End the Glow!

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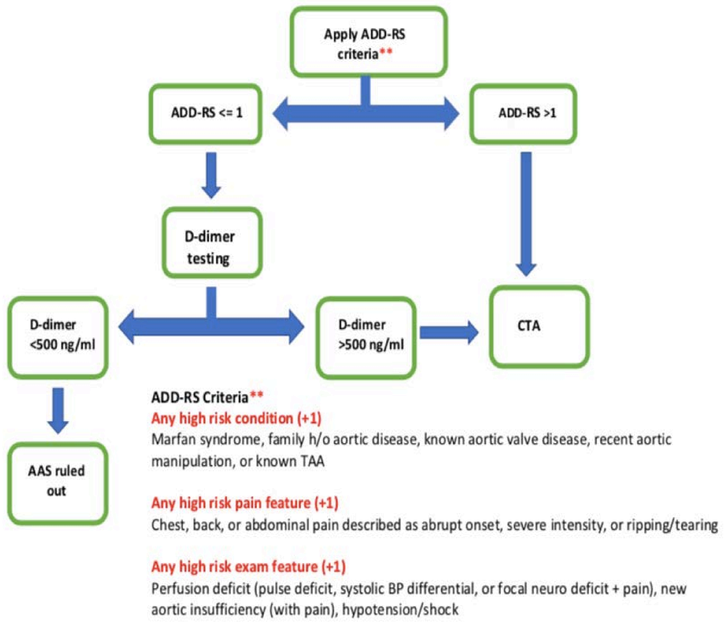
Background

Aortic dissection (AD) is part of a group of acute aortic syndromes consisting of intramural aortic hematoma, penetrating aortic ulcer, and aortic rupture. On its own, the incidence is ~3 to 8 cases per 100,000 per year, and up to 25% of cases are missed. The in-hospital mortality when treated is 27%, and with a 2% increase in mortality/hour. Imaging modalities like CT angiography, TEE, and MRA have made improved diagnosis of the disease, but are costly, potentially harmful, time consuming, and require patient stability when in use (1). The key question we have as emergency department providers is if there is a way to risk stratify patients for AD and if so, is there a test with high enough sensitivity and negative likelihood ratio (-LR) to rule out aortic dissection. Smooth muscle myosin heavy chain is a proposed modality, which is released from injured aortic media at the start of AD but there is a lack of observational studies testing its efficacy as biomarker in making the diagnosis (2). Hence, algorithms to aid physician in reducing both misdiagnosis and overtesting is much needed.

Risk Stratification tool



ADD-RS is a set of 12 clinical markers of aortic dissection released in 2010 by American Heart Association (AHA) and the American College of Cardiology (ACC) (5). This scoring system was developed using the International Registry for Aortic Dissection, comparing common historical and clinical features. The strength of the ADD-RS scoring system is that its retrospective analysis of IRAD showed that low risk scores of 0 had a sensitivity for AD of 95.4%. Of the 4.6% that had AD with a score of 0, 48.6% of these patients had abnormal chest radiographs, including things such as widened mediastinum. If considering that these patients would be worked up anyway due to an abnormal chest radiograph, the miss rate of the ADD-RS would be 2.23%.
The ADvISED Trial (Nazerian et al, 2018) evaluated the ADD-RS combined with D-dimer testing by conducting a multicenter, prospective observational study which enrolled 1,850 consecutive chest pain patients, 241 (13%) of which were diagnosed with acute aortic syndrome (AAS). ADD-RS<=1 and negative D-dimer showed a sensitivity of 98.8%, NPV 99.7%, and LR-0.02. An ADD-RS=0 had a sensitivity of 99.6%. Furthermore, application of this rule could potentially spare ~3 in 5 conclusive imaging exams in all patients with AAS, and could avoid up to 1 in 2 CTA exams in pts with suspected AAS (1).

Literature Review

Plasma D-dimer, a degradation product of cross linked fibrin by the endogenous fibrinolytic system, is found to be elevated in states like cancer, MI, pregnancy, sepsis, or disorders where there is indiscriminant activation of the coagulation cascade(2). Meta-analysis reviews of D-dimer studies have shown that a cut off level 0.50 ug/mL has proven to have high sensitivity, (-)LR, and negative predictive value (2)(3). According to the IRAD-Bio study, when utilized in the first 24 hours of symptoms, D-dimer has proven to reliably rule out pulmonary embolism (PE) and acute aortic dissection with sensitivity of 96.6% and specificity of 46.6% studied on AD patients(3, 4). Although a rapid, economical, and accessible biomarker, it is also nonspecific with a low specificity and PPV, and a poor (+) LR (2). The possibility of excessive advanced imaging is increased when used alone on a low risk patient population. Therefore, when coupled with a decision rule like the Aortic Dissection Detection Risk Score (ADD-RS), it can provide better utility with increased sensitivity.

Conclusion

Implementation of this ADD-RS criteria could aid in standardizing decisions on advanced imaging for suspected AAS, while balancing the risks of misdiagnosis and over testing. This could become an essential tool to safely rule out ultra-low risk populations, analogous to Wells Criteria, PERC, and D-dimer. The authors suggest further prospective studies to validate this decision-making algorithm, but are optimistic for its implementation in the near future.

References

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