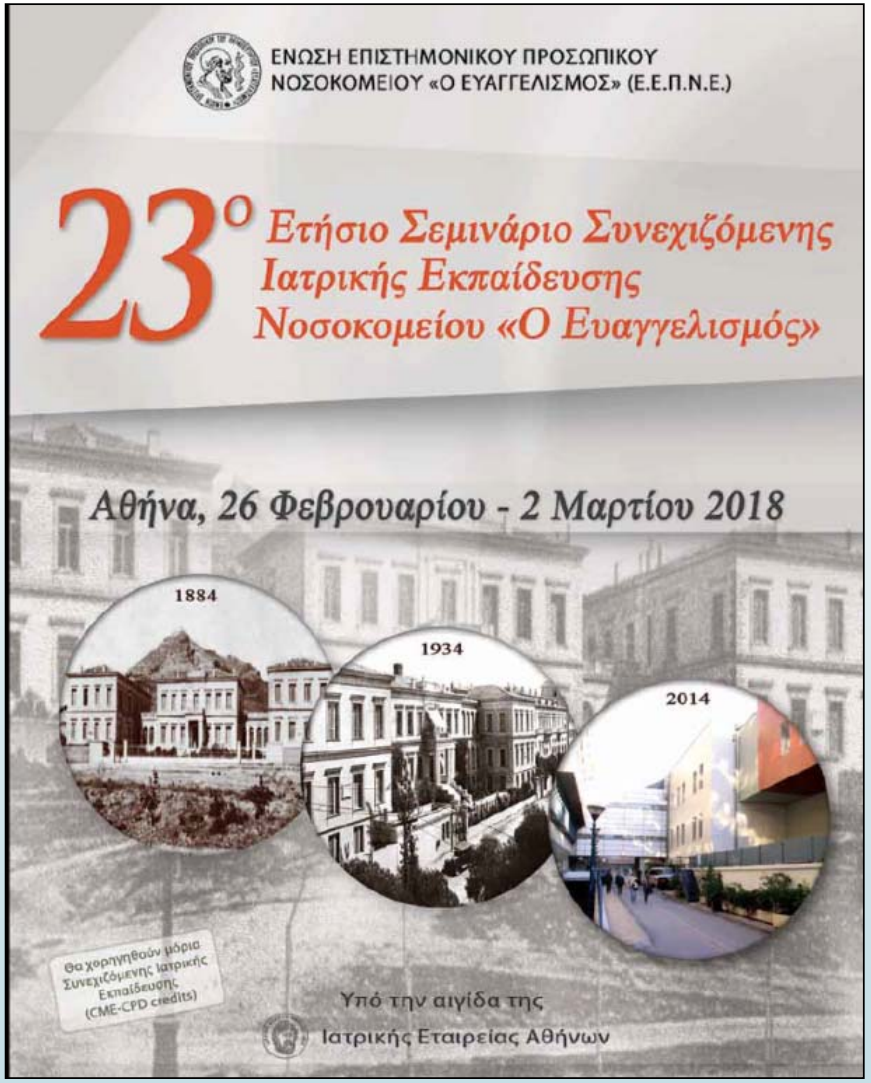
Οξέα Αορτικά Σύνδρομα

Διοισοφάγειο Υπερηχογράφημα

Έφη Ι. Πράππα

Β Καρδιολογική Κλινική



23° Ετήσιο Σεμινάριο Συνεχιζόμενης Ιατρικής Εκπαίδευσης Νοσοκομείου «Ο Ευαγγελισμός»

Αθήνα, 26 Φεβρουαρίου – 2 Μαρτίου 2018

Δεν υπάρχει σύγκρουση συμφερόντων με τις παρακάτω χορηγούς εταιρείες:

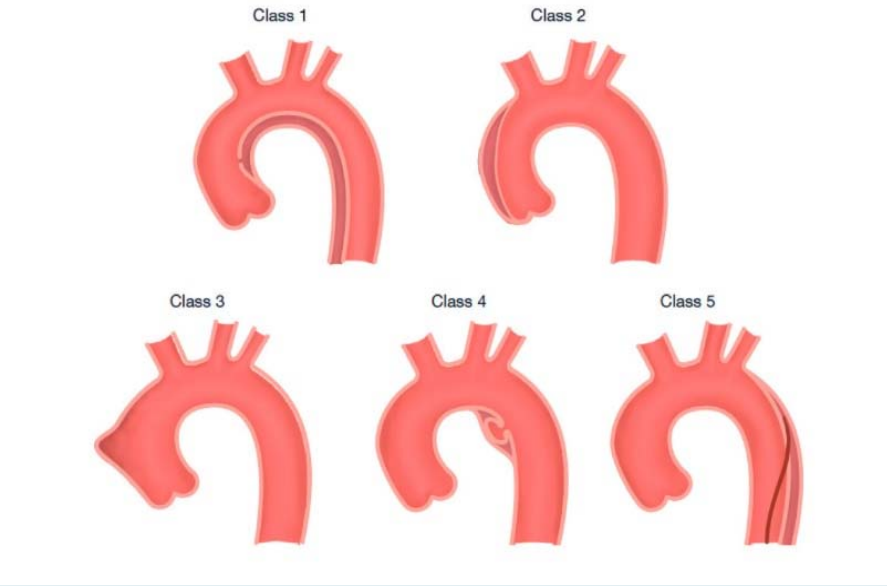
NOVARTIS, JANSSEN ONCOLOGY, ABBVIE, BRISTOL-MYERS SQUIBB, MEDTRONIC, TAKEDA, GENESIS, MSD, PFIZER, AMGEN, ASTELLAS, GILEAD, AENORASIS, BAXTER, BIANEΞ, WINMEDICA, ABBOTT, BIOΣΕΡ, SANOFI, ANGELINI, DEMO, ELPEN, EDWARDS, ROCHE, RONTIS, SPECIFAR, UCB, ΥΓΕΙΟΔΥΝΑΜΙΚΗ, MAVROGENIS

Svensson's Classification

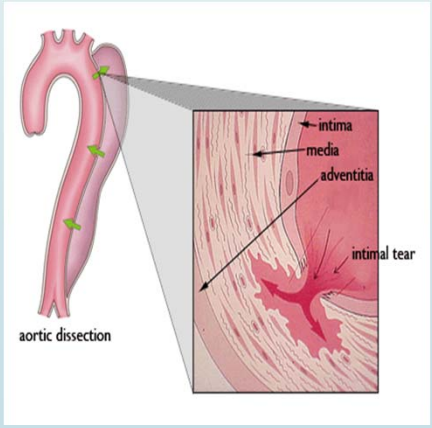
- Class I: Classical dissection with true and false lumen (85-95% of AAS)

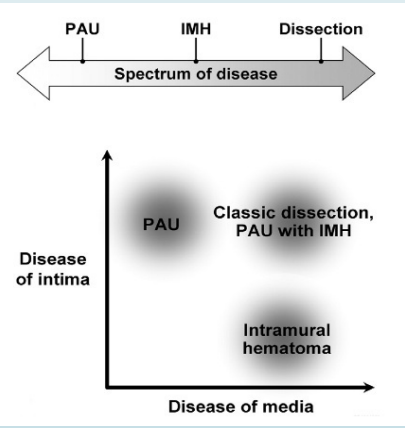
Aortic dissection variants :

- Class II: Intramural haematoma or haemorrhage
- Class III: Subtle dissection with buldging of the aortic wall
- Class IV: Penetrating atherosclerotic aortic ulcer
- Class V: Iatrogenic or traumatic dissection

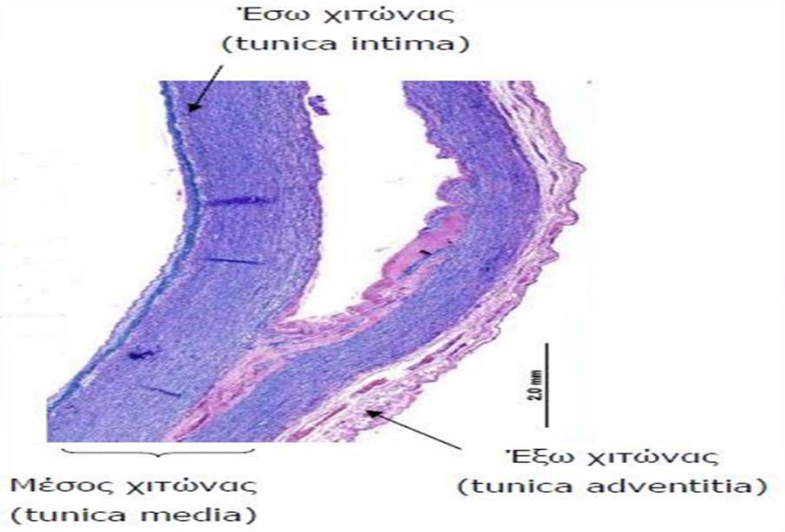


Svensson LG., et al., Circulation 1999, 99: 1331-1336





Sundt TM, Ann Thorac Surg 2007; 83: S835-S841



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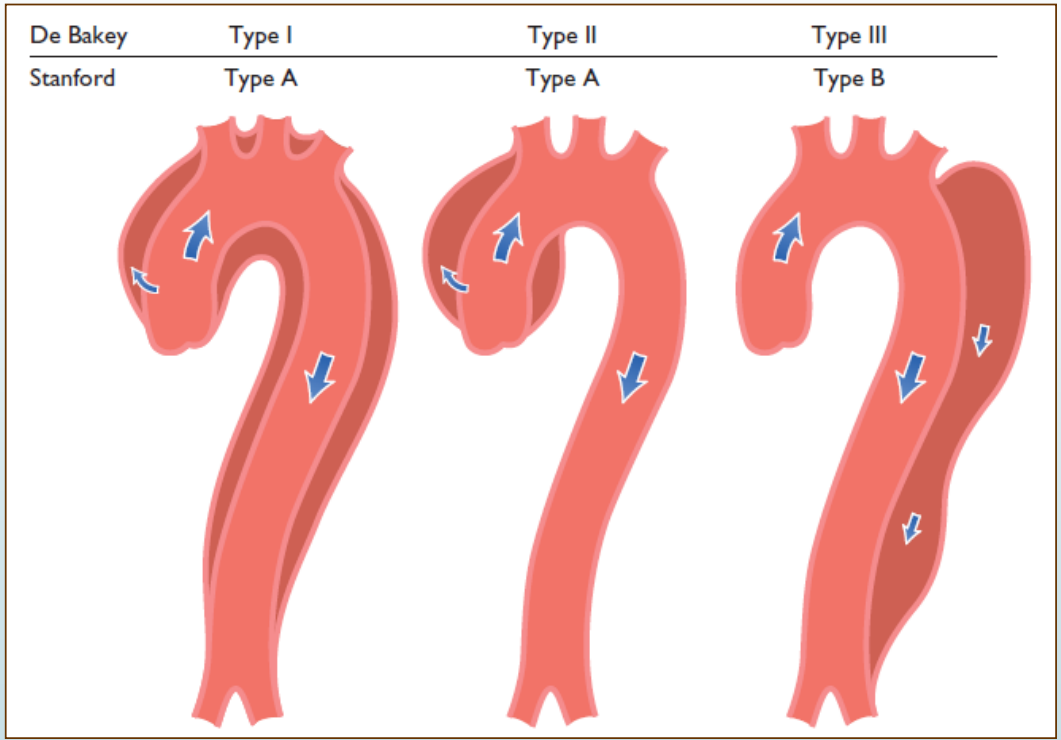


Relative strengths of imaging modalities for acute aortic syndromes

1. Precise and rapid diagnosis
2. Classification – Identification of the site and the extension of the disease
3. Definition of the entry and exit point
4. Discrimination of the true and the false lumen
5. Detection of complications
6. Determination of prognosis
7. Determination of appropriate treatment

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

Elevated clinical suspicion is important for the early identification of discrete aortic dissection, leading to prompt surgery, shorter hospital stays, and better outcomes.

Chirillo F., et al., Am J Cardiol 2007; 100: 1314-1319

The choice depends on the *availability* and *expertise* of the particular hospital as well as the patient's presenting clinical status.

Bossone E., et al., Herz 2013; 38: 269-276

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

Bossone E., et al., Eur Heart J 2017 [Ahead of print]

Classical dissection with true and false lumen
Transthoracic echocardiography

TTE is recommended as an initial imaging investigation.	I	C

Erbel R., et al., Eur Heart J 2014; 35: 2873-2926

…it is readily available, it can be performed quickly, and it offers the unique option to image at the bedside.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

TTE is recommended as an initial imaging investigation.

Erbel R., et al., Eur Heart J 2014; 35: 2873-2926

In patients with acute chest pain, special attention should be paid during the TTE exam to *aortic root dilatation*, *aortic regurgitation*, and/or *pericardial effusion*, since these findings should raise the suspicion of acute aortic syndrome.

The diagnosis of AD by standard transthoracic M-mode and two dimensional echocardiography is based on detecting intimal flaps in the aorta.

TTE is useful for the detection of wall motion abnormalities (coronary involvement ?).

Limitations: abnormal chest wall configuration, narrow intercostal spaces, obesity, pulmonary emphysema etc.

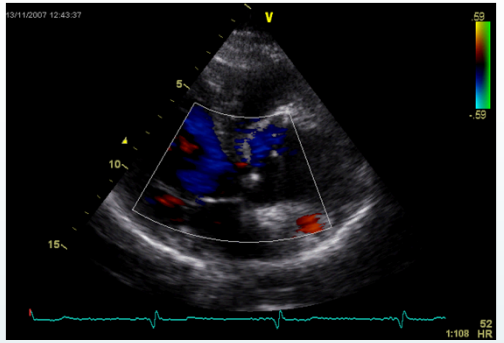
TTE is limited in visualizing the distal ascending aorta and the arch.

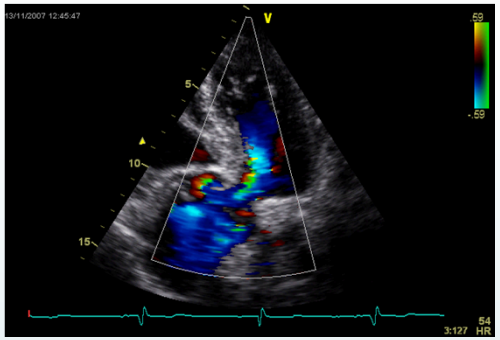
For Type A dissection, TTE has a sensitivity of 75 – 100%, but only 31 – 55% for type B.

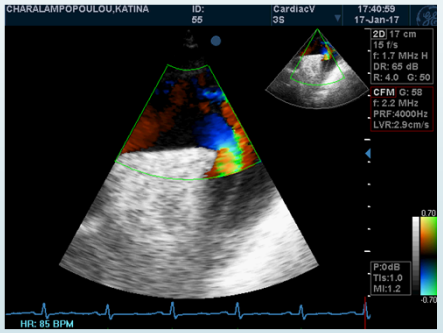
"The overall sensitivity of TTE for detecting all forms of aortic dissection is only 59 – 83% and specificity is 63 – 93% when compared to other modalities.

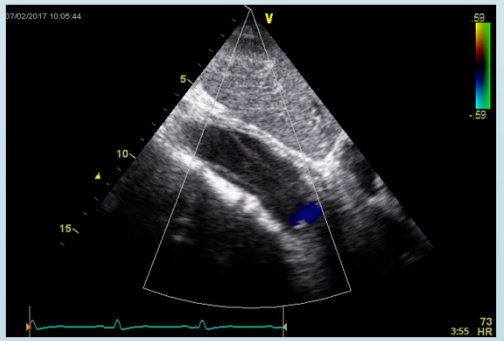
Therefore, a negative TTE does not exclude aortic dissection."

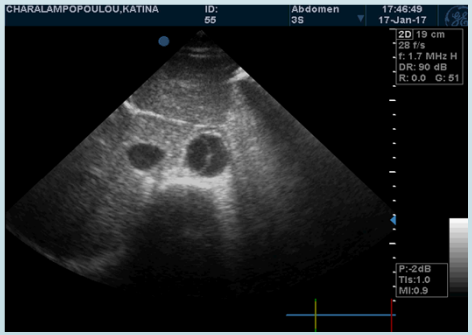
Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424











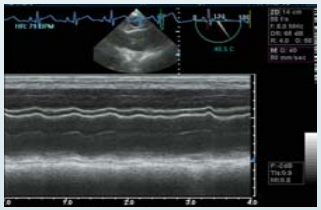
Classical dissection with true and false lumen
Transesophageal echocardiography

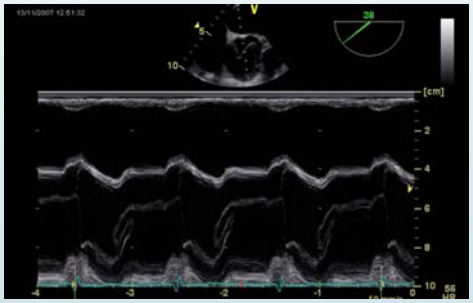
Highly accurate for the detection of acute aortic syndromes (intima tears can be detected in 99% of patients).

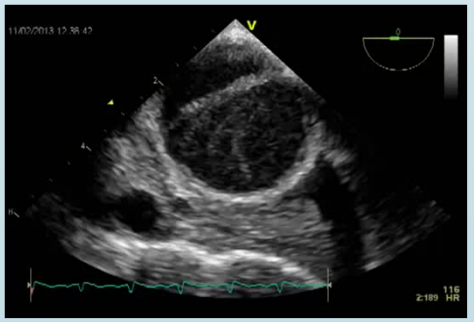
When evaluating the ascending aorta (120º), artefactual echoes are often encountered (usually due to reverberation from the anterior wall of the left atrium or from the posterior wall of the right pulmonary artery in the middle one-third of the ascending aorta), but:

- they lack the typical movement of the flap.
- Color flow imaging will show margination of flow by a true dissection flap, whereas an artifact does not affect the distribution of the color flow signal.

M-mode echocardiography can be useful in distinguishing an intimal flap from imaging reverberations







Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424
Evangelista A., et al., Rev Esp Cardiolo 2009;60:1076-1081

Classical dissection with true and false lumen

Transesophageal echocardiography – true and false lumen identification

Intimal tear(s) can be localized in 78 – 100% of patients by TOE, and Color doppler is helpful in detection of multiple small communitation between 2 lumina

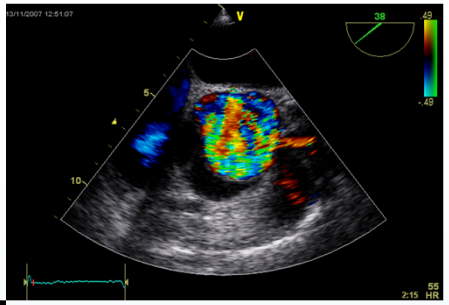
Differentiation between true and false lumen is often easy and diagnostic with color Doppler flow mapping.

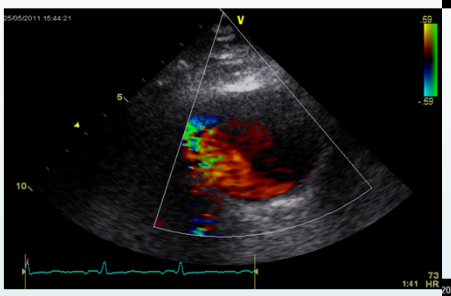
Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

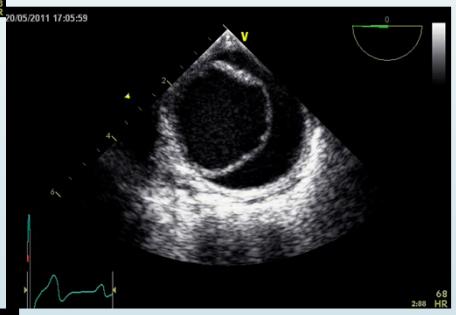
Table 1. Aortic Dissection: Differentiation Between True and False Lumen

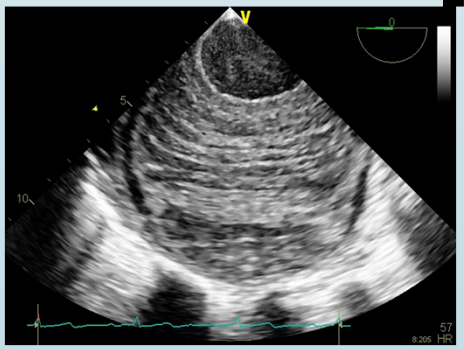
	True Lumen	False Lumen
Size	True < false	Most often false > true
Pulsation	Systolic expansion	Systolic compression
Flow direction	Systolic antegrade flow	Systolic antegrade flow reduced or absent or retrograde flow
Localization within the aortic arch	Inner contour	Outer contour
Signs of slow flow	Rare	Frequent; depending on degree of communication
Thrombus	Rare	Frequent; depending on degree of communication

Erbel R., et al., Eur Heart J 2001;22:1642–81









Classical dissection with true and false lumen
Transesophageal echocardiography – Complications

TOE is able to identify the different mechanisms of aortic regurgitation and can be helpful prior to surgical correction.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

Possible AR mechanisms include:

1. Extension of the dissection flap into a sinus of Valsava disrupting the base of an aortic cusp (prolapse).
2. Dissection causing dilation of the sinotubular junction and valve cusp malcoaptation.
3. Prolapse of an aortic dissection flap through the valve orifice.

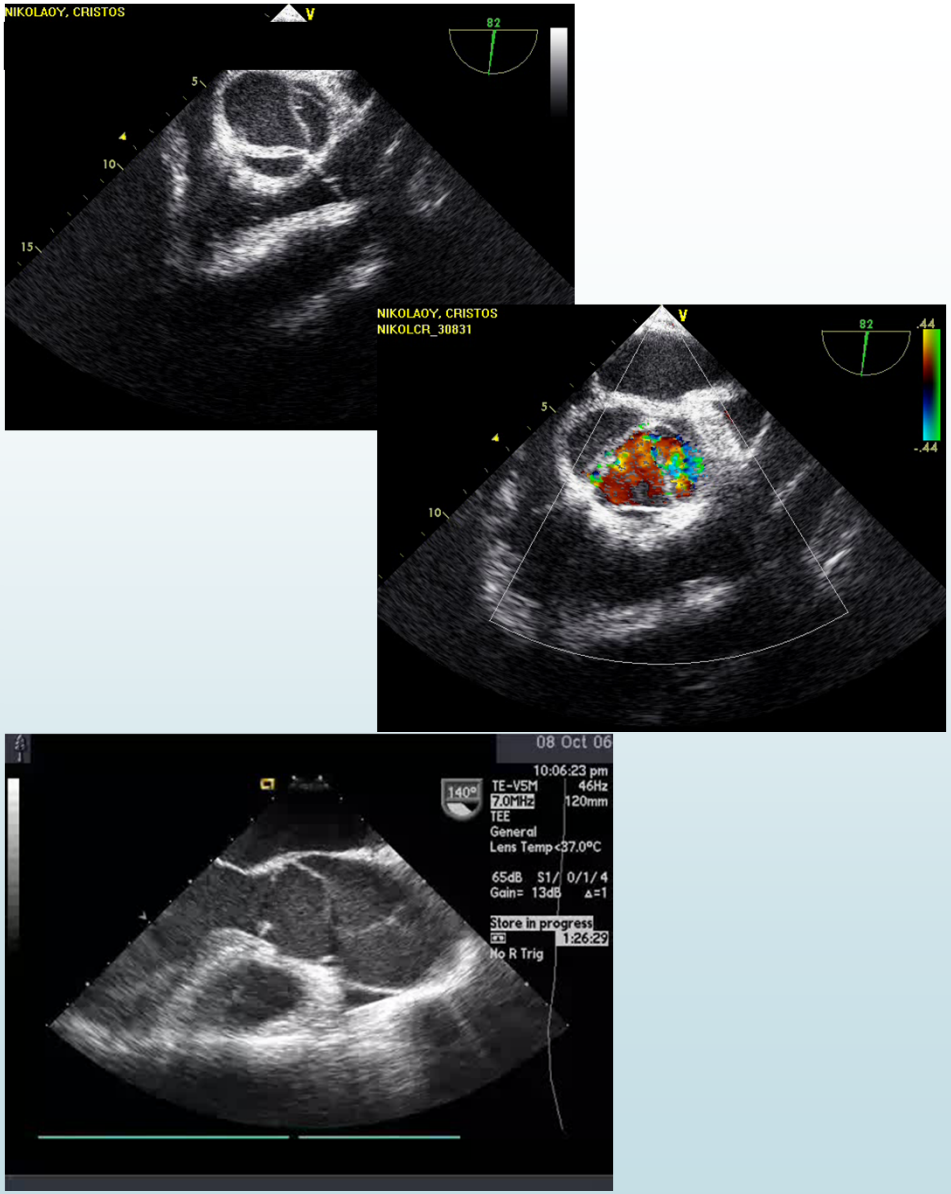
Bossone E., Evangelista A., et al., Am Heart J 2007;153:1013–20

TOE can be useful perioperatively to confirm post – operative aortic valve competence when the aortic valve is preserved.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

Additionally, TOE can determine whether the dissection extends into the coronary artery.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424



Classical dissection with true and false lumen

Transesophageal echocardiography – limitations, sensitivity and specificity

1. Esophageal diseases (varices etc).
2. Adequate sedation is important to avoid hypertensive response during the procedure.
3. Limited ability to visualize distal ascending aorta and proximal arch.
4. Reverberation artifacts.
5. Less suited than CT or MRI for long – term serial imaging to monitor patients after an acute aortic syndrome.

TOE can reach a sensitivity of 99% with a specificity of 89%.

It is not the first choice but it still has a role in the emergency assessment of suspected aortic dissection.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424
Moore AG., et al.. Am J Cardiol 2002;89:1235–8.

Intramural Hematoma – Transesophageal Echocardiography

TOE is useful to demonstrate:

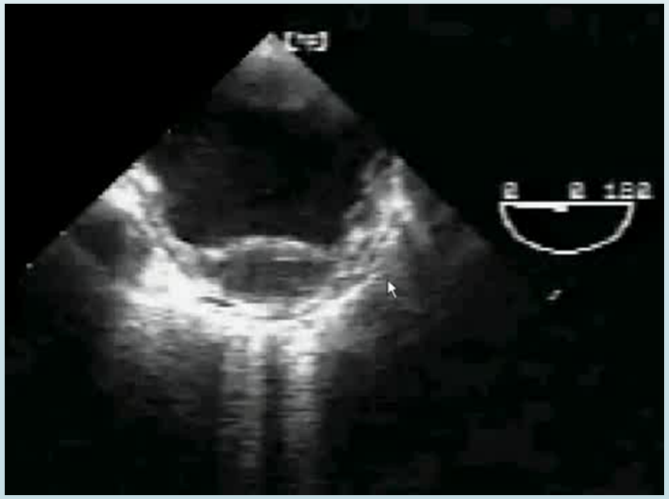
1. circumferential or crescentic aortic wall thickening without intimal tear.
2. Displacement of intimal calcification caused by accumulation of blood within the aortic media.

Song JK., Heart 2004; 90: 368-371

Differential diagnosis:

1. Aortic wall thickening caused by atherosclerotic changes or aortic dilatation with mural thrombi.
2. Aortic dissection with thrombosed false lumen.

Song JK., Heart 2004; 90: 368-371



Class III: Discrete-Subtle Aortic dissection without haematoma

The most neglected variant of aortic dissection.

Partial stellate or linear tear of the vessel wall, without intima flap or intramural hematoma.

Chirillo F., et al., Am J Cardiol 2007; 100: 1314-1319

Initially reported by Svensson in a 9 – patient series (predominantly with Marfan syndrome).

All preoperative TOE, **CT and MRI missed diagnosis** which was made at surgical inspection.

Svensson SG., et al., Circulation 1999; 99: 1331-1336

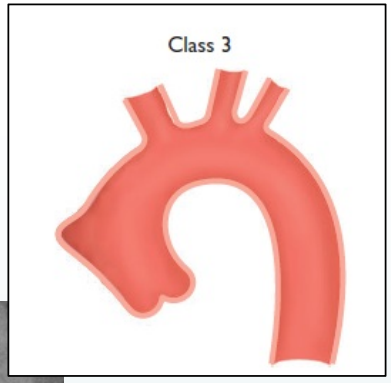
Only sparse case reports have been published. **The diagnosis was mostly obtained by TOE,**

Darbar D., et al., J Am Soc Echocardiogr 2000; 13: 1130-1134
Akashi H., et al., Circ J 2003; 67: 461-463

or at surgery indicated on the sole basis of clinical symptoms and family history.

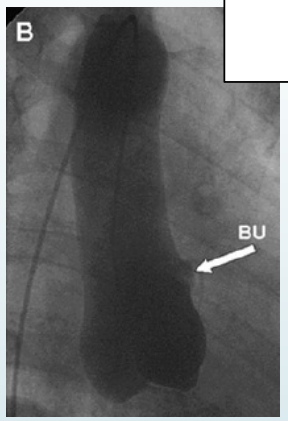
Eleftheriades JA ., et al., Ann Thorac Surg 2005; 80: 1098-1100

Class III: Discrete-Subtle Aortic dissection without haematoma
Echocardiography



Most diagnostic techniques provide ancillary findings:

- TTE: pericardial effusion/cardiac tamponade, aortic regurgitation. The ascending aorta can be markedly enlarged, slightly enlarged or normal.
- CT: small hematic pericardial or periaortic effusions.
- Aortography: buldging of the aortic wall.

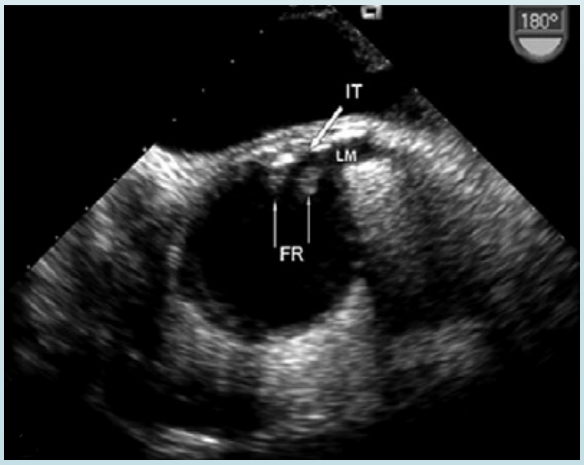


In **all patients**, TOE identified the dissection **on the posterior aspect** of the ascending aorta

(1 to 40 mm above the left coronary ostium).

Aortic wall fragments can be seen oscillating in the lumen.

Periaortic fluid (defined as an echo-free space surrounding the proximal ascending aorta) and discrete intramural hematomas near the intimal tear were identified in all patients.



Patients with suspected acute aortic syndrome may need more than 1 diagnostic test

to rule out or to confirm dissection of the aorta, and

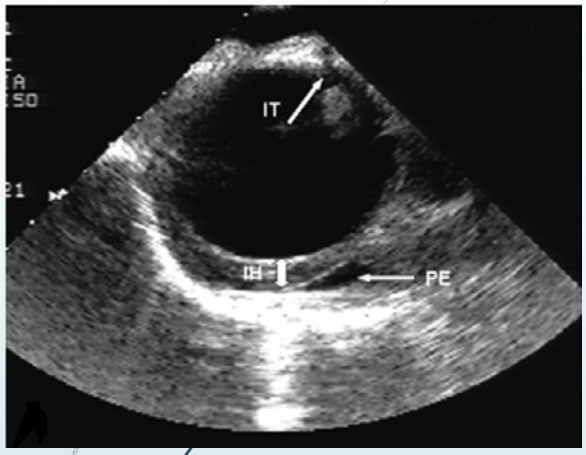
TOE may provide

additional information not seen on routine CT, MRI, or aortography.

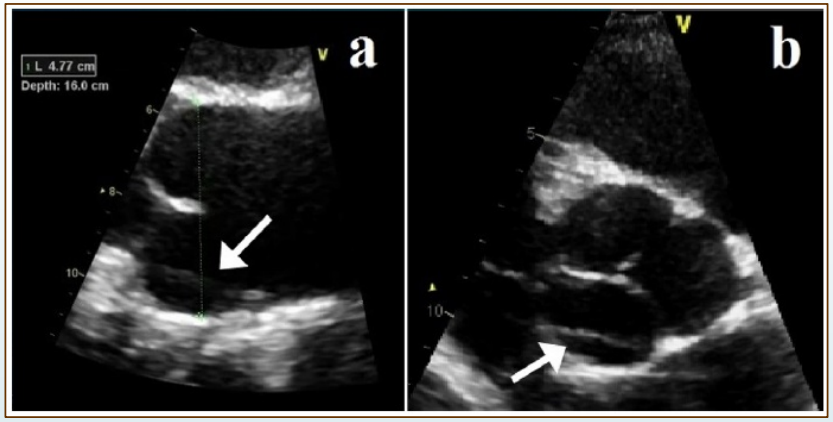
The TOE signs diagnostic for class 3 dissection are subtle and require **experienced operators**.

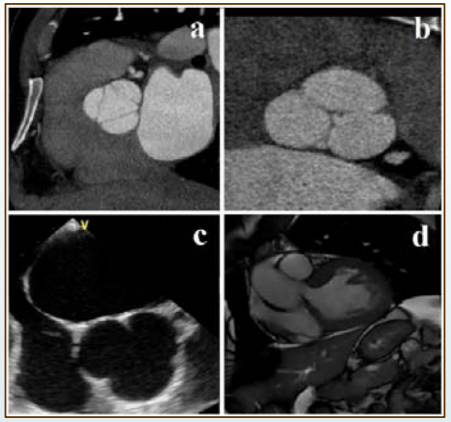
Chirillo F., et al., Am J Cardiol 2007; 100: 1314-1319

Class III: Discrete-Subtle Aortic dissection without haematoma
Lethal Case reports



Chirillo F., et al., Am J Cardiol 2007; 100: 1314-1319



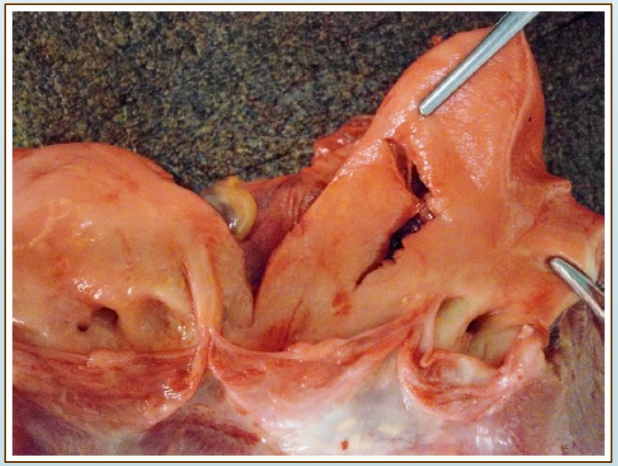


In patients with class 3 dissection, attentive inspection of the proximal ascending aorta by transoesophageal echocardiography can provide unique diagnostic information (subtle intimal discontinuity, circumscribed intra-mural haematoma, discrete periaortic effusion)

Chirillo F., et al., Heart 2008; 94 :924

Should an abortive dissection be suspected, it is not unreasonable to procede with surgery on an urgent surgery in of the potential for future fatal rupture

Kalogerakos PD., et al., J Card Surg 2016; 31: 546 - 548



Kalogerakos PD., et al., J Card Surg 2016; 31: 546 - 548

Penetrating atherosclerotic ulcer

Ulceration of an aortic atherosclerotic plaque penetrating through the internal elastic lamina into the media.

Erbel R., et al., Eur Heart J 2001;22:1642–81

Crater-like outpouchings in the aortic wall with jagged edges, and they are often associated with extensive aortic atheroma.

Evangelista A., et al., J Am Coll Cardiol 1996; 27: 102-107

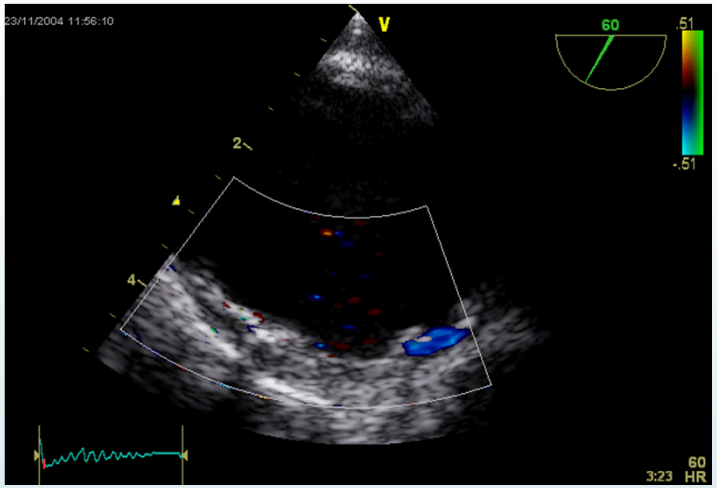
Thickening of the aortic wall with inward displacement of intimal calcification suggests accompanying intramural hematoma.

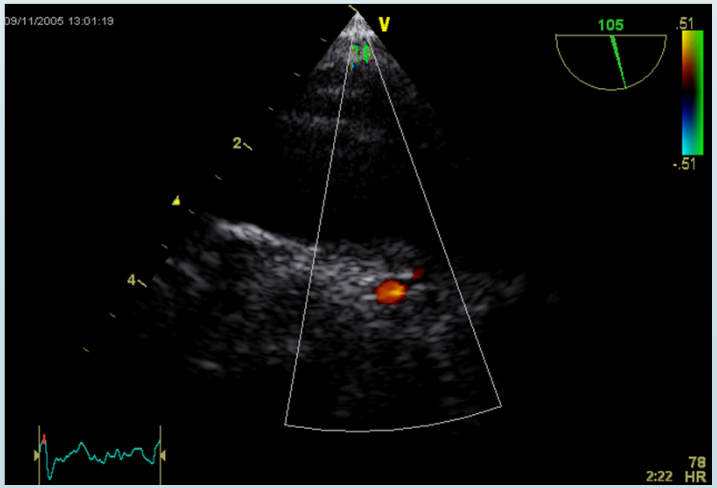
Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424

Contrast-enhanced CT, including axial and multiplanar reformations,

is the technique of choice for diagnosis of PAU

Erbel R., et al., Eur Heart J 2001;22:1642–81





Conclusions

Currently, TOE plays a leading role in primary diagnosis, treatment, planning and prognosis in patients with acute aortic syndromes.

TOE is first priority bedside for patients unsuitable for transportation (ICU).

BUT

Has a blind spot confined to the proximal arch from bronchial air.

Fails to provide sufficient anatomic detail to plan endovascular interventions.

For stable patients, any modality will work depending on availability and expertise.

Baliga RR., et al., JACC: Cardiovasc Imaging 2014; 7(4): 406-424