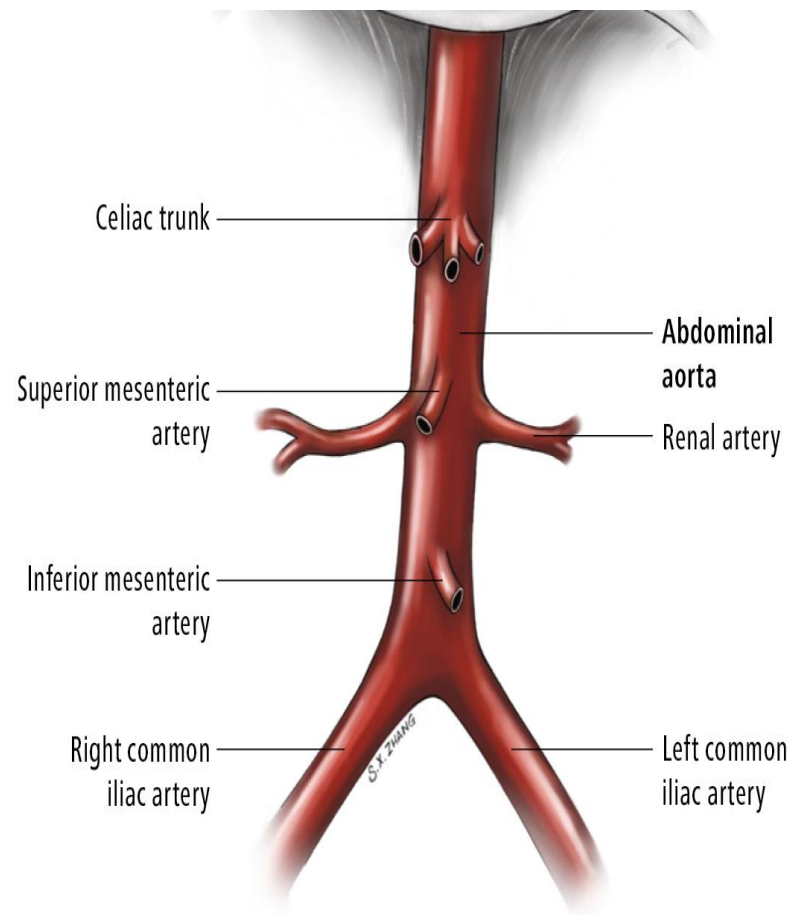
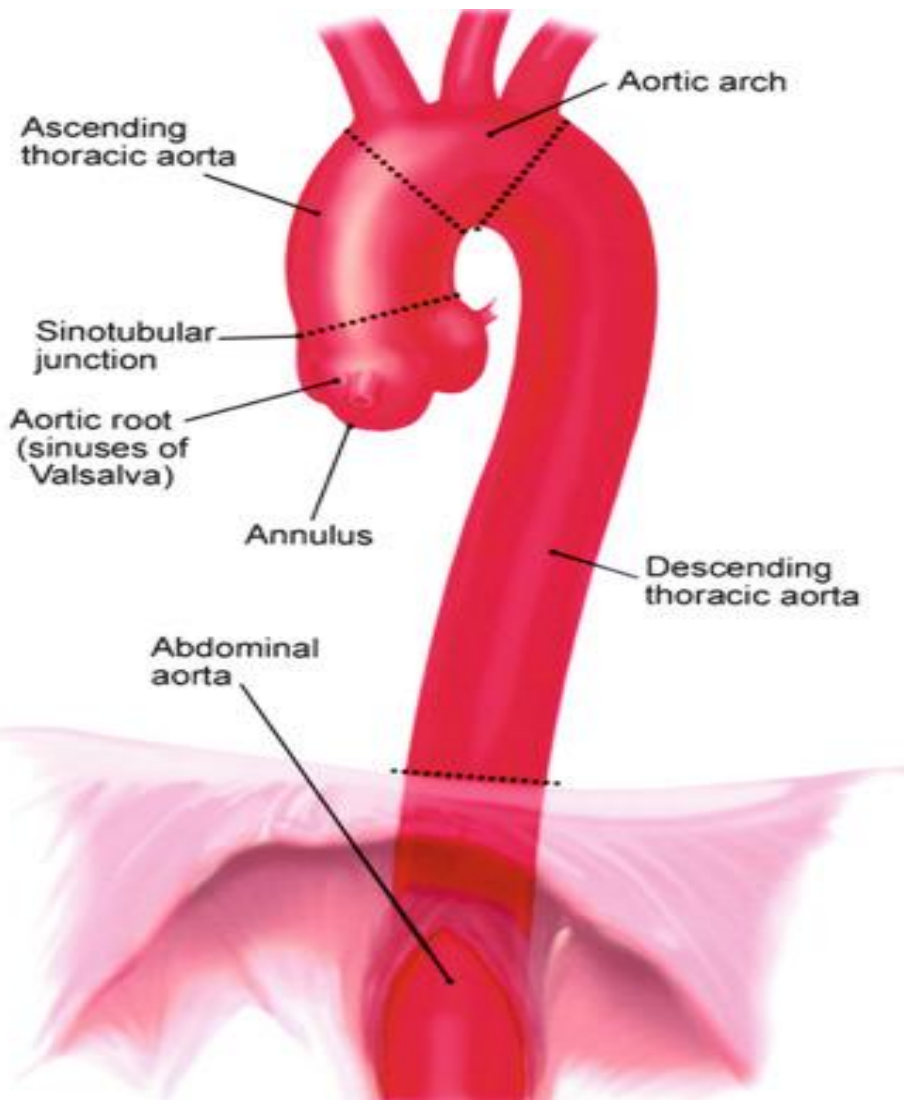


# Acute aortic syndromes overview

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- Acute aortic syndromes (AAS) encompass a of **life-threatening** medical conditions including
  - Classic acute aortic dissection
  - Intramural hematoma,
  - Penetrating atherosclerotic aortic ulcer.
- Given the **non-specific symptoms** and physical signs, a **high clinical index of suspicion** is necessary to detect the disease before irreversible lethal complications occur.

- The aorta, called ‘**the greatest artery**’ by the ancients, is the ultimate conductance vessel carrying roughly **200 million litres** of blood to the body in an average lifetime.
- Anatomically, it is divided into
  - Thoracic ,above the diaphragm
    - Aortic root
    - Ascending,
    - Arch,
    - Descending segments
  - Abdominal ,below the diaphragm.
    - Suprarenal
    - Infrarenal segments.



# Acute Dissection

- Although the true **incidence** of AAD is difficult to define (pre-hospital mortality and sudden death cases may be missed unless autopsy is carried out),
  - **Population-based studies** suggest that it may range between **2.6 and 3.5 cases per 100 000** person-years,
  - And **necropsy series** have reported a prevalence ranging from **0.2% to 0.8%**.
- Notably, many studies support the presence of an evident **chronobiologic rhythmic pattern** in the incidence of acute aortic events, characterized by significant higher risk in **winter** (December), On **Monday**, and in **morning** hours (between 6 - 12 a.m.).

Historically, acute dissection has been defined as occurring within

- 2 weeks of symptom onset, with chronic dissection occurring beyond the second week.

European society of cardiology (ESC) guidelines have recently suggested to further divide the time course of aortic dissection into

- Acute (<14 days), subacute (15–90 days), and chronic (>90 days)

Booher et al, using data from the international registry of aortic dissection (IRAD), developed kaplan–meier survival curves identified four time domains:

- Hyperacute (<24 h), acute (2–7 days), subacute (8–30 days), and chronic (>30 days).

Overall survival was progressively lower through the four time periods, regardless of treatment strategy.

# Risk factors for development of thoracic aortic dissection

Conditions associated with increased aortic **wall stress**

- Hypertension, particularly if uncontrolled
- Pheochromocytoma
- Cocaine or other stimulant use
- Weightlifting or other Valsalva manoeuvre
- Trauma
- Deceleration or torsion injury (e.g. motor vehicle crash, fall)
- Coarctation of the aorta

Conditions associated with aortic **media abnormalities**

- Genetic
  - Marfan syndrome
  - Ehlers–Danlos syndrome, vascular form
  - Bicuspid aortic valve (including prior aortic valve replacement)
  - Turner syndrome
  - Loey–Diez syndrome
  - Familial thoracic aortic aneurysm and dissection syndrome

## Inflammatory vasculitis

- Takayasu arteritis
- Giant cell arteritis
- Behçet arteritis

## Other

- Atherosclerosis
- Pregnancy
- Polycystic kidney disease
- Chronic **corticosteroid** or immunosuppression agent administration
- Infection involving the aortic wall either from bacteremia or extension of adjacent infection

Modified from Hiratzka et al.



## Presenting symptoms, signs, chest X-ray, and electrocardiographic features

### Symptoms and signs:

- Chest or back pain (87.9%)
- Severe or worst ever pain (87.9%)
- Abrupt onset of pain (84.0%)
- Migrating pain (14.8%)
- Pain presenting within 6 h of symptom onset (75.8%)
- Any focal neurological deficit (13.7%)
- Hypotension, shock, or tamponade (23.4%)
- Hypertension at presentation (40.0%)
- Any pulse deficit (32.3%)
- Aortic regurgitation (38.7%)
- Abdominal pain (30.5%)

### Chest radiography:

- Normal (28.1%)
- Widened mediastinum (49.5%)

## Relative strengths of imaging modalities for acute aortic syndromes

	<b>TTE</b>	<b>TOE</b>	<b>MRI</b>	<b>CT</b>
<b>Imaging factors</b>				
Comprehensive aortic assessment	+	++	+++	+++
Tomographic (3D reconstruction)	-	-	+++	+++
Functional data	+++	+++	++	+
Tissue characterization	-	-	+++	+++
<b>Clinical factors</b>				
Portability	+++	+++	-	-
Patient access/monitoring	+++	+++	+	++
Rapidity	+++	++	++	+++
Need for contrast	-	-	++	+++
Need for sedation	-	+++	-	-
Lack of radiation exposure	+++	+++	+++	-

3D, three-dimensional; CT, computed tomography; MRI, magnetic resonance imaging; TOE, transoesophageal echocardiography; TTE, transthoracic echocardiography.

Modified from Bossone et al.<sup>33</sup>

# Long-term follow-up

Ten-year survival rate from 30% to 60%

- Medical treatment
  - Optimal blood pressure (<120/80 mmHg)
  - Heart rate (<60 b.p.m.)
  - First line: beta-blockers
  - Second line: ACE-inhibitors or ARBs
  - Third line: calcium channel blockers (long-acting dihydropyridine)
- Lipid-lowering therapy:
  - Target of LDL-cholesterol <70 mg/dL

## Imaging surveillance:

- CT or MRI of chest and abdomen+TTE before discharge and **at 1, 3, 6, and 12 months** and annually thereafter.

## Patient education and lifestyle goals

- Smoking cessation and risk factor modification for atherosclerotic disease
- Avoid **cocaine** or other stimulating drugs such as **methamphetamine, strenuous physical activities** (isometric exercise, pushing, or straining that would require a **Valsalva manoeuvre**), and **contact sports** (e.g. competitive football, ice hockey, or soccer, etc.).
- **Mild aerobic exercise and daily activities are not restricted.**

# Intramural haematoma

- Aortic IMH (5–25% of AAS) is a clinical entity characterized by haemorrhage within the aortic wall in the absence of an intimal flap
- The diagnostic hallmark
  - Thickening of **>5mm** of the aortic wall,
  - Without evidence of **blood flow** on imaging examination
- IMH is more frequently observed in the descending thoracic aorta (**Type B IMH, 60–70%**) and less commonly in the ascending aorta and aortic arch (**Type A IMH; 30% and 10%, respectively**).

- Intramural haematoma is characterized by a dynamic evolution and may lead to:
  - Classic aortic dissection (28% to 47%)
  - And/or aortic rupture (20% to 45%).
  - Regression is seen in just 10% of patients.
- Involvement of the ascending aorta (Type A IMH) carries a high in hospital mortality (up to 40%),
- On the other hand, Type B IMH is less likely to be associated with an adverse outcome, with an in-hospital mortality risk of <10%.

# Penetrating aortic ulcer

- Penetrating aortic ulcer is defined as an ulceration of **an aortic atherosclerotic plaque penetrating the internal elastic lamina into the media**,
  - Often associated with a **variable degree** of IMH formation.
  - Often **multiple**
  - May vary greatly in size (ranging from **5mm** in diameter and **4–30mm** in depth).
  - Most commonly in the **middle and lower descending aorta**,
  - Less frequently in the **aortic arch** and **abdominal aorta**,
  - And rarely in the **ascending aorta**.
- Although the true prevalence of PAU is unknown, it may account for **2–7%** of all AAS.

# Diagnostic

- **Contrast-enhanced CT** is considered the diagnostic technique of choice.
- The risk of rupture is considerably higher (up to **40%**) (**7% for Type A and 4% for Type B AAD**)
- **Surgery** for **Type A PAU** and **medical therapy** with careful clinical follow-up and imaging surveillance for **Type B PAU**
- In **complicated Type B PAU** (signs of aortic rupture), **endovascular stent grafting** (TEVAR/EVAR) is usually preferred to surgical repair.