YONSEI UNIVERSITY

Acute Aortic Syndrome

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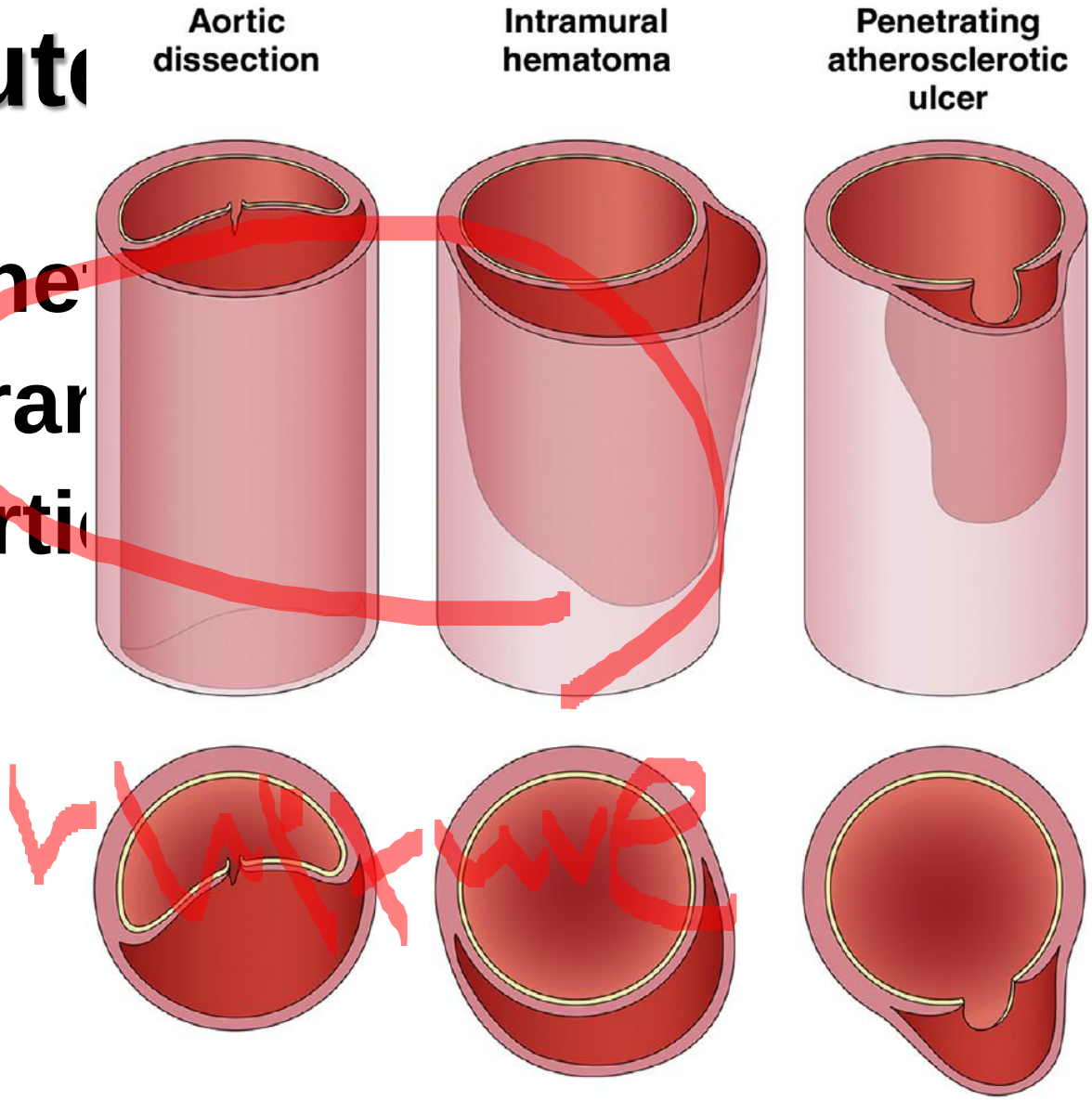
Take home message

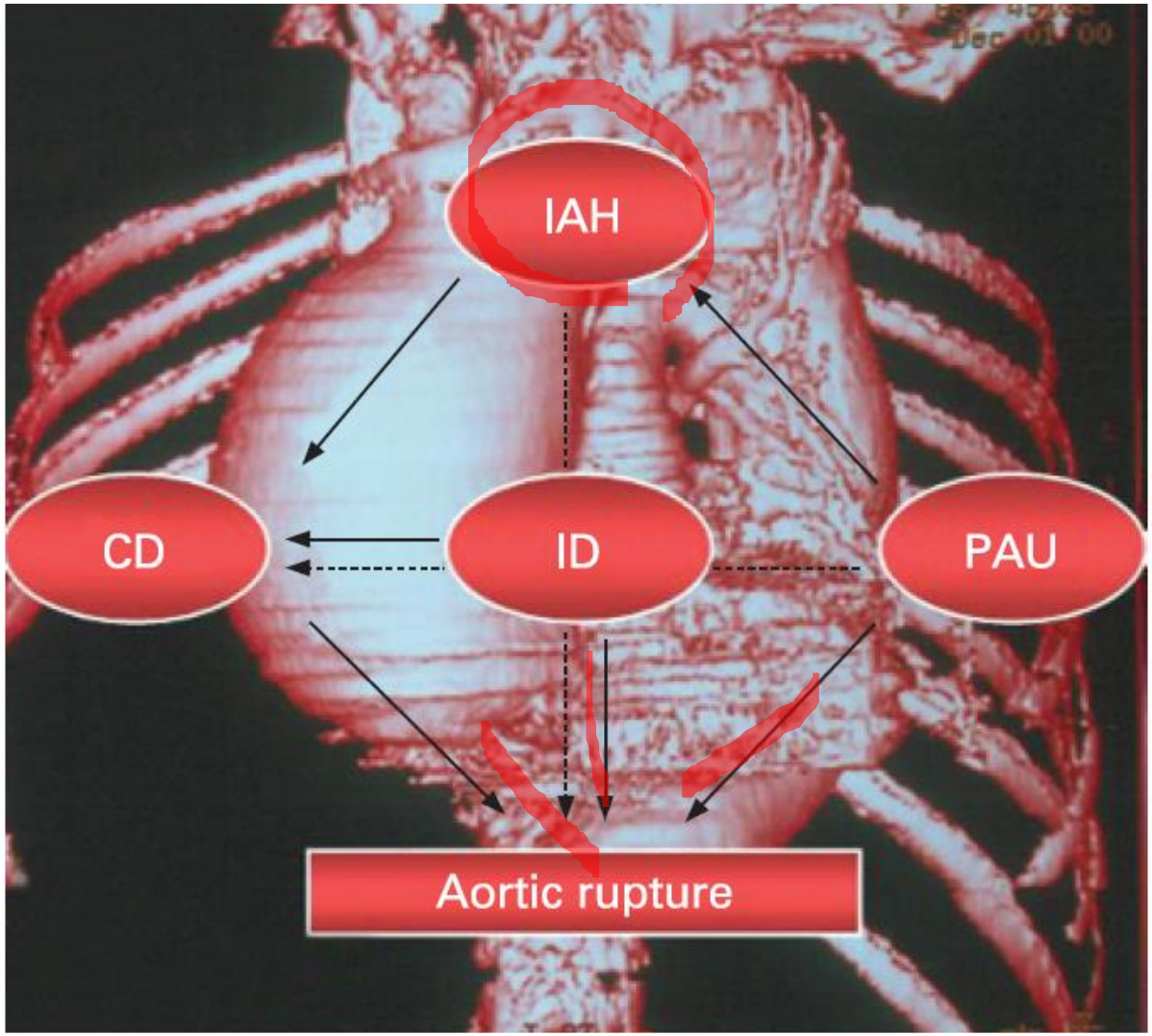
- Definition
- CT finding / Assessment / Pathophysiology
- Plan

Acute

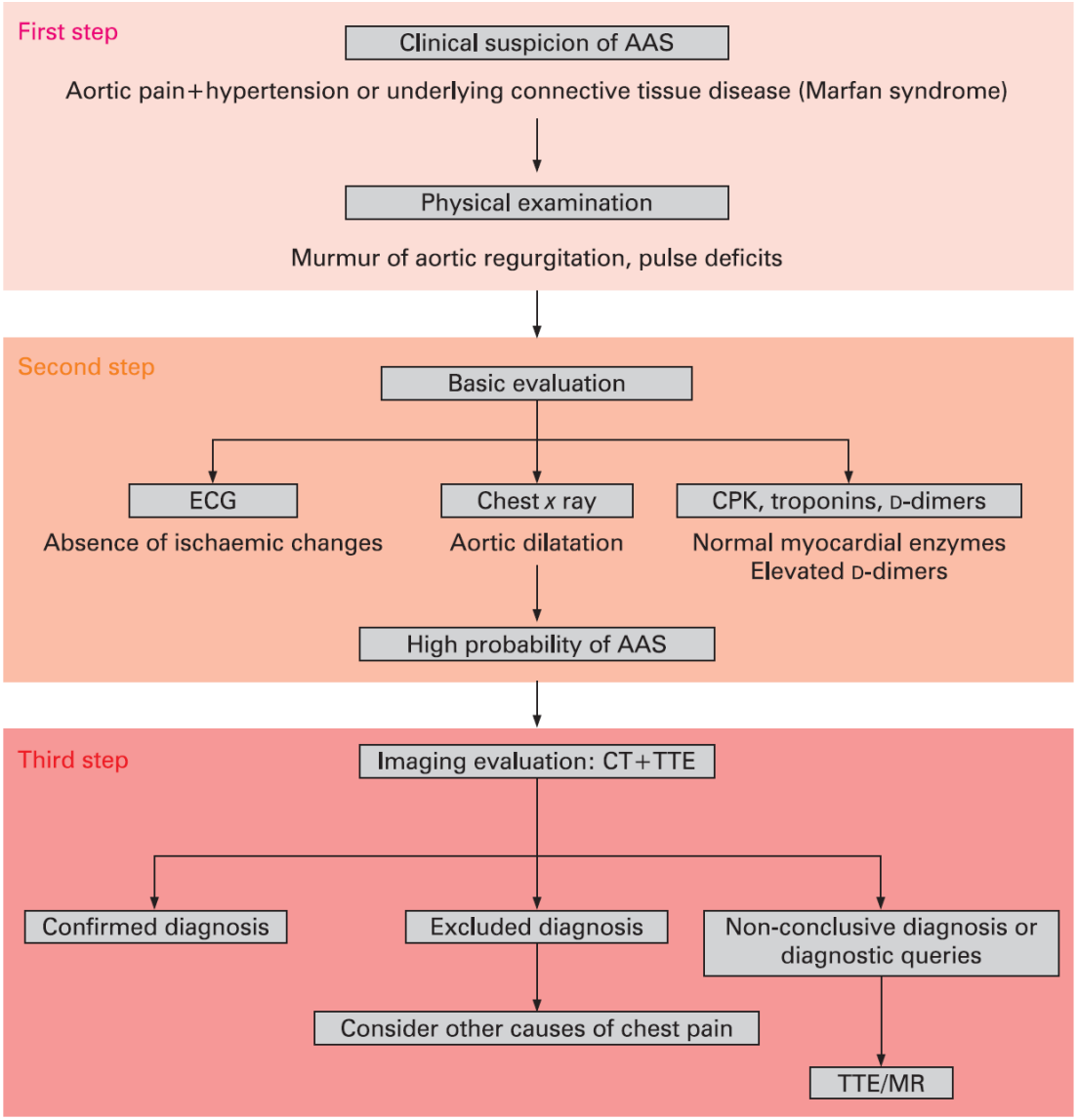
- Pene
- Intra
- Aorti



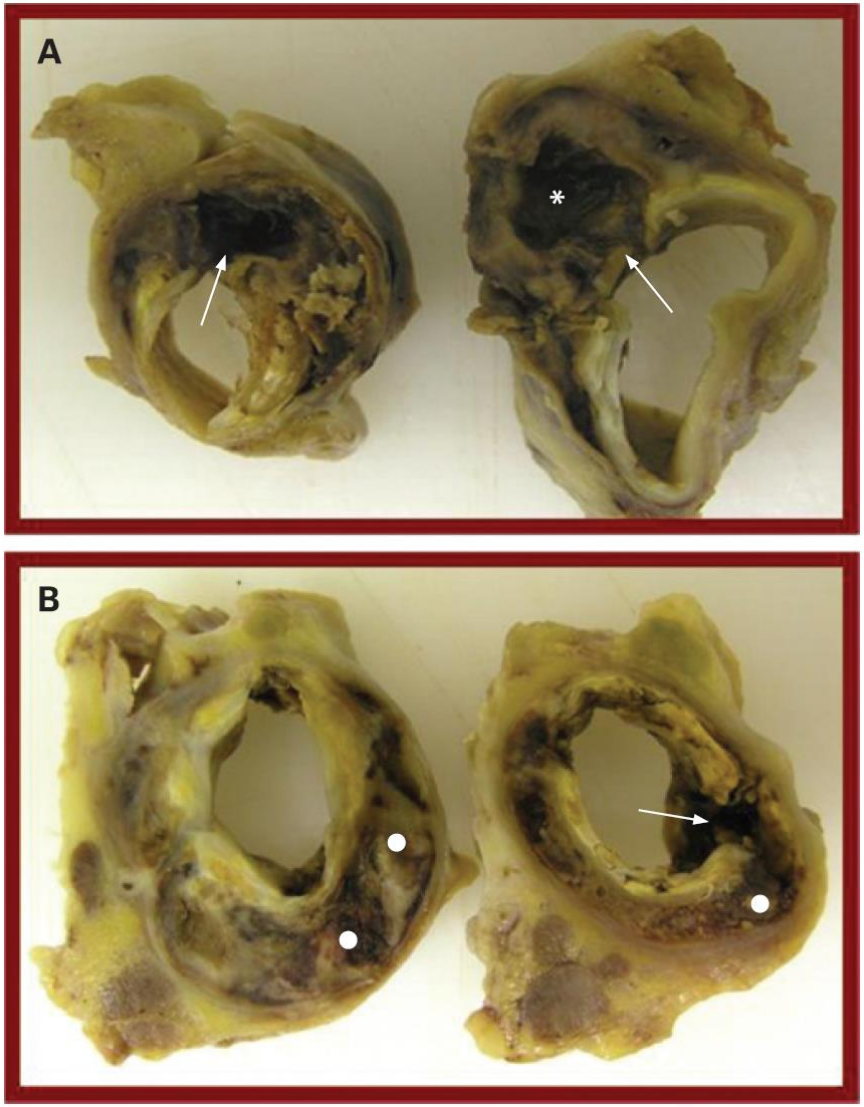
Acute aortic syndrome



Acute aortic syndrome

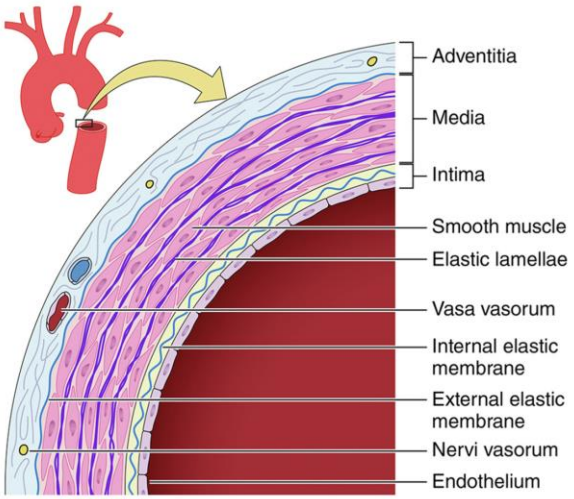


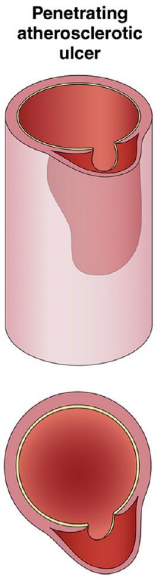
Penetrating aortic ulcer



- Dissection ?
- Intimal tear ?
- Communicating channel ?

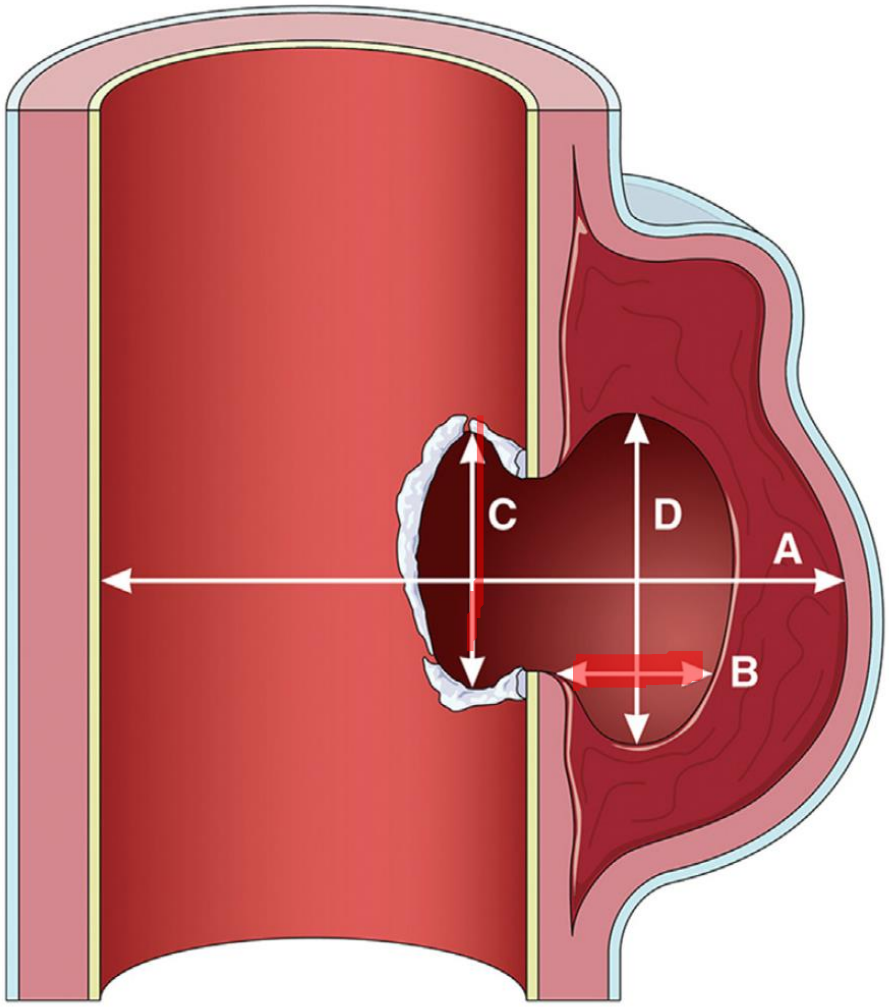
- Penetrate internal elastic lamina
  - Localized hematoma
  - IMH
  - Classical dissection





Penetrating aortic ulcer

FIGURE 22 Dimensions of Penetrating Atherosclerotic Ulcers



- A: Maximal aortic diameter
- B: Depth
- C: Length of intimal defect (diameter)
- D: Width of intramural pool

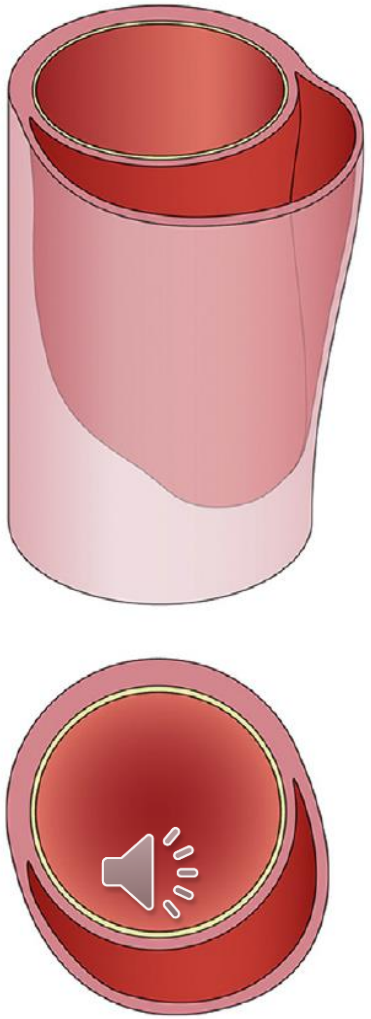
Feature
Maximum PAU diameter ≥13–20 mm[1]
Maximum PAU depth ≥10 mm[1]
Significant growth of PAU diameter or depth
PAU associated with a saccular aneurysm[5]
PAU with an increasing pleural effusion[1]

Penetrating aortic ulcer

COR	LOE	RECOMMENDATIONS
1	C-LD	1. In patients who require repair of a PAU in the ascending aorta or proximal aortic arch (zones 0-1), open surgical repair is recommended.
2a	C-LD	2. In patients who require repair of a PAU in the distal aortic arch (zones 2-3), descending thoracic aorta, or abdominal aorta, either open surgical repair[1-3] or endovascular repair is reasonable, based on anatomy and medical comorbidities.[4-6]

Intramural hematoma

- 10~30% of AAS
- Definition
  - Absence of intima tear
    - No intimal tear
    - Small intimal tear without significant reentry
  - Vasa vasorum bleeding



Intramural hematoma

TABLE 30 High-Risk Imaging Features of IMH

For Type A IMH	For Type B IMH
■ Maximum aortic diameter >45–50 mm[18,20]	■ Maximum aortic diameter >47–50 mm[15,20]
■ Hematoma thickness ≥10 mm[4]	■ Hematoma thickness ≥13 mm[15]
■ Focal intimal disruption with ulcer-like projection involving ascending aorta or arch[18,21]	■ Focal intimal disruption with ulcer-like projection involving the descending thoracic aorta if it develops in acute phase[15,16]
■ Pericardial effusion on admission[18]	■ Increasing or recurrent pleural effusion[19,22]

For Both Type A and Type B IMH

- Progression to aortic dissection[19]
- Increasing aortic diameter[21,22]
- Increasing hematoma thickness[21,22]

Intramural hematoma

TABLE 29 Features of Complicated IMH

Feature
■ Malperfusion
■ Periaortic hematoma
■ Pericardial effusion with cardiac tamponade
■ Persistent, refractory, or recurrent pain
■ Rupture

Intramural hematoma

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In patients with complicated (Table 29) acute type A or type B aortic IMH, urgent repair is recommended.[1-3]
1	B-NR	2. In patients with uncomplicated acute type A IMH, prompt open surgical repair is recommended.[1,4-6]
2b	C-LD	In selected patients with uncomplicated acute type A IMH who are at increased operative risk and do not have high-risk imaging features (Table 30), an initial or expectant approach of medical management may be considered.[6-12]
1	B-NR	3. In patients with uncomplicated acute type B IMH, medical therapy as the initial management strategy is recommended.[1-3,13]
2a	C-LD	4. In patients with type B IMH who require repair of the distal aortic arch or descending thoracic aorta (zones 2-5) and have favorable anatomy, endovascular repair is reasonable when performed by surgeons with endovascular expertise.[2,14]
2a	C-LD	5. In patients with type B IMH who require repair of the distal aortic arch or descending thoracic aorta (zones 2-5) and have unfavorable anatomy for endovascular repair, open surgical repair is reasonable.[2,3]
2b	C-LD	6. In patients with uncomplicated type B IMH and high-risk imaging features (Table 30), intervention may be reasonable.[13-16]

Intramural hematoma

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In patients with PAU of the aorta with rupture, urgent repair is recommended.[1-3]
1	B-NR	2. In patients with PAU of the ascending aorta with associated IMH, urgent repair is recommended.[1-3]
2a	C-LD	3. In patients with PAU of the aortic arch or descending thoracic aorta with associated IMH, urgent repair is reasonable.[1-3]
2b	C-LD	4. In patients with PAU of the abdominal aorta with associated IMH, urgent repair may be considered.[4]

TABLE 30 High-Risk Imaging Features of IMH

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■ Maximum aortic diameter >45-50 mm[18,20]	■ Maximum aortic diameter >47-50 mm[15,20]
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■ Pericardial effusion on admission[18]	■ Increasing or recurrent pleural effusion[19,22]

For Both Type A and Type B IMH

- Progression to aortic dissection[19]
- Increasing aortic diameter[21,22]
- Increasing hematoma thickness[21,22]

Aortic dissection

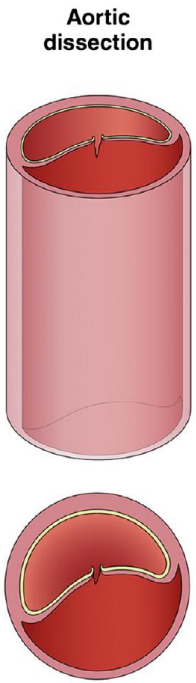


Table 2 Imaging criteria to distinguish classic aortic dissection, intramural aortic haematoma (IAH) and incomplete dissection

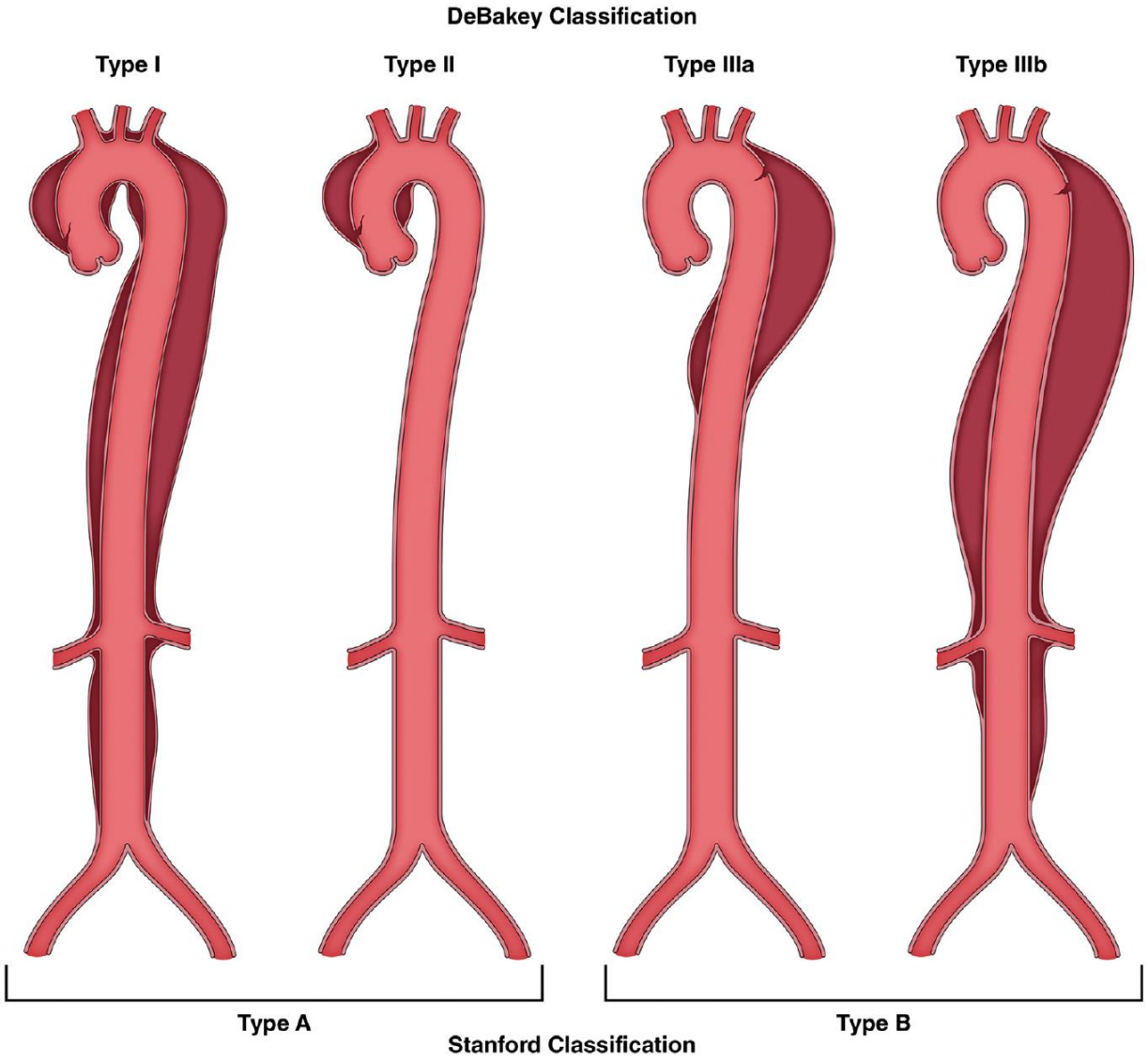
Criteria	Classic dissection	IAH	Incomplete dissection
Dissection flap	Yes	No	No
Double aortic lumen	Yes	No	No
Entrance tear	Yes	No	Yes*
Aortic wall thickening	No	Yes	Yes
Decreased aortic lumen	Yes	Yes†	No

Aortic dissection

TABLE 3 Classification of Aortic Dissection Chronicity Based on the 2020 SVS/STS Reporting Standards

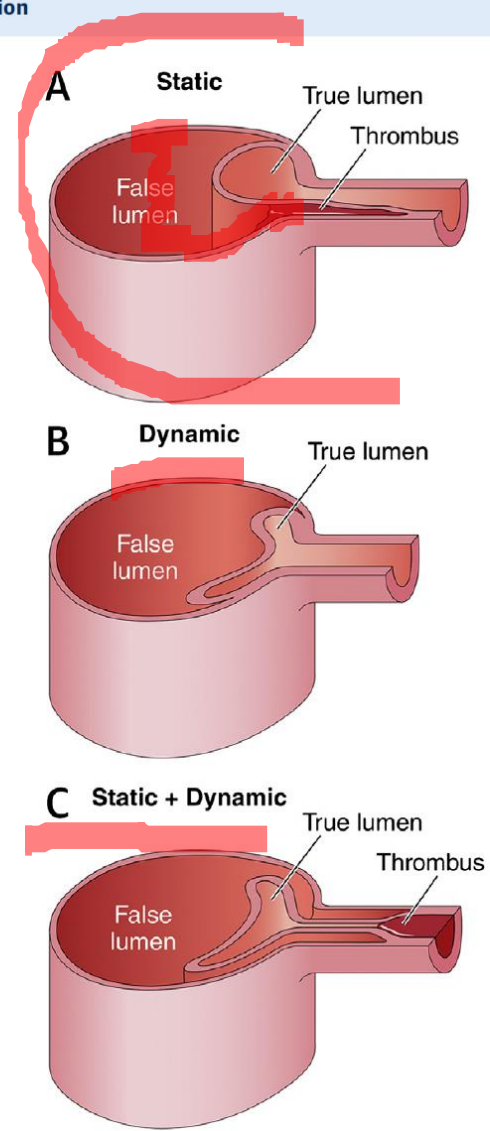
Chronicity	Time From Onset of Symptoms
Hyperacute	<24 h
Acute	1-14 d
Subacute	15-90 d
Chronic	>90 d

Aortic dissection

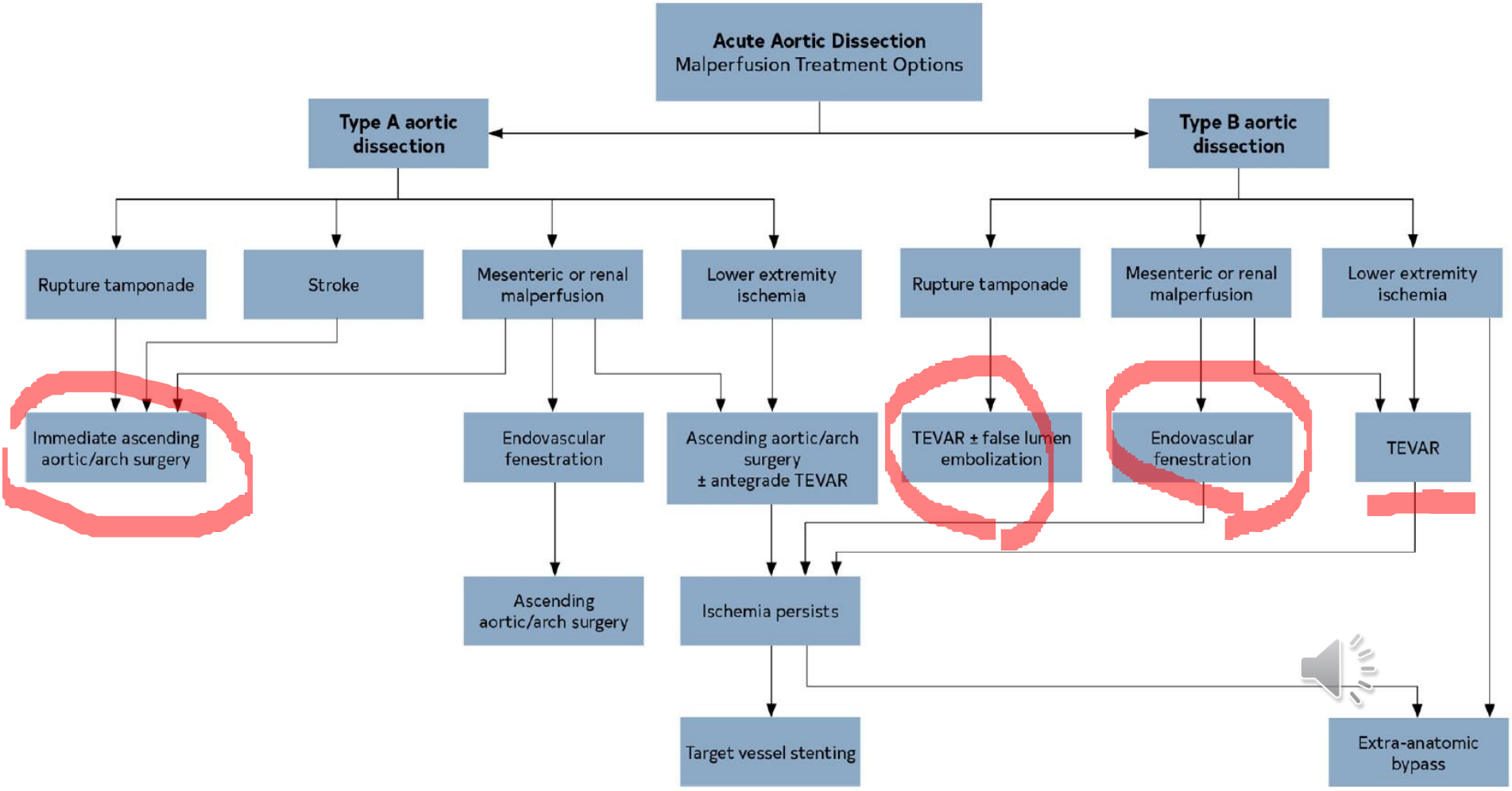


Aortic dissection

FIGURE 9 Mechanisms of Dynamic and Static Obstruction in Aortic Dissection



Aortic dissection



Aortic dissection

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In patients presenting with suspected or confirmed acute type A aortic dissection, emergency surgical consultation and evaluation and immediate surgical intervention is recommended because of the high risk of associated life-threatening complications.[1,2]
2a	B-NR	2. In patients presenting with acute type A aortic dissection, who are stable enough for transfer, transfer from a low- to a high-volume aortic center is reasonable to improve survival.[3,4]
2a	B-NR	3. In patients presenting with nonhemorrhagic stroke complicating acute type A aortic dissection, surgical intervention is reasonable over medical therapy to reduce mortality and improve neurologic outcomes.[5,6]

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In patients with acute type A aortic dissection presenting with renal, mesenteric, or lower extremity malperfusion, it is recommended to proceed to immediate operative repair of the ascending aorta.[1,2]
2a	C-LD	2. In patients with acute type A aortic dissection presenting with clinically significant mesenteric (celiac, SMA) malperfusion, either immediate operative repair of the ascending aorta or immediate mesenteric revascularization via endovascular or open surgical intervention by those with this expertise before ascending aortic repair is reasonable.[3-6]

Aortic dissection

COR	LOE	RECOMMENDATIONS
		Aortic Repair Strategies
1	B-NR	1. In patients with acute type A aortic dissection and a partially dissected aortic root but no significant aortic valve leaflet pathology, aortic valve resuspension is recommended over valve replacement.[1-5]
1	B-NR	2. In patients with acute type A aortic dissection who have extensive destruction of the aortic root, a root aneurysm, or a known genetic aortic disorder, aortic root replacement is recommended with a mechanical or biological valved conduit.[6-9]
2b	C-LD	In selected patients who are stable, valve-sparing root repair may be reasonable, when performed by experienced surgeons in a Multidisciplinary Aortic Team.[10,11]
1	B-NR	3. In patients with acute type A aortic dissection undergoing aortic repair, an open distal anastomosis is recommended to improve survival and increase false-lumen thrombosis rates.[12-15]
1	B-NR	4. In patients with acute type A aortic dissection without an intimal tear in the arch or a significant arch aneurysm, hemiarch repair is recommended over more extensive arch replacement.[16-18]
2b	C-LD	5. In patients with acute type A aortic dissection and a dissection flap extending through the arch into the descending thoracic aorta, an extended aortic repair with antegrade stenting of the proximal descending thoracic aorta may be considered to treat malperfusion and reduce late distal aortic complications.[19,20]

Aortic dissection

Perfusion and Cannulation Strategies

2a	B-NR	6. In patients with acute type A aortic dissection undergoing surgical repair, axillary cannulation, when feasible, is reasonable over femoral cannulation to reduce the risk of stroke or retrograde malperfusion.[21,22]
2a	B-NR	7. In patients with acute type A aortic dissection undergoing surgical repair who require circulatory arrest, cerebral perfusion is reasonable to improve neurologic outcomes.[23-25]
2a	B-NR	8. In patients with acute type A aortic dissection undergoing surgical repair, direct aortic[26,27] or innominate artery[28] cannulation with imaging guidance is reasonable as an alternative to femoral or axillary cannulation.[29-31]

Aortic dissection

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In all patients with uncomplicated acute type B aortic dissection, medical therapy is recommended as the initial management strategy.[1-3]
1	C-LD	2. In patients with acute type B aortic dissection and rupture or other complications (Table 27), intervention is recommended.[4-6]
1	C-EO	In patients with rupture, in the presence of suitable anatomy, endovascular stent grafting, rather than open surgical repair, is recommended.
2a	C-LD	In patients with other complications, in the presence of suitable anatomy, the use of endovascular approaches, rather than open surgical repair, is reasonable.[4-6,7]
2b	B-R	3. In patients with uncomplicated acute type B aortic dissection who have high-risk anatomic features (Table 28), endovascular management may be considered.[8,9]

TABLE 27 Consensus Features of Complicated Acute Type B Aortic Dissection

Feature	Comment
Aortic rupture[1]	This can be either free or contained (including hemothorax, increasing periaortic hematoma, or both; or mediastinal hematoma) and should be addressed promptly.
Branch artery occlusion and malperfusion[2]	Complete or partial occlusion of a major branch, with or without clinical evidence of ischemia; this includes visceral, renal, and peripheral arterial branches.
Extension of dissection[3]	Extension of the dissection flap either distally or proximally (ie, retrograde type A dissection)
Aortic enlargement	Progressive enlargement of the true, false, or both lumens while in the acute phase may require prompt intervention.
Intractable pain[15]	
Uncontrolled hypertension[15]	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