

## Clinical Reasoning in Acute Aortic Syndromes

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### Short Communication

Acute aortic syndromes include a spectrum of life-threatening aortic conditions. By convention, acute disease is distinguished from chronic disease at an arbitrary time point of two weeks from initial clinical presentation (hyper acute: <24 hours, acute: 1 to 14 days, subacute: >14 to 90 days, chronic: >90 days) and typically manifests with symptoms [1]. Acute aortic syndromes (AASs) are a group of disease involving the thoracic aorta. Including, acute aortic dissection, intramural aortic hematoma, penetrating aortic ulcer [2]. The incidence of AAS is approximately 50–150 cases per million populations per year, 80% of which are dissections, 15% intramural haematomas (IMH) and 5% penetrating ulcers (PAU) [3]. The classic acute aortic dissection is due to the separation of the layers of the aortic wall. A tear in the intimal layer results in the progression of the dissection (either proximal or retrograde) chiefly due to the entry of blood in between the intima and media. An acute aortic dissection is associated with very high mortality [4]. The most common classifications of AASs are those by DeBakey and Stanford. DeBakey categorizes AASs in type I (involving ascending aorta, arch and descending thoracic aorta) Type II (limited to ascending aorta) and type III (involving descending aorta distal to left subclavian artery origin). Stanford categorizes AASs in type A (involving ascending aorta) and type B (not involving ascending aorta) (**Figure 1**) [2].

Prognosis is most favorable when patients are treated early. Mortality follows a linear increase with diagnostic delay and can be as high as 2% per hour of delay [5].

Acute aortic syndromes cannot be distinguished from each other clinically, and imaging confirmation is necessary to determine the type of acute aortic syndrome, classify the location extent of the pathology, and identify any anatomic complications [1]. CT is the most used imaging technique in the diagnosis of aortic dissection (77%), given that it is available 24h a day even in remote community hospitals and allows whole aorta visualization and most of the AAS complications [3]. Conclusive diagnosis of AASs requires urgent computed tomography angiography (CTA) of the chest and abdomen or transesophageal echocardiography (TEE), but pretest selection of patients is needed owing to the risks, costs, and hassles of advanced aortic imaging [6]. So, knowing the importance of earlier treatment is needed to establish the best

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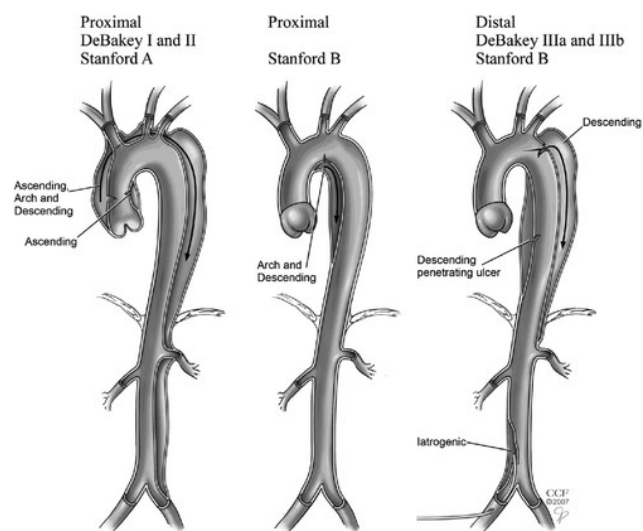
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**Figure 1** Aortic dissection classification: DeBakey and Stanford Classifications.

diagnostic strategy in AASs that can be used to guide diagnostic decisions, based on pretest probability [5]. The tool used to assess

the pretest probability of AAS was the aortic dissection detection risk score (ADD-RS), endorsed by international guidelines on aortic diseases [6]. This process should include specify questions about risk factors, and pain features, as well as a focused examination to identify findings that are associated with AASs, to define a patient as having a low ( $\leq 0.5\%$ ), moderate (0.5%–5%) or high ( $> 5\%$ ) probability for AAS. The committee suggests no further testing in a population with a low pretest probability (prevalence of AAS of  $\leq 0.5\%$ ). suggests using a strategy starting with D-dimer for excluding AAS in a population with an intermediate pretest probability (prevalence 0.5%–5%), followed by ECG-gated CT in patients with a positive D-dimer test [7]. If D-dimer testing is

not readily available, an alternative acceptable strategy includes performing ECG-gated CT alone and recommends using a strategy starting with ECG-gated CT for assessing patients suspected of having AAS in a population with a high pretest probability (prevalence  $\geq 5\%$ ) (Figure 2) [5].

The diagnostic flow chart combines the pre-test probabilities according to clinical data, and the laboratory and imaging tests, as should be done in clinical practice in emergency or chest pain units (Figure 3) [8]. Acute aortic syndrome is a difficult-to-diagnose aortic emergency. So its proposed recommendations to aid clinicians in risk stratifying patients and, depending on risk level, suggest further investigations needed [5].

Risk assessment category	Characteristic	Score
<b>Risk factors</b> • Connective tissue disease • Aortic valve disease • Recent aortic manipulation • Family history of AAS • Aortic aneurysm	No risk factors	0
	Any nonaneurysmal risk factors	1
	Aortic aneurysm	2
<b>Pain features</b> • Severe or worst ever • Thunderclap or abrupt • Tearing or ripping • Migrating or radiating	No high-risk pain features	0
	1 or 2 high-risk pain features	1
	3 or more high-risk pain features	2
<b>Physical examination findings</b> • Pulse deficit • Neurological deficit • Aortic insufficiency • Hypotension or pericardial effusion	No high-risk physical examination findings	0
	Any high-risk physical examination findings	2
<b>Alternative diagnosis</b>	Suspicion for an alternative diagnosis††	-1
	Unsure	0
	AAS the most likely diagnosis	1

**Score results**  
 0: Low-risk probability ( $< 0.5\%$ ) — no further investigations  
 1: Moderate-risk probability (0.5%–5%) — D-dimer testing  
 $\geq 2$ : High-risk probability ( $> 5\%$ ) — ECG-gated CT aorta

Note: AAS = acute aortic syndrome, CT = computed tomography, ECG = electrocardiogram.  
 \*Includes patients presenting with symptoms or signs suggestive of acute aortic syndrome (chest, abdominal or back pain) or perfusion deficit (central nervous system, cardiac, mesenteric, limb), syncope, blood pressure differential  $> 20$  mm Hg, systolic blood pressure  $> 180$  mm Hg; excludes patients who are  $< 18$  years or pregnant or those with recent trauma or cocaine use.  
 †† acute coronary syndrome is suspected and there are high-risk pain features or physical examination findings or risk factors for AAS, consider chest radiograph, point-of-care ultrasound and possibly D-dimer testing.  
 ‡If pulmonary embolism is suspected and there are high-risk pain features or physical examination findings or risk factors for AAS, hold anticoagulation until confirmation.

Figure 2 Clinical decision aid for assessing pretest probability and conditional recommendations for investigation at a low-risk, moderate-risk and high-risk pretest probability.

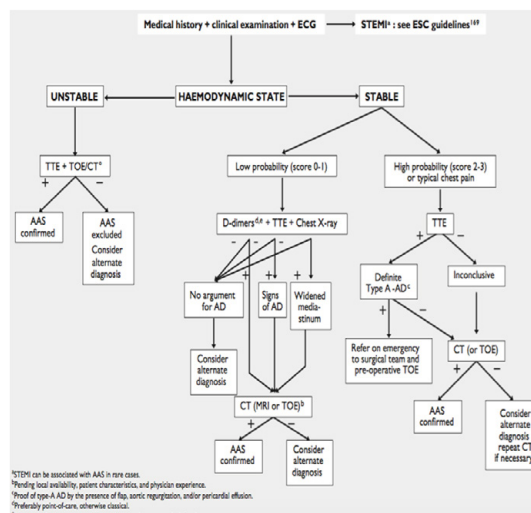


Figure 3 Flowchart for decision-making based on pre-test sensitivity of acute aortic syndrome. AAS = abdominal aortic aneurysm; AD = aortic dissection; CT = computed tomography; MRI = magnetic resonance imaging; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.

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