Relationship between Pulmonary Artery Obstructive Index and Pulmonary Artery Pressure in Patients undergoing Catheter Directed Thrombolysis for Pulmonary Embolism

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Background

The refined modified Miller index (RMMI) is a tool that is used for anatomic quantification of pulmonary artery obstruction in pulmonary embolism (PE) based on computed tomographic angiogram[1]. Given catheter-directed thrombolysis (CDT) has been shown to reduce RMMI scores[2], we explored whether RMMI scores correlated with the initial and net change in pulmonary artery (PA) pressure during CDT.

Figure 1: Pre-Treatment Modified Miller Index compared to the associated initial mean pulmonary artery pressure.

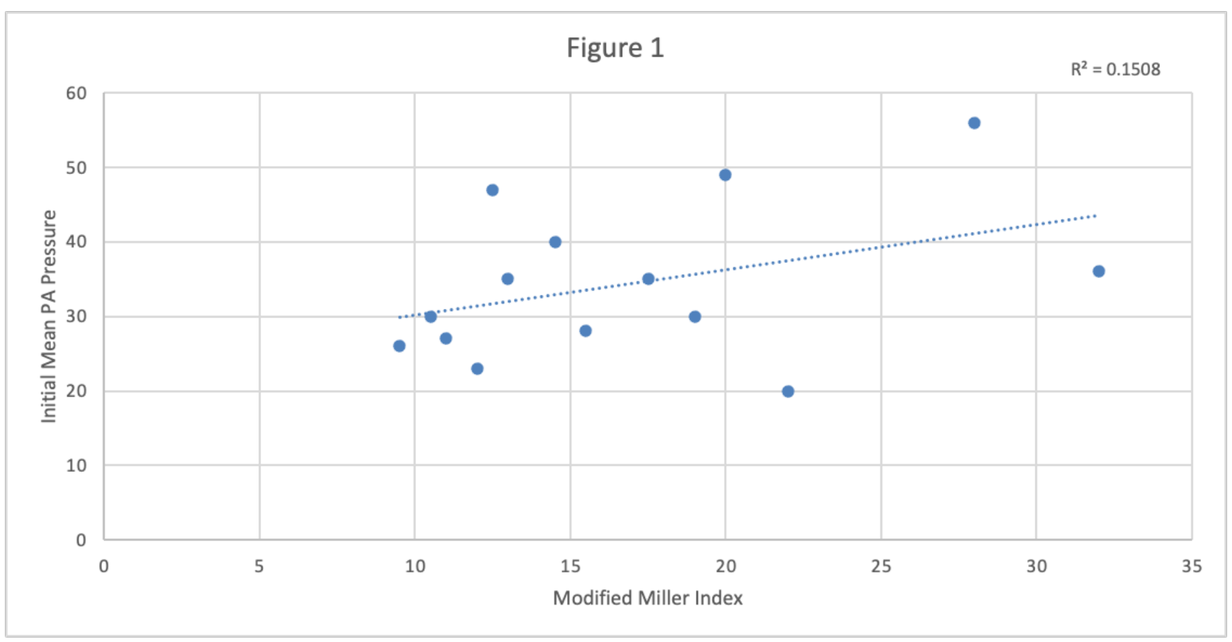
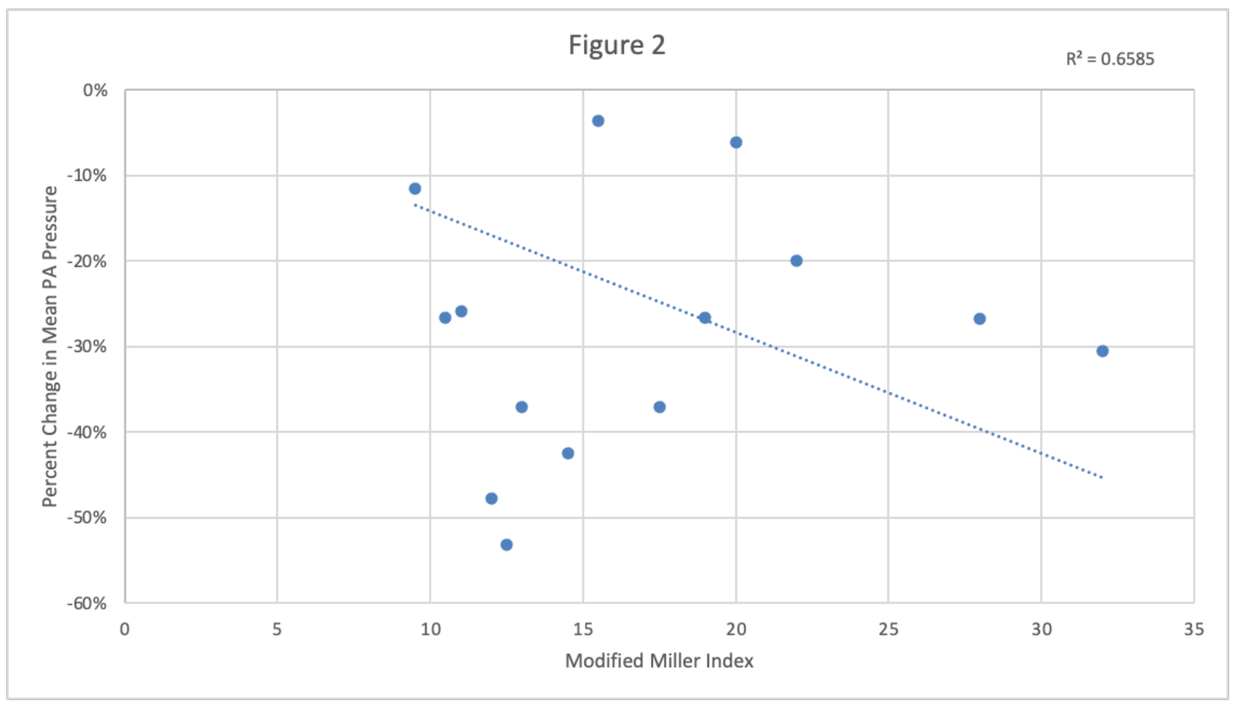


Figure 2: Pre-Treatment Modified Miller Index compared to the associated percent change in mean pulmonary artery pressure.



Citations

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Disclosures

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Methods

Fourteen consecutive patients presenting with acute intermediate-high risk PE who were deemed suitable CDT candidates underwent placement of thrombolytic delivery catheters alongside a pulmonary artery (i.e. Swan-Ganz) catheter. Baseline hemodynamic measurements were collected in the cardiac catheterization lab. Following CDT initiation, right atrial (RA) and pulmonary artery (PA) pressures were measured hourly in the ICU until therapy was stopped. Therapy termination was triggered by hemodynamic improvement, maximum cumulative tPA dose administration, or provider discretion.

Refined modified miller index scores (RMMI) were calculated for each patient as follows: the degree of obstruction in 10 segmental arteries in the right lung and 10 in the left lung were assessed and assigned scores of 0 (no obstruction), 0.5 (1%-33%), 1 (34%-66%), 1.5 (67%-99%), and 2 (total obstruction) to each of these segmental arteries. A cumulative score was calculated by adding the scores for all arteries. Total scores can range from 0 to a maximum of 40 (20 per lung). These scores were compared to the percent change in systolic, diastolic, and mean pulmonary artery pressure by the end of therapy.

Results

With a total of 14 patients, the average RMMI was 16.9 with a standard deviation (SD) of 6.7. For the right lung, it was 8.9 (SD 3.3), and for the left lung, it was 8.0 (SD 4.2). The average change in systolic and diastolic PA pressure was -27% and -36% (-46% to -10% and -63% to 0%, respectively), and the average change in mean PA pressure was -28% (-53% to -4%). Across our population, higher RMMI weakly corresponded with a higher initial mean PA pressure (R2 = 0.15, Figure 1). Furthermore, higher RMMI scores strongly correlated with a greater magnitude of systolic PA pressure reduction at the end of treatment (R2 = 0.66, Figure 2).

Conclusion

Though the current cohort is small and underpowered to yield statistically significant trends, it appears that higher RMMI scores may be associated with a higher initial PA pressure. Moreover, there is a strong trend between higher RMMI scores and more robust responses to CDT, as measured by percent reduction in PA pressure. Although no definitive conclusions can be made from the current cohort, patient enrollment, interval analysis, and exploration of trends are ongoing and required to better understand how to predict hemodynamic improvements during CDT for PE.