

KNOBOLOGY & machine care

Emergency Ultrasound Course

Justin Bowra

Why bother?

Best possible image

Most accurate image (artifacts)

Every machine is different!



Standard controls

Transducer selection (curved, linear...)

Preset selection (abdo, cardiac, OG...)

Frequency selection (high, low...)

TGC (time gain compensation)

Gain (overall amplification)

Focal zone

Depth

Dynamic range

Tissue harmonics

Auto optimise!

Which transducer?

CURVED

Range approx. 3.5 – 5 MHz

Big things

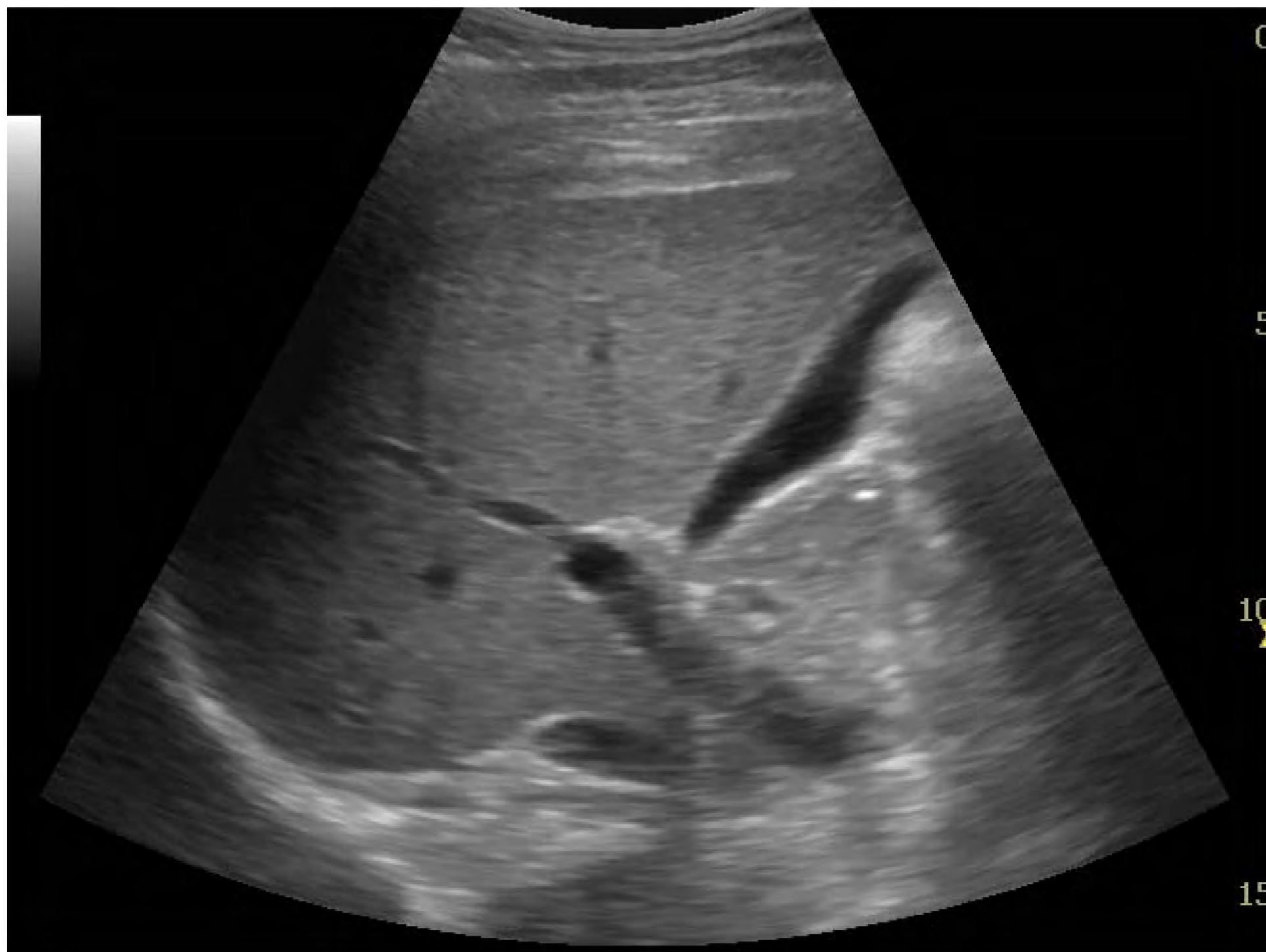
Torsos

EFAST

AAA

Pregnancy...





SECTOR

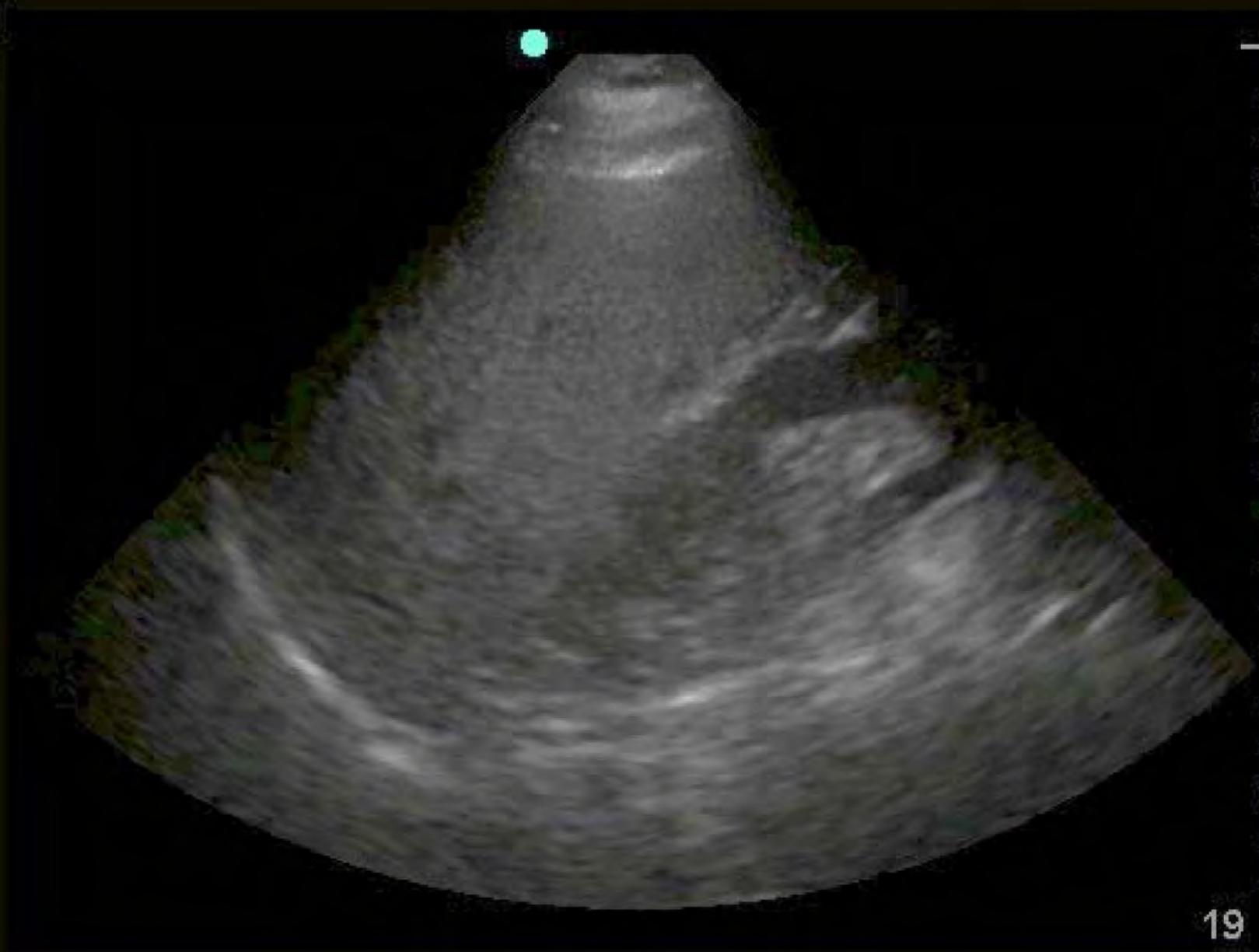
Range approx. 2-4 MHz

Ribcage

(Torsos too)



THI
MB



Abd
P21



100%

MI

1.1



33



A



B



19

LINEAR

Approx 8-15 MHz

Small things

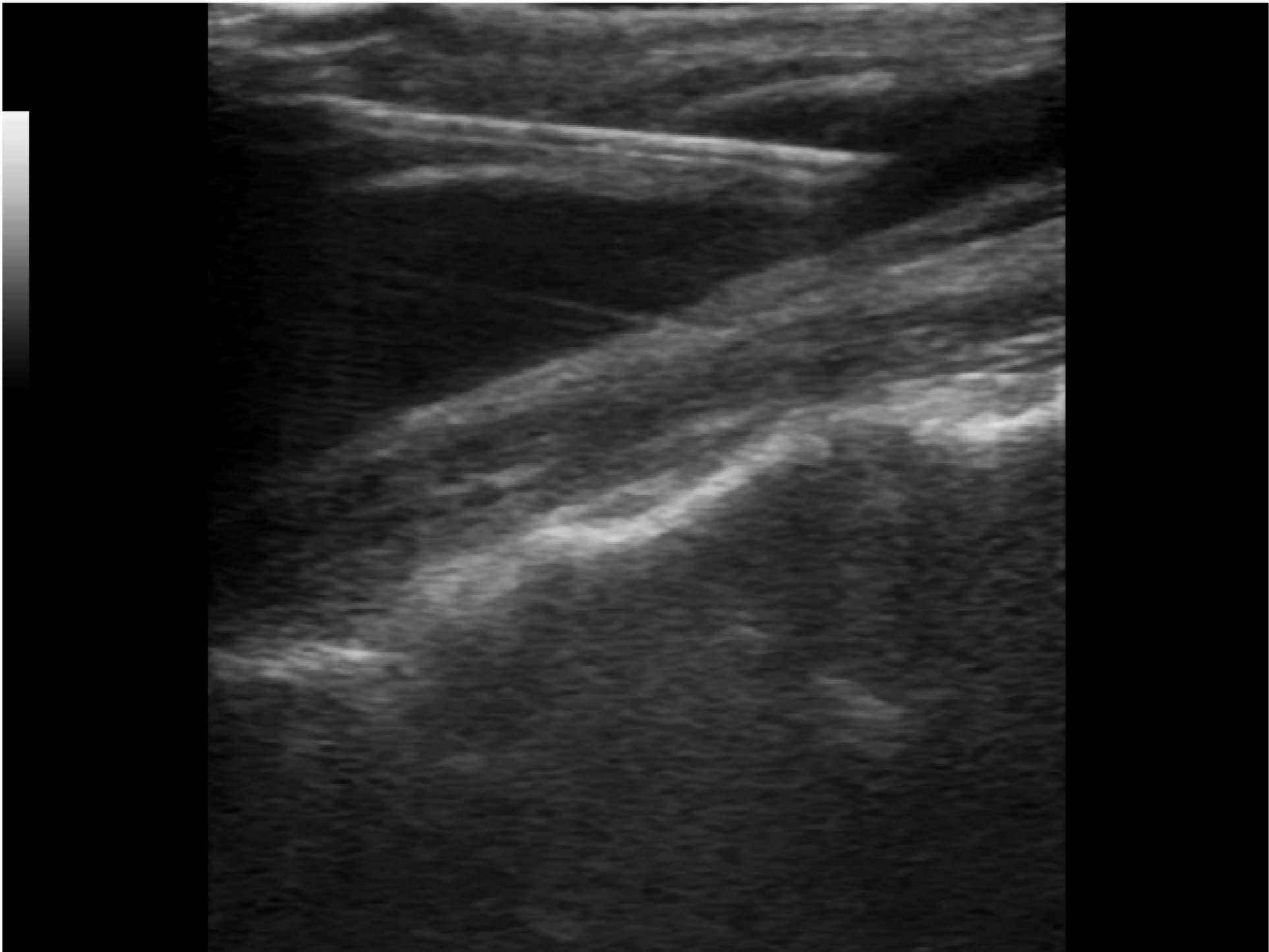
Vessels

Nerves

Foreign bodies

Abscesses





How to hold a probe







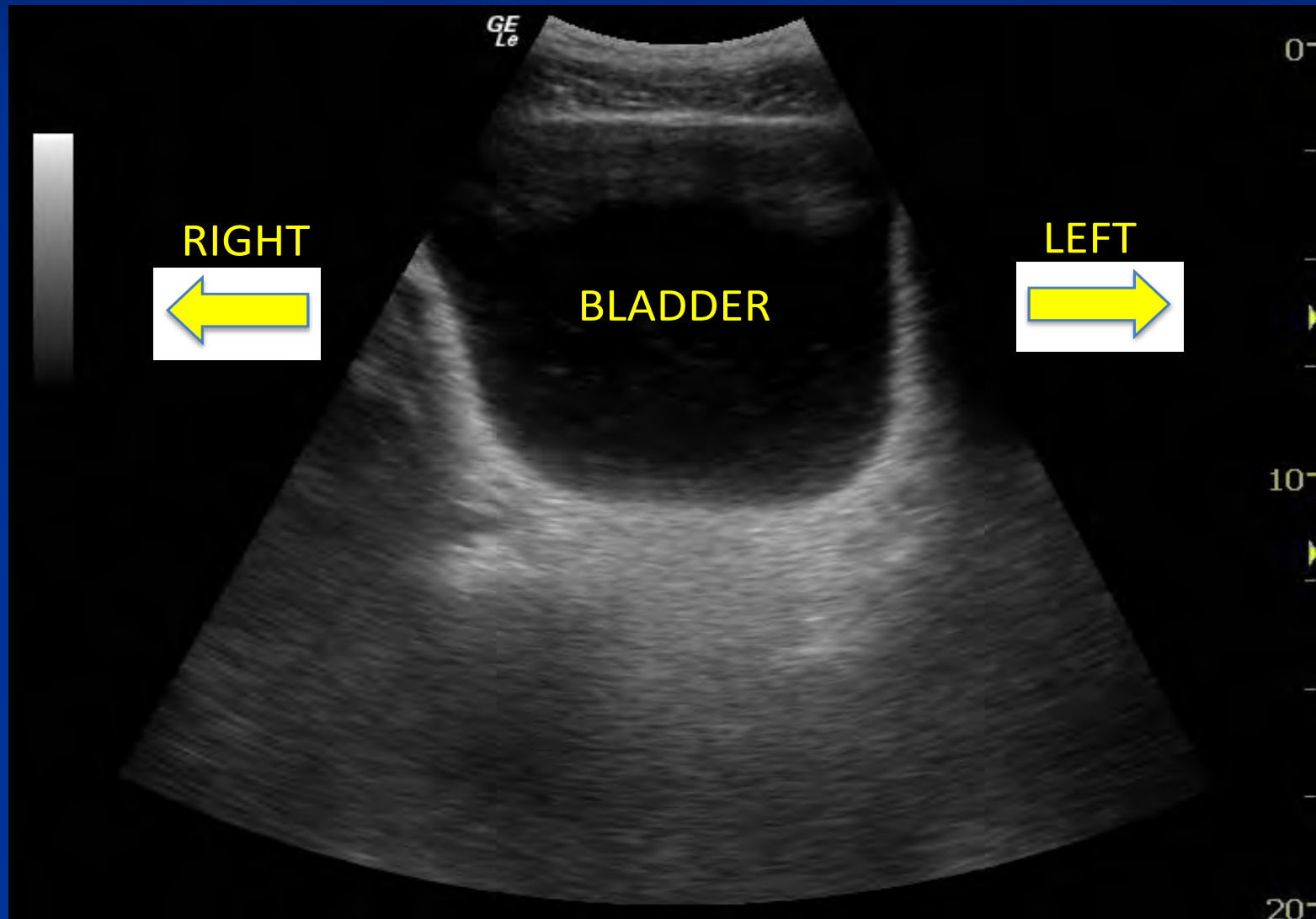


How to orient the probe

Torso transverse: marker to patient's right



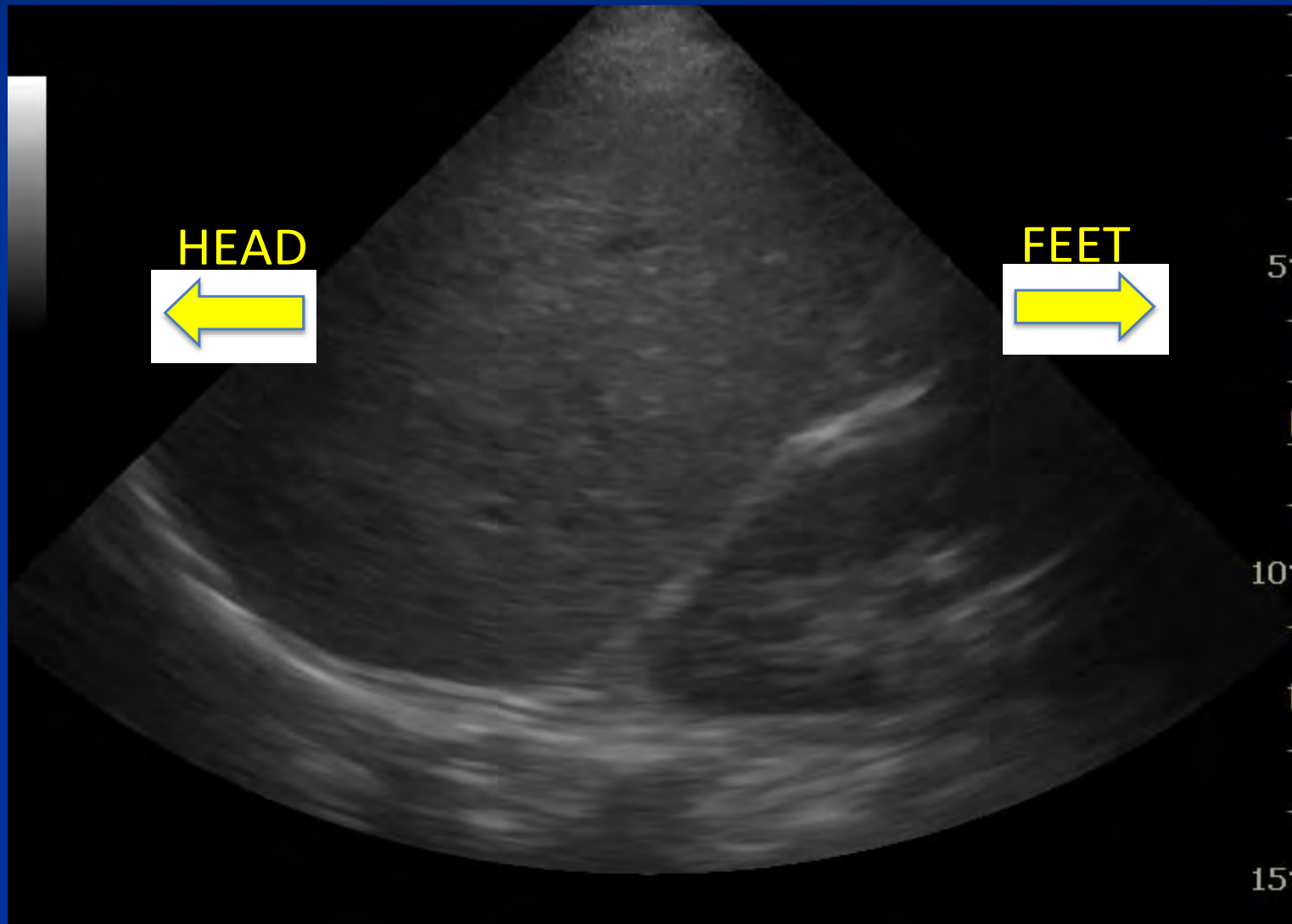
Torso transverse: marker to patient's right



Torso longit: marker to patient's head



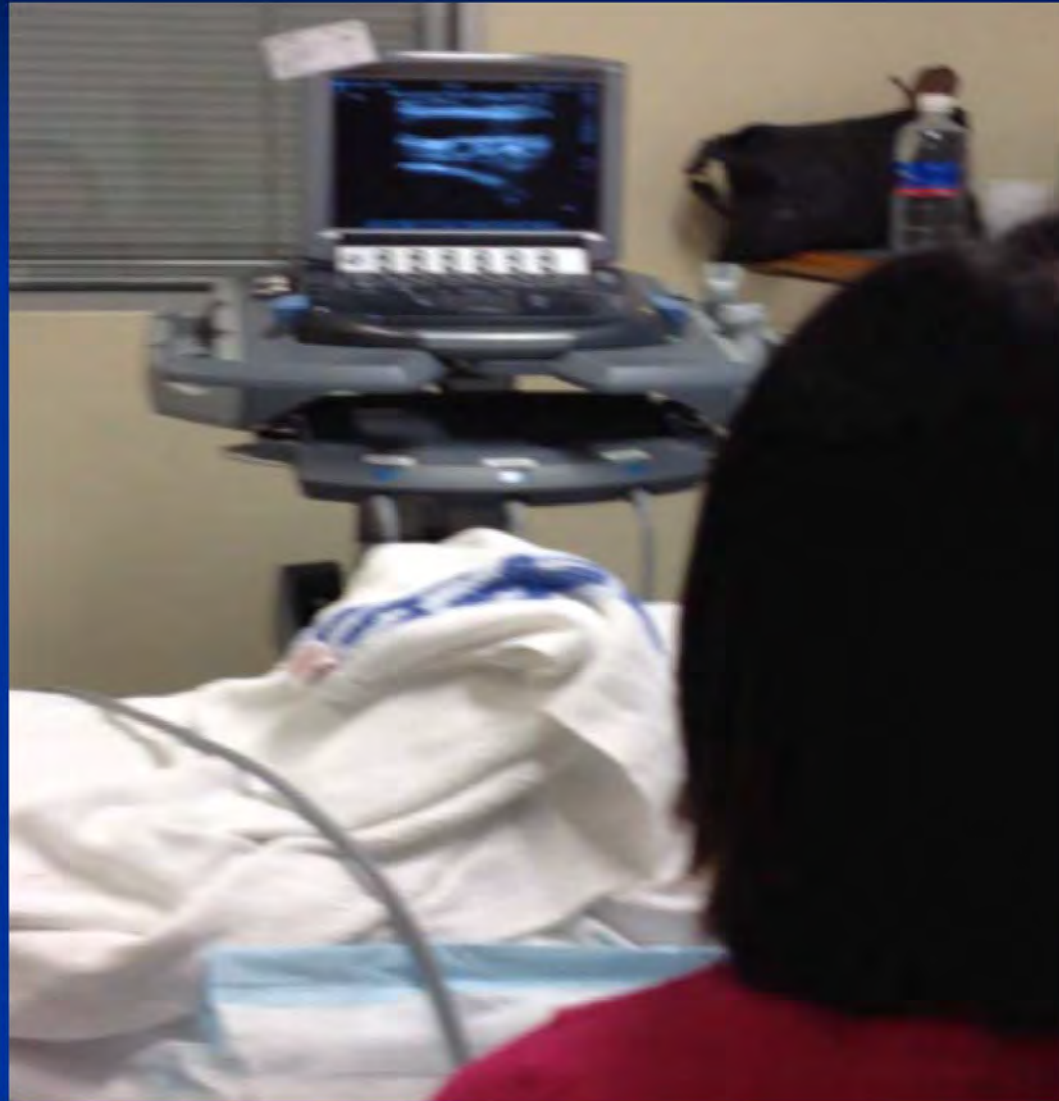
Torso longit: marker to patient's head



Procedural: marker on **your** left



And machine in front of you

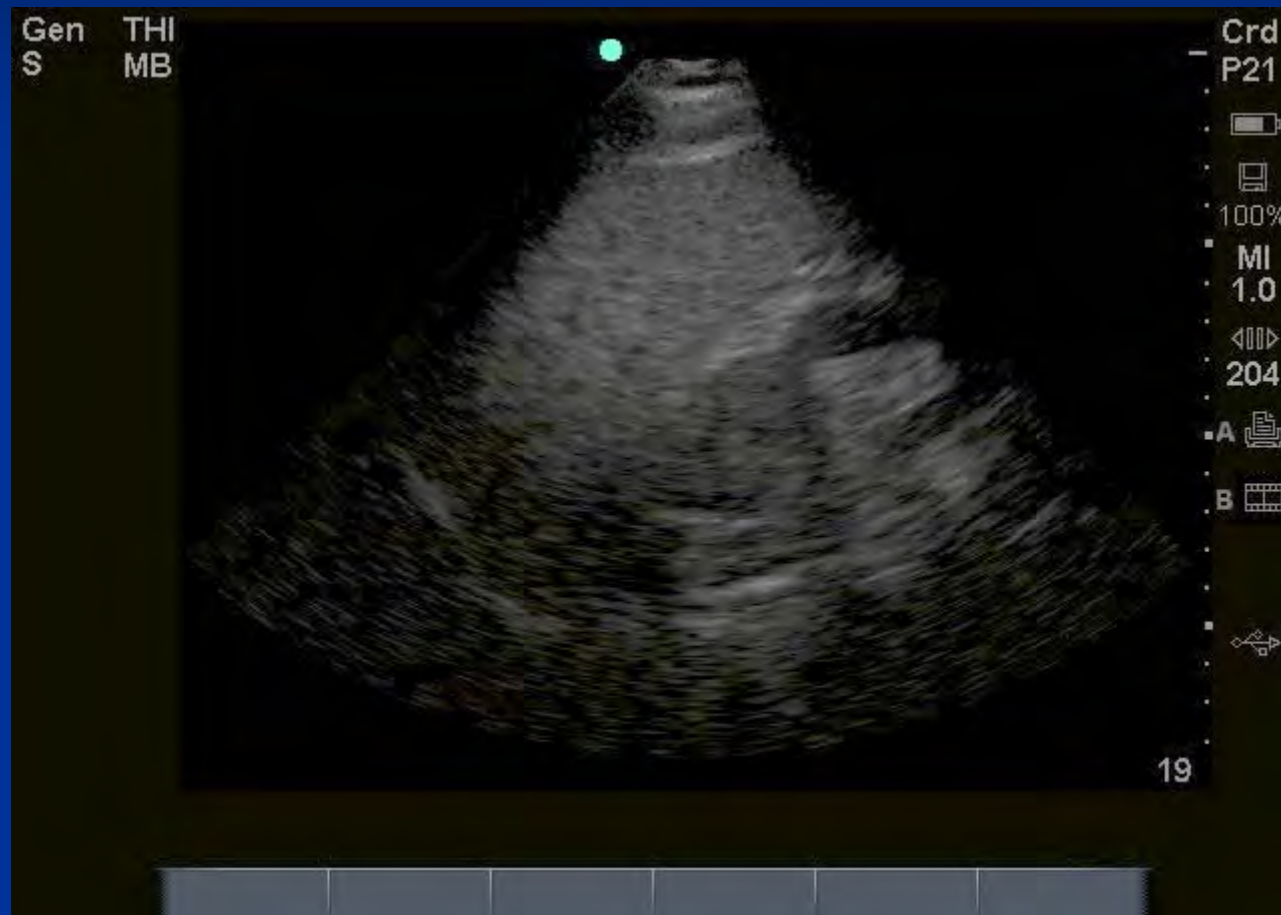


Which preset?

Which preset?

- Easy to forget
- Correct preset maximises many of the features you would otherwise need to change manually
 - Dynamic range
 - Frequency
 - Focal zone
 - Depth
 - Frame rate

RUQ (cardiac preset)



RUQ (abdo preset)



Which frequency?

As frequency increases, waves get smaller

Resolution increases

Penetration decreases

Golden rule

Turn up the frequency!

Overall gain

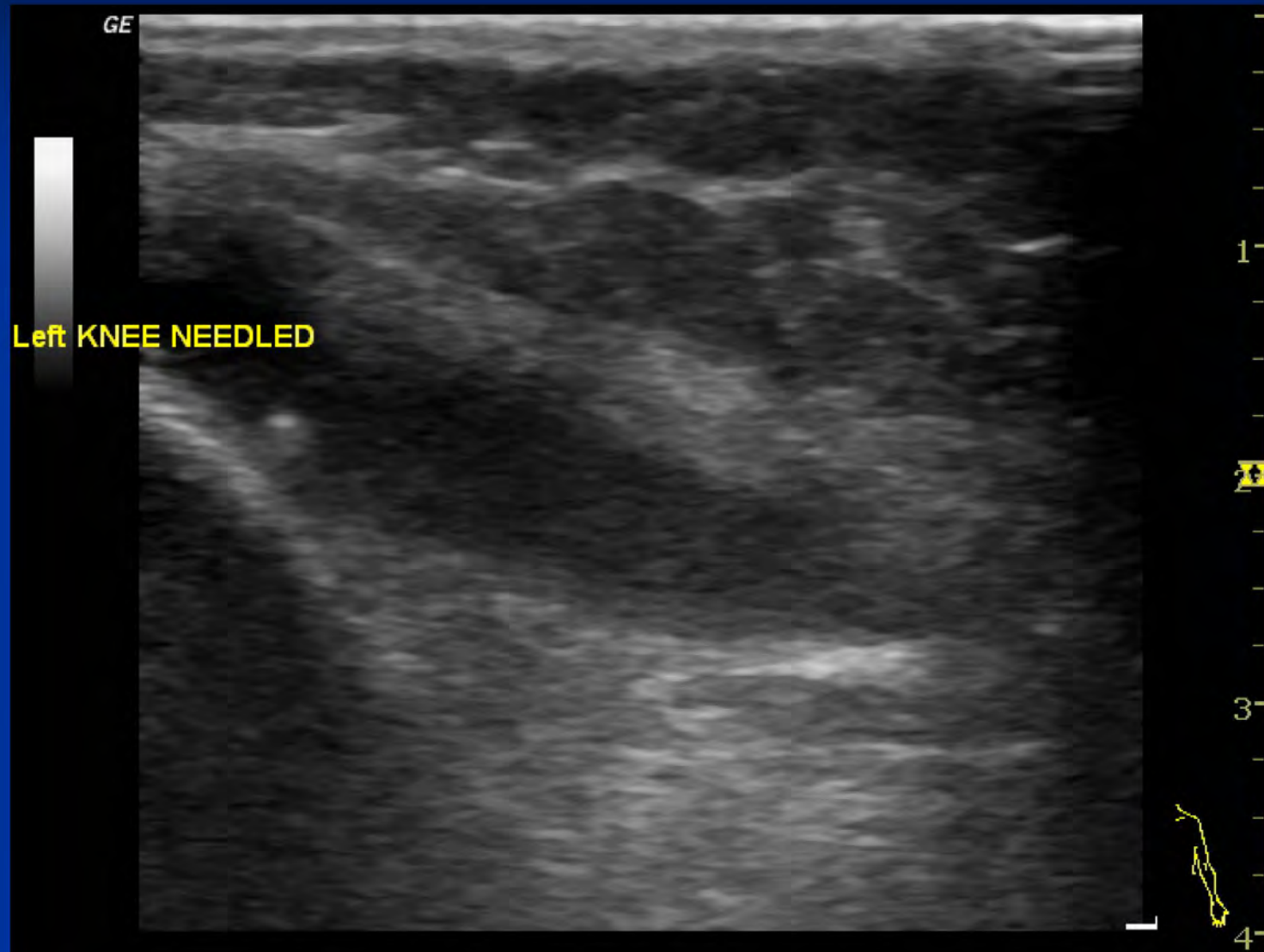
OVERALL GAIN

Signal amplification

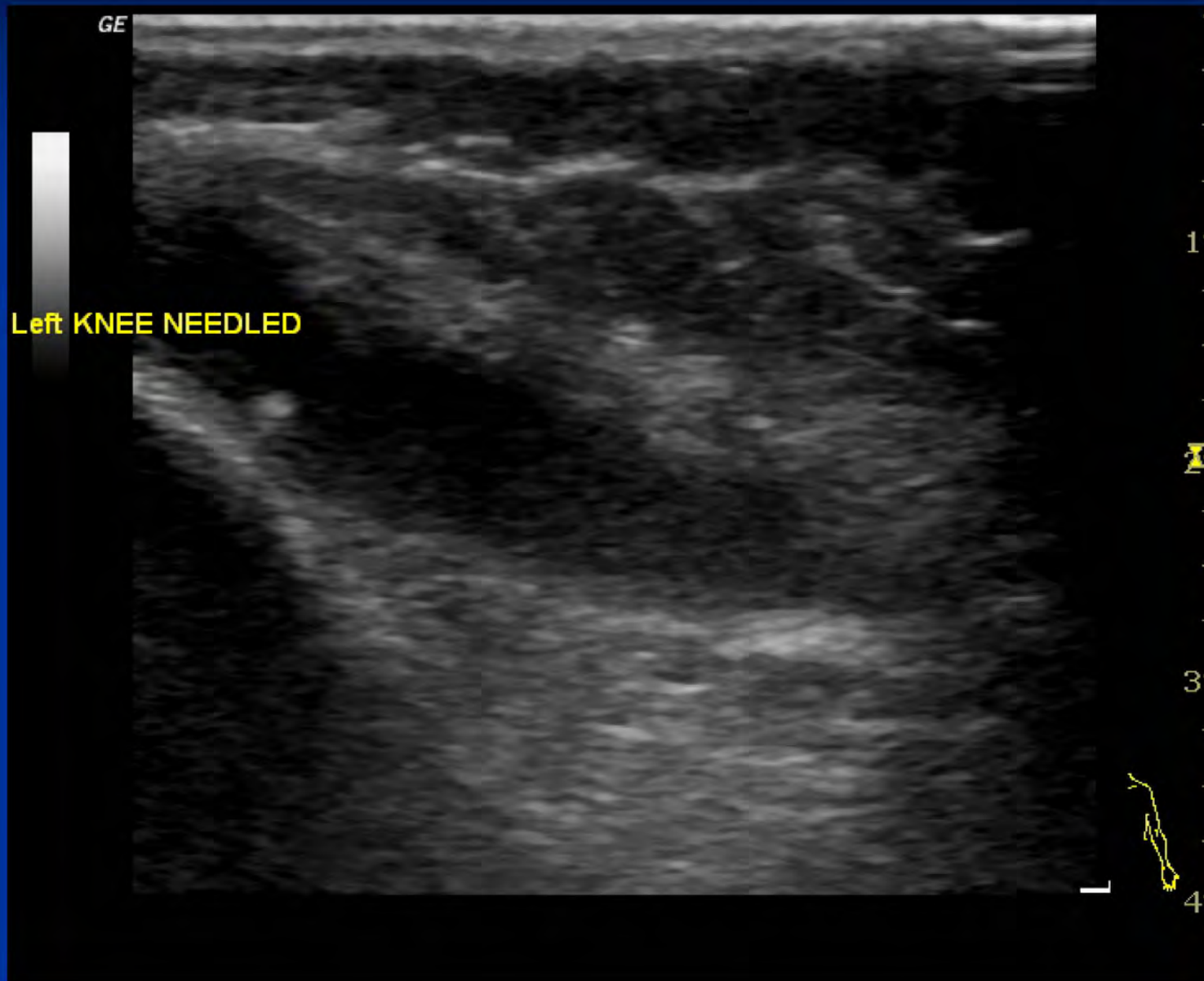
Makes **whole image** brighter / darker

Over-used!!

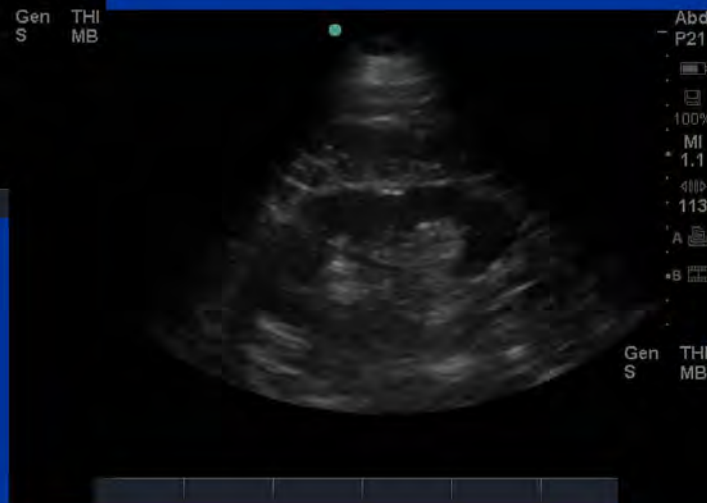
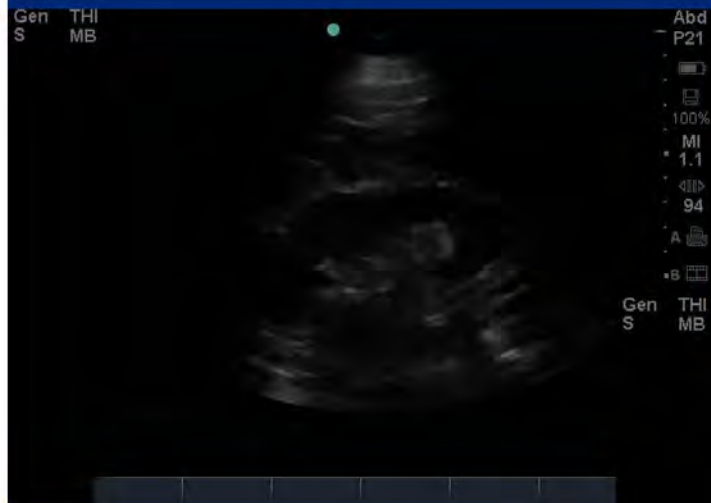
OVERALL GAIN



OVERALL GAIN



OVERALL GAIN



Time gain compensation

A better control

TGC : TIME GAIN COMPENSATION

‘Graphic equaliser!’

Aim: uniform echo brightness in the display

Focal zone



Best image resolution occurs in the section of tissue through which the focal zone passes

Always place the focal zone at the area of major interest in the image

Lateral Resolution



Would be
seen as one
structures



Would be
seen as two
structures



Would be
seen as one
structures

Depth

The background is a solid dark blue color. In the lower right quadrant, there are several faint, wavy, light blue lines that create a sense of depth and movement, resembling ripples on water or stylized waves.

Set depth just deep to area of interest

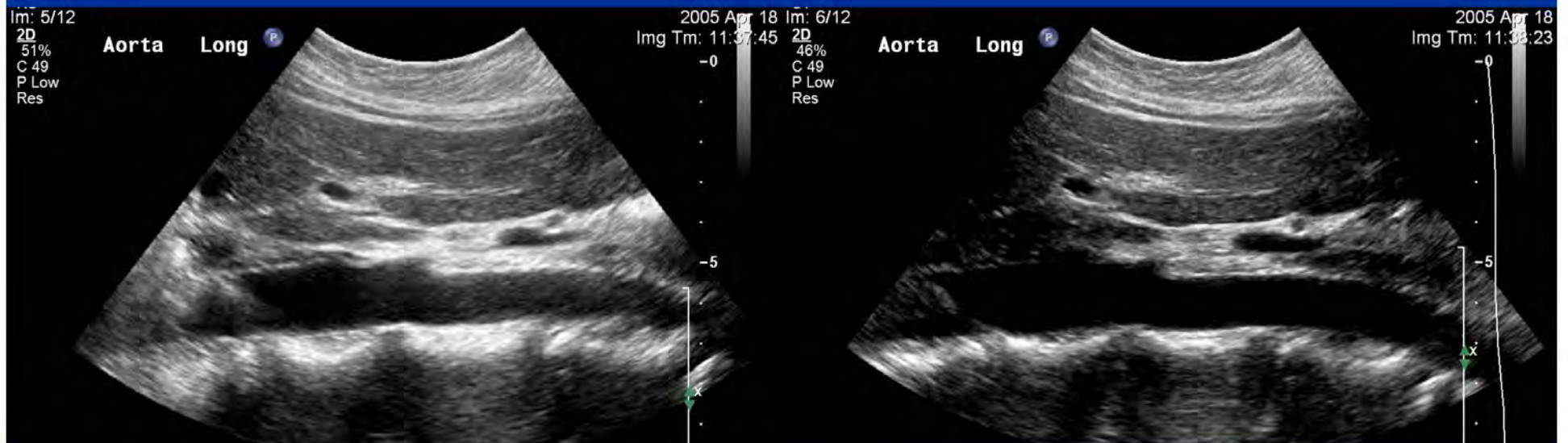
Too shallow = miss stuff

Too deep = wasted space
...and too slow

Dynamic range

How many Derwent colour pencils are
in your box?

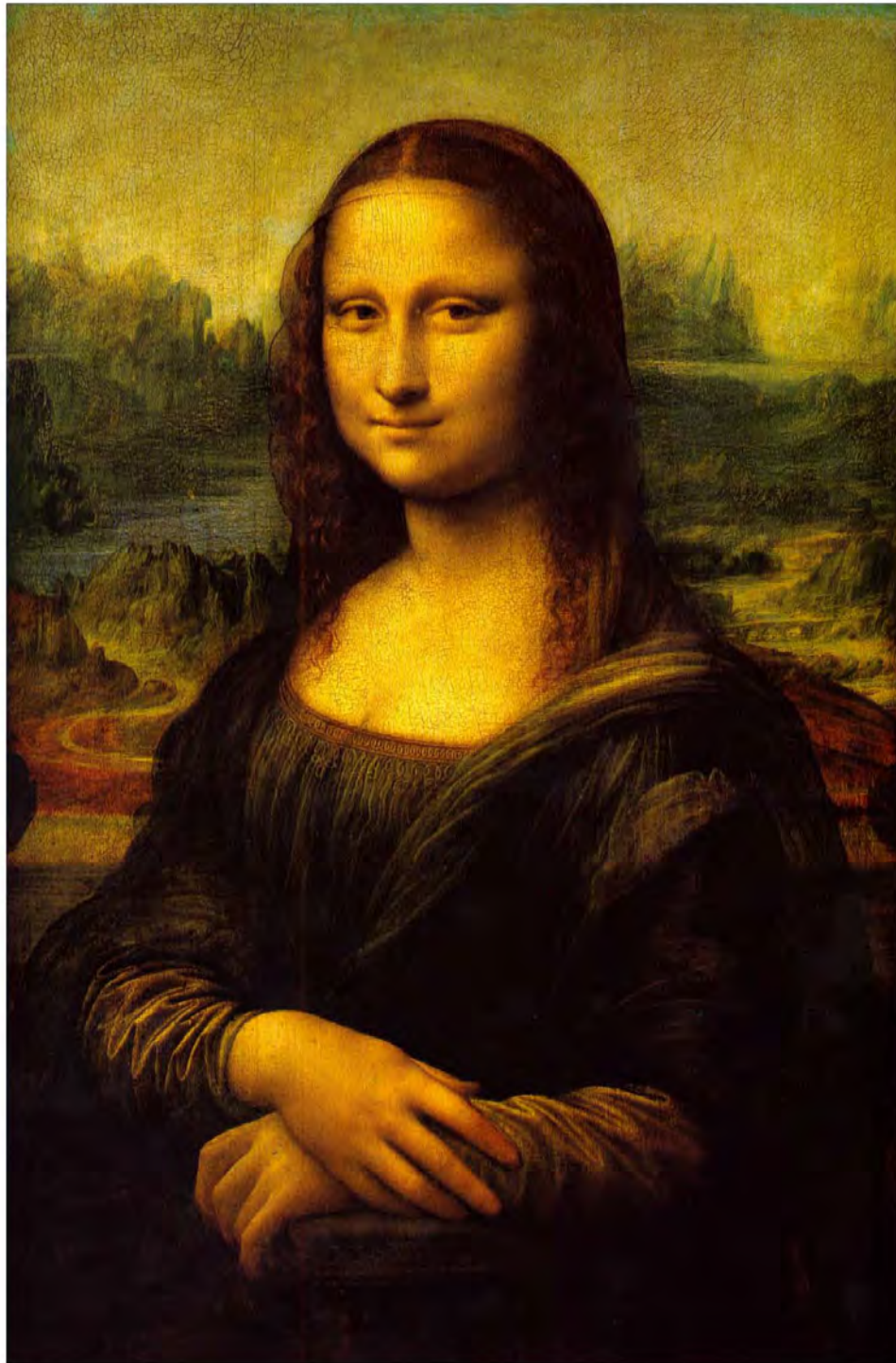
DYNAMIC RANGE



DYNAMIC RANGE

= the range of echo amplitudes displayed

Maximum setting = full range

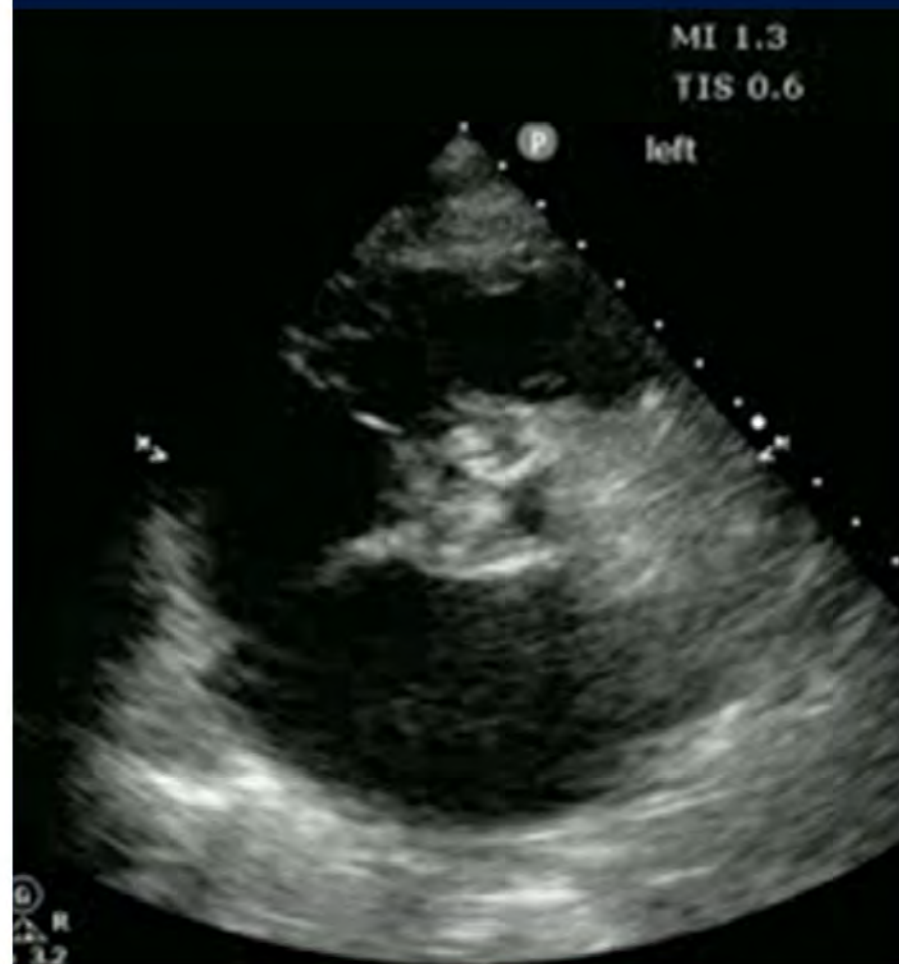


Reducing dynamic range

“Cleans up” an image... eg good for looking at
heart

Pitfall : can remove “real” echoes from the
display...

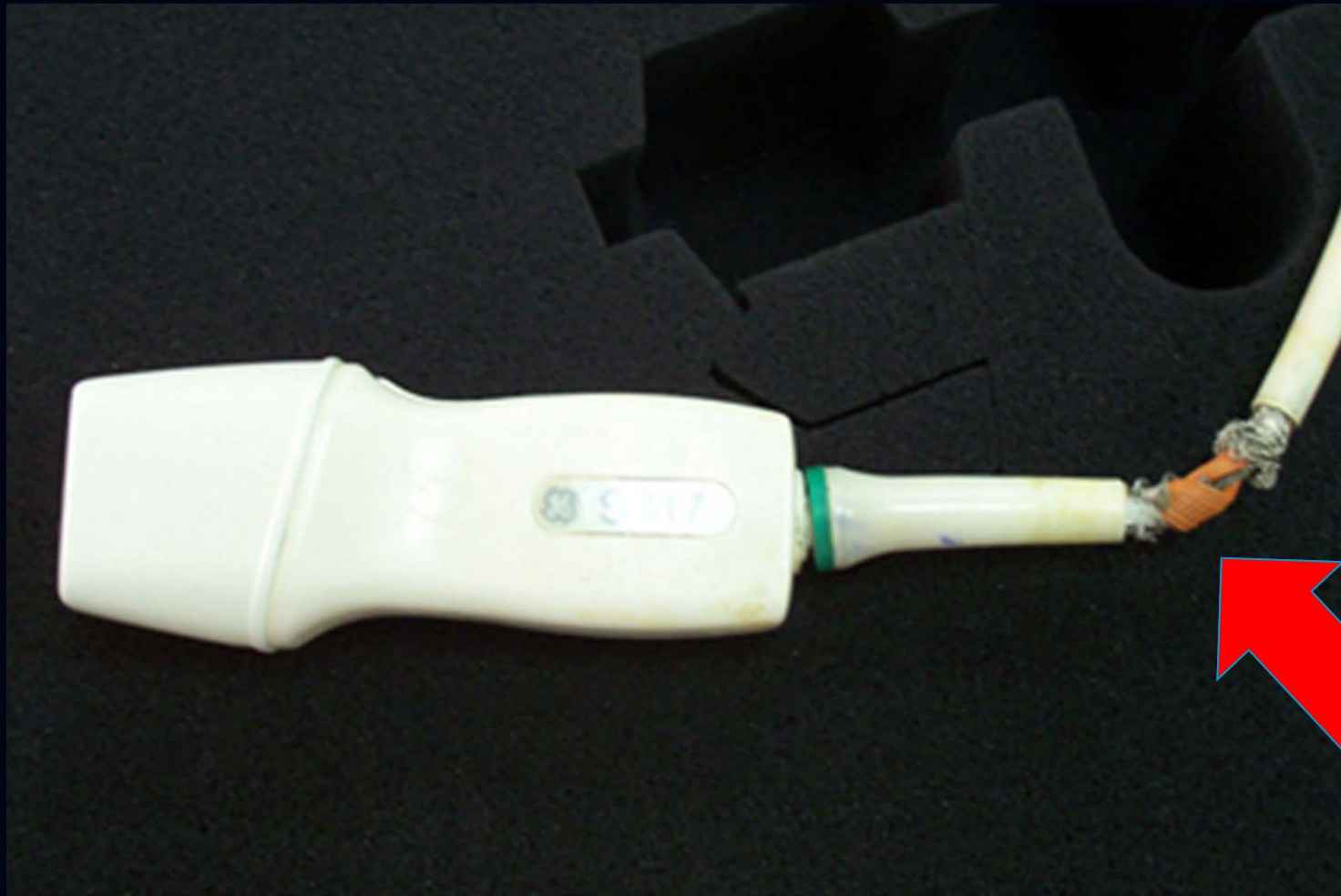
eg bad for looking at the liver!



Know your keyboard!



Machine care





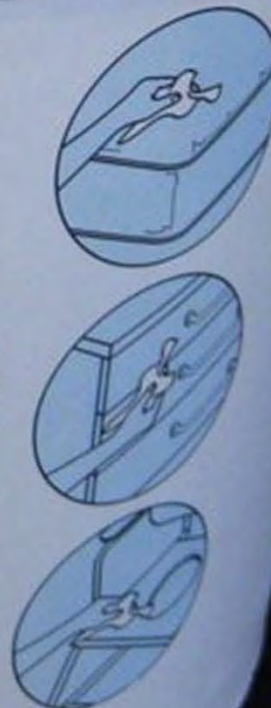
Vernacare
cleaner safer healthcare

tuffie

**225 large
detergent wipes**

Alcohol free multi surface
general cleaning wipes

Alcohol
free



Machine care

Probe: don't drop

Cord: don't run over

Blood

Vomit

Ground rules for scanning

Ground rules

1. Explain (focused scan, not formal)
2. Enter patient data
3. Document image (R / L etc)
4. Save images
5. Clean the patient afterwards (bath towel)
6. Clean the probe, cord & keyboard
7. Document in the patient record
8. Log scan in log book

COMMON PROBLEMS

The obese patient

Increase depth

Decrease frequency

Lower the focus

Decrease dynamic range

Turn off harmonics



The machine

Unfamiliar

Insufficient for the task

The operator

Idiot

Can't scan

Can't interpret

Combination of the above

IDIOT



“NORMAL AORTA”

?

SUMMARY

Know your machine

Be nice to it

Follow the ground rules

Refs / thanks

- <http://www.alnmag.com/articles/2006/10/ultrasound-technology-small-animal-imaging>
- <http://www.minnesotasocietyofanesthesiologists.com/>
- Dr Maggie Chung
- Dr Steve Clenaghan
- Dr Niall Collum