



## Pitfalls

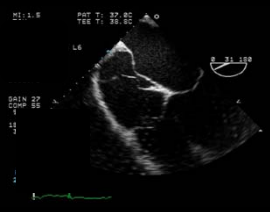
Annette Vegas, MD, FRCP, FASE  
Professor Anesthesiology



Toronto General Hospital Department of Anesthesia  
Perioperative Interactive Education  
<http://pie.med.utoronto.ca/TEE/>





### Question 1

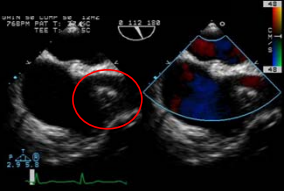


What structure is shown in this clip?

1. Eustachian valve
2. Thebesian valve
3. Chiari network
4. Cor triatriatum






### Question 2

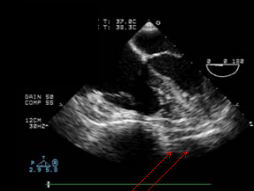


What structure is shown in this clip?

1. Eustachian valve
2. Thebesian valve
3. Coumadin ridge
4. Crista terminalis






### Question 3




What structure is shown by the double arrows in this clip?

1. Pericardial fat
2. Epicardial fat
3. Hematoma
4. Myocardium






### Question 4

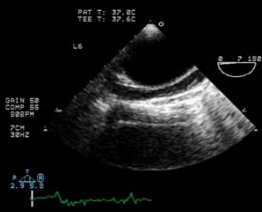


What structure is shown in this clip?

1. Moderator band
2. False chordae
3. False tendon
4. Papillary muscle






### Question 5



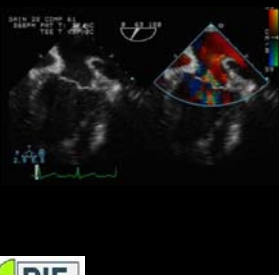
What finding is shown in this clip?

1. Aortic dissection
2. Pericardial effusion
3. Aberrant subclavian artery
4. Innominate vein






### Question 6

What finding is shown in this clip?





1. Normal left upper pulmonary vein
2. Normal left atrial appendage
3. Cyst
4. Persistent left SVC



### Outline

- Normal structures that mimic pathology
- 3 categories
  - Structures
  - Echo-free spaces
  - Foreign material
- Identify to avoid unnecessary clinical interventions

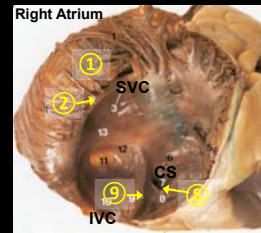
 

### Structures



- **RA**
  - Eustachian valve
  - Chiari network
  - Crista terminalis
  - Thebesian valve
  - Pectinate muscles
- **RV**
  - Moderator band
  - Trabeculations
- **LA**
  - Coumadin ridge
  - Pectinate muscles
- **LV**
  - False tendon
  - Papillary muscles
  - Apical trabeculations
- **Aortic valve**
  - Nodules of Arantius
  - Lambd's excrescences
- **Pericardium**
  - Epicardial fat
  - Transverse sinus
- **Aorta**
  - Innominate vein
- **Interatrial septum**
  - Lipomatous hypertrophy
  - IAS aneurysm



### RA Anatomy



1. pectinate muscles
2. crista terminalis
3. SVC
4. right auricle
5. tricuspid valve
6. position of AV node
7. coronary sinus
8. coronary sinus valve
9. IVC valve (eustachian)
10. IVC
11. fossa ovalis
12. limbus of fossa ovalis



 

### RA Eustachian Valve

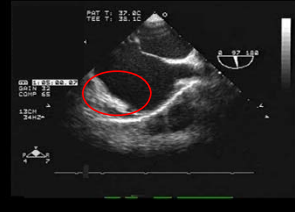




Bartolomeo Eustachio

- Important fetal structure
  - Directs blood IVC to fossa ovalis
- Embryonic valve of IVC
  - Fold RA at posterior margin
- Often involutes, adult (25%)
- RA/IVC junction
- Variable length
  - Cor triatrium dexter
- Independently mobile
- Mimic RA thrombus
- May obstruct IVC flow



 

### RA Chiari Network

Hans Chiari

- Embryologic remnant
  - R sided sinus venosus valve
  - Variant of Eustachian valve
- 2-3% at autopsy
- Fenestrated membrane
- Connect vena cavae + RA
- IVC attachment, mobile curvilinear structure
- Mimic free RA thrombus, TV vegetation, tumors

### RA Crista Terminalis

- Fibromuscular ridge smooth sinus venarum + trabeculated RA
- IVC to SVC at lateral RA wall
- Bicaval view
- Anterior SVC + RA
- Echogenic mass
- Moves with heart
- ↑ atrial systole
- Mimic thrombus or vegetation

PIE

### Thebesian Valve

Adam Thebesius

- Valve of coronary sinus
- Fold of RA endocardium
  - 65-90% of patients
- Posterior RA
- Between TV + IVC
- Rarely obstructs flow
- Complicate cannulation
- Mimic thrombus or vegetation

PIE

Katti K and Patel NP. Clin Anat 2012; 25:379-385.

### Pectinate Muscles

- Parallel muscle ridges in the RA free wall + RAA
- Echogenic masses
- Move with the RA
- Mimic thrombus or vegetation

PIE

### RV Moderator Band

- Prominent RV trabeculation
  - Differentiate RV from LV
- Base of anterior papillary muscle to IVS
  - Contains RBB
- ME 4C view
- Thick echo-dense muscle band
- Tumor, thrombus, vegetation

PIE

### RV Epicardial Fat

- Epicardial fat between outer myocardium and visceral pericardium
- Pericardial fat
  - between visceral + parietal pericardium
  - anterior to epicardial fat
- Echogenic layer
- Mimic pericardial effusion

PIE

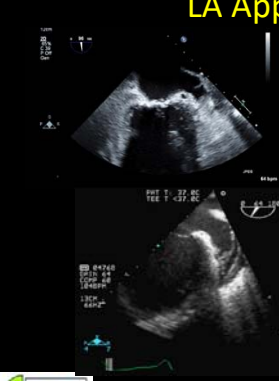
Iacobellis G et al. J Am Soc Echocardiogr 2009;22:1311-9

### LA Coumadin Ridge

- LA tissue between LUPV + LAA
- Muscle ridge
- Moves with heart
- Globular fatty appearance
  - Q-tip sign
- Mimic tumor, thrombus

PIE

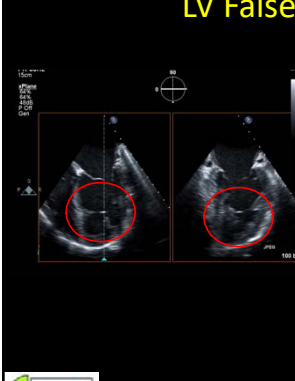
### LA Appendage



- Variable number 1(20%), 2(54%), 3(23%), 4(3%)
- Pectinate muscles
- ME views
- Echogenic masses
- Mimic thrombus
- Inversion

PIE



### LV False Tendon



- Fibromuscular structures that cross the LV
  - Fine filamentous
  - Muscle band
- 55% of normal hearts
- ME views (2 views)
- Solid structure, non-contractile
- Not affect LV function
- Associated
  - Mural thrombus
  - Arrhythmias

PIE

### AV Nodules of Arantius

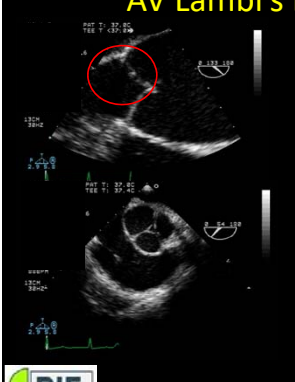
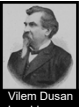



Julius Caesar Arantius

- Fibrous thickening at midpoint of AV cusp edge at point of coaptation
- Associated with excrescences
- Mimic vegetations
- May be calcified

PIE

### AV Lambi's Excrescences





Vilem Dusan Lambi

- Fibrous strands from nodules
- < 1mm thick, <1 cm long
- Filiform or lamellar
- 90% of patients
- Can occur on MV
- No independent motion
- No functional abnormality
- Mimic vegetation, tumor

PIE

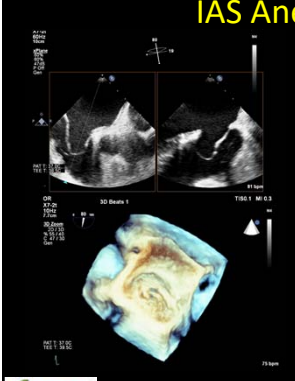
### Lipomatous Hypertrophy of IAS



- Fatty infiltrate within IAS
  - Not true tumor
  - Also ↑ pericardial fat
- Bicaual view
- > 2cm thickness
- Dumbbell shape
  - Spares the fossa ovalis
- Rarely SVC obstruction
- Mimic amyloid (LV wall thickened), tumors

PIE

### IAS Aneurysm



- Redundant IAS
- Mobile > 10mm beyond plane of IAS
- Passive motion with heart
- Increased stroke risk
- Associated
  - PFO
  - ASD
  - MV prolapse
  - Marfan

PIE

### Aorta Innominate Vein

- Innominate vein anterior to aorta looks like an aortic dissection
- Differentiate color and spectral Doppler
- Agitated saline in left arm shows contrast in vein

### Echo Spaces

- Persistent left SVC
- Transverse sinus
- Oblique sinus
- Effusions

### Persistent LSVC

- 10% congenital patients
- Echo free space between LAA + LUPV
- Color flow
- Big coronary sinus (> 2 cm)
- Left arm injection into CS
- Mimic cyst or abscess
- Associated
  - Coarctation
  - ASD
  - VSD
  - Cor-triatrrium

### Transverse Pericardial Sinus

- ME AV LAX and ME RVOT views
- No color flow
- Fibrinous material
- Floating LAA tip
- Mimic cyst or abscess

### Foreign Material

- Catheters
- Pacer wires
- Sutures

### Pacer Wires

## Readings

- Kim MJ and Jung HO. Anatomic Variants Mimicking Pathology on Echocardiography: Differential Diagnosis. *J Cardiovasc Ultrasound* 2013;21(3):103-112.
- Katti K and Patel NP. The Thebesian Valve: Gatekeeper to the Coronary Sinus. *Clin Anat* 2012; 25:379–385
- Iacobellis G et al. Echocardiographic Epicardial Fat: A Review of Research and Clinical Applications *J Am Soc Echocardiogr* 2009;22:1311-9
- Goyal SK, et al. Persistent left superior vena cava: a case report and review of literature. *Cardiovasc Ultrasound* 2008 10;6:50. doi: 10.1186/1476-7120-6-50.

