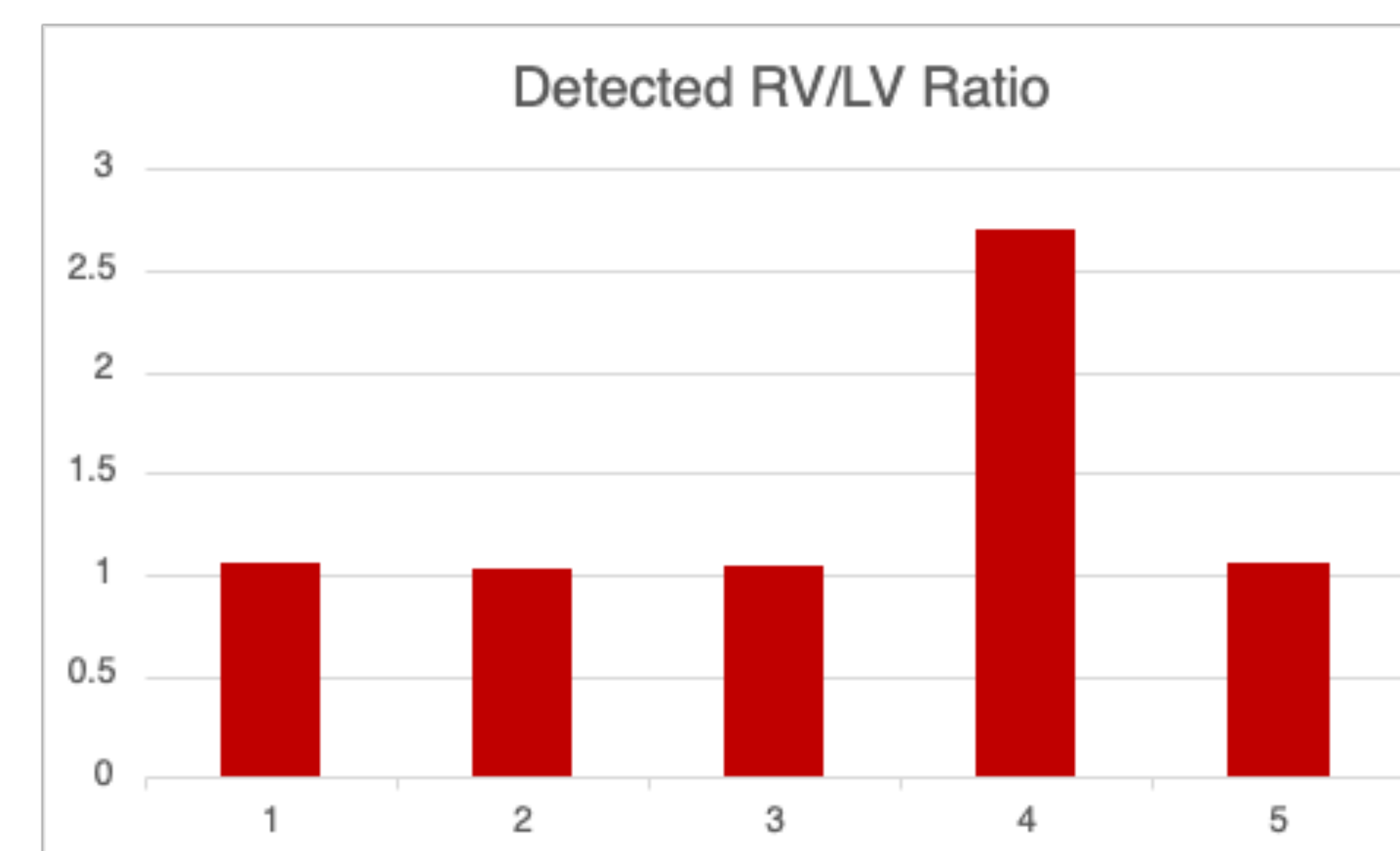


Figure 2: Detected RV/LV ratio in the five patients flagged by software who did not have PE.

- 5 of the 70 patients (7%) collected who were flagged by the app as having RV/LV ratio >1, did not have a pulmonary embolism.
- The average RV/LV ratio was 1.38. Only 1 patient had an RV/LV ratio > 2.
- Only 2 of these 5 patients (40%) ever had follow up echocardiograms:

- One showed no RV dysfunction.
- One showed moderate to severe RV dysfunction.
- RV function of the other 3 patients remains unclear.

Background

- Right ventricular (RV) strain is a frequent consequence of pulmonary embolism (PE) but may also be caused by other pathologies such as pulmonary hypertension.
- Artificial intelligence (AI) technologies are rapidly emerging and may assist with faster and more accurate detection of PE and RV strain.

Hypothesis

The institution of AI software to detect RV strain will expedite pulmonary hypertension work-up.

Conclusions

- We identified a subset of patients at risk for pathology that can be easily flagged by looking for RV strain with AI. However, most of them did not have follow up testing to confirm or rule out the presence of pulmonary hypertension.
- Since we do not know what the incidence of pulmonary hypertension is in this group, we cannot determine if the incidental finding of RV strain in a patient without PE strongly correlates with pulmonary hypertension or other pathologies.
- AI has the potential to expedite pulmonary hypertension work-up in those patients found to have incidental RV strain.