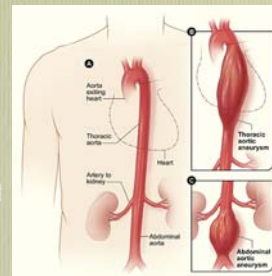


Ultrasound of Abdominal Aorta

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A&E Dept., Ruttenjee Hospital

Aortic Emergencies

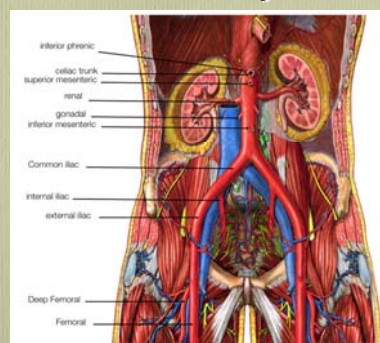
- Rupture of Aortic Aneurysm
- Aortic dissection: intimal flap
- Need early detection and intervention to prevent fatal outcome



Anatomy

- Abdominal Aorta
 - continuation of the thoracic aorta at aortic hiatus in the diaphragm T12
 - bifurcates into common iliac arteries L4
 - main branches:
 - Coeliac trunk
 - Superior mesenteric artery [SMA]
 - Left and Right renal arteries
 - Inferior mesenteric artery [IMA]

Anatomy



Normal Size of Aorta

- Diameter varies with age and gender
- Young males: infrarenal 2.3cm
- Young females: infrarenal 1.9cm
- At age of 70: 2.8cm
- Aneurysmal if >3cm

Image Acquisition

- 3.5-5 MHz Curvilinear transducer
- Depth around 15-20cm
- Supine position
- Transverse and Longitudinal Scans
- Start off at the epigastrium
- Normal aorta decreases in size caudally



Minimal Requirement

- Transverse Scan
 - Coeliac Trunk level: Seagull Sign
 - SMA level
 - Distal Aorta
 - Bifurcation
- Longitudinal Scan
 - SMA level
 - Bifurcation

Practical Tips

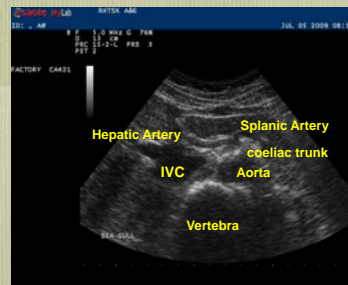
- Bowel gas can hinder the visualization of the aorta
- Overcome by application of gentle pressure and changing the transducer angle
- Using liver as a windows to visualize the aorta
- Coronal scan plane can allow for better visualization of iliac arteries
- Low frequency for deeper penetration

Aorta vs Inferior Vena Cava

	IVC	Aorta
Shape	Almond	Round
Compressibility	Easily	Difficult
Respiration	Size changed	No change
Location	Right to vertebra	Above the vertebra

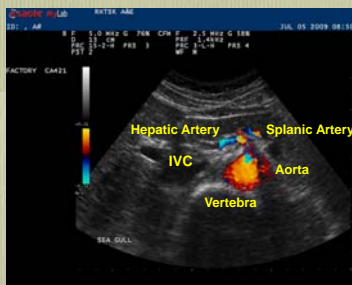
Normal Aorta

- Transverse scan at coeliac trunk



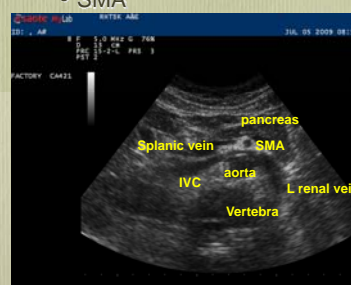
Normal Aorta

- Transverse scan with colour doppler



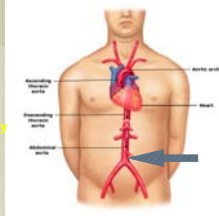
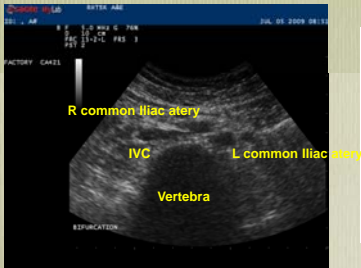
Normal Aorta

- SMA



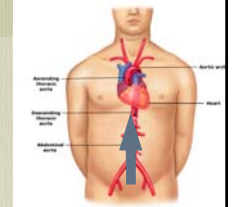
Normal Aorta

- At bifurcation



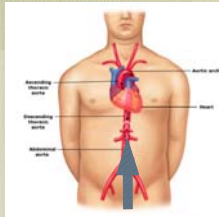
Normal Aorta

- Longitudinal Scan: IVC and Aorta



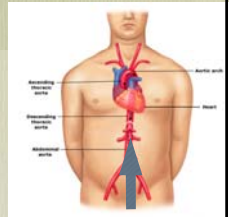
Normal Aorta

- Longitudinal: coeliac trunk and SMA



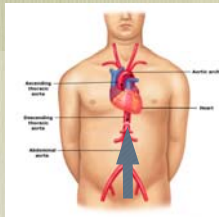
Normal Aorta

- Longitudinal: coeliac trunk and SMA



Normal Aorta

- Aorta with renal artery



Abdominal Aorta Aneurysm

- **Etiology:**
 - Atherosclerosis [Most common]
 - Connective Tissue Disorder e.g. Marfan's syndrome
 - Mycotic: atypical site and age group, Saccular shape
 - Trauma

Abdominal Aortic Aneurysm

- **Location:**
 - Suprarenal: rare
 - Juxtarenal
 - Infrarenal: *most common*
- **Shape:**
 - Fusiform
 - Saccular
 - Hour glass



AAA

- Criteria for diagnosing AAA
- Focal dilatation of aorta >3cm
- Increase in aortic diameter to 1.5x normal
- Ratio of infrarenal to suprarenal aortic diameter >1.2
- Iliac arteries >1.5cm

AAA Size

- Size matters
- It correlates with the risk of rupture and mortality
- <4cm 2%/year rupture
- 4-5cm 3-12%/year rupture
- >5cm 25-41%/year rupture



J Vas Surg 1991; 12:540-8

Palpable AAA

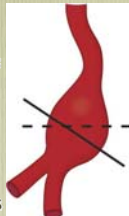
- Physical examination not always sensitive
- 30% 3-3.9cm palpable
- 50% 4-4.9cm palpable
- 75% >5cm palpable



JAMA 1999; 281:77

AAA Measurement

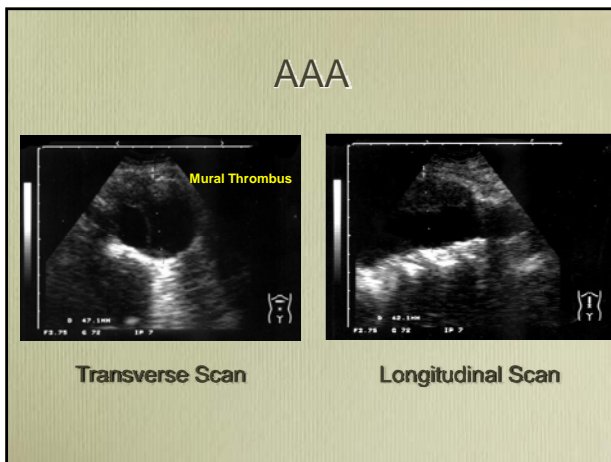
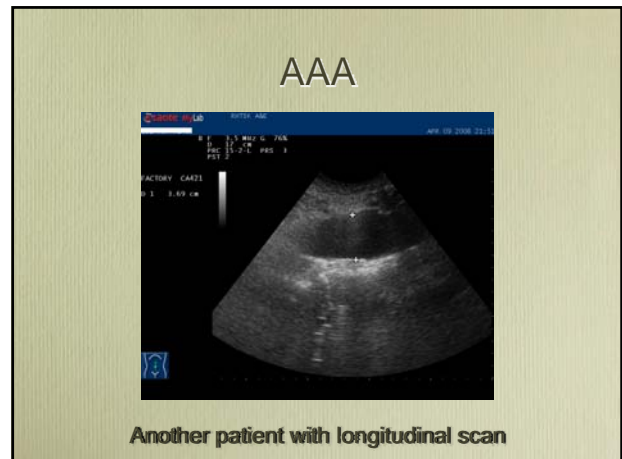
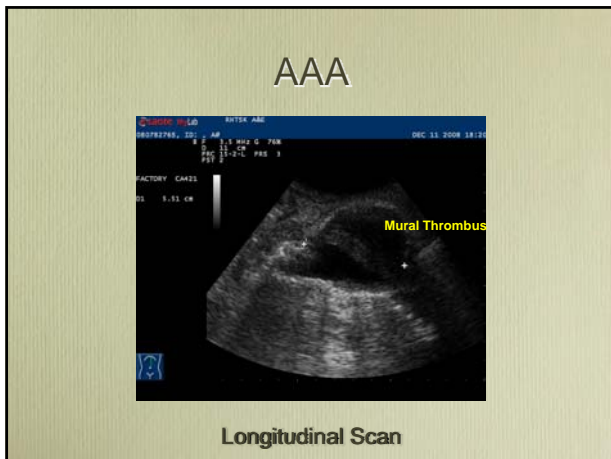
- Measured in true transverse and longitudinal planes at correct axes
- Outer to Outer wall measurement
- Mural thrombi common
- Beware of the tortuous aneurysms [over-estimation]
- Beware of off centre measurement in longitudinal scans [under-estimation]



AAA



Transverse scan with mural thrombi+ colour flow doppler



Ruptured AAA

- High Mortality Rate
- Spontaneous rupture: 66-95% mortality
- 40-50% die before reaching hospital
- Overall mortality >90%
- Small AAA can still rupture!

Semin Vasc Surg 1999; 12: 300-5

Ruptured AAA

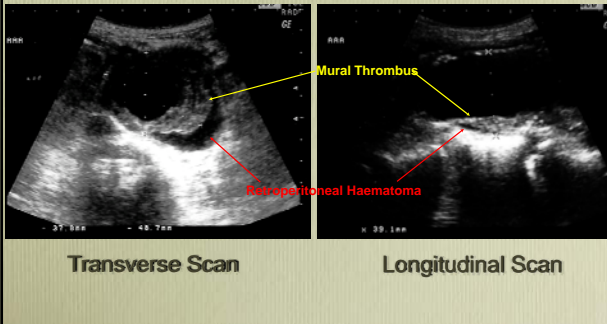
- Classical Triad
- Back/abdominal pain, Shock and Pulsatile mass
- Present in less than 1/3 of patients
- Misdiagnosed as other causes of acute abdomen in 30% cases

Adv Surg 1993; 26:73-98

USG features of rupture

- Retroperitoneal haematoma
 - appeared as an echogenic retroperitoneal fluid collection esp in periaortic location
 - perirenal, posterior pararenal, psoas compartment
- Haemoperitoneum: Mostly fatal

Ruptured AAA



Ruptured AAA



AAA with free fluid in Morrison Pouch

Diagnostic Accuracy

- Tayal et. al. 2003
- Emergency USG performed by EM physicians Vs confirmatory tests on patients suspected of AAA
- Sensitivity=100%; Specificity=98%
- NPV=100%; PPV=93%

Acad Emerg Med 2003; 10:867-71

USG Enhanced Management

- Plummer et al. 1998
- Randomized trial: USG Vs standard diagnostics
- USG improved time to diagnosis 5.4 vs 83 min
- USG improved time to disposition for patient requiring operation 12 vs 90 min

Acad Emerg Med 1998; 5:417

Summary

- USG is sensitive and specific to detect AAA.
- But not sensitive to detect rupture.
- Thus if clinical suspicious is high esp in shock + AAA detected by USG



- Emergency Operation!



THANK YOU
Any Questions?