IVC assessment

Inferior vena cava (IVC): diameter and collapse

Why scan the IVC?

- non-invasive surrogate for central venous pressure (CVP) measurement
- rough estimate of fluid status

Numbers

- The following numbers provide a rough guide to the patient's intravascular volume status.
- NB these figures were derived from stable outpatients, and the absolute figures may not be applicable to the acutely ill.

IVC diameter (cm)	Collapse with sniff	Interpretation	Estimated CVP (mm Hg)
<1.5	>50%	Underfilled	0-5
1.5-2.5	>50%	A little dry	5-10
1.5-2.5	<50%	Euvolaemic	10-15
>2.5	<50%	Overload	>15

To simplify:

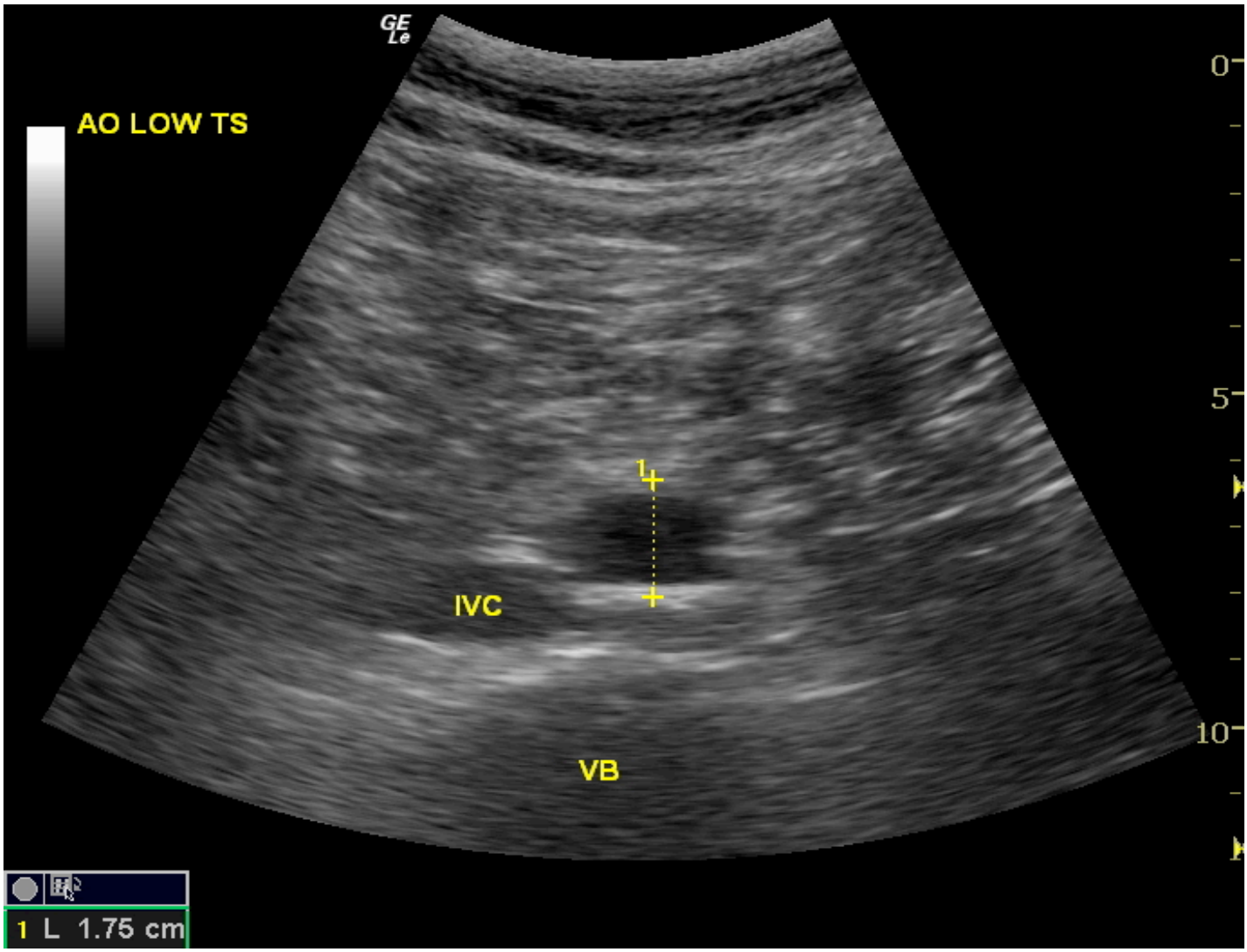
Big IVC and <50% collapse: CVP is high
Small IVC and >50% collapse: CVP is low

Technique

- Patient position usually supine or semi-recumbent
- Probe: either the sector (cardiac) or curved probe
- Two windows can be used:
  - the subcostal is preferred
  - If substal window is unhelpful, try the right upper quadrant (the latter uses the liver as a sonographic window).
- Scan the IVC in two planes: both long axis and transverse
- Differentiate between the aorta and IVC as described in AAA scanning.

Subcostal scan IVC, curved probe

Subcostal scan, transverse plane: ID the aorta & IVC as for AAA scan

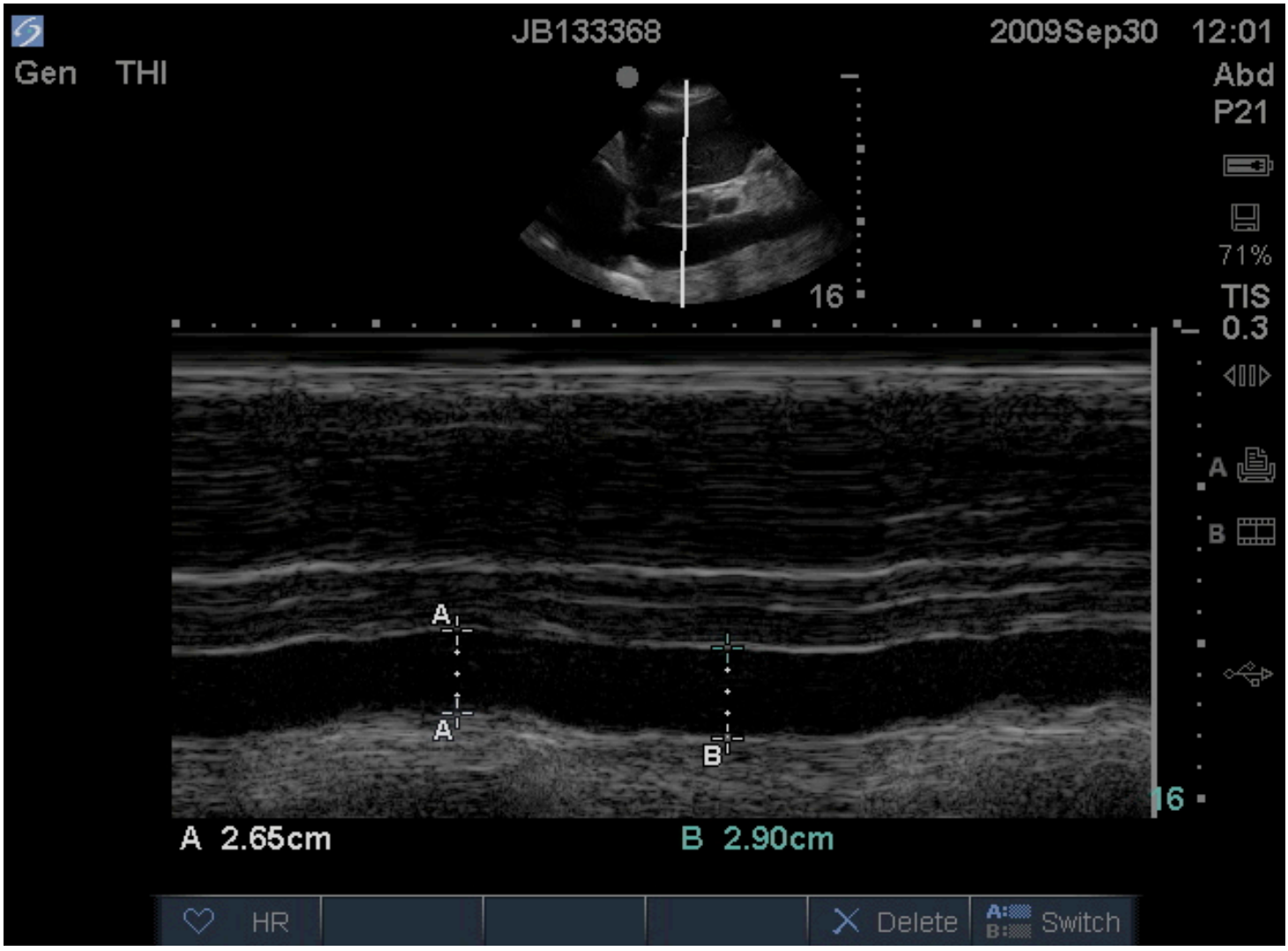


Subcostal scan, long axis: IVC seen in longitudinal section

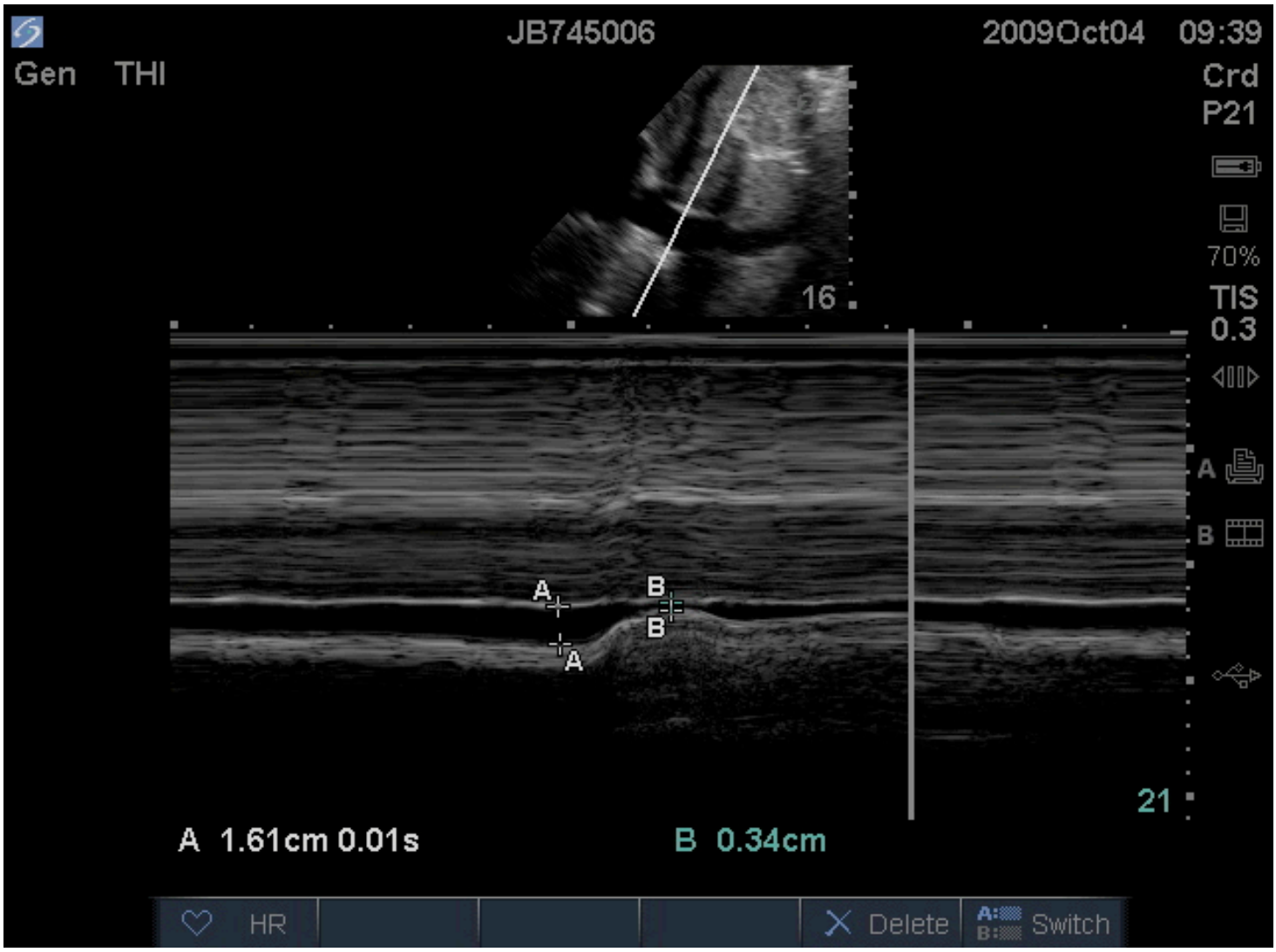
Then measure the minimum IVC diameter using the sniff test: ask the patient to sniff quickly (this will cause intrathoracic pressure to fall rapidly, and a normal IVC will collapse).

M-mode scanning can be used to capture maximum and minimum diameters on a single image.

Same site & patient as in above image, IVC max & min diameters using M-mode. Patient with CCF, IVC dilated.



Long axis view IVC, subcostal window. 'Sniff test' in a shocked, hypovolaemic patient.



Handy hints and pitfalls

Beware the 'falsely dry' IVC:

- Excess probe pressure while scanning
- High intra-abdominal pressure (eg abdominal compartment syndrome)

And remember that a big IVC occurs in many conditions:

- intravascular overload
- heart failure
- pulmonary hypertension
- any distal ['downstream'] obstruction to flow

If the IVC is also difficult to compress by direct pressure with the US probe, then distal obstruction is more likely eg:

- massive PE
- tension pneumothoraxcardiac tamponade

Don't scan too close to the diaphragm! The IVC naturally dilates just before the diaphragm, so measuring here can overestimate the diameter.

Remember how dependent the IVC is on **patient position** [this is why we lie shocked pregnant patients on their left]. So beware of over-interpretation of your findings!

Keep repeating the scan during ongoing resuscitation: trends are more important than single readings.

Finally, clinical context is everything. For example, a dilated IVC is less meaningful in a patient with chronic right heart failure.

Treat the patient, not the scan.