

The Perfect Storm: Hypercoagulability, Structurally Abnormal Heart, and STEMI

Ricardo Andrés Nieves, MD¹ & Ravi Ramani, MD¹

University of Pittsburgh Medical Center Heart & Vascular Institute

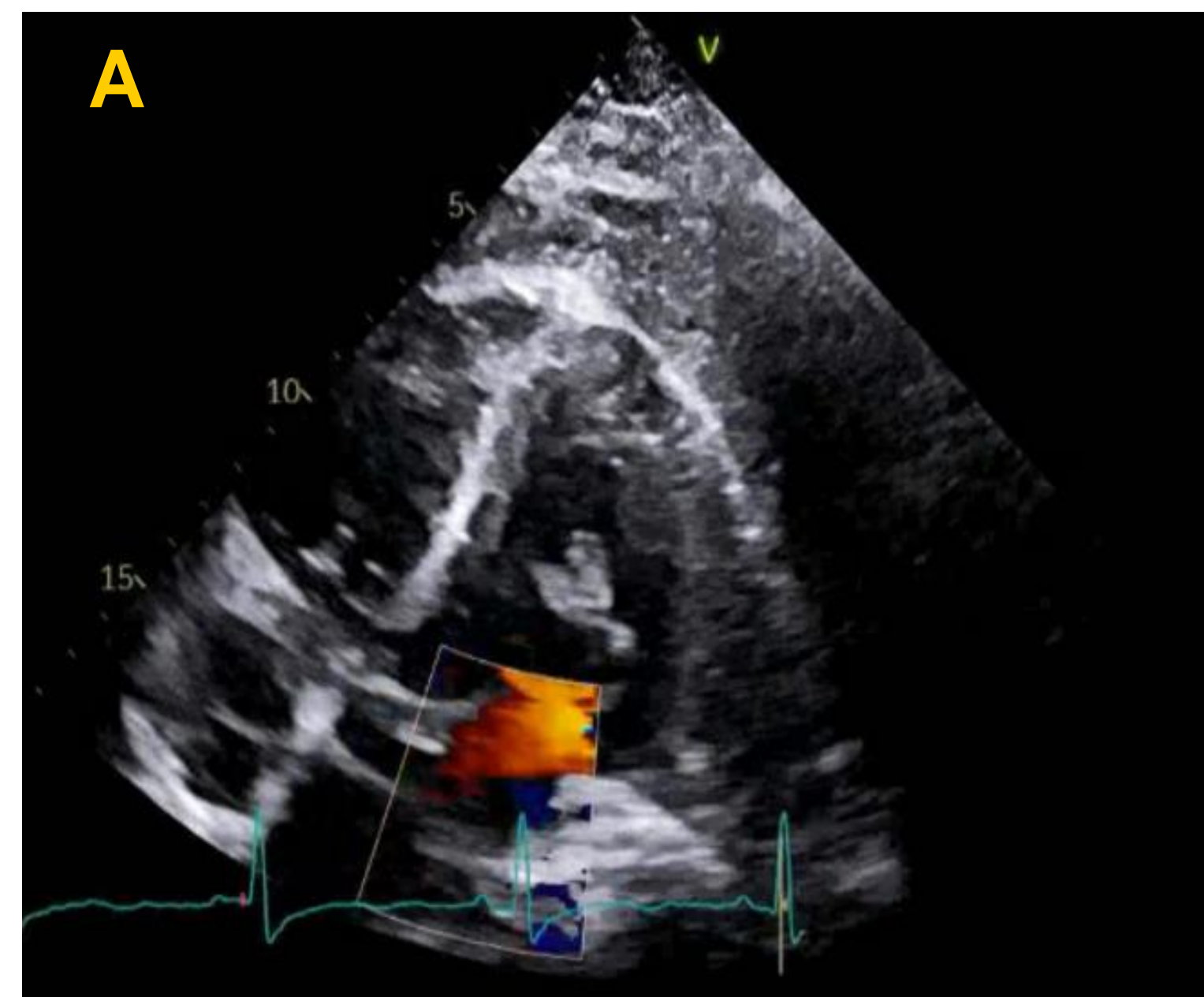
LEARNING OBJECTIVES

- Recognize the importance of invasive echocardiographic imaging for the evaluation and management of potential complications from STEMI.
- Demonstrate the importance of consistently evaluating for cognitive biases in medicine.

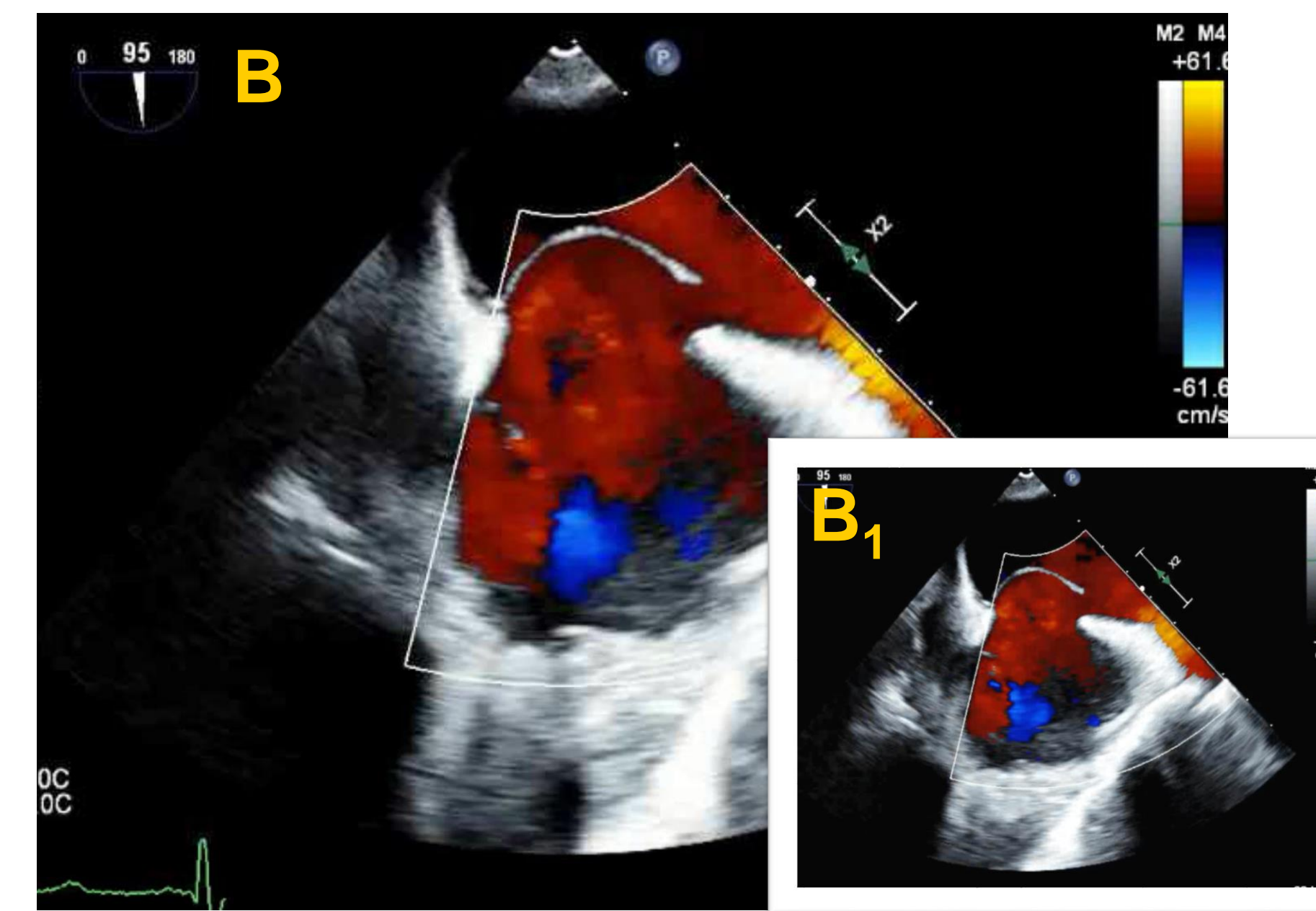
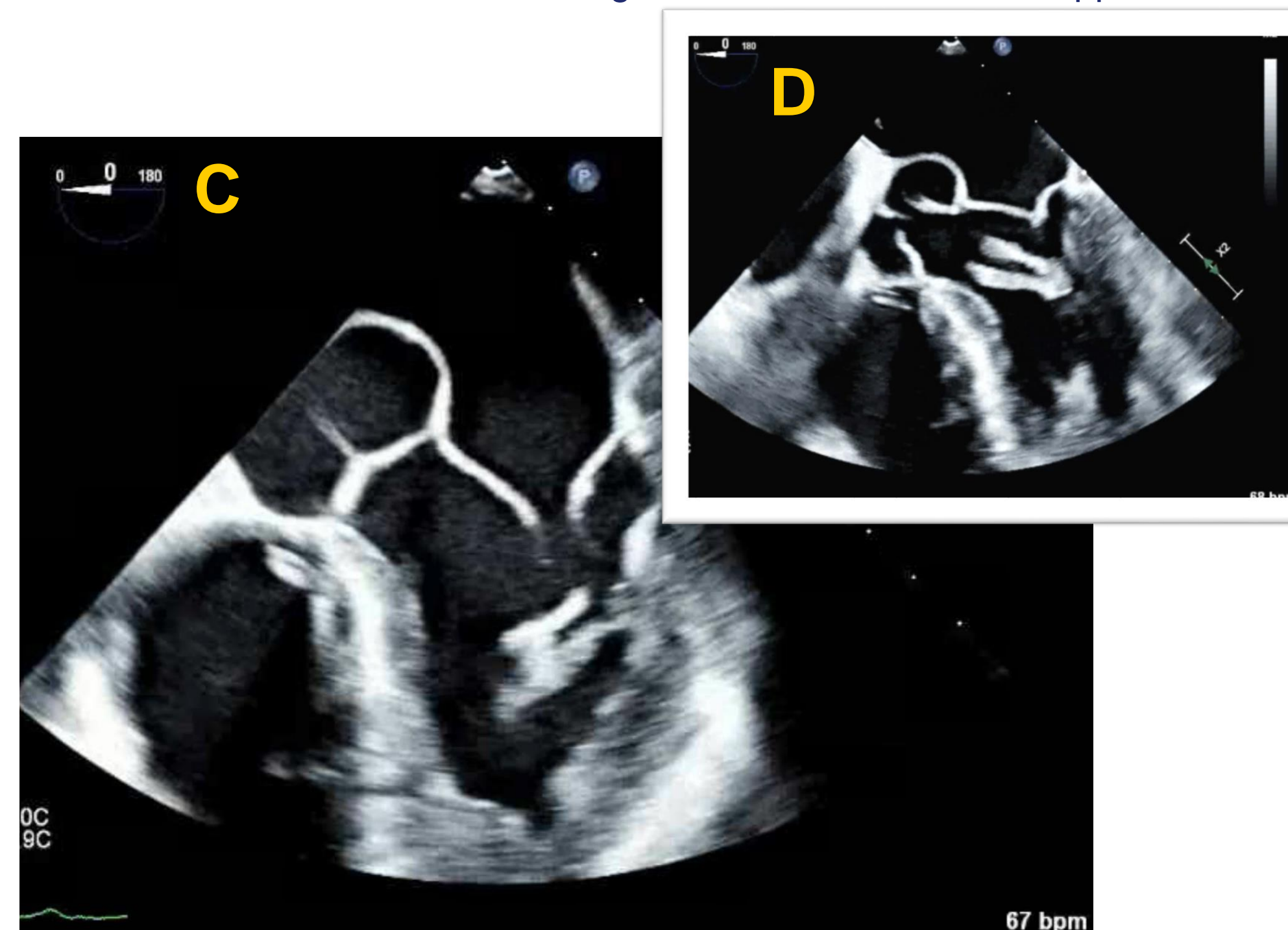
CASE

- 69-year-old male with no past medical history who presented with altered mental status and a STEMI for which he received a drug eluting stent to the left anterior descending (LAD) artery via a right radial approach.
- There was a large thrombus burden in the LAD, with otherwise unremarkable coronary arteries.
- Afterwards, patient was noted to have pain and loss of a pulse in the left upper extremity for which an emergency embolectomy was performed. He would remain intubated given persistent hypoxia.
- CTA of the chest demonstrated large bilateral pulmonary emboli.
- TTE revealed a mobile mass in the left ventricle potentially representative of a mechanical complication of STEMI.
- Emergent TEE demonstrated a PFO with right to left shunt as well as evidence of a thrombus entrapped in the mitral sub-valvular apparatus.
- Cardiopulmonary bypass was performed with removal of left ventricular mass, pulmonary embolectomy, and repair of atrial septal defect.
- Outpatient hypercoagulable evaluation is ongoing.

IMAGING



- A. Four chamber view on transthoracic echocardiogram with evidence of a highly mobile object in the left ventricle concerning for a thrombus versus ruptured papillary muscle (Still-frame)
- B. Transesophageal echocardiogram bicaval view with evidence of PFO and right to left shunt (Video), insert (B1) is a representative still frame
- C. Transesophageal Echocardiogram demonstrating a highly mobile mass entangled in the mitral sub-valvular apparatus (Video)
- D. Still frame of thrombus entangled in mitral sub-valvular apparatus



Cognitive Biases in Medicine

- Studies have established a “dual process” model of thinking and reasoning which proposes Type I and Type II processes.¹
 - Type I processes are fast reflexive, intuitive, and may operate on a subconscious level
 - Type II processes are analytic, slow, and deliberative – which requires focused attention
- In this case, patient’s initial pre-station as a middle-aged male with a smoking history and lack of medical follow up initially framed the case as single pathophysiologic process.
- Type II reasoning however prevented following biases:
 - Confirmation bias the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand²
 - Representative restraint: prototypical manifestations of a disease (pattern recognition) leads to a failure to recognize atypical variants^{1,3}

DISCUSSION

- This case highlights the importance of the proper application of diagnostic testing and type II reasoning in an atypical presentation of a hypercoagulable state.
- While initially treated for a STEMI, patient’s presentation and course represent the hemodynamic sequelae of embolized thrombus in the setting of a structurally abnormal heart.
- The first event was likely a pulmonary embolism which created a right to left shunt (Video B) and allowed for additional clot to traverse the structural abnormality.
- This hemodynamic change resulted in patient’s altered mental status at the time of presentation (stroke) and STEMI (embolism).
- While patient was appropriately treated for his STEMI, application of type II reasoning and imaging allowed providers to avoid confirmation bias and representative restraint especially given his complicated course.

IMPACT

- While the patient was initially presented as a STEMI, the inciting event appears to have been an embolic one in the setting of a previously undiagnosed hypercoagulable state.
- A deliberative and analytical approach to this patient’s case as well as timely recognition of confirmation biases allowed for the appropriate evaluation, diagnosis and treatment patient’s atypical presentation.

REFERENCES

- ¹Ely, John W., MD; Graber, Mark L., MD; Croskerry, Pat, MD, PhD Checklists to Reduce Diagnostic Errors, *Academic Medicine*: March 2011 - Volume 86 - Issue 3 - p 307-313.
- ²Nickerson RS. Confirmation Bias: A Ubiquitous Phenomenon in Many Guises. *Review of General Psychology*. 1998;2(2):175-220.
- ³Croskerry P. Cognitive and affective dispositions to respond. In: Croskerry P, Cosby K, Schenkel S, Wears R, eds. *Patient Safety in Emergency Medicine*. Philadelphia, Pa: Lippincott Williams & Wilkins; 2009:219–227.

