

Ultrasound – Abdominal Aorta Evaluation

PURPOSE:

To evaluate the abdominal aorta for aneurysm (AAA) formation and atherosclerotic disease burden.

SCOPE:

Applies to all ultrasound Doppler studies of the aorta performed in Imaging Services / Radiology

EPIC ORDERABLE:

- UTSW: US ABDOMINAL AORTA
- PHHS: US ABDOMEN AORTA
US ABDOMEN AORTA ANEURYSM SCREENING*

INDICATIONS:

- 1. Diagnostic Evaluation for suspected Abdominal Aortic Aneurysm:
 - Palpable or pulsatile abdominal mass or abdominal bruit
 - Unexplained lower back pain, flank pain, or abdominal pain
 - Follow-up of a previously demonstrated abdominal aortic aneurysm
 - Follow-up of patients with an abdominal aortic and/or iliac endoluminal stent graft

- 2. Screening Evaluation for Abdominal Aortic Aneurysm*
 - Men age 65 or older
 - Women age 65 or older with cardiovascular risk factors
 - Patients age 50 or older with a family history of aortic and/or peripheral vascular aneurysmal disease
 - Patients with a personal history of peripheral vascular aneurysmal disease
 - Patients with additional risk factors (smoking history, hypertension, or certain connective tissue diseases e.g. Marfan's syndrome).

**a screening exam can only be performed once in a patient's lifetime.*

CONTRAINDICATIONS:

No absolute contraindications. If aortic rupture or dissection is clinically suspected, ultrasound is usually not the examination of choice if CT Angiography is immediately available.

EQUIPMENT:

Transducer that allows for appropriate penetration and resolution of anatomy, depending on patient's body habitus

PATIENT PREPARATION:

- Patient should be NPO for 6-8 hours prior to study to reduce bowel gas

EXAMINATION:

GENERAL GUIDELINES:

Complete examination includes evaluation of the entire abdominal aorta and common iliac arteries

EXAM INITIATION:

- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Explain test
- Obtain patient history including symptoms. Enter and store data page
- Place patient in supine position

TECHNICAL CONSIDERATIONS:

- Review any prior imaging, making note of prior aorta measurements.
- Longitudinal images are taken along the long axis of the vessel
- Transverse images are taken perpendicular to the long axis of the vessel
- Measurements of arteries are taken from outer edge to outer edge
 - If mural thrombus is present, additional images of the patent lumen may also be helpful.
- If an aneurysm is present, the maximal size and location of the aneurysm should be documented. Additional images proximal and distal to the aneurysm must be recorded. The relationship of the dilated segment to the renal arteries and to the aortic bifurcation should be determined, if possible
- The mid and lower abdominal aorta is often obscured by bowel gas. Bowel loops can be pushed aside with compression with a curvilinear probe, especially in thin patients. A coronal image of the aorta in the RLD position can be useful in this situation
- Color Doppler imaging and/or spectral Doppler with waveform analysis of the aorta and iliac arteries may be helpful to demonstrate patency and the presence of intraluminal thrombus.
- Angle-corrected spectral Doppler imaging may be used to distinguish arterial from venous anatomic structures.
- After endoluminal graft placement, Color (or Power) and spectral Doppler are required to document the presence or absence of an endoleak (exclude flow within the excluded aneurysmal sac).
- Inter-observer measurements of an aortic aneurysm can vary by as much as 5 mm. Visual comparison with prior studies is recommended to ensure measurements are obtained at similar locations and to assess for interval change in aneurysm size. Consistent measurements of aneurysm diameter are recommended following endograft repair to check for interval enlargement in sac size.

DOCUMENTATION:

A. Diagnostic Examination

- Abdominal aorta
 - Longitudinal images (along the long axis of the vessel)
 - Proximal (below diaphragm, near the celiac artery)
 - Mid (near the level of the renal arteries)
 - Distal (above the iliac bifurcation)
 - The aorta should be imaged in the plane that is parallel to the long axis of the lumen (for measurement of the AP dimension) and perpendicular to the long

axis of the lumen (for measurement of the transverse dimension). The transverse measurement may also be obtained in the coronal plane

- Transverse images (perpendicular to the long axis of the vessel)
 - Proximal (below diaphragm, near the celiac artery)
 - Mid (near the level of the renal arteries)
 - Distal (above the iliac bifurcation)
- Measurements
 - Proximal, mid, and distal aorta should be obtained using predominantly the long axis view to measure the AP dimension.
 - Transverse views should be obtained to measure the width in cross-section. Coronal view may be used for width dimension, if needed.
 - Measurements are taken at the greatest diameter of the aorta in each segment, from outer edge to outer edge.
 - If an aneurysm is present, the maximal size and location of the aneurysm should be documented and recorded. The relationship of the dilated segment to the renal arteries and to the aortic bifurcation should be determined if possible. **Additional images proximal and distal to the aneurysm must be recorded.**
 - At a minimum, the largest measurement should be recorded and reported. A measurement of the length of the aneurysm is not necessary though it may be helpful.
 - If mural thrombus is present, additional images of the patent lumen may also be helpful.

B. Common iliac arteries

- Longitudinal images of the proximal right and left common iliac arteries (along the long axis of the vessel)
- Transverse images (perpendicular to the long axis of the vessel) of the proximal common iliac arteries, just below the bifurcation
- Measurement of the widest visualized portion of each common iliac artery, from outer edge to outer edge

Anatomy	Greyscale (Long & Trans)	*AP Measurement	Width Measurement	*Color Doppler	*Waveform	*PSV
Proximal aorta	x	x	x	x	x	x
Mid aorta	x	x	x	x	x	x
Distal aorta	x	x	x	x	x	x
Right common iliac artery	x	x	x	x	x	x
Left common iliac artery	x	x	x	x	x	x
*Image in longitudinal view						
If aneurysm present: Length measurement; relationship to renal arteries proximally, and CIA distally						
If mural thrombus present: AP measurement of patent lumen						
PSV = peak systolic velocity						

- Data page(s)

UT Southwestern Department of Radiology

PROCESSING:

- Review examination images and data
- Export all images to PACS
- UTSW: Confirm data in Imorgon
- Document relevant history and any study limitations.

REFERENCES:

ACR-AIUM-SPR-SRU Practice Guideline (Revised 2017)
IAC Guidelines (Updated 1/15/2018)
ACR Accreditation Grading Sheet

REVISION HISTORY:

SUBMITTED BY:	David T. Fetzer, MD	Title	Medical Director
APPROVED BY:	David T. Fetzer, MD	Title	Medical Director
APPROVAL DATE:	11-07-2015		
REVIEW DATE(S):	11-16-2018		Cecelia Brewington, MD
REVISION DATE(S):	06-01-2020	Brief Summary	
	07-10-2020	Brief Summary	Clarified measurements needed
	08-26-2023		Added diagnostic criteria for CIA diameter and PSV
	08/24/2024	Jana Smith, RDMS, RVT	Clarified statements, removed Trans AP measurement requirement, revised data table, added images

APPENDIX:

US ABDOMINAL AORTA DIAGNOSTIC CRITERIA

- Smooth tapering of aorta and iliac arteries without focal dilation
- Suprarenal aortic caliber not greater than 3.9 cm for males and 3.1 cm for females
- Infrarenal aortic caliber, above the celiac artery, not greater than 3 cm;
 - In women and small adults, the vessel is considered aneurysmal if it is greater than or equal to 1.5 times the diameter of the more proximal infrarenal aorta
- No intraluminal echoes (dissection, thrombus, etc.)

IAC Reporting Criteria

Interpretation of the Screening Examination Should Include at Least 3 Categories

1. Positive – Infrarenal abdominal aortic aneurysm greater than or equal to 3 cm in diameter or greater than or equal to 1.5 times the diameter of the more proximal infrarenal aorta. The latter definition is particularly important in women and small adults.
2. Negative – No infrarenal abdominal aortic aneurysm
3. Indeterminate – Aneurysmal status not defined because of non-visualization or partial visualization of the infrarenal abdominal aorta

Report should state whether or not suprarenal aorta was seen and, if seen, should reflect whether or not it is normal.

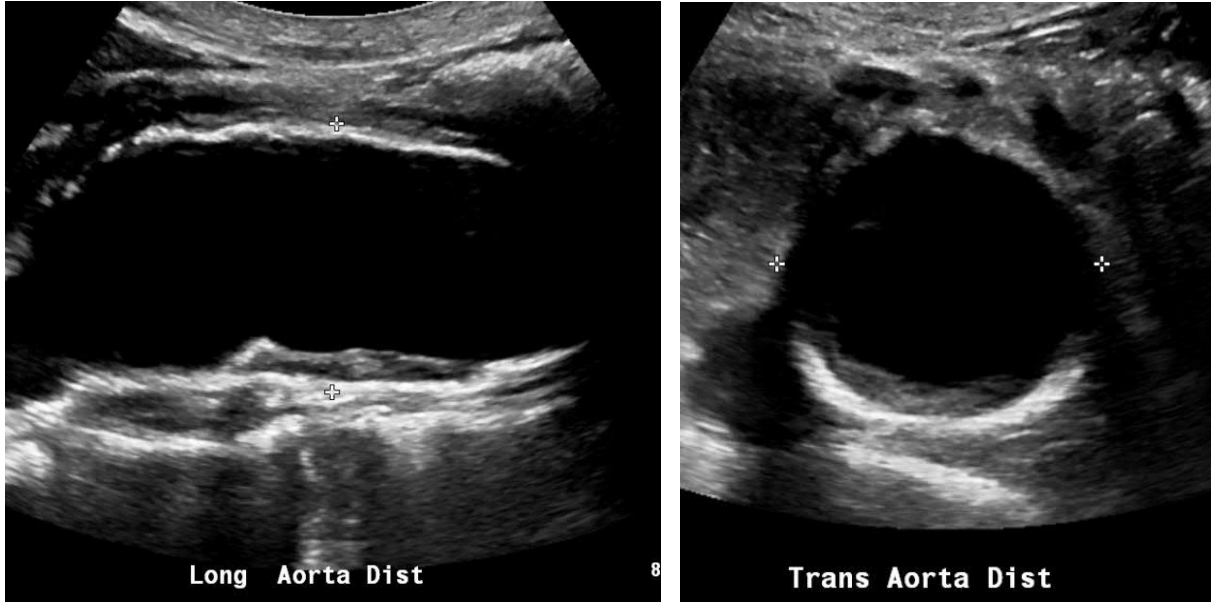
Common Iliac Artery Diagnostic Criteria

CIA Diameter

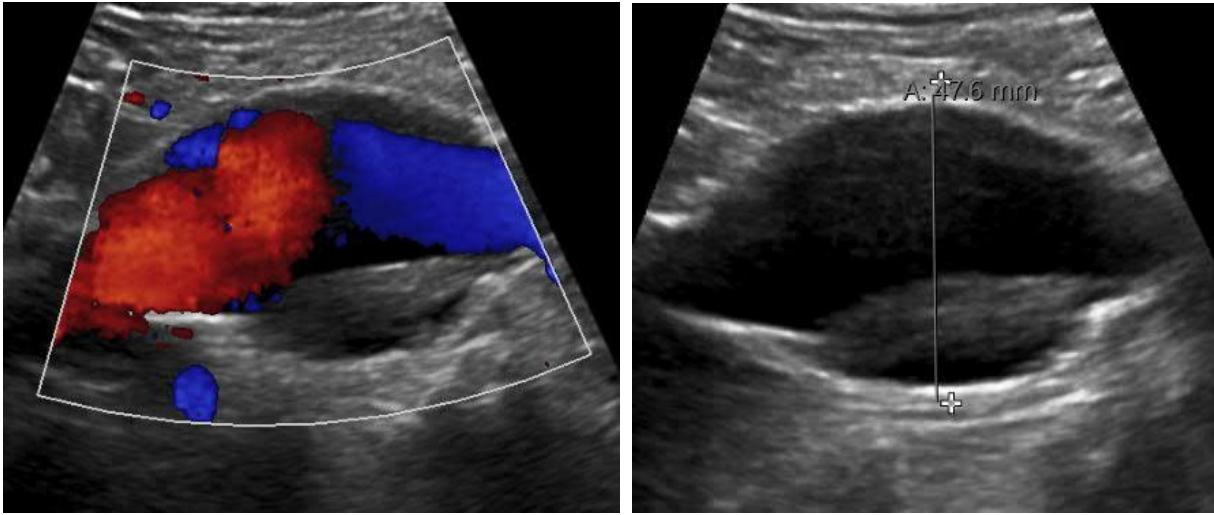
- Up to 1.0 cm is normal
- 1.0 cm to 1.5 cm, ectasia
- >1.5-1.7 cm, aneurysmal dilatation

CIA PSV

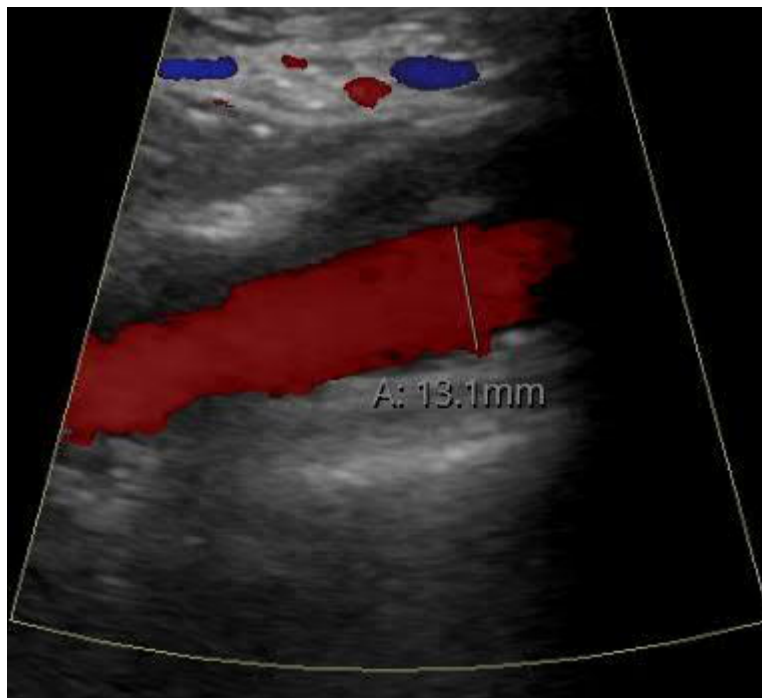
- Normal < 180 cm/sec
- Abnormal > 200 cm/sec



Longitudinal view with AP dimension (right) and transverse view with TRV measurement (left), at point of greatest dimension, outer wall-to-outer wall.



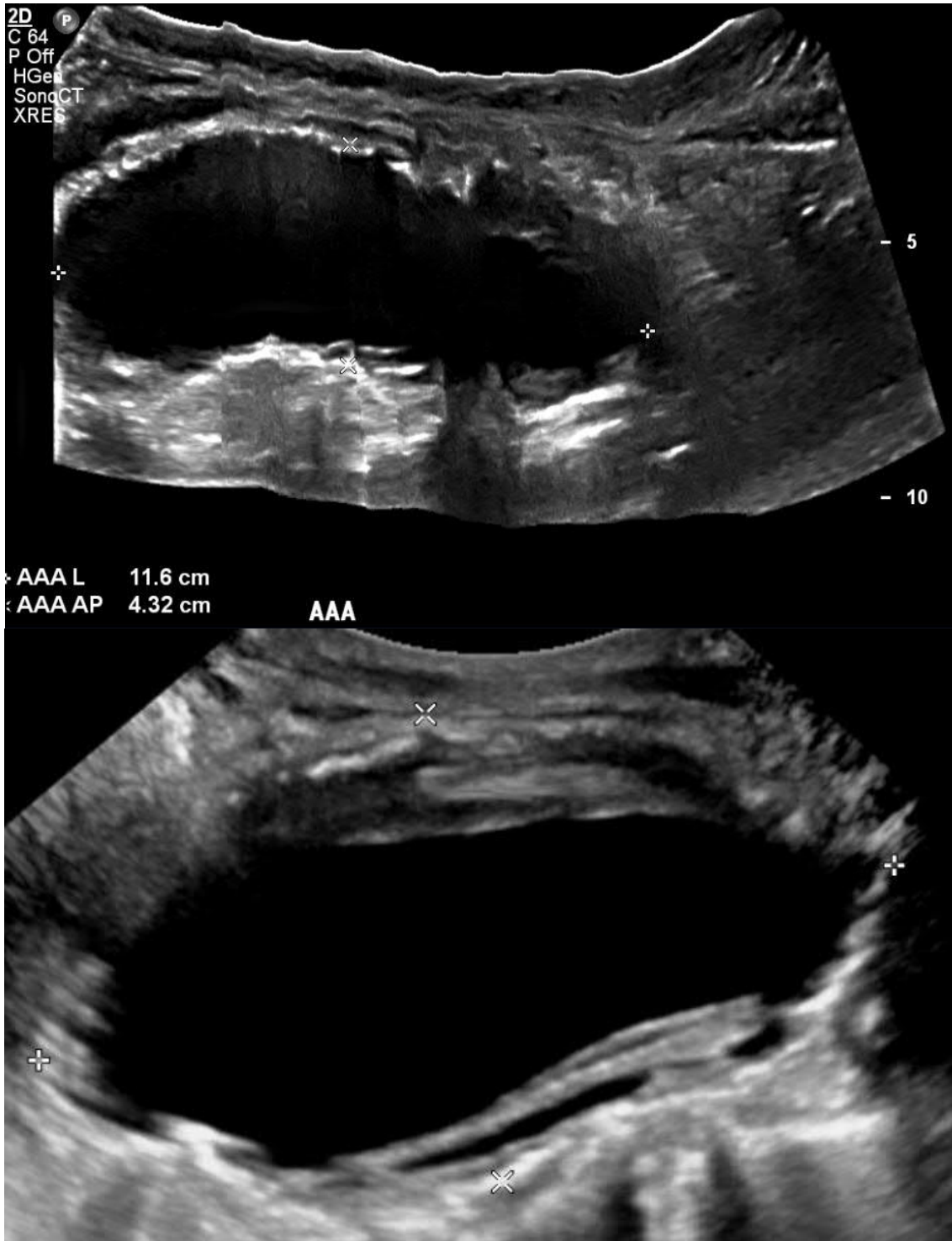
AAA with mural thrombus. Long image of aorta with and without color Doppler shows measurement in the longitudinal plane including the aortic walls and mural thrombus.



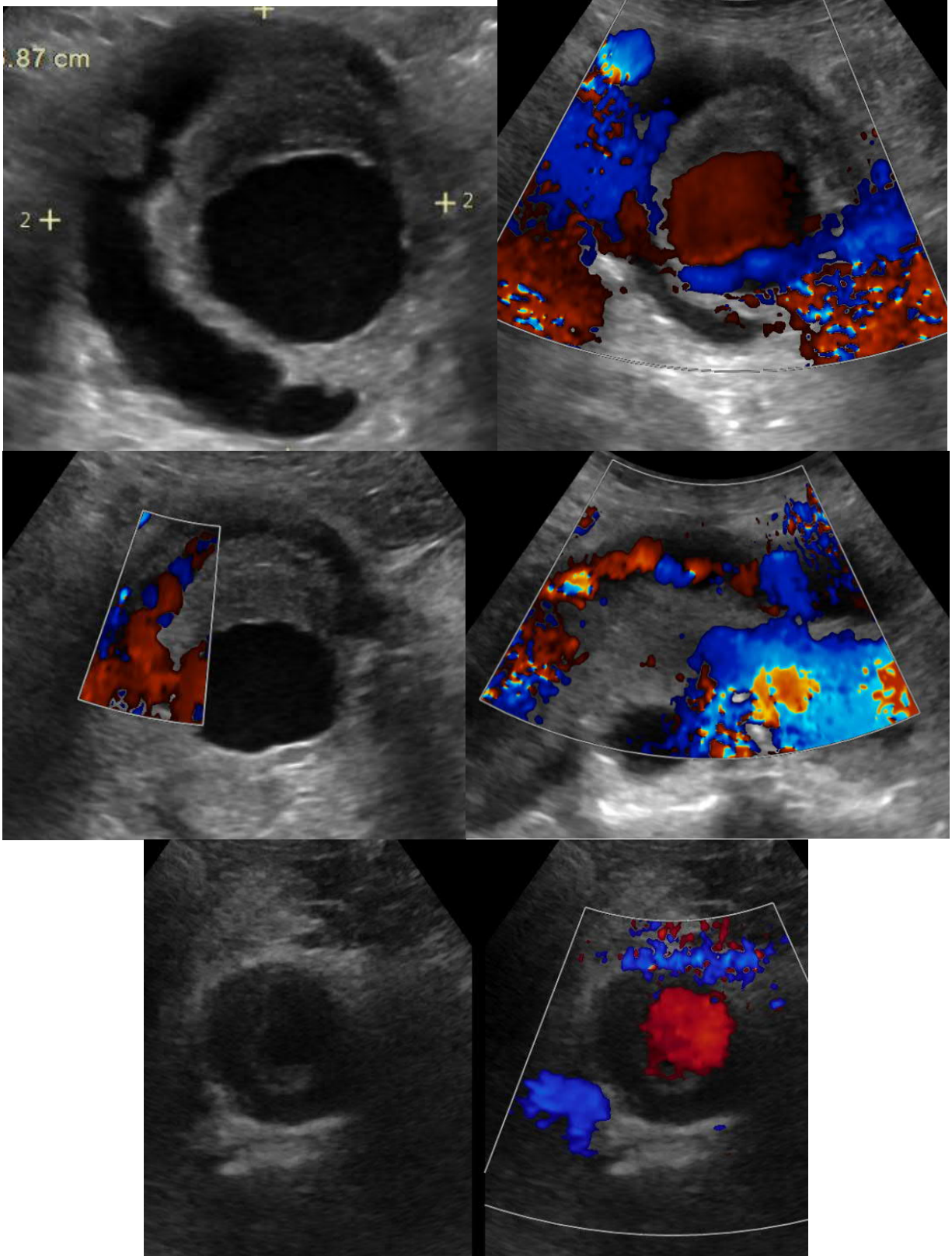
AP measurement of the residual lumen in longitudinal plane.



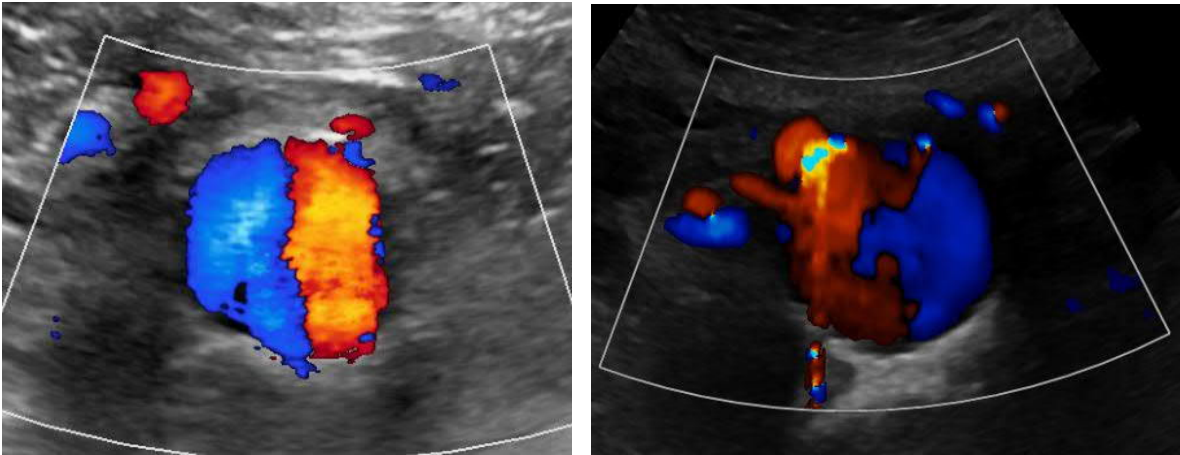
AP measurement in the longitudinal plane of the residual lumen is indicated by the blue line, inside the mural thrombus.



Large AAA with AP and length measurements.



AAA with mural thrombus and suspected aortic wall rupture with fluid collection outside the wall.
Color Doppler image shows residual lumen.



Color Doppler demonstrates the “ying-yang” sign frequently seen with large AAAs.

References:

- Update the IAC rev. date to 1/15/2018
- Battaglia S, Danesino GM, Danesino V, Castellani S. Color Doppler ultrasonography of the abdominal aorta. *J Ultrasound*. 2010 Sep;13(3):107-17. doi: 10.1016/j.jus.2010.10.001. Epub 2010 Oct 20. PMID: 23396814; PMCID: PMC3553042.
- [https://www.jvascsurg.org/article/S0741-5214\(96\)80043-7/pdf](https://www.jvascsurg.org/article/S0741-5214(96)80043-7/pdf)<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3553042/pdf/main.pdf>