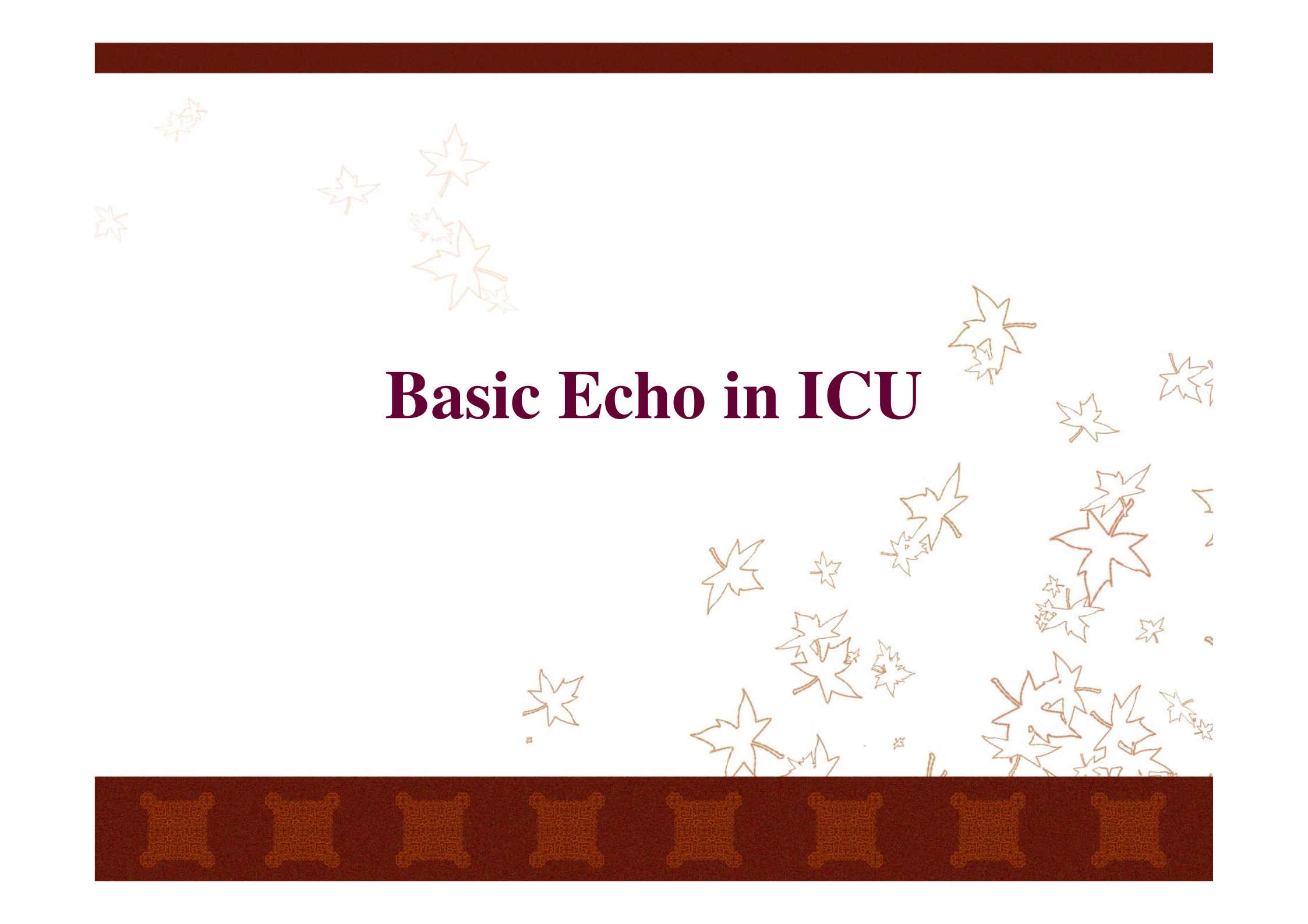


The background of the slide is white with a decorative theme of falling autumn leaves. The leaves are drawn in a simple, sketchy style with orange and brown outlines. They are scattered across the slide, with a higher concentration in the upper left and lower right areas. A solid dark brown horizontal bar is positioned at the very top of the slide. At the bottom, there is a dark brown horizontal band containing a repeating pattern of square, interlocking geometric motifs in a slightly lighter brown color.

Basic Echo in ICU

WINFOCUS:
World Interactive Network Focused on
Critical Ultrasound

www.winfocus.org

WINFOCUS

● Scope

- to promote and spread “point-of-care” ultrasound into clinical practice, in order to improve primary, emergency and critical care provided in all extra-hospital and in-hospital scenarios.

● Vision

- Improving Primary, Emergency, and Critical Care Medicine, by incorporating 'point-of-care' Ultrasound into Clinical Practice

● Mission Statement

- Bringing quality “Point-of-care” Ultrasound to the patient in all out-of-hospital and in-hospital “critical” scenarios, by developing and fostering, on a global and multi-disciplinary basis, Ultrasound Education, Technological Development, Evidence-based Research and International Teamwork



Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused on Critical Ultrasound (WINFOCUS)

<http://www.cardiovascularultrasound.com/content/6/1/49>

2008



Scope of uses in ICU

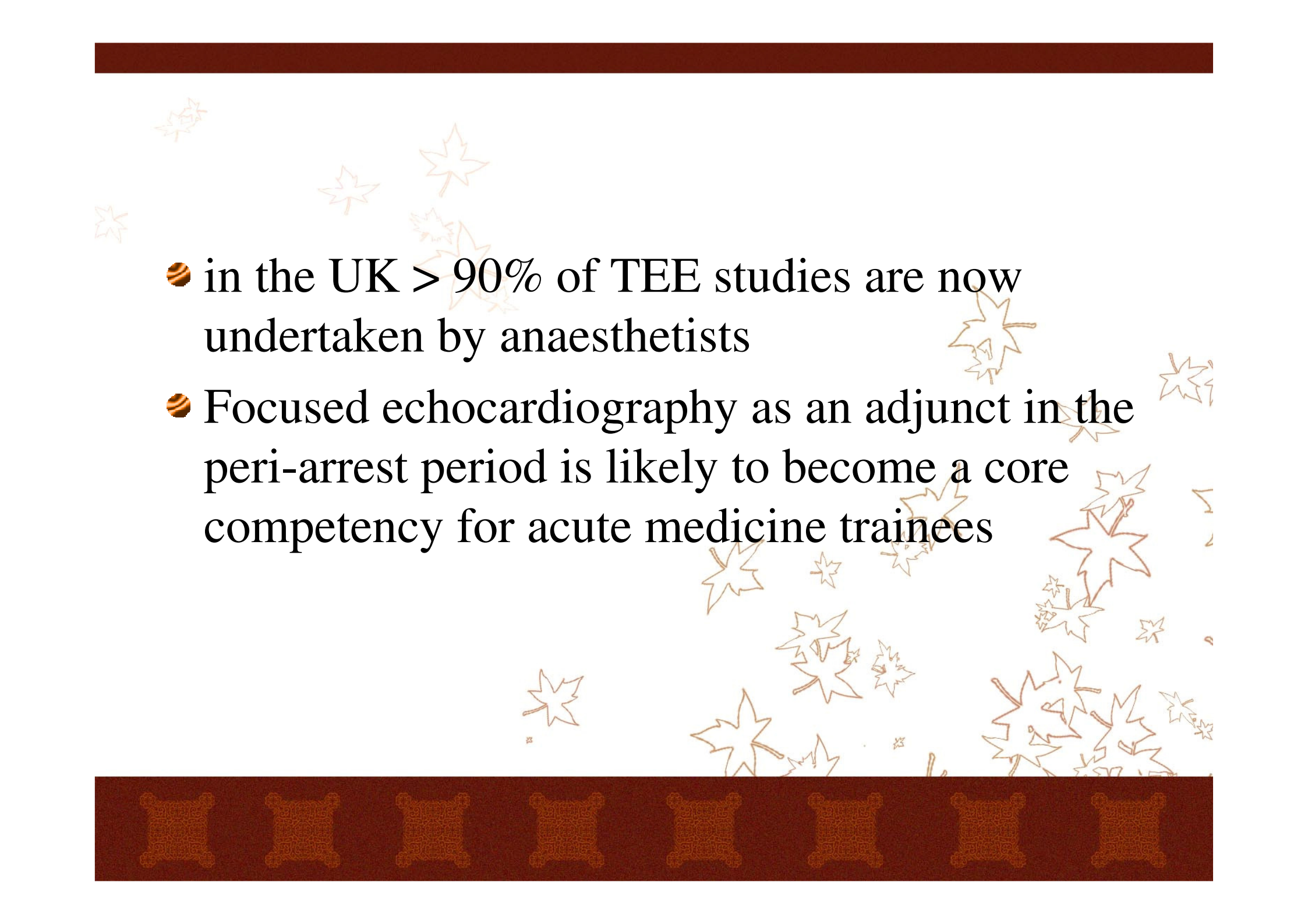
- Following cardiac surgery
- Diagnosis
- Monitoring

Advantages

- Cheap
- Portable
- Widely available
- Echocardiography should be incorporated into ICU training programs due to its ability to positively impact on patient management

Rationale of use in ICU

- Point-of care echocardiography in the management of the critically ill patient
- Providing rapid assessment of cardiac function and physiology
- Complements data available from standard invasive hemodynamic monitoring
- Both a monitoring and diagnostic tool for rapid bedside assessment of cardiovascular pathophysiology in the critically ill

- 
- in the UK > 90% of TEE studies are now undertaken by anaesthetists
 - Focused echocardiography as an adjunct in the peri-arrest period is likely to become a core competency for acute medicine trainees

Intensivist vs. Cardiologist

- Cardiology training programmes

- excludes formal exposure to general ICU
- the specific conditions most relevant to the ICU are not generally addressed
- the use of echocardiography as a monitoring tool is not taught

Intensivist vs. Cardiologist

- Appropriately trained consultant cardiologist-echocardiographers for the repeated examinations required in the ICU is not always available
- The practicing intensivist may not have the necessary echocardiographic skills

Intensivist vs. Cardiologist

- Development of an appropriate program will require extensive cooperation and support from a hospital's cardiology service
 - initial training
 - support for quality assurance
 - maintenance of competency among the ICU
 - backup in the case of a difficult diagnosis

Training

- **Theoretical Training**

- **Practical training**

- gained under the guidance of a named supervisor trained in echocardiography within a department

Winfocus Critical Care Echocardiography

- Winfocus Basic Echo
- Winfocus Advanced Echo

Growing support

- ICU echocardiography- should we use it in a heartbeat? Chest 2002
- Portable echocardiography- is essential for the treatment of acutely ill patients BMJ 2006
- Echocardiography for the intensivists Care of the Critically Ill 2003
- Beside Ultrasonography in the ICU Chest 2005
- Echo in ICU- time for widespread use ICM 2006

Potential scope in ICU

- systolic function and RWMA
- tamponade and pericardial effusion
- hypovolemia and volume responsiveness
- acute cor pulmonale
- hypoxemia
- complication of AMI
- chest trauma
- assessment of shock

● Jones et al CCM 2004

- "Incorporation of goal directed ultrasound in the evaluation of non-traumatic, symptomatic, undifferentiated hypotension in adult patients results in fewer viable diagnostic aetiologies and a more accurate physician impression of final diagnosis"

Echo Examination

- The transducers:

- Frequency of transducer: 3.5-5Mhz
- Phased array of pizeo-electric crystals in the transducer

The patient

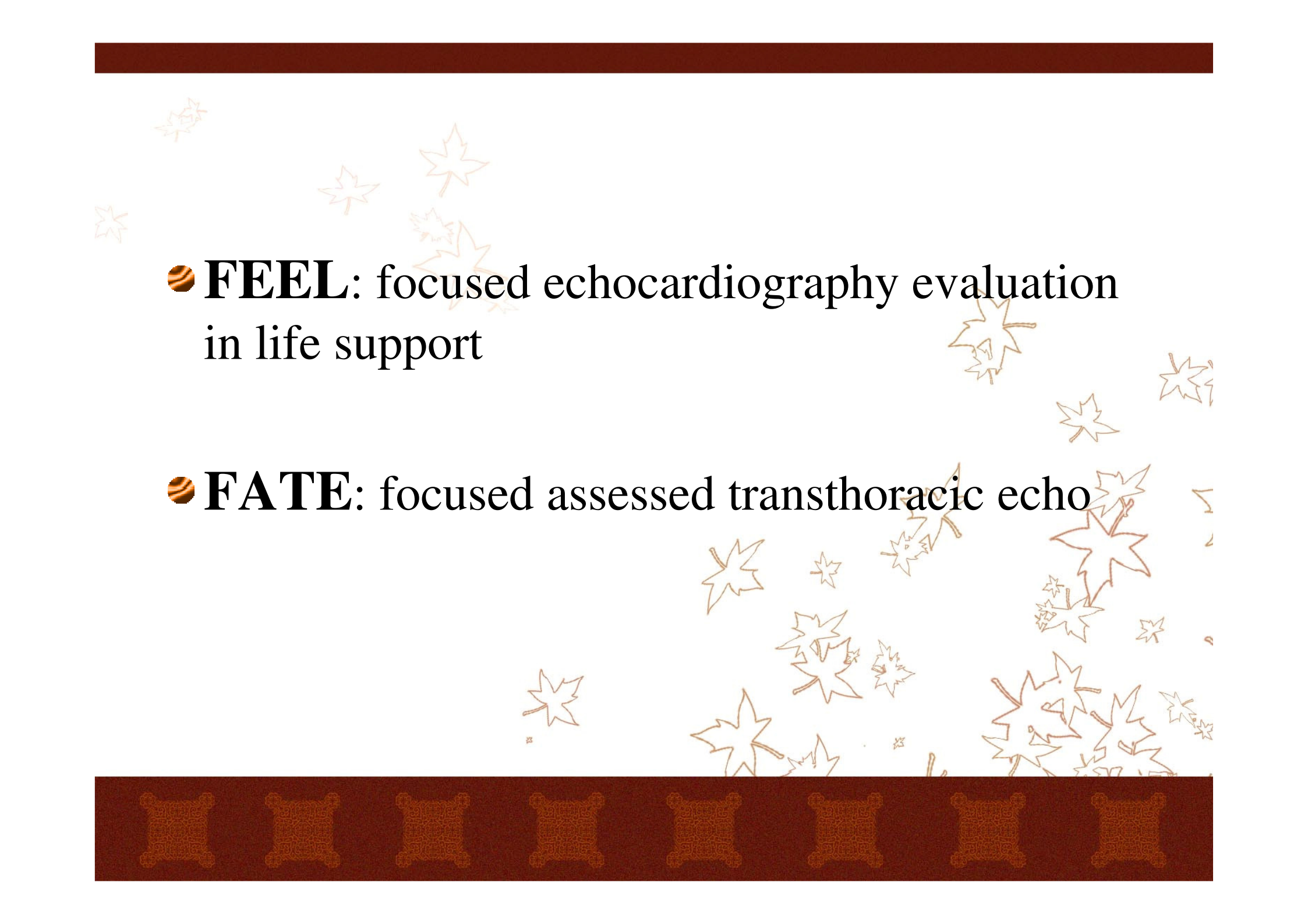
- Undress the top
- Supine position
- Turn slightly left lateral
- Adequate Sonic Gel
- Poor ECHO images in:
 - Obese
 - COAD/hyperinflated chest
 - Chest wall deformity
 - Edema

Emergency Echo

● **FATE** and **FEEL**

● Goals

- acquire standard TTE views in ACLS compliant manner
- recognise major causes of arrest/ shock
- recognise when referral for second opinion

- 
- **FEEL**: focused echocardiography evaluation in life support
 - **FATE**: focused assessed transthoracic echo

Normal FATE view

- Subcostal 4 chamber
- Apical 4 chamber
- Parasternal long axis
- Parasternal LV short axis
- Pleural scanning

Extended FATE

- Normal FATE +
- Subcostal vena cava
- Apical 2 chamber
- Apical long axis
- Apical 5 chamber
- Parasternal short axis mitral plane
- Parasternal aorta short axis

FATE

- Hypovolemia
- Myocardial dysfunction
- Pericardial effusion
- Pulmonary embolism
- Papillary muscle rupture
- VSD in AMI
- valve dysfunction
- Pleural effusion/ pneumothorax

Pathologies to be considered

- Pericardial effusion

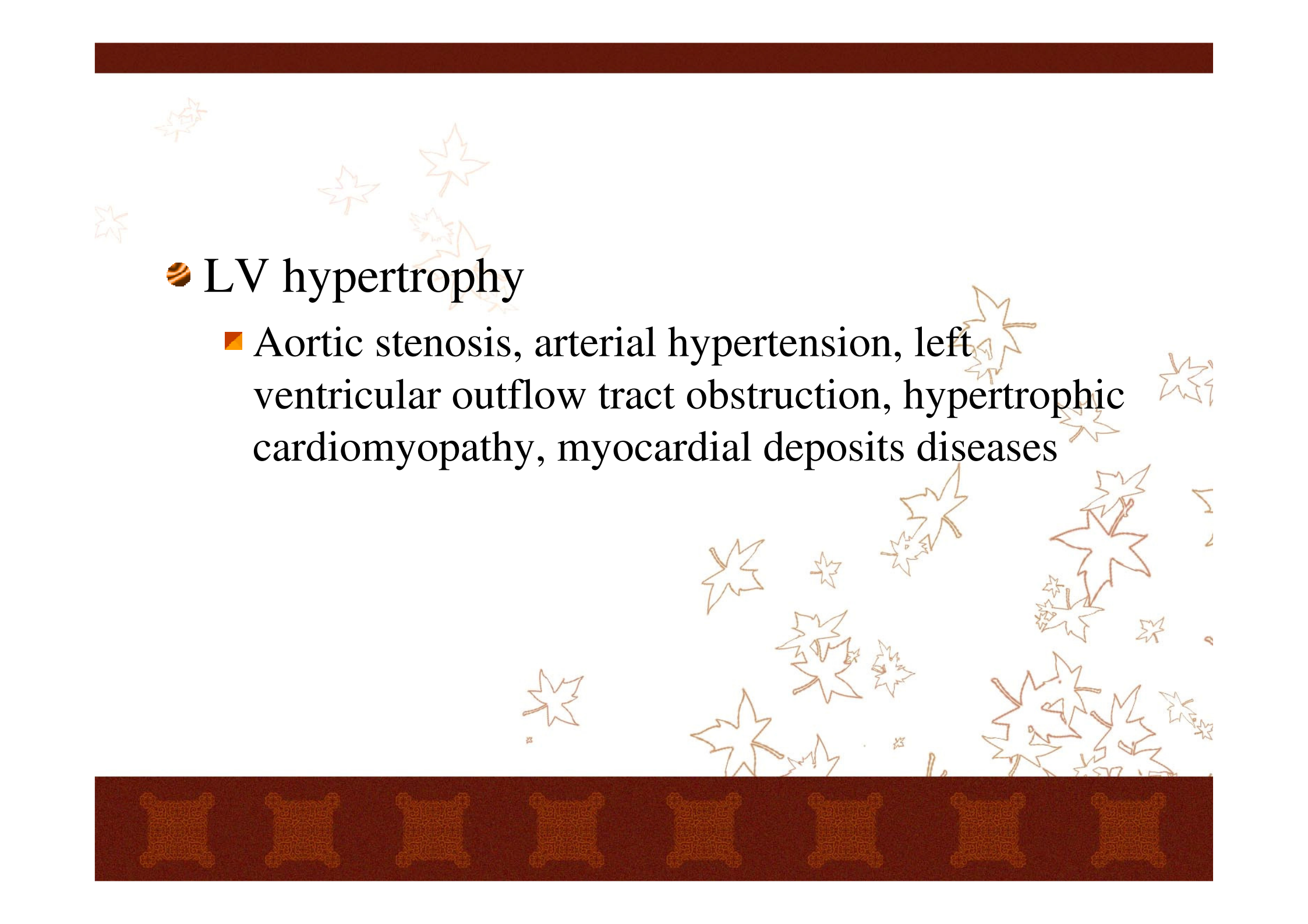
- post cardiac surgery, post cardiac catheterization, trauma, renal failure, infection

- Dilated RA + RV

- pulmonary embolism, RV infarction, pulmonary hypertension, volume overload

- Dilated LA + LV

- ischemic heart disease, dilated cardiomyopathy, sepsis, volume overload, aortic insufficiency



● LV hypertrophy

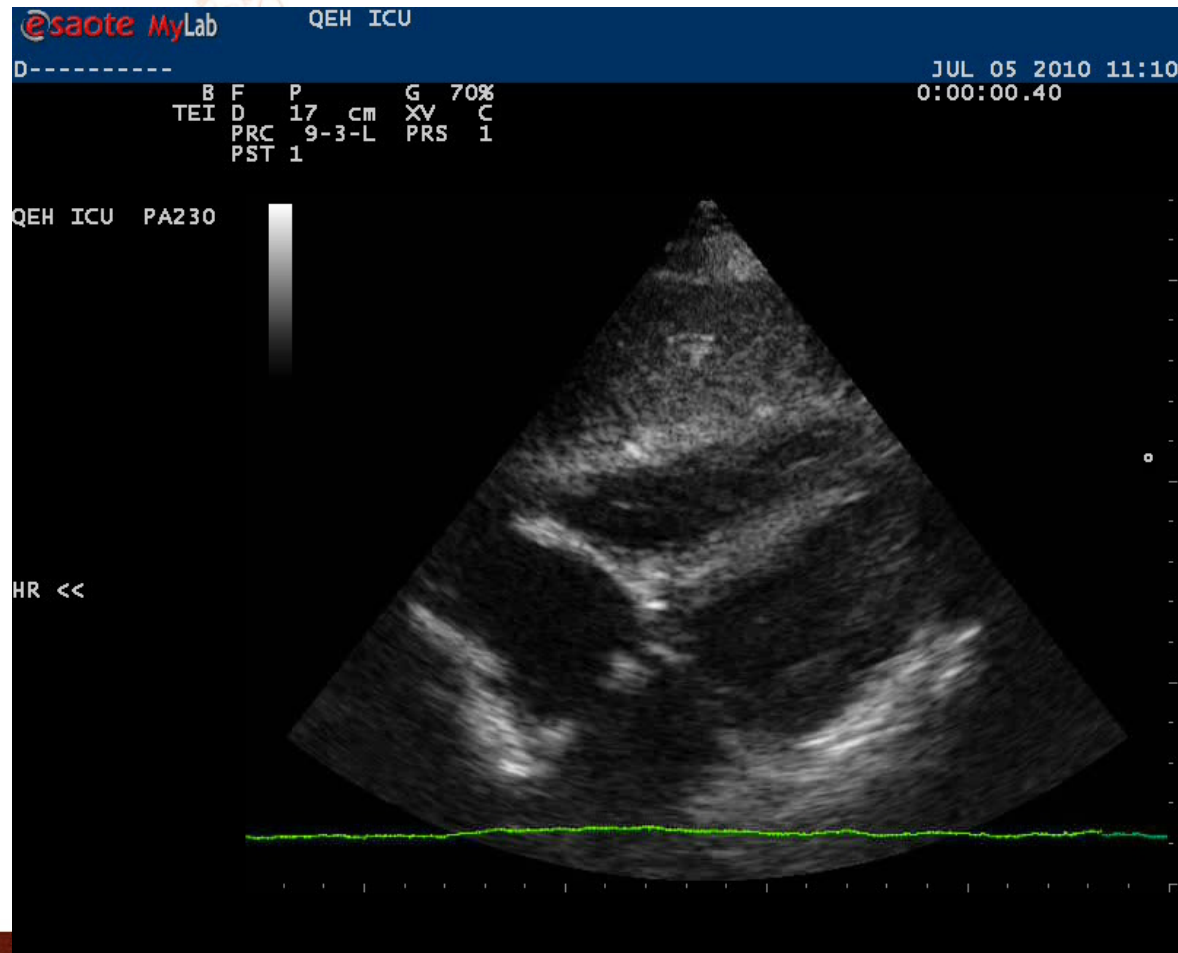
- Aortic stenosis, arterial hypertension, left ventricular outflow tract obstruction, hypertrophic cardiomyopathy, myocardial deposits diseases

Subcostal view

● 4 Chamber:

- Place transducer below the xyphoid process
- The index marker is rotated to 3 o'clock position

Subcostal view



@saote MyLab

QEH ICU

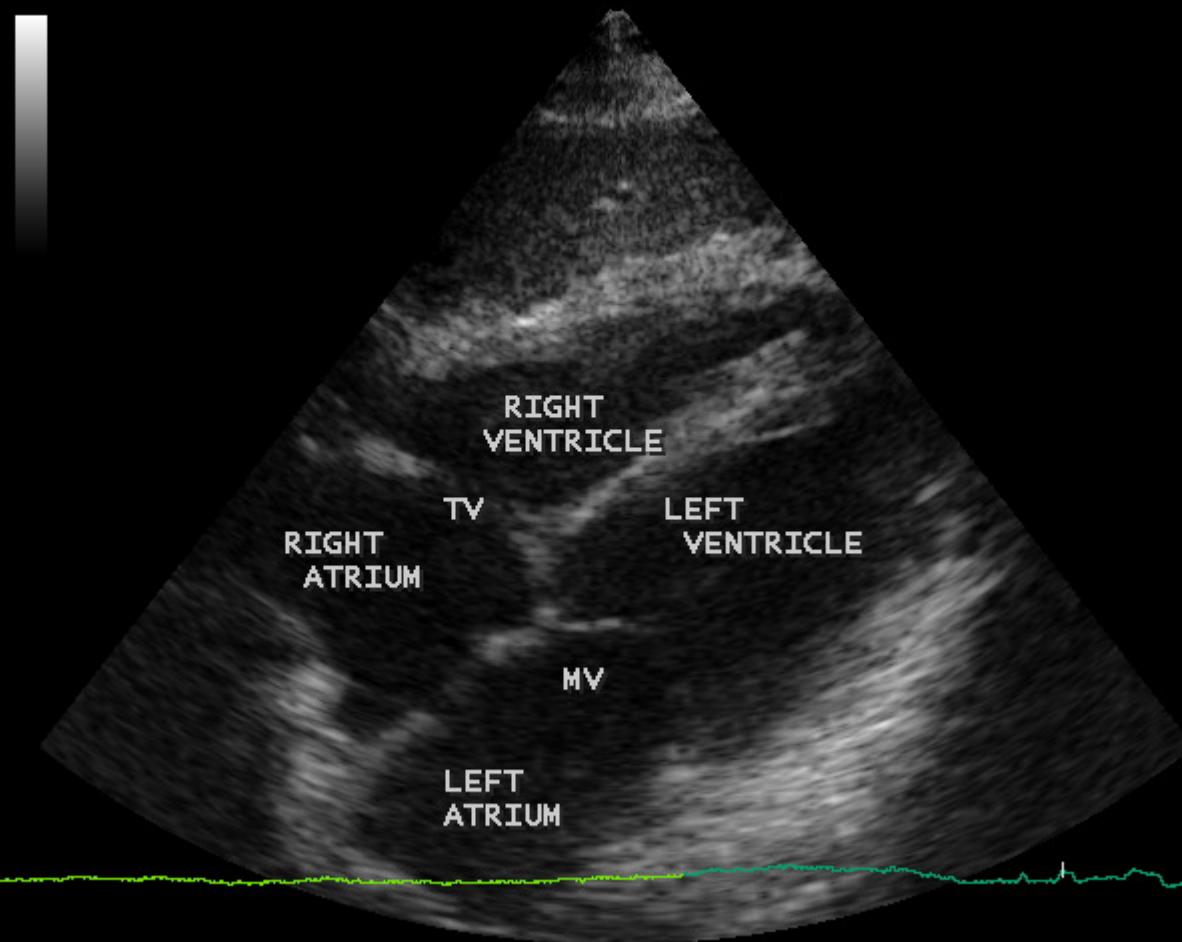
D-----

JUL 05 2010 11:10

B	F	P	G	70%
TEI	D	17	cm	XV
	PRC	9-3-L	PRS	1
	PST	1		

QEH ICU PA230

HR 138



Parasternal view

- Long axis

- index marker of transducer pointing to the right shoulder

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QEH ICU

D-----

JUL 05 2010 10:59

B	F	P	G	52%
TEI	D	13	cm	XV
	PRC	9-3-L	PRS	1
	PST	1		

QEH ICU PA230

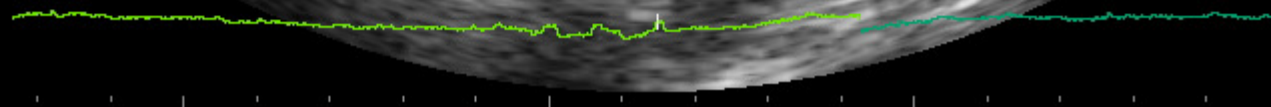
HR <<

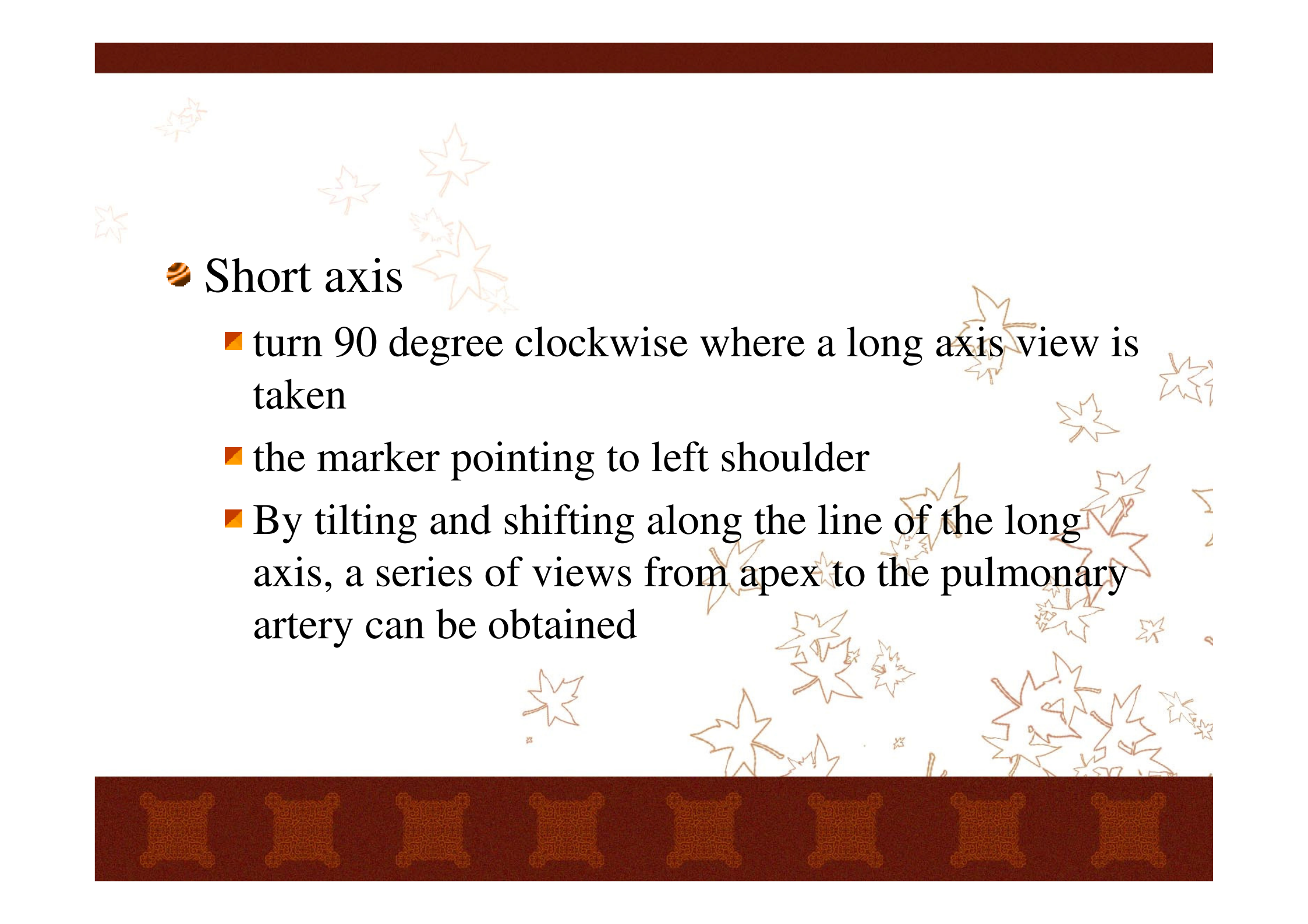
RIGHT
VENTRICLE

LEFT
VENTRICLE

AORTA

LEFT
ATRIUM





● Short axis

- turn 90 degree clockwise where a long axis view is taken
- the marker pointing to left shoulder
- By tilting and shifting along the line of the long axis, a series of views from apex to the pulmonary artery can be obtained

Apical view

- 4 chamber:

- Palpate the apex beat. Place the transducer at the apex towards the patient's head
- Index marker is rotated to approximately 3 o'clock position

- 5 Chamber:

- Fanning of the transducer at apex to open up the LVOT and aortic valve [the 5th chamber]

- 2 chamber:

- Rotate the transducer 45 clockwise

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QEH ICU

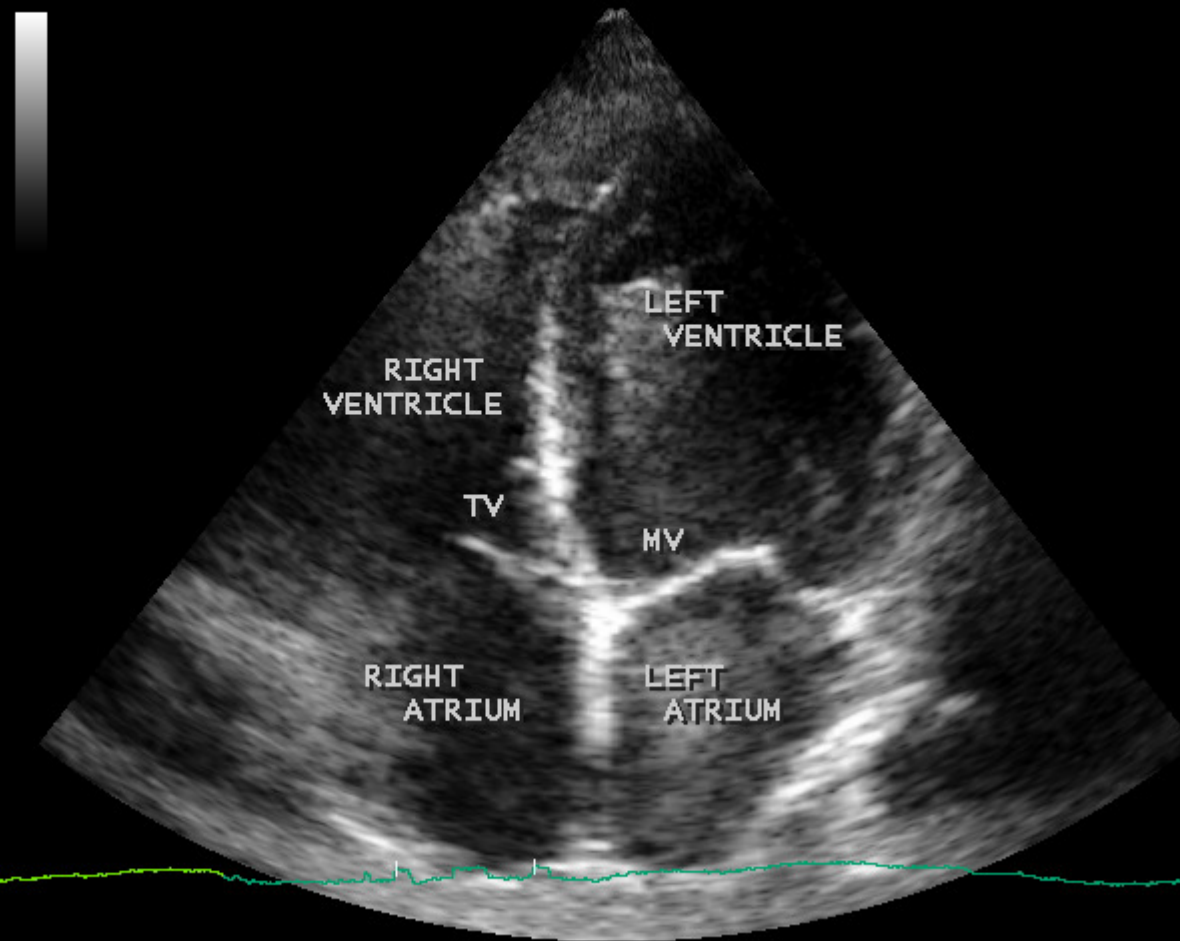
JUL 05 2010 11:06

D-----

B	F	P	G	70%
TEI	D	14	cm	XV
	PRC	9-3-L	PRS	1
	PST	1		

QEH ICU PA230

HR 137



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QEH ICU

JUL 05 2010 11:08

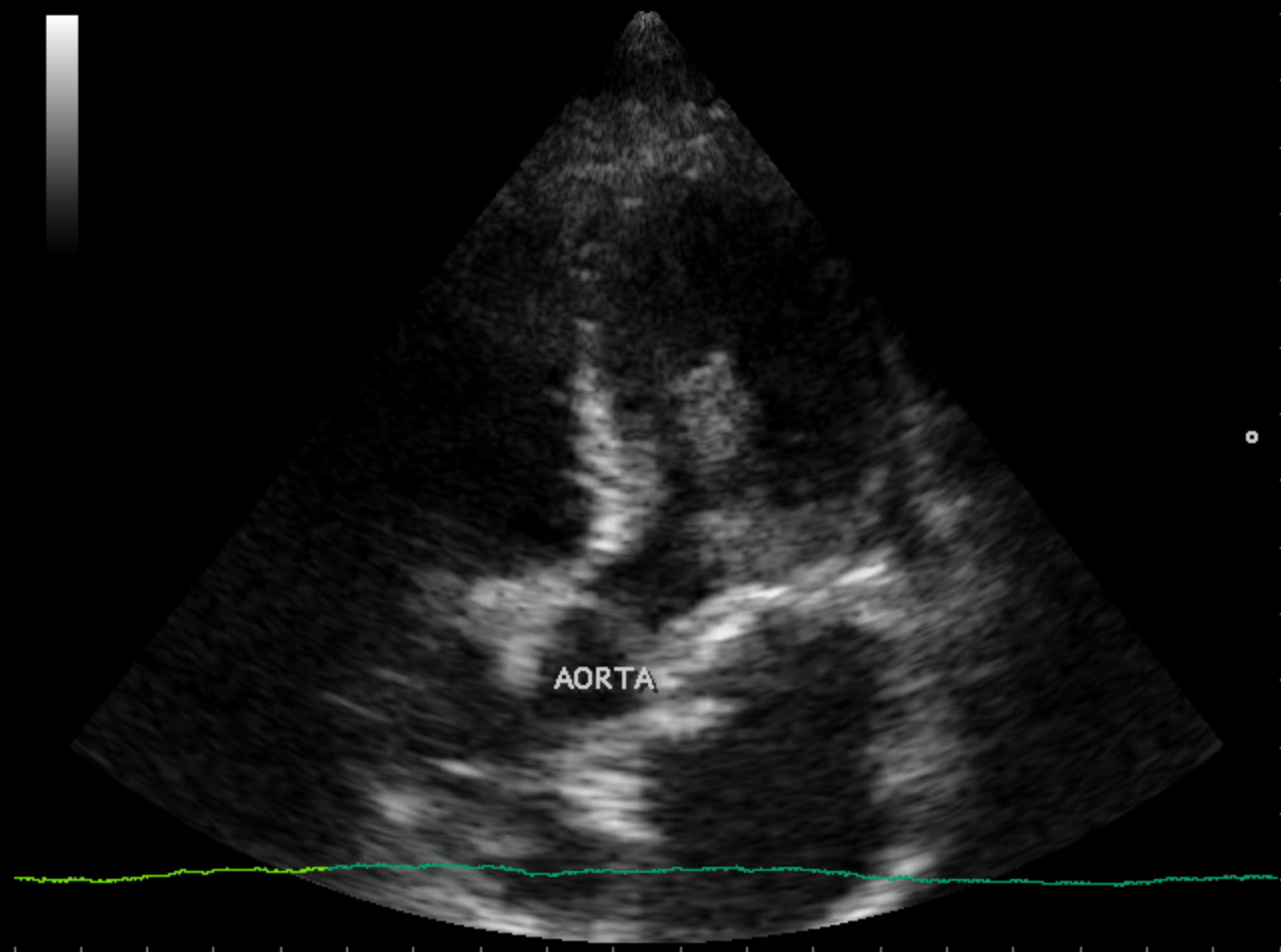
D-----

B	F	P	G	70%
TEI	D	14	cm	XV
	PRC	9-3-L	PRS	1
	PST	1		

QEH ICU PA230

HR <<

AORTA



@saote MyLab

QEH ICU

JUL 05 2010 11:14

D-----

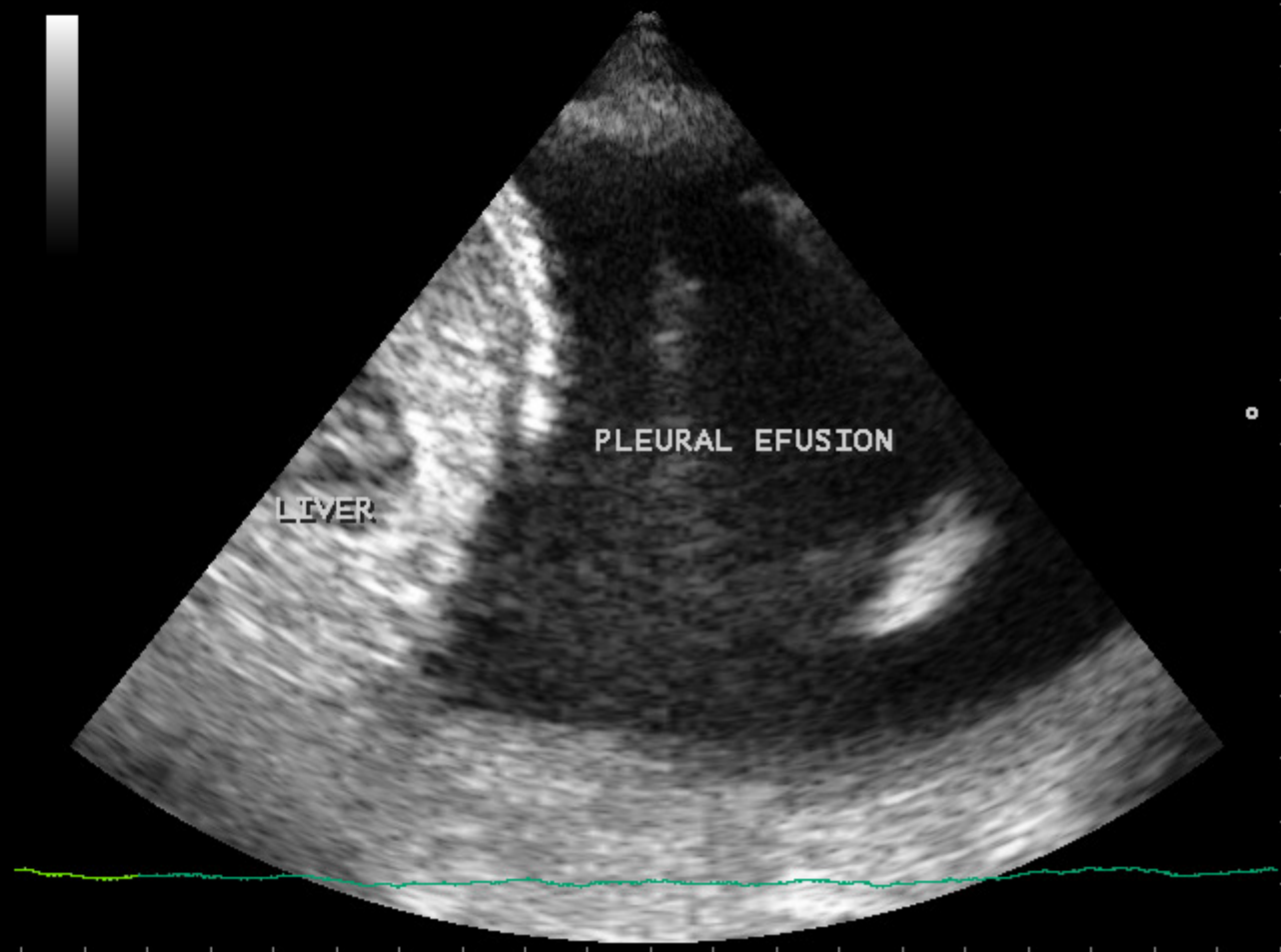
B	F	P	G	70%
TEI	D	15	cm	XV
	PRC	9-3-L	PRS	1
	PST	1		

QEH ICU PA230

HR <<

LIVER

PLEURAL EFUSION

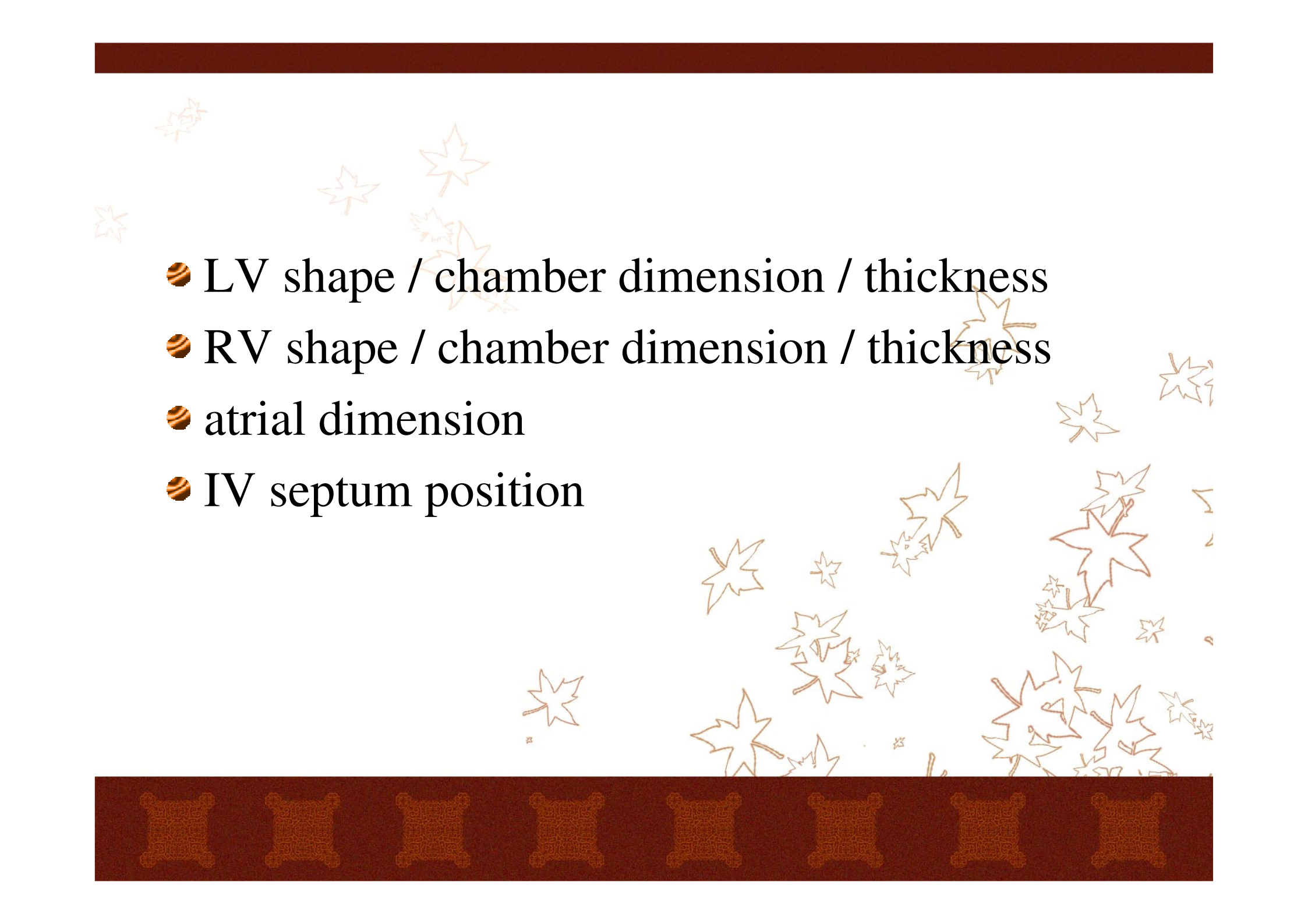


Echo examination

- 2D image:
 - anatomical assessment, valvular movement, RWMA
- M mode:
 - motion assessment over time, distance or depth measurement
- CW and PW:
 - haemodynamic assessment, calculate velocity, then pressure gradients
- CFM:
 - both haemodynamic and anatomical information

Pre-existing cardiac disease?

- RV dilatation = acute or chronic
- LV dilatation = almost always chronic
- Biventricular dilatation = chronic failure
- Atrial dilatation = chronic pressure or volume overload
- RV or LV hypertrophy = chronic pressure overload

- 
- LV shape / chamber dimension / thickness
 - RV shape / chamber dimension / thickness
 - atrial dimension
 - IV septum position

LA measurement

- Select M-mode
- Align cursor to give horizontal IVS at the level of aortic valve cusps
- Freeze the image
- Measure with caliper LA diameter at end systole
- Upper limit of LA: 40mm

LV Dimension

● LV systolic Fx Evaluation

- M mode Measurement of LV dimension
- LVEDD [normal=3.5-5.6 cm] measured at Q wave
- LVESD [normal=2.0-4.0 cm] measured at end of T wave

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QEH ICU

B-----

JUN 30 2010 12:43

B F P G 82%
TEI D 15 cm XV C
PRC 9-3-H PRS 1
PST 1

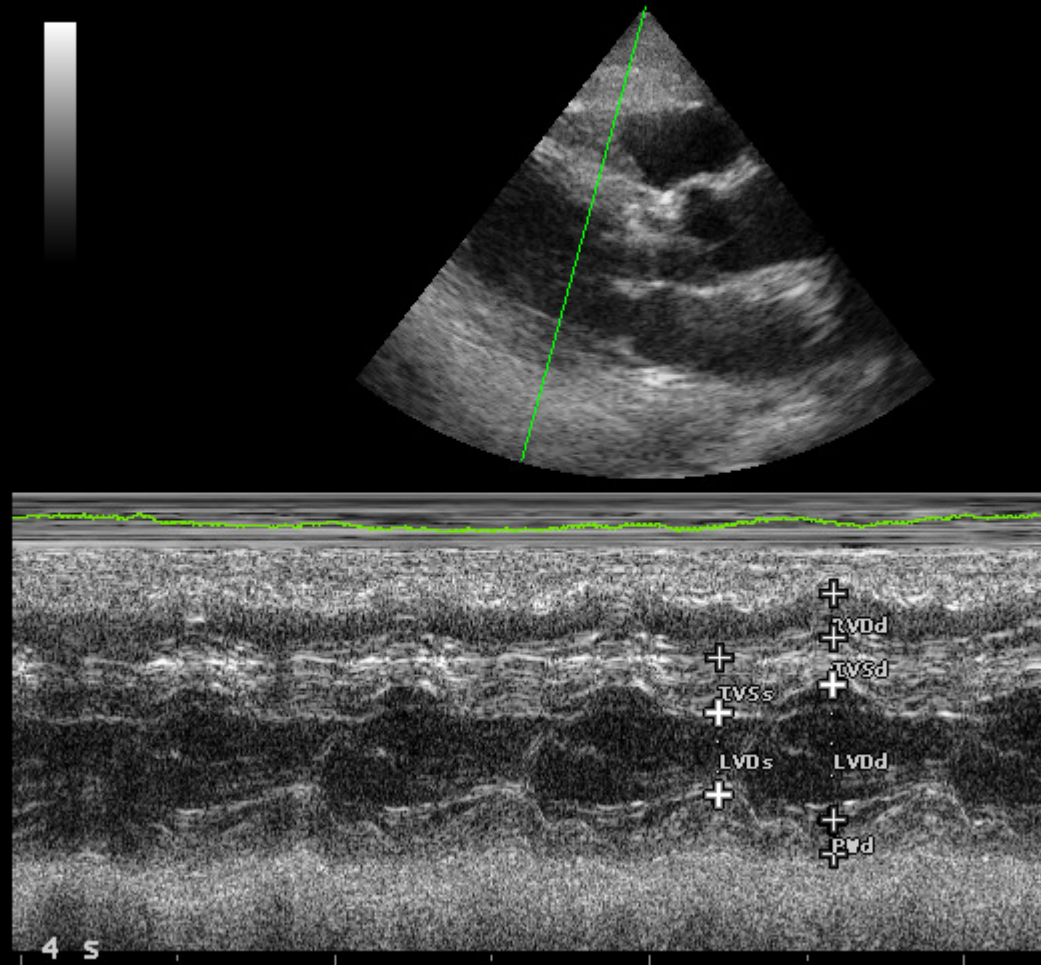
M G 82%

PRC 7-3
PST 1

QEH ICU PA230

LV

RVDd 14.2 mm
IVSd 14.9 mm
LVDd 44.0 mm
PwD 11.0 mm
SPwD --- ms
IVSs 17.5 mm
LVDs 26.5 mm
Pws --- mm
EF 71 %
FS 40 %
S% 17 %
PW% --- %
LVM 252 g
HR <<



Basic volume assessment

- Severe hypovolemia
- Volume overload
- Pitfalls

Severe hypovolemia

- End systolic LV obliteration (kissing walls)
- LV end diastolic area (LVEDA)
 - $< 5.5 \text{ cm}^2/\text{m}^2 \text{ BSA}$
- LVEDA variation with loading

Severe hypovolemia

- IVC diameter
 - spontaneous respiration: EED < 9 mm
 - mechanical ventilation: EED < 15 mm
- IVC respiratory variation
 - spontaneous respiration: > 50%
 - mechanical ventilation: > 18%
- IVC variation with loading

* EED end expiratory diameter

Volume overload

- Dilated, fixed IVC
- Pitfall
 - cardiac tamponade
 - constrictive pericarditis

Basic volume status assessment

- Easy in severe hypovolemia
- Easy in clear volume overload
- Difficult in less severe hypovolemia/
significant cardiac disease
- Consider pre-existing cardiac disease
- Consider respiratory status

Ventricular dysfunction assessment

- LV global systolic function
 - fractional shortening (FS)
 - visual ejection fraction (eyeballing)
- LV regional function
- RV systolic function

Fractional shortening

- Parasternal Long Axis View with M-mode cursor just below the MV leaftlets, perpendicular to the IVS
- $FS\% = (LVEDD - LVESD) / LVEDD \times 100\%$

Fractional shortening

- Normal

 - $> 30\%$

- Severely impaired

 - $< 20\%$

Fractional shortening

- RWMA

- unreliable

- Simplification of Teicholz method

- $EF \% = FS \% \times 2$

Ejection fraction

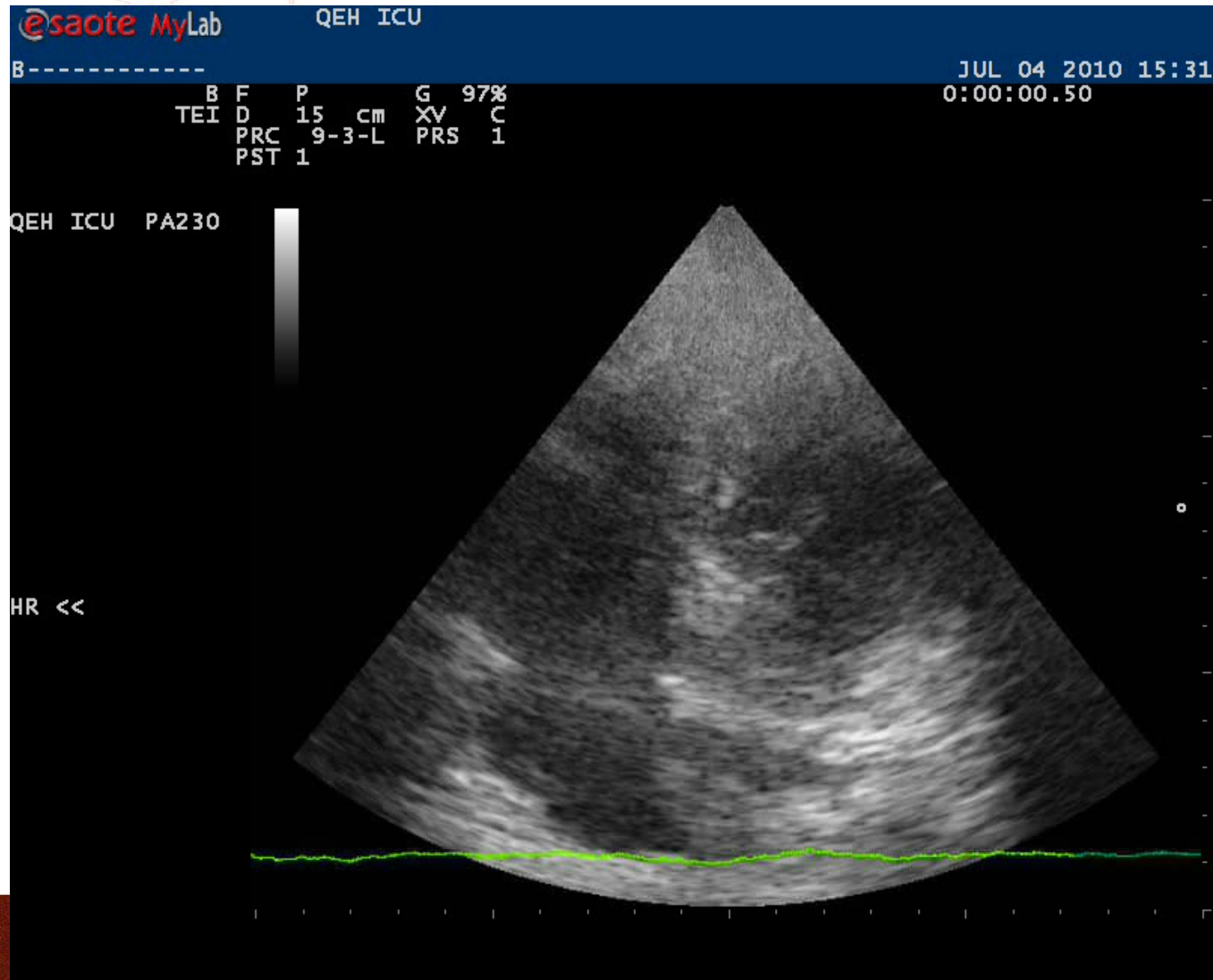
- Normal > 55%
- mild dysfunction: 45-55%
- moderate dysfunction: 30-44%
- severe dysfunction: < 30%

Ejection Fraction

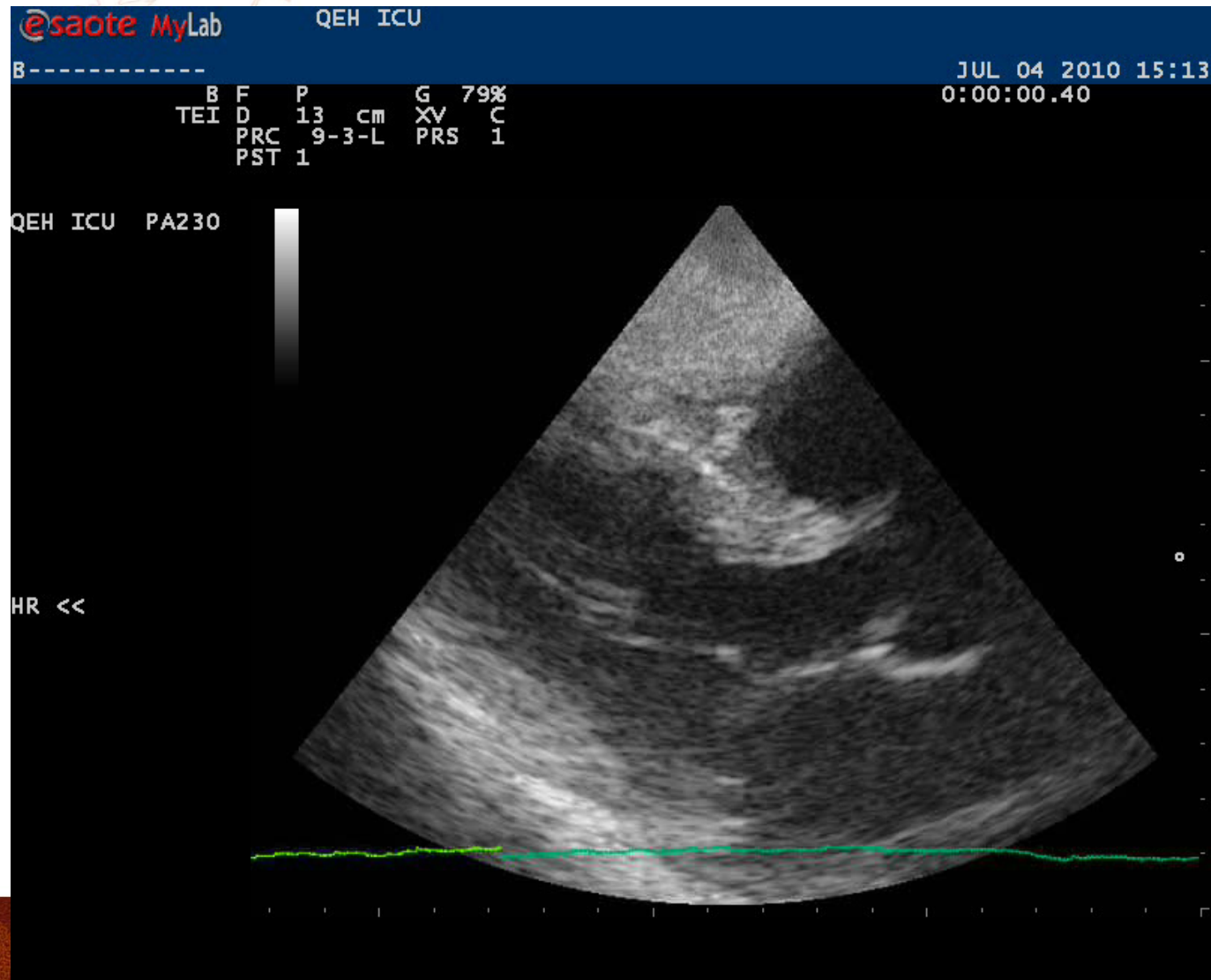
● 2D Echo

- Simpson's Method
- Apical 2 or 4 chamber view
- Divide the LV into different slices of known thickness
- Volume size = Slice area X Slice thickness
- $EF = (LVEDV - LVESV) / LVEDV \times 100\%$

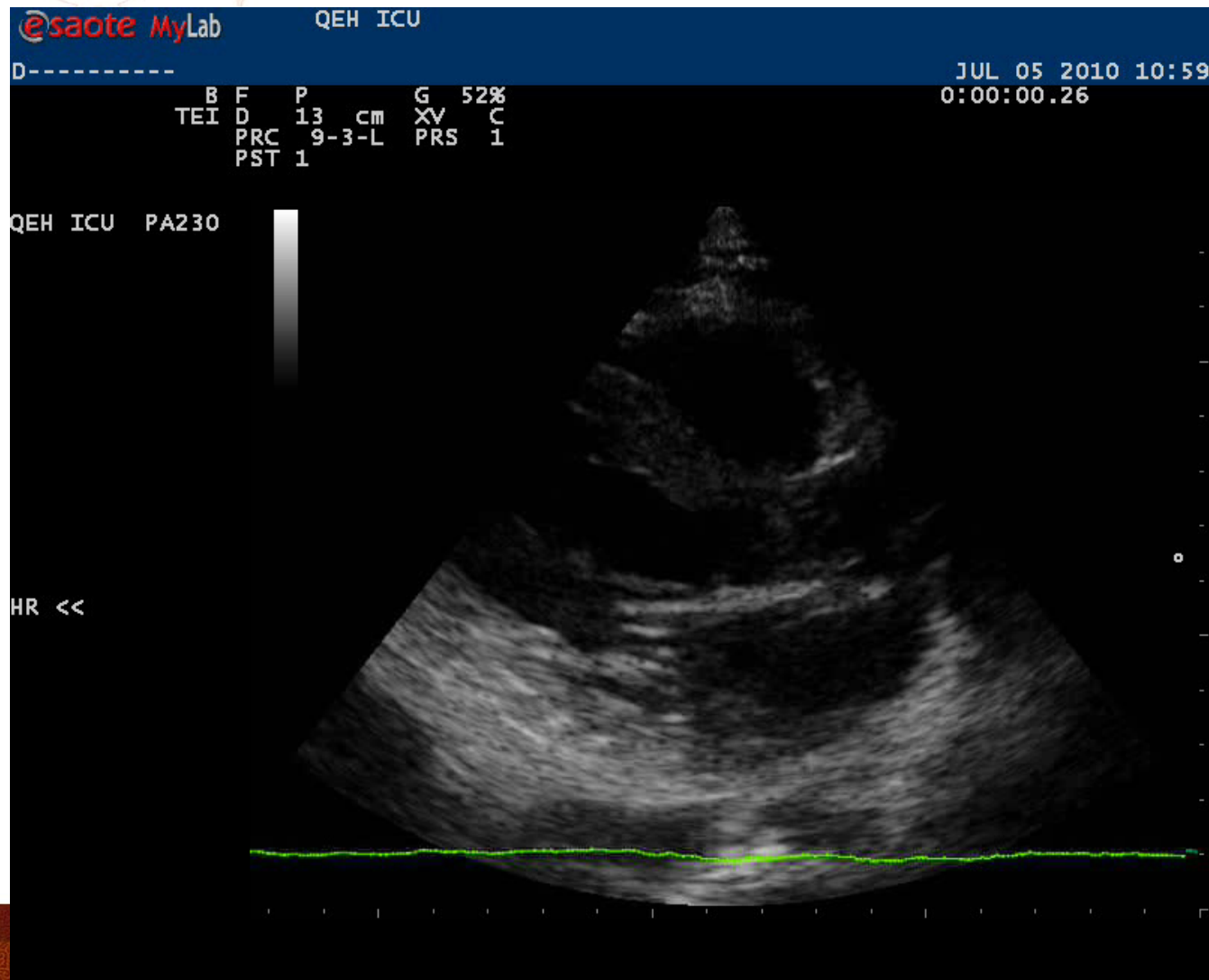
Normal LV function



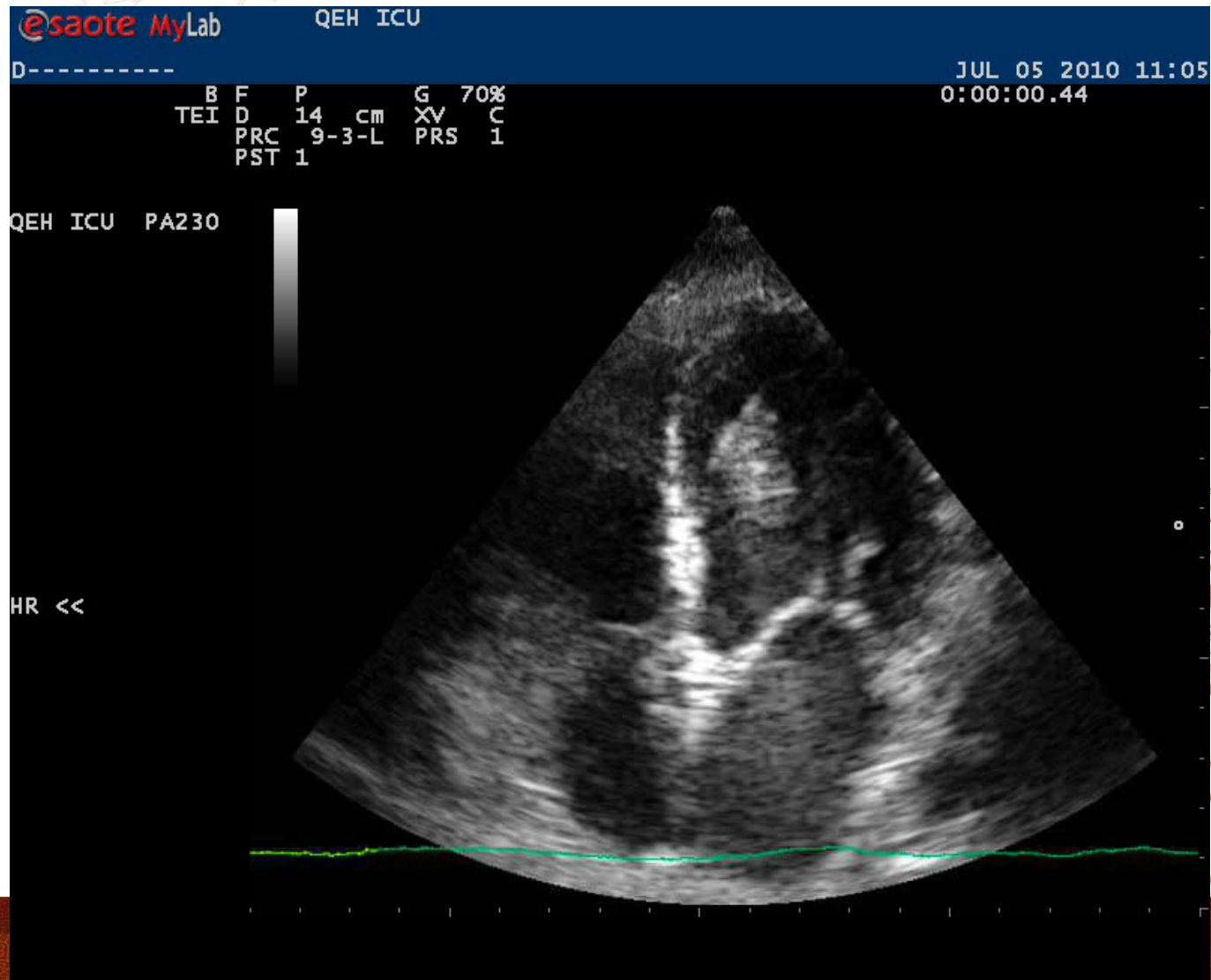
Normal LV function



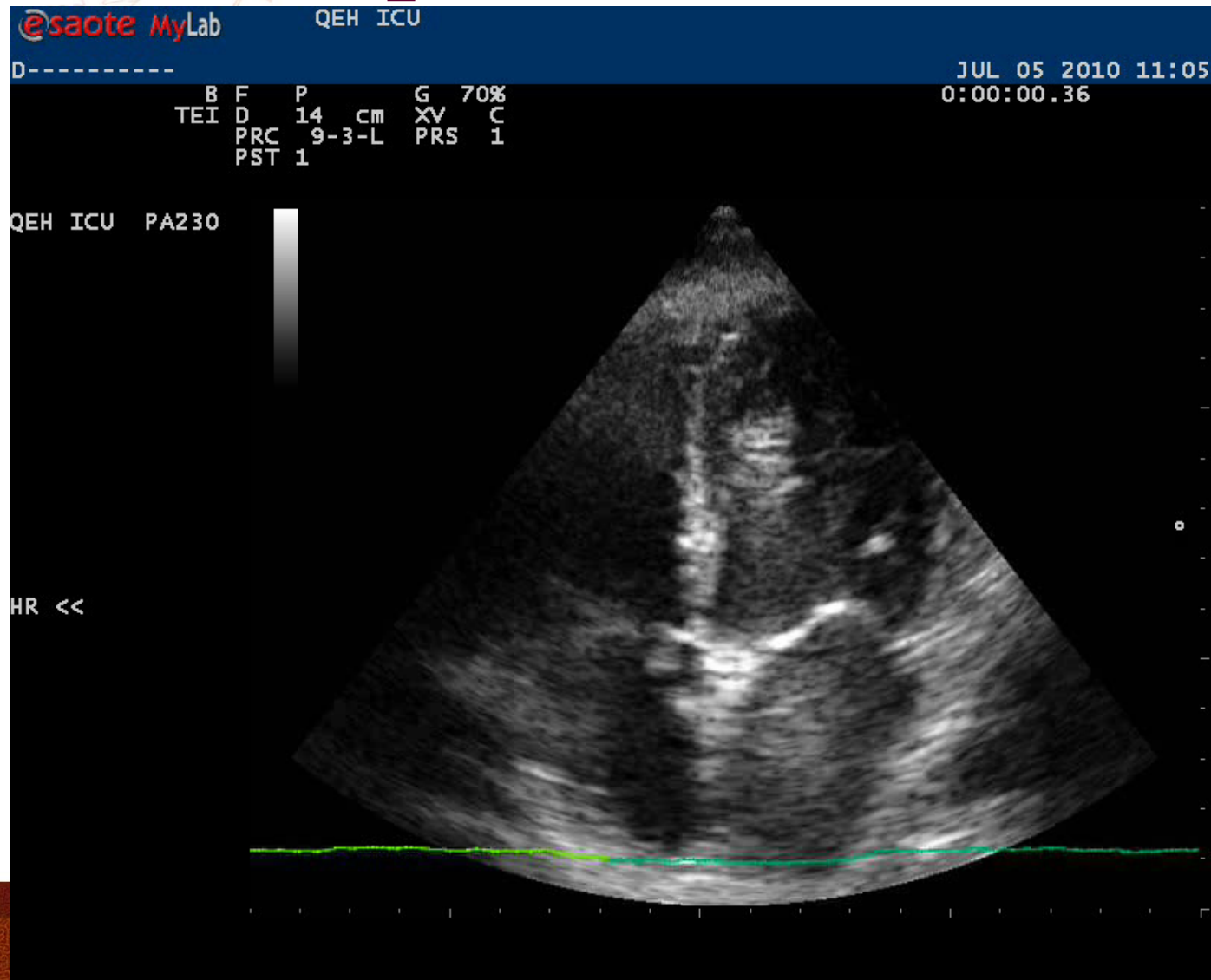
Poor LV



Poor LV



Impaired LV



LV function

- Qualitative assessment of LV function

- tend to be underestimated in a dilated LV
- overestimated in small cavity LV

LV function

- Interpret findings in the context of drugs and in the context of actual preload (volume status)
- Repeated echo assessment of LV function
- Interpret findings considering inotropic/mechanical support
- marked tachycardia/atrial fibrillation may underestimate of LV systolic function

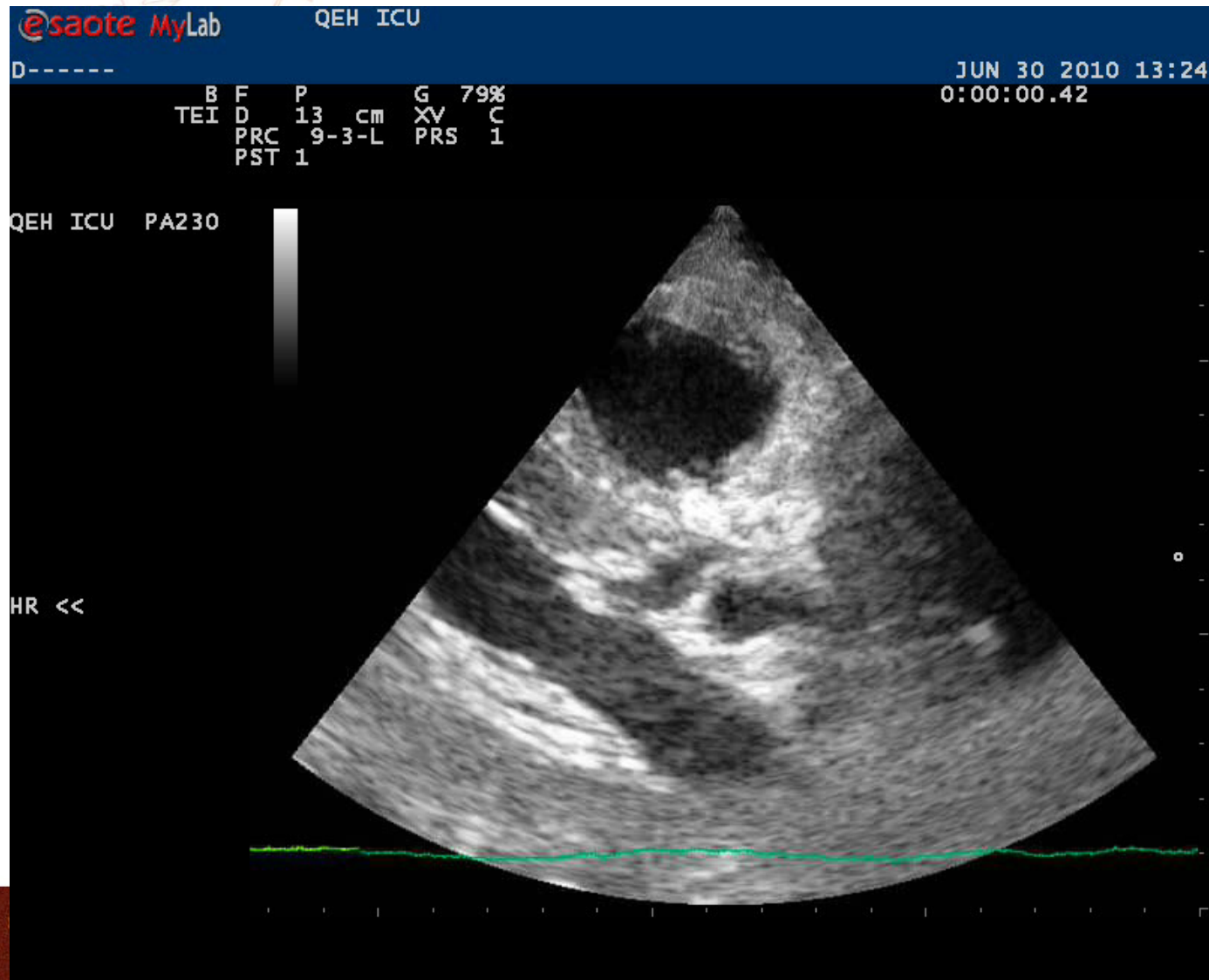
Right ventricle

- RVEDA / LVEDA

- > 0.6 moderate dysfunction
- > 1 severe dysfunction

- Paradoxical septal movement

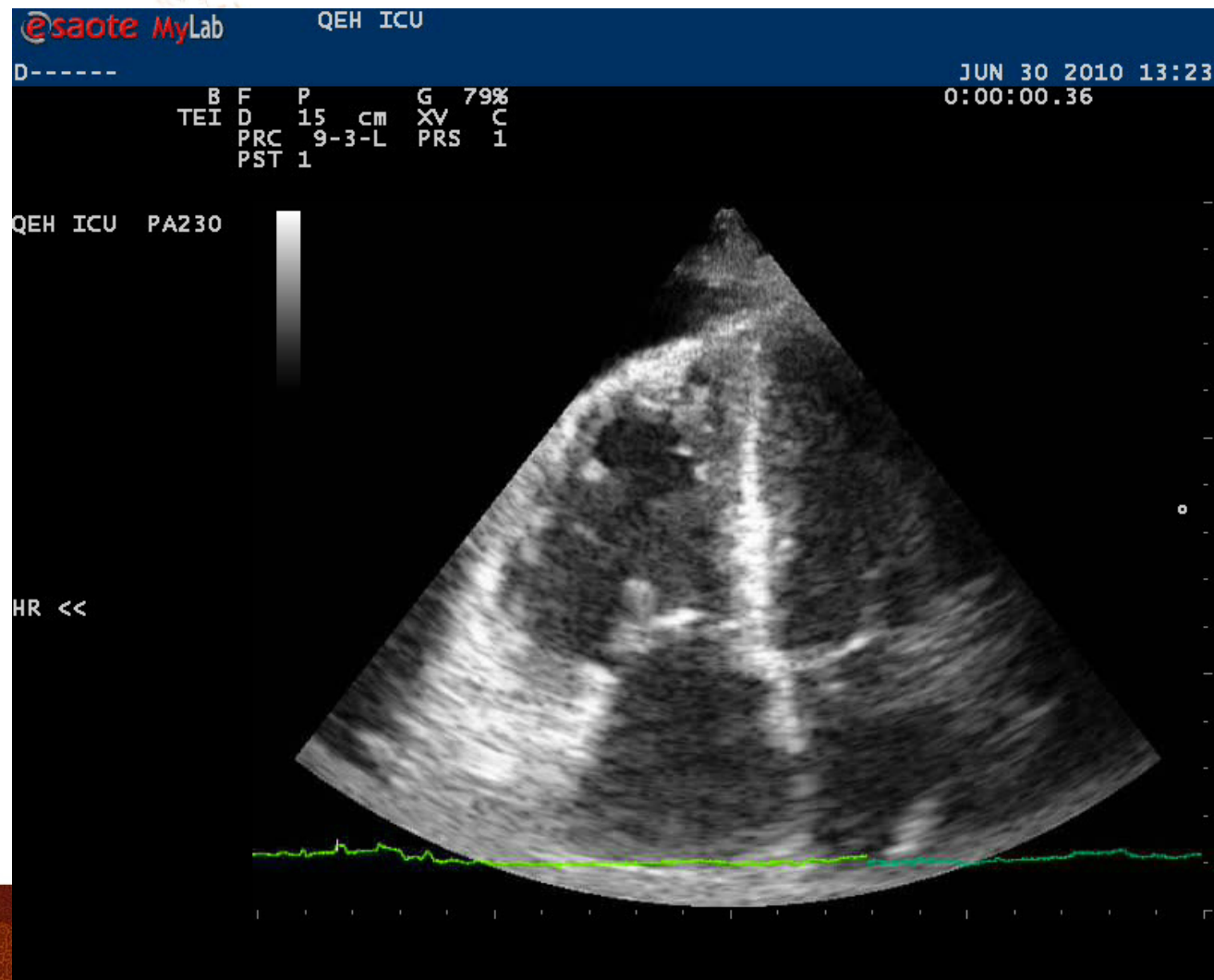
Dilated RV



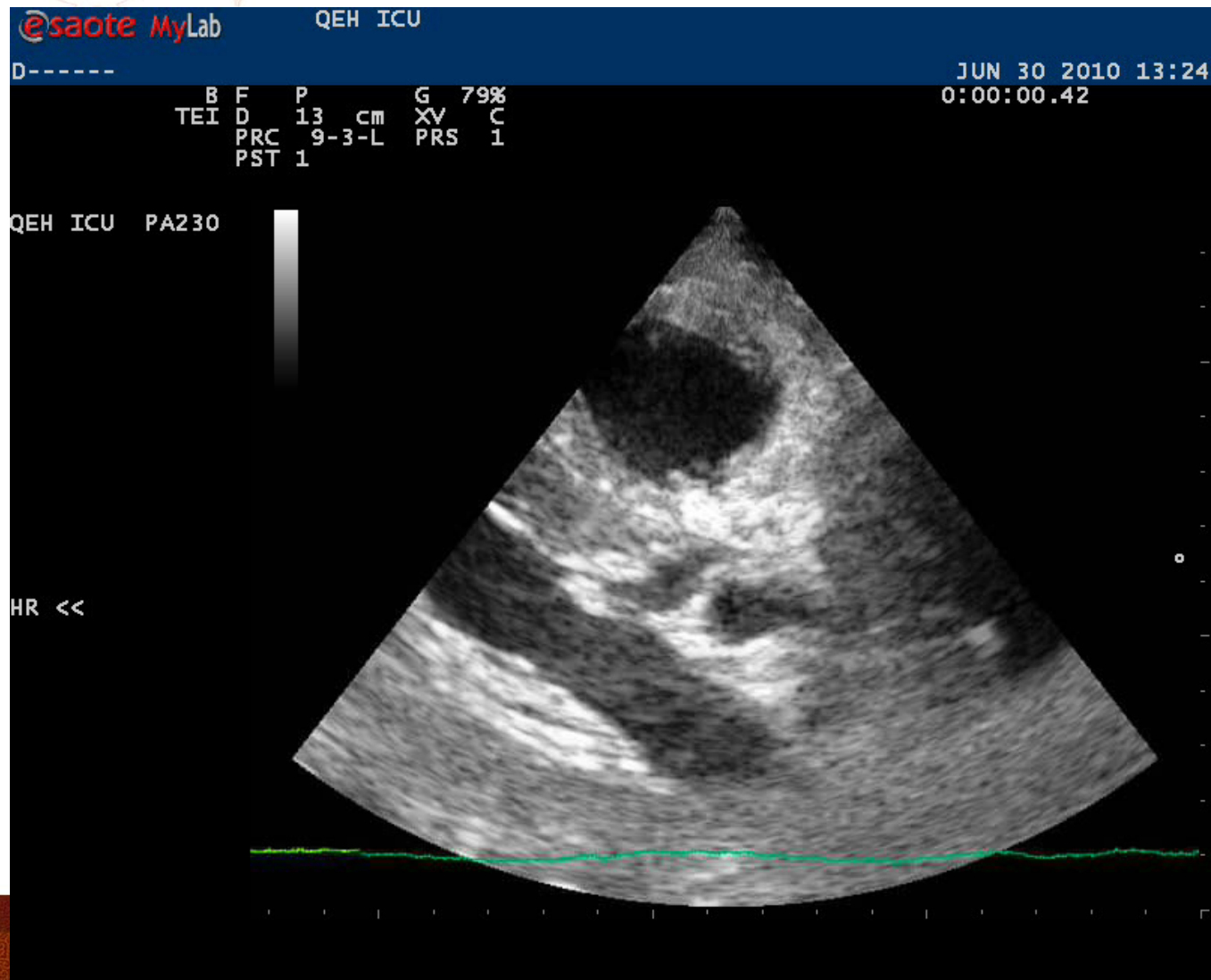
Dilated RV



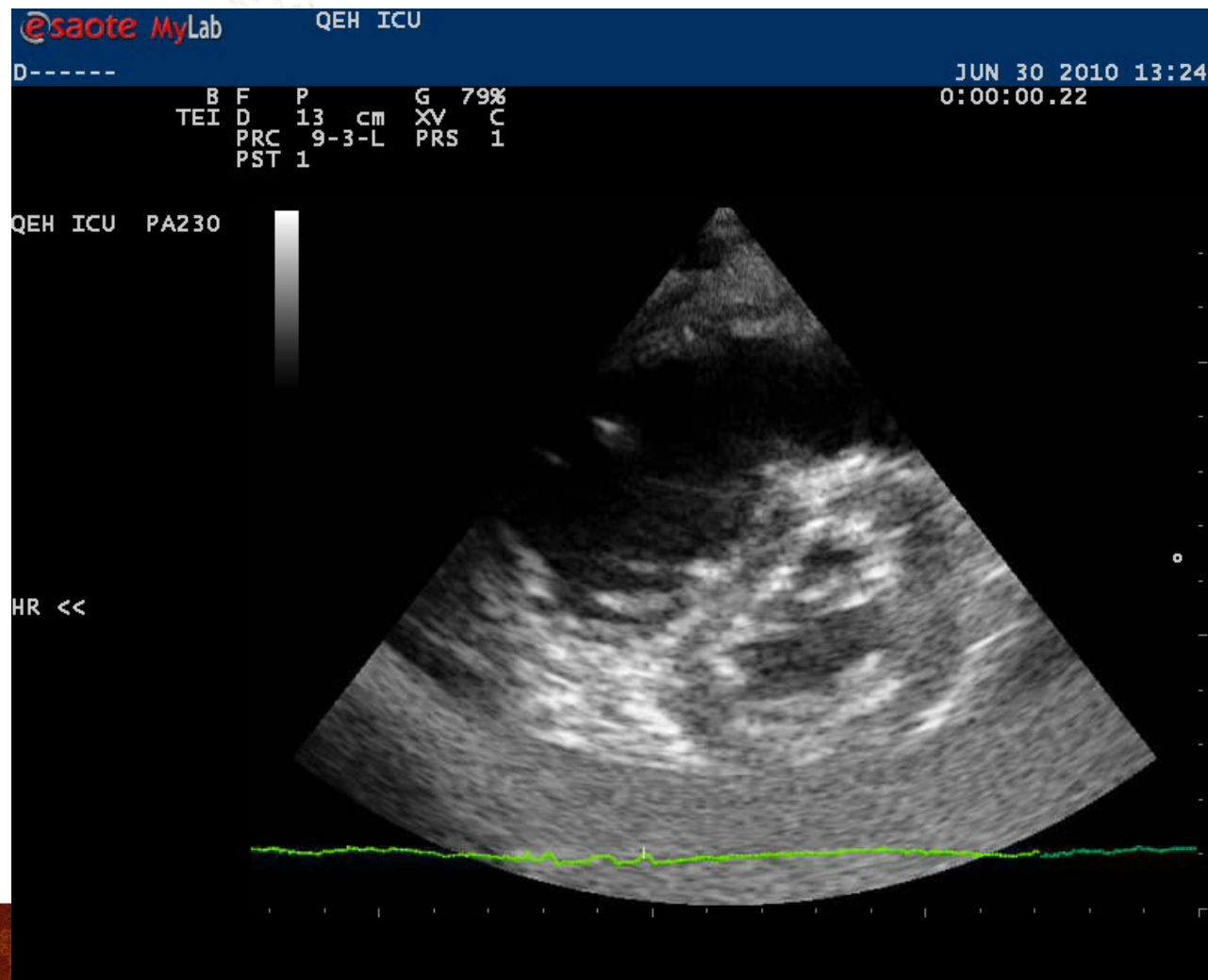
Dilated RV



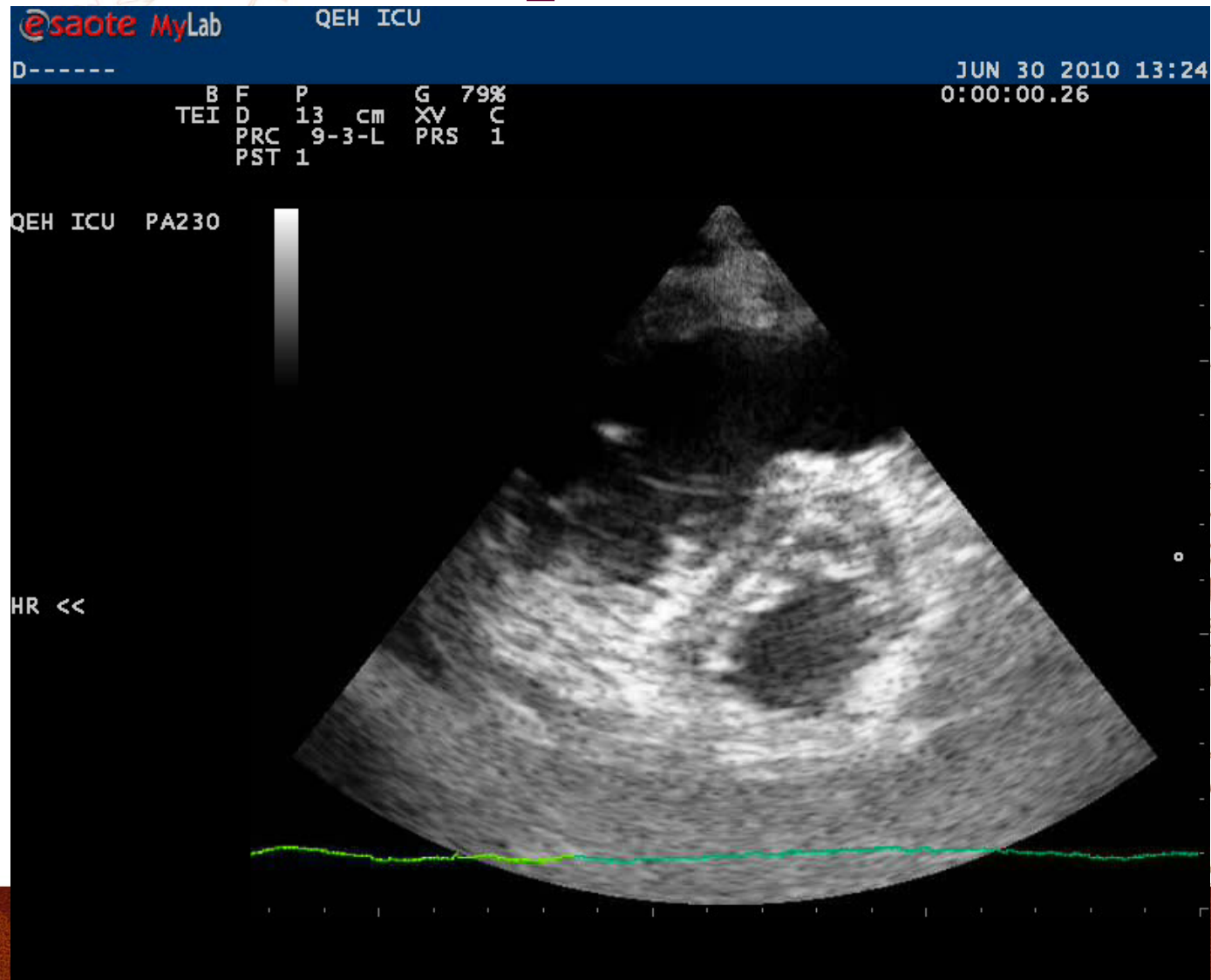
Dilated RV



D shaped LV



D shaped LV



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QEH ICU

D-----

JUN 30 2010 13:10

B F P G 52%
TEI D 13 cm XV C
PRC 9-3-H PRS 1
PST 1

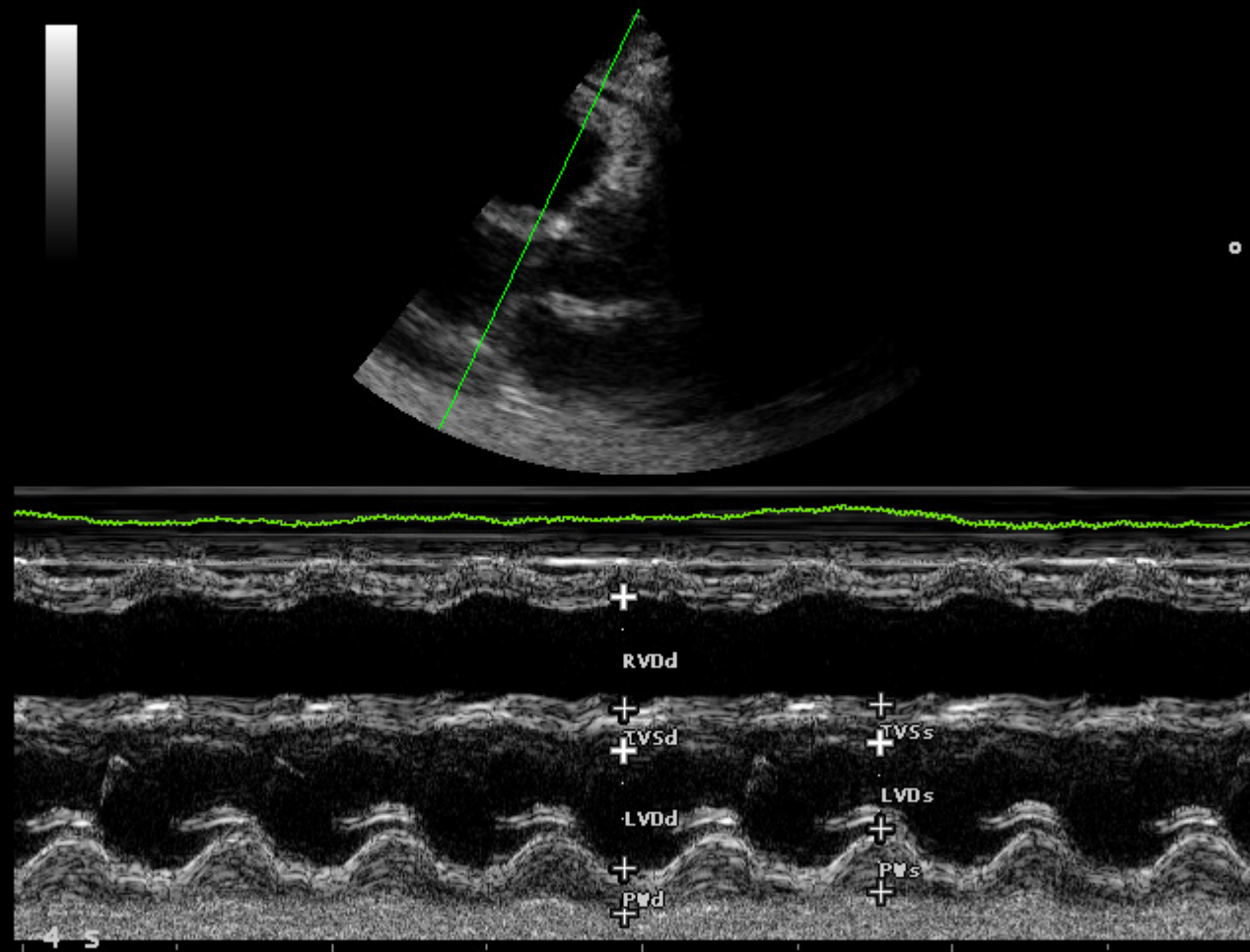
M G 52%

PRC 7-3
PST 1

QEH ICU PA230

LV

RVdD 31.8 mm
IVSd 11.7 mm
LVdD 33.5 mm
PwD 12.8 mm
SPWD --- ms
IVSs 10.6 mm
LVdS 24.5 mm
Pws 17.8 mm
EF 53 %
FS 27 %
S% -10 %
PW% 39 %
LVM 150 g
HR <<



Mitral valve

- Excessive leaflet mobility
 - myxomatous valve disease, torn chordae, prolapse, flail
 - myocardial infarction, torn papillary muscle
- Restrictive leaflet mobility
 - rheumatic disease
 - calcific disease
 - dilated cardiomyopathy
 - acute ischemic disease

Interpretation guide

- Look for obvious pathology
- Assess wall thickness and chamber dimensions
- Assess myocardial function
- image pleura on both side
- relate the information to the clinical context

FEEL

- to assess the function of the heart and identify treatable conditions in peri-resuscitation care

FEEL

- to differentiate "true" PEA from "pseudo-PEA"
- early detection of ROSC
- identify 4 treatable causes of cardiac arrest
 - cardiac tamponade
 - hypovolemia
 - pulmonary embolism
 - severe LV dysfunction

FEEL

- high quality CPR with minimal interruptions to reduce the no-flow intervals
- FEEL < 10 sec

Approach to Shock

- Any pre-existing cardiac disease?

- IVC

- RV

- LV

Any pre-existing cardiac disease?

- LV and LA dilatation: DCM (postischemic/ valvular/ idiopathic)
- Marked LV hypertrophic: HOCM, severe AS, Hypertension
- RA dilatation: chronic cor pulmonale

IVC

- Differentiate between hypovolemia and other causes of shock
 - Spontaneous breathing: EDD < 9mm and respiratory variation > 50%
 - Mechanical ventilation: EDD < 15mm and respiratory variation > 18%

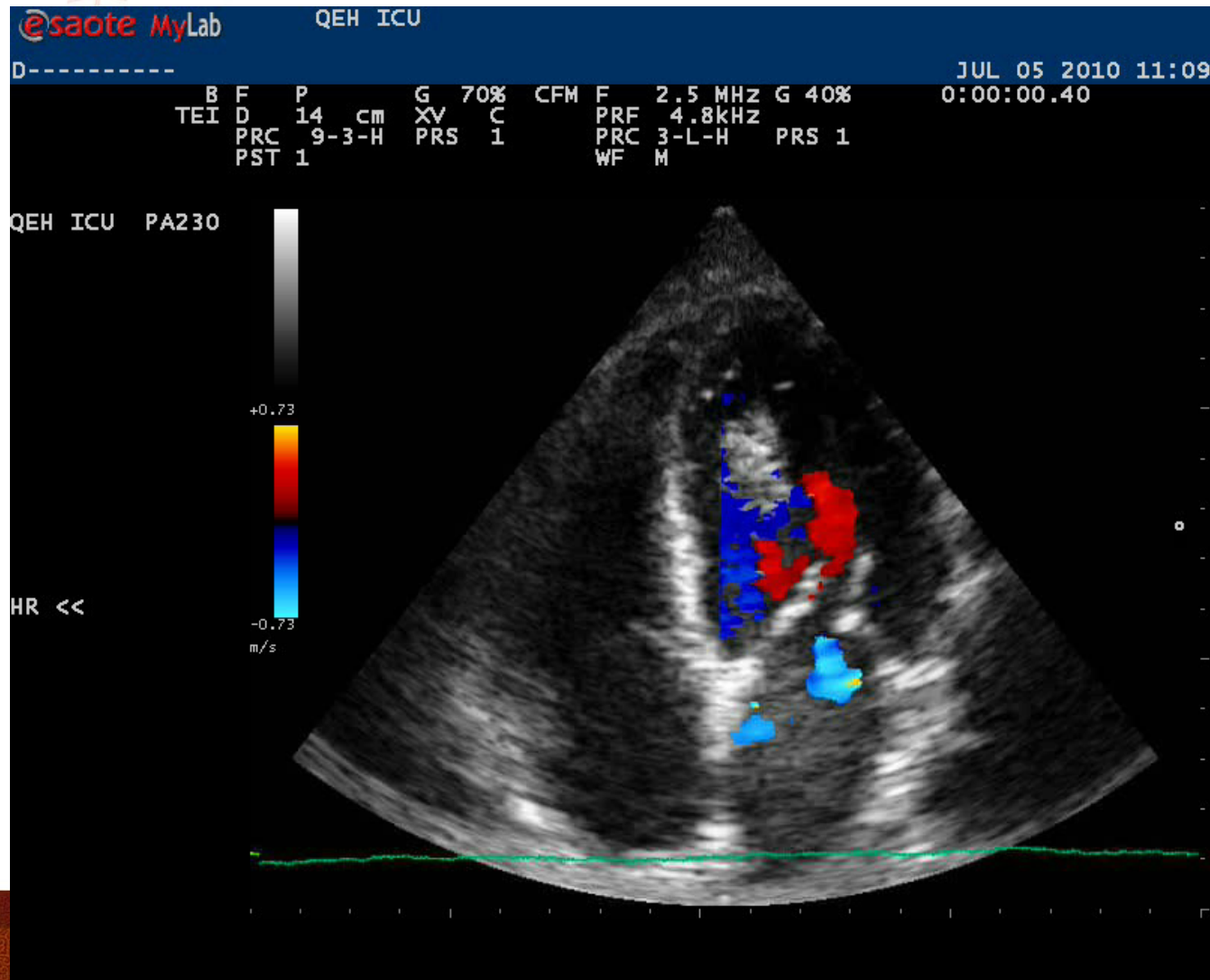
Right Ventricle

- Small and hyperkinetic RV: tamponade
- Dilated and hypokinetic RV: RV failure
 - LV dysfunction
 - RV AMI
 - Acute cor pulmonale: pulmonary embolism

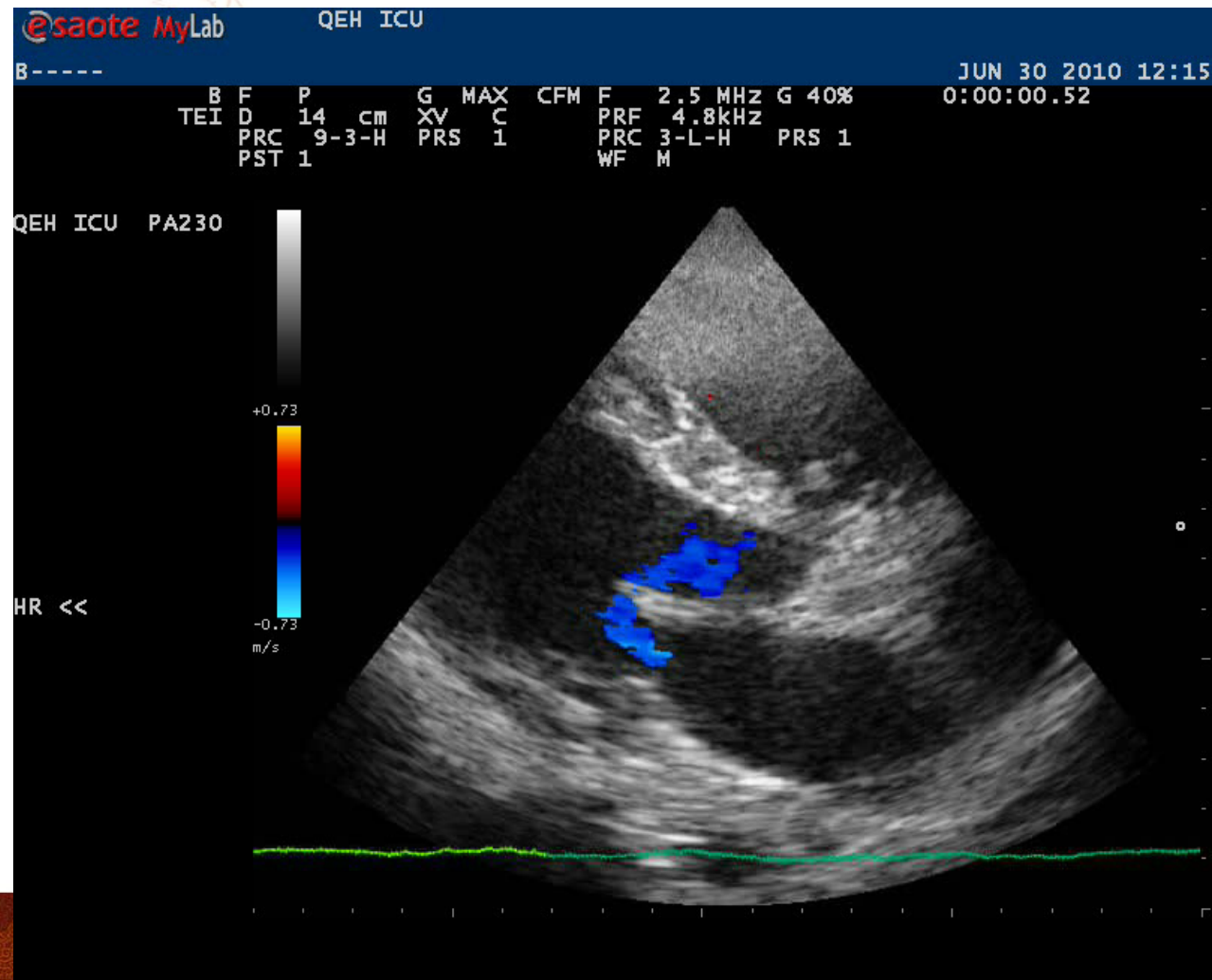
Left Ventricle

- Severe LV hypokinesia
 - LV AMI, Sepsis related, myocarditis, DCM
- LV hyperkinesia
 - Acute valvular dysfunction (AR, MR), HOCM, diastolic dysfunction

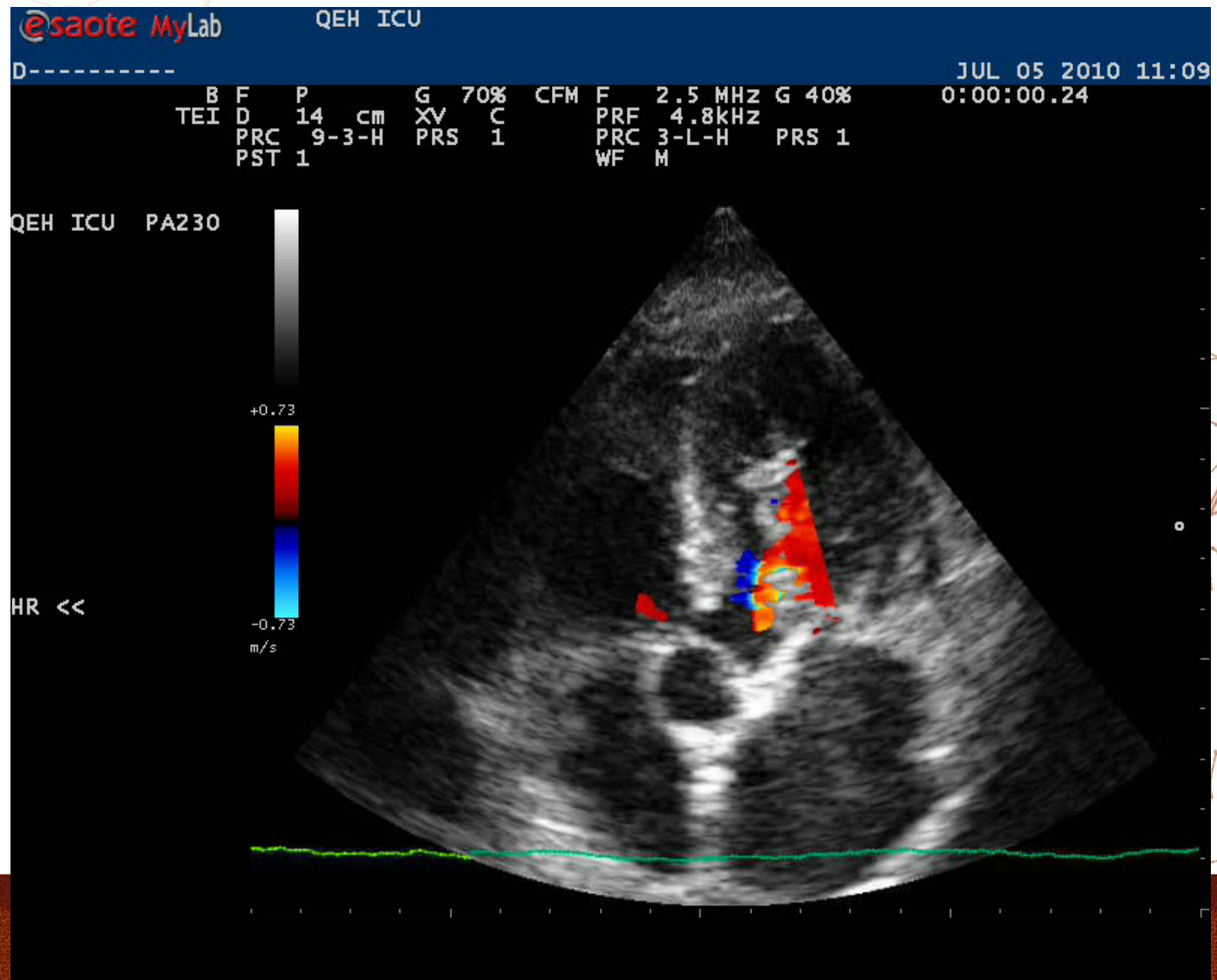
Mild MR



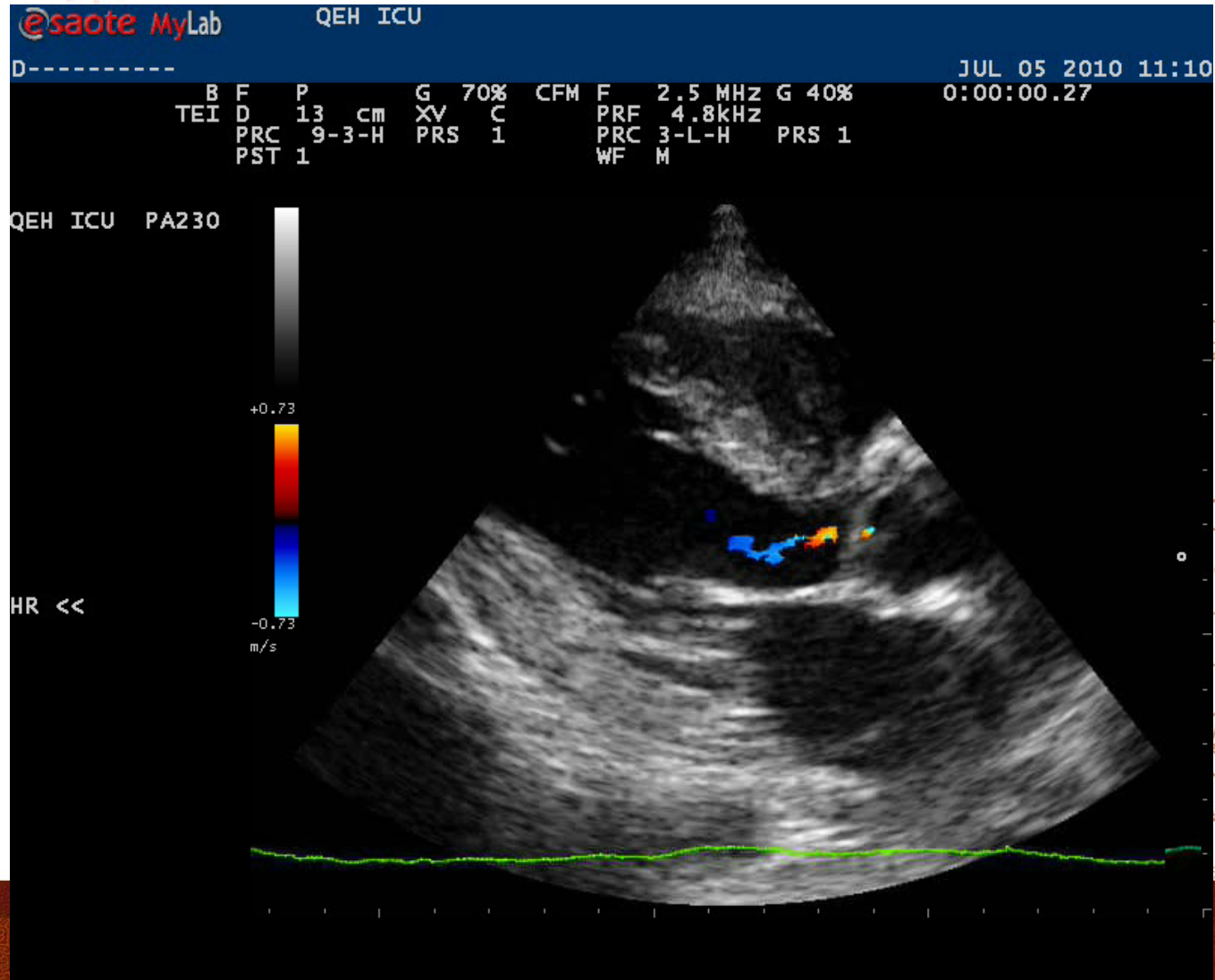
Mild MR



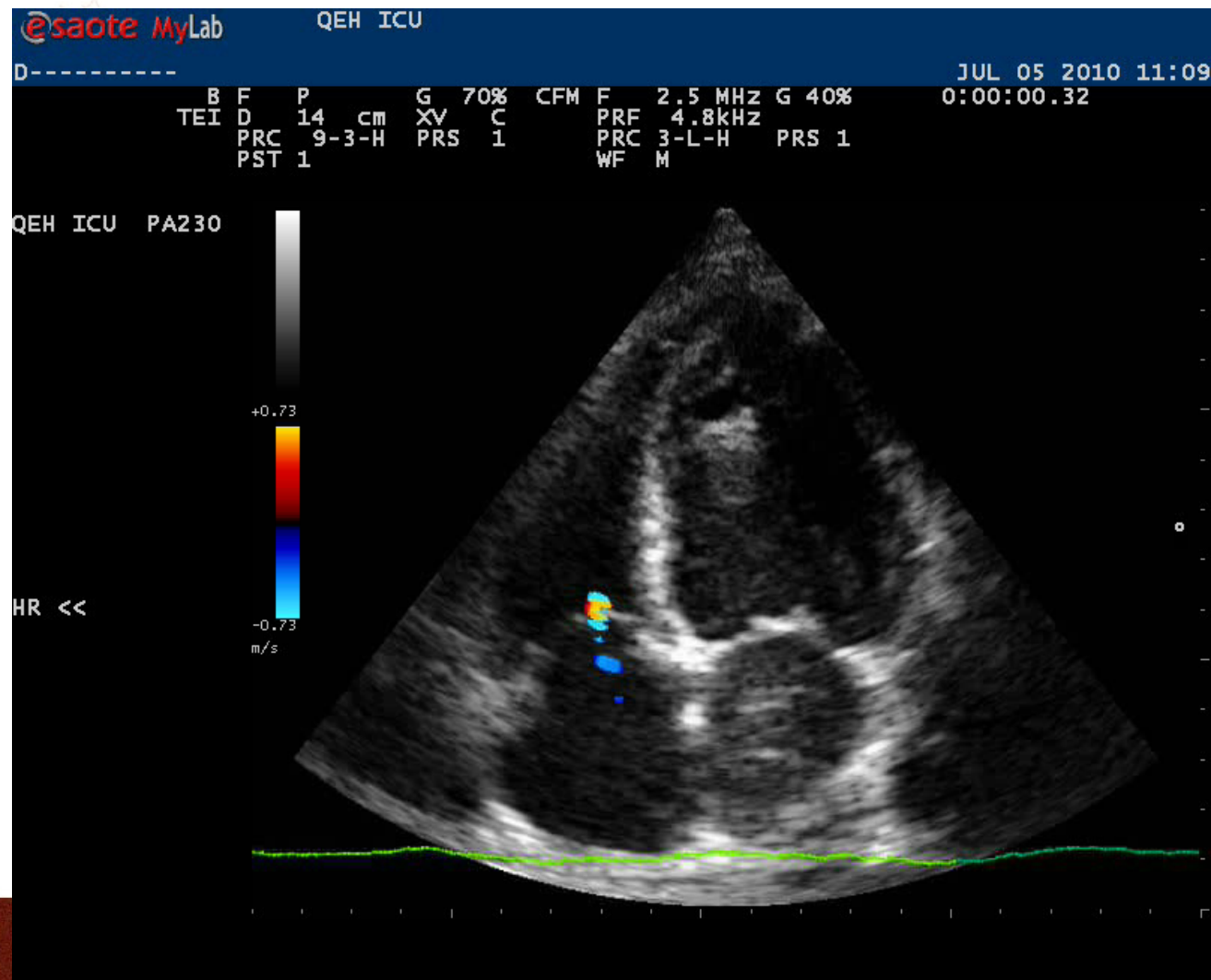
Mild AR



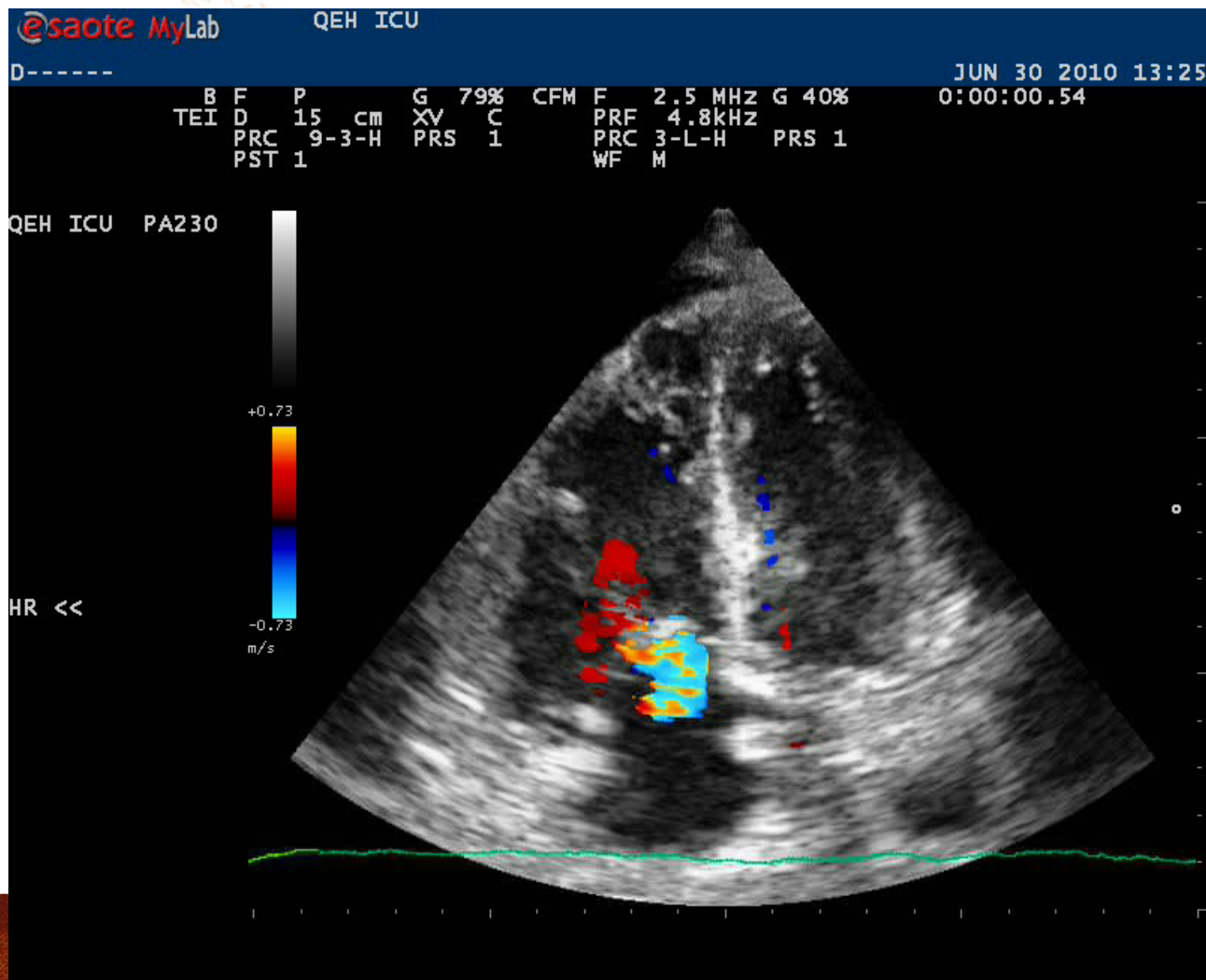
Mild AR



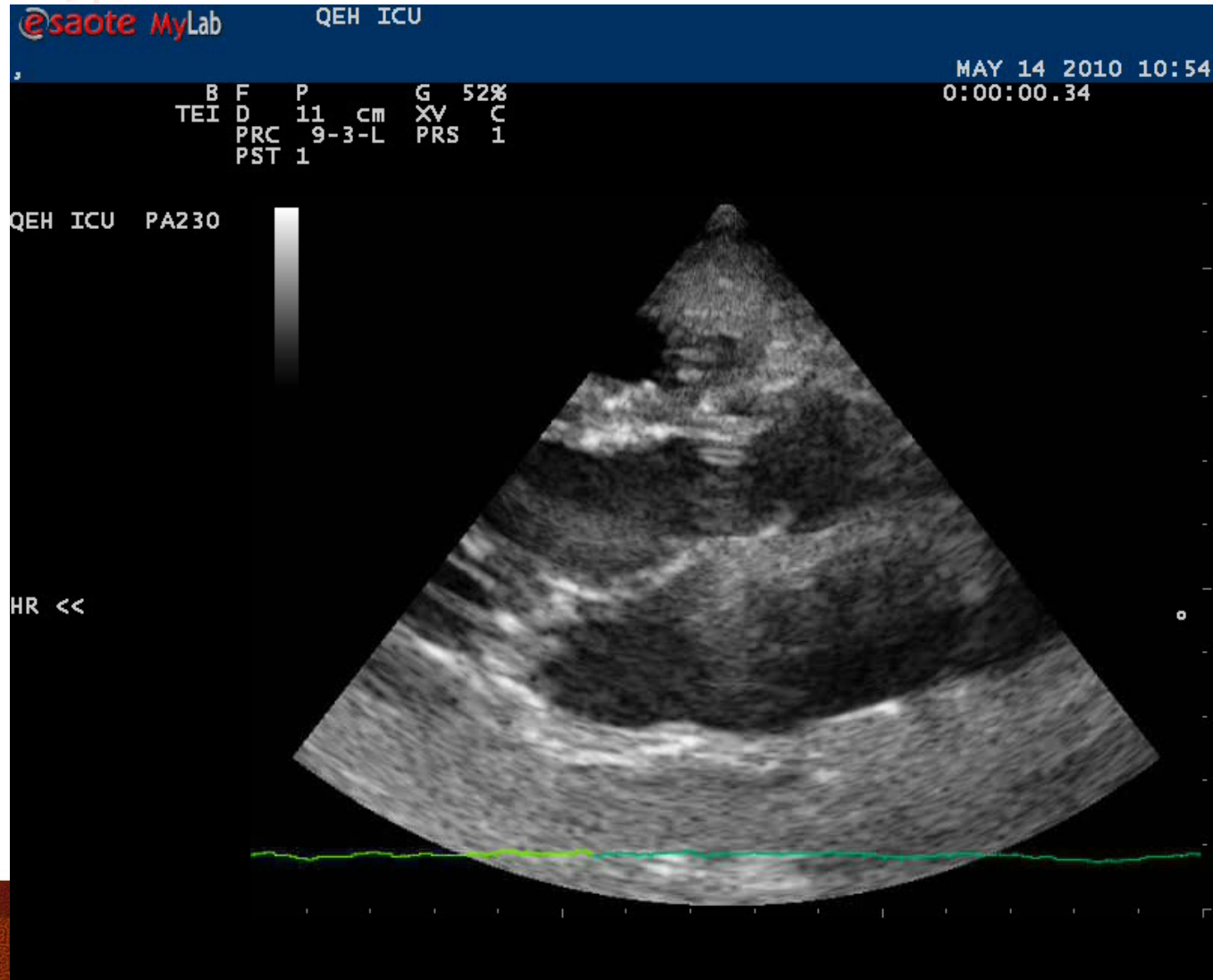
Mild TR



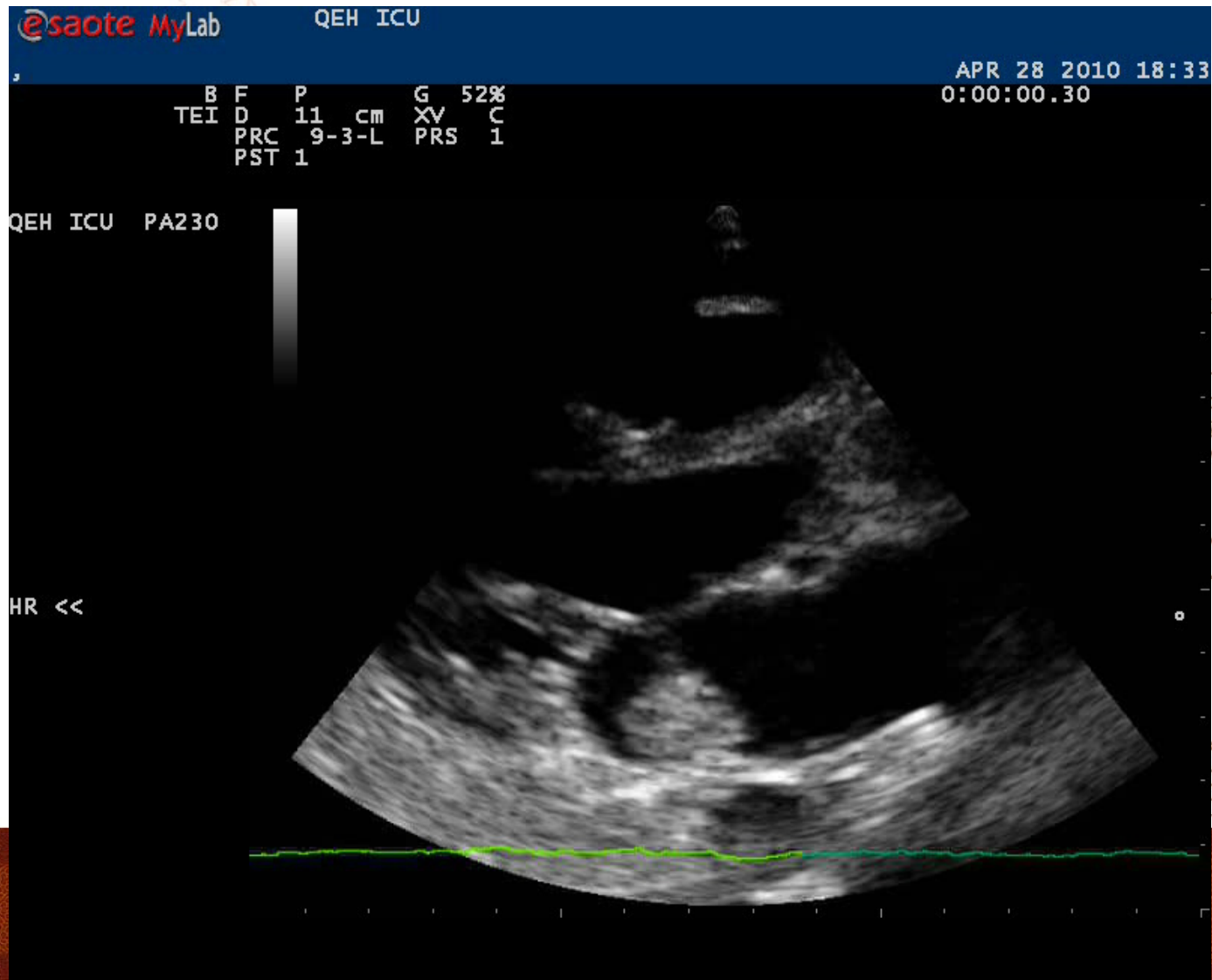
Severe TR



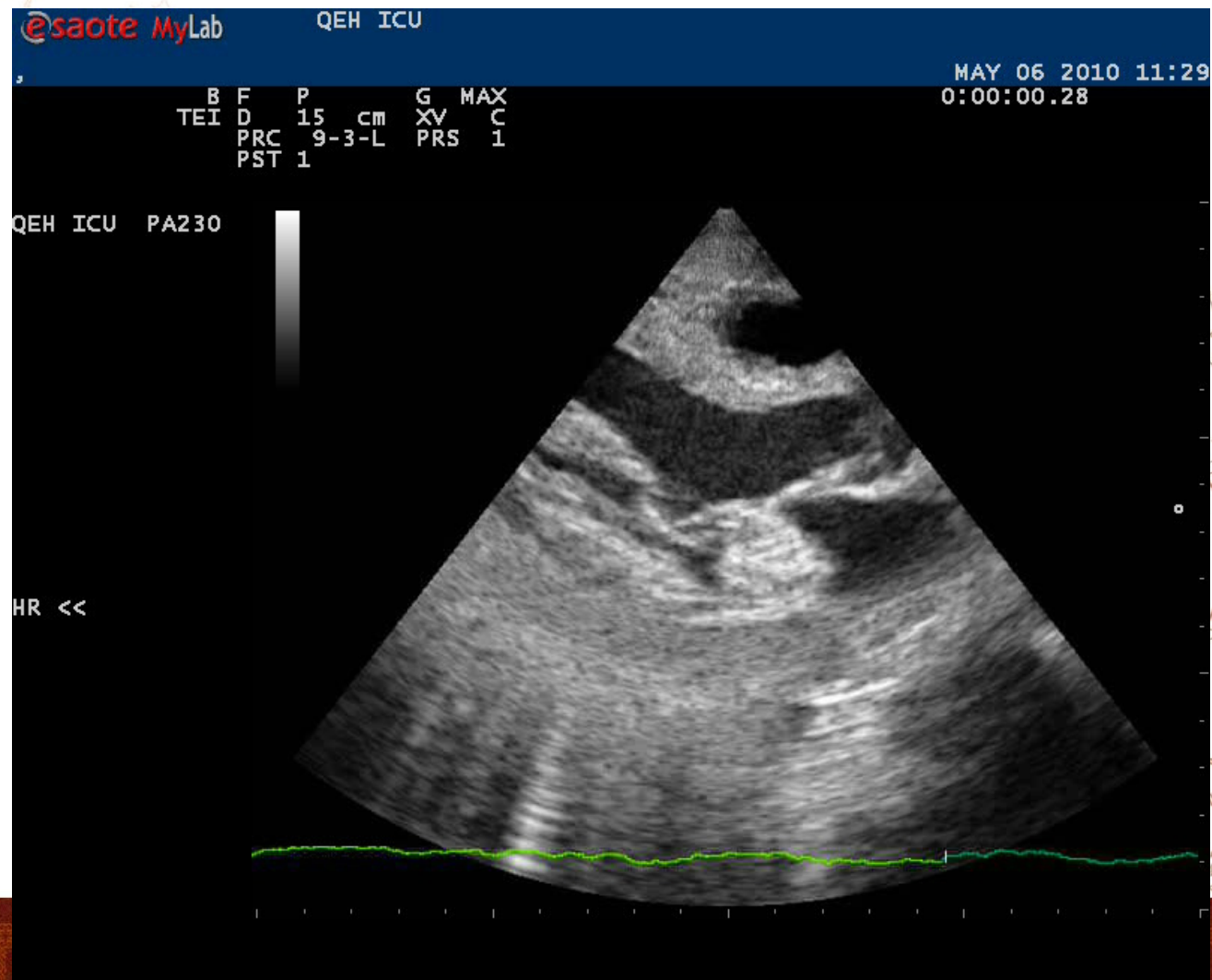
Infective endocarditis



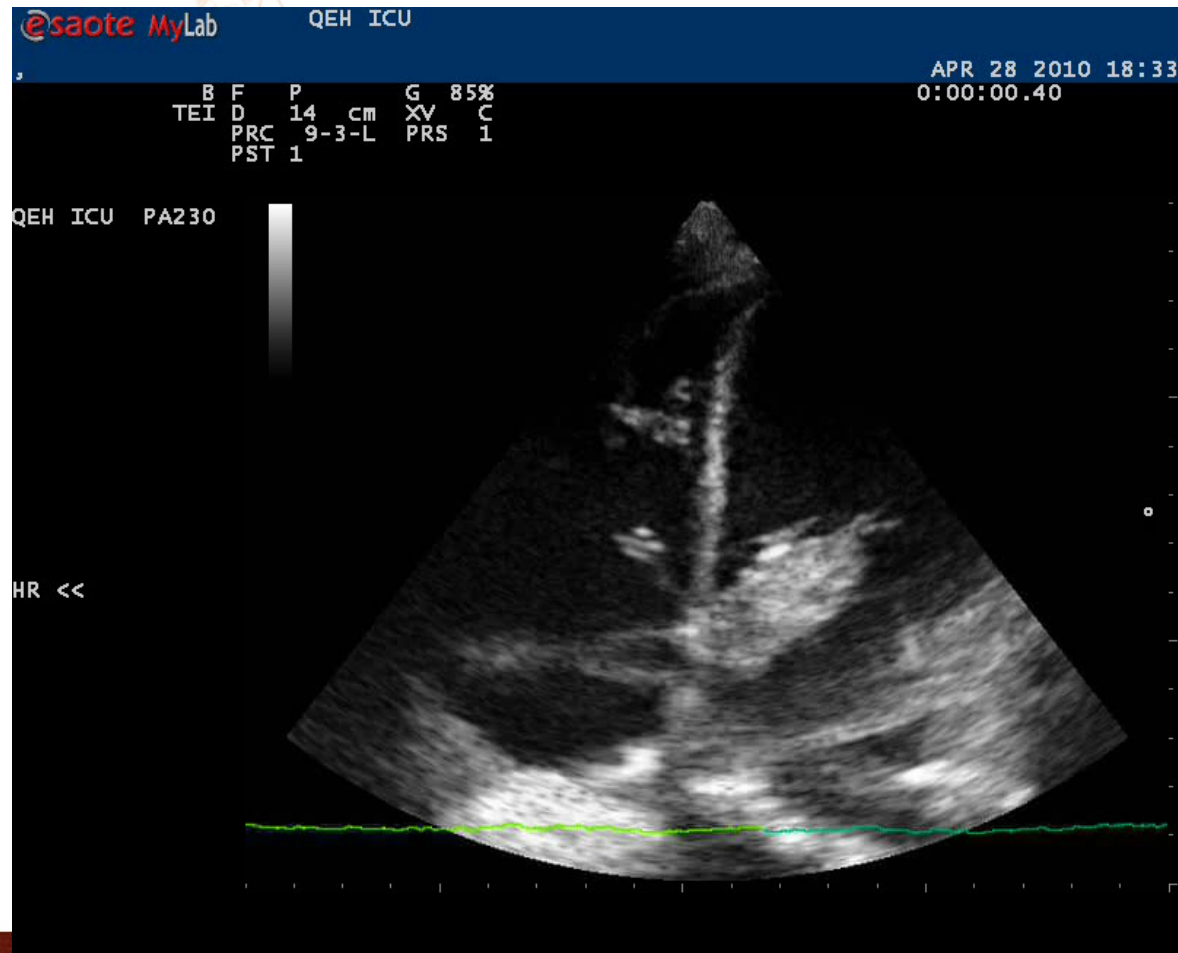
Infective endocarditis



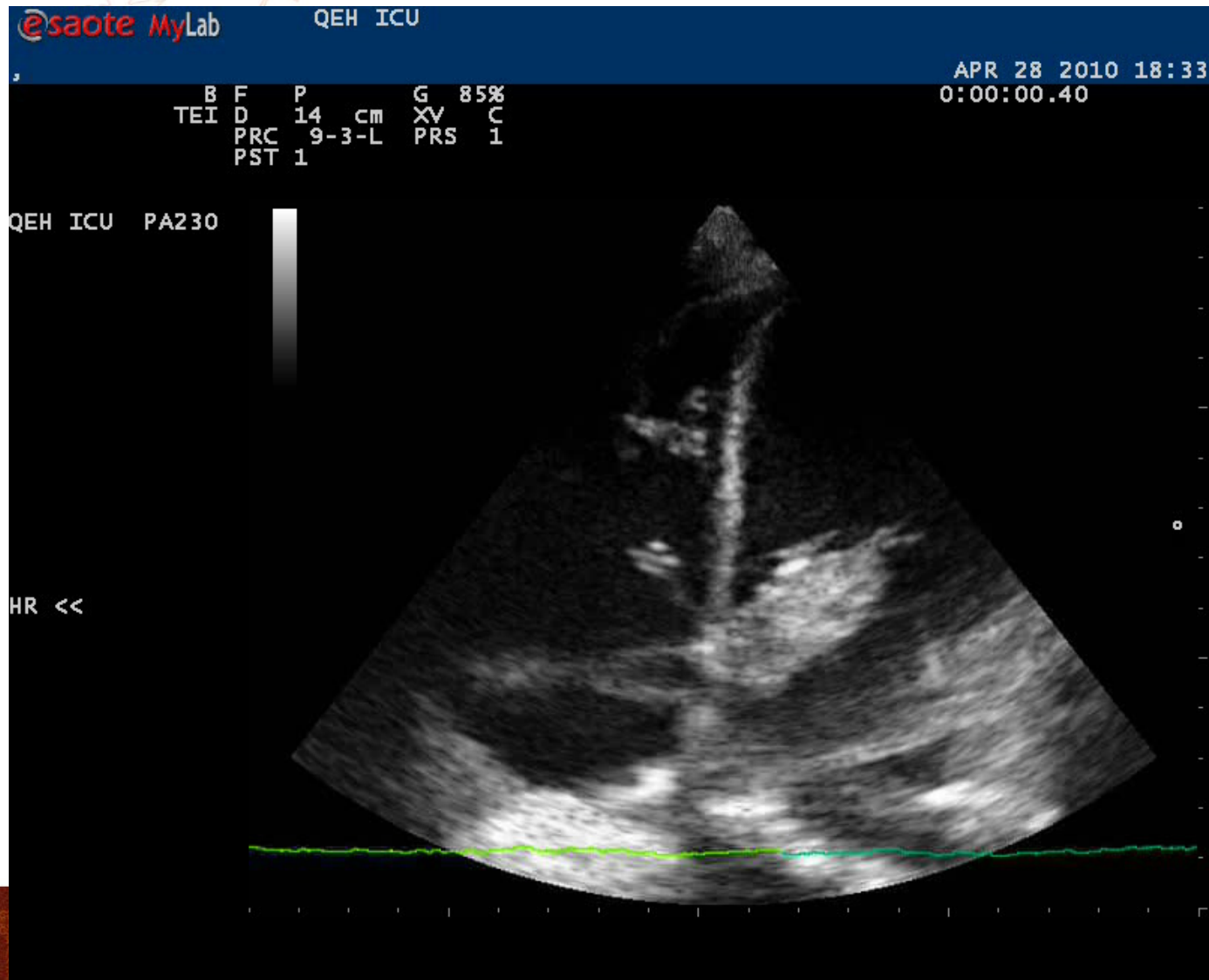
Infective endocarditis



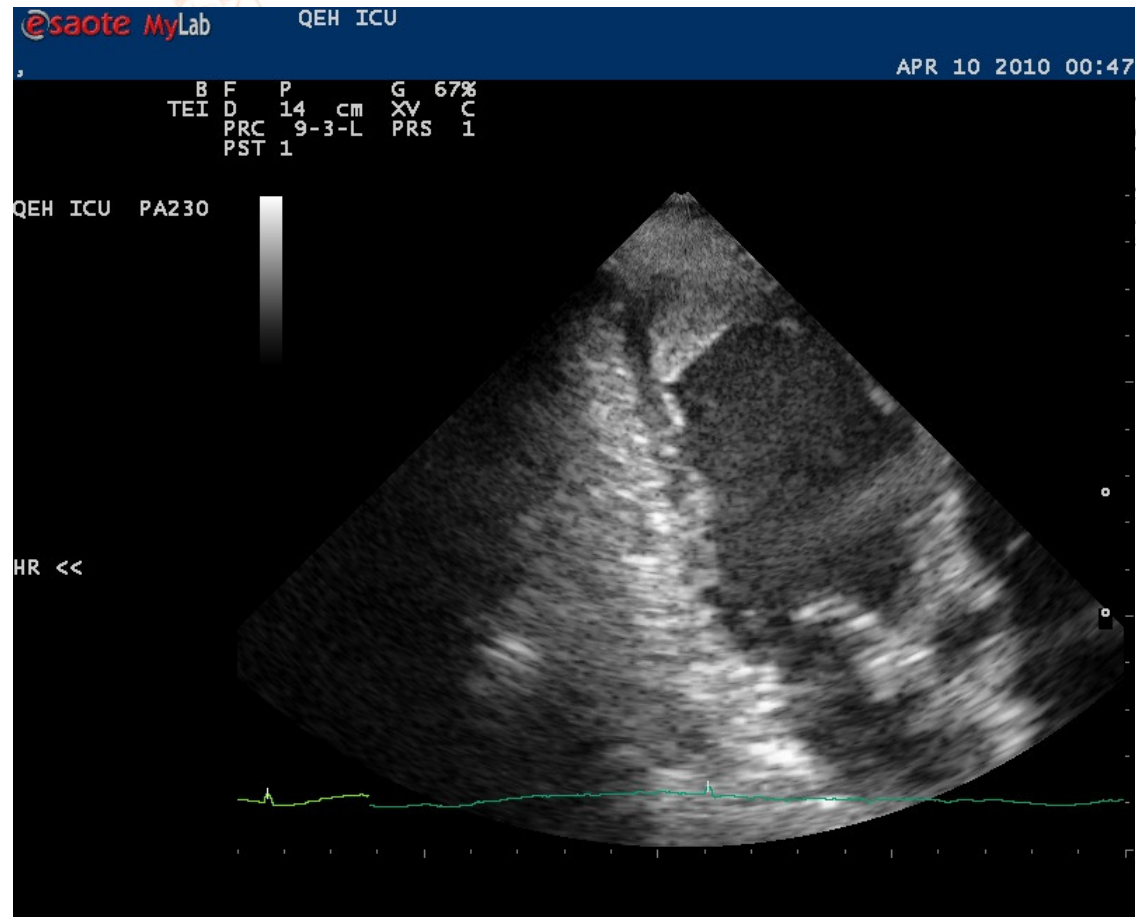
Infective endocarditis



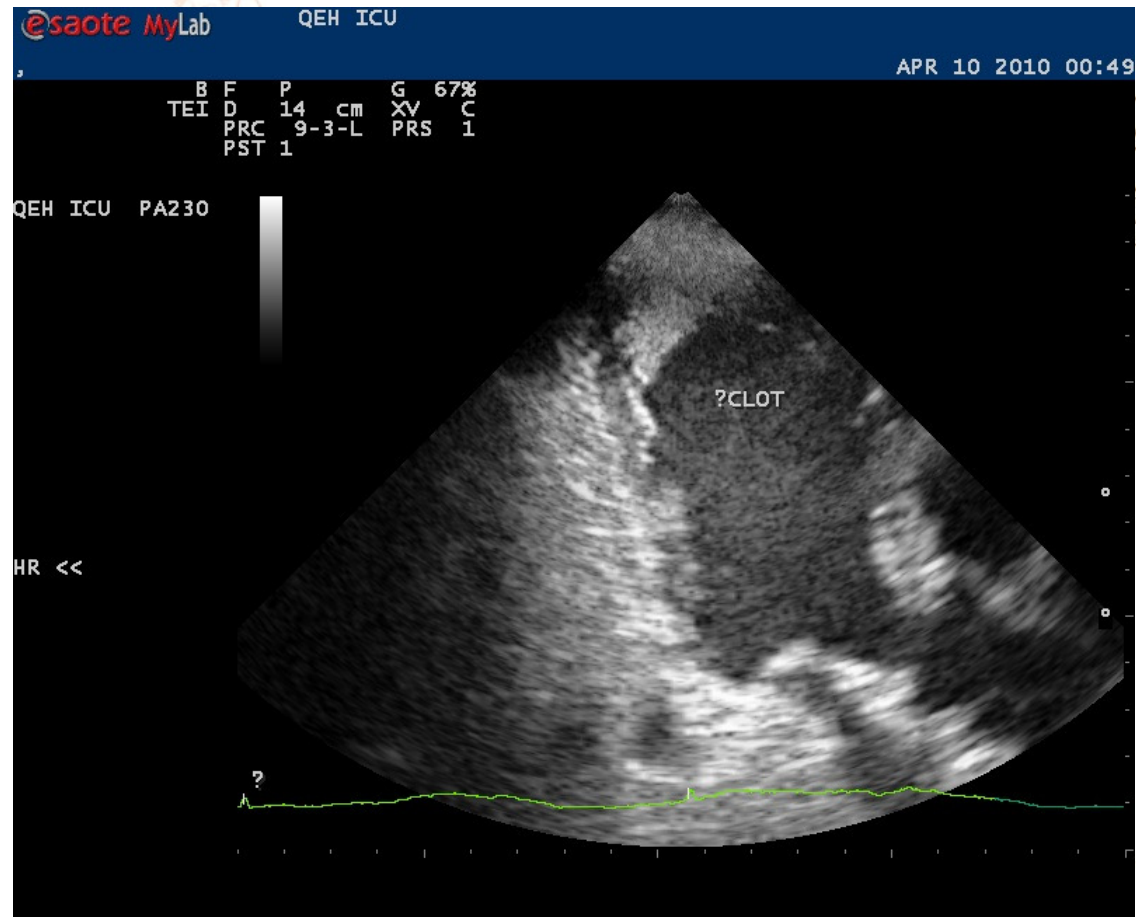
Infective endocarditis



LV thrombus



LV thrombus



References

- Course material of Winfocus basic echo
- Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused on Critical Ultrasound
<http://www.cardiovascularultrasound.com/content/6/1/49>

Useful links

- www.winfocus.org
- www.fate-protocol.com
- <http://www.hkcem.com/html/courses/usg/>

Upcoming events

- Winfocus course

- Organisers: HKCEM and WINFOCUS
- Date: 13-17, Nov, 2012
- <http://www.hkcem.com/html/courses/usg/>

- 8th Winfocus World Congress

- Barcelona, Spain
- 20-22, October, 2012
- <http://www.winfocus.org/world/barcelona2012/registration>



www.winfocus.org/world/echo

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WIN-ECHO Educational Guidelines (2008 Edition)

Price S, Via G, Sloth E, Guarracino F, Breikreutz R, Catena E, Talmor D. World Interactive Network Focused On Critical UltraSound ECHO-ICU Group. Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused On Critical Ultrasound (WINFOCUS). Cardiovasc Ultrasound. 2008 Oct 6;6:49.

>>> See [Online Publication](#) on [Cardiovascular Ultrasound](#)

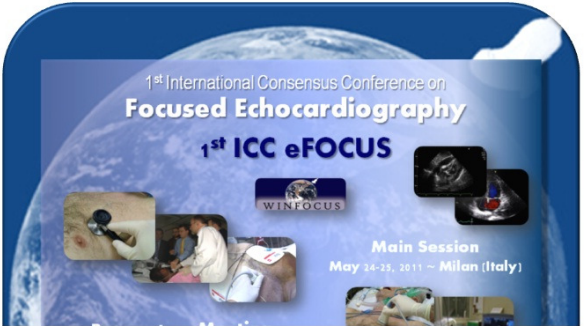
eLEARNING TOPICS	ONLINE MODULES
DEMO (free viewer)	- The Sepsis Syndromes - Left ventricle (PLAYLIST)
Introductory modules	- Principles of US - Principles of Doppler - Knobology: Pitfalls&Artefacts in Echo - Patient safety & consent - Sonoanatomy of the Heart - ALS Conformed Focused Echo (FEEL) - Screening Focused Echo (FATE)
Basic modules	- Right ventricle - Left ventricle
Intermediate modules:	- Cardiac Output - PAPs Measurement - Left ventricular diastolic function - Right ventricular diastolic function - Right heart filling - Left atrial pressure - Myocardial ischaemia - Cardiomyopathies - Aortic Stenosis - Aortic Regurgitation - Mitral Regurgitation - Mitral Stenosis - Tricuspid valve - Pulmonary valve
Intermediate modules:	General Approach to the Shocked patient

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Done

11:49 2/8/2012

<http://www.hkcem.com/html/courses/usg/>

Hong Kong College of Emergency Medicine - Ultrasound Subcommittee Website - Windows Internet Explorer

http://www.hkcem.com/html/courses/usg/

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Ultrasonography For Emergency Physician

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香港急症科醫學院
Hong Kong College of Emergency Medicine

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**Welcome to Hong Kong College of Emergency Medicine
Ultrasound Subcommittee Website**

This is the website of Hong Kong College of Emergency Medicine Ultrasound Subcommittee Website.

Upcoming Events & News
(Last Updated on 21 May 2012)

Upcoming USG courses in Nov:

WINFOCUS Basic Echo course 13-14 Nov
WINFOCUS Lung USG course 15 Nov
WINFOCUS Trauma Life Support course 16-17 Nov

International Teaching Faculty:
Dr Enrico Storti (Italy)
Prof Daniel Lichtenstein (France)
Dr Gabriele Via (Italy)
Dr Young Rock Ha (Korea)
Dr Francis Lee (Singapore)
Dr Suthaporn Lumlertgul (Thailand)

plus local faculties from Emergency Medicine and Intensive Care Medicine
further course details and application will be announced later

USG INDUCTION COURSE
Date: 20-21 August 2012 (Thu-Fri)

USG of the week
What are the ultrasonic features of acute cholecystitis?

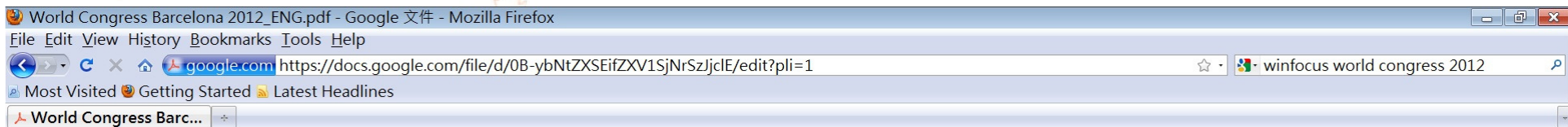
Useful Links
Hong Kong College of Emergency Medicine
Evidence Based Medicine
SSEM 2009

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World Congress Barcelona 2012_ENG.pdf

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8th WINFOCUS WORLD CONGRESS ON

ULTRASOUND

in Emergency & Critical Care

EMPOWERING RESUSCITATION:

The emerging role of point-of-care clinical sonography in cardio-pulmonary life support throughout the globe

GREETING MESSAGE

Dear Colleagues & Friends,

on behalf of WINFOCUS, the "World Interactive Network Focused On Critical Ultrasound", we are honored to invite you to attend the **8th World Congress on Ultrasound in Emergency & Critical Care**, to be held in Barcelona (Spain) on October 20-23, 2012.

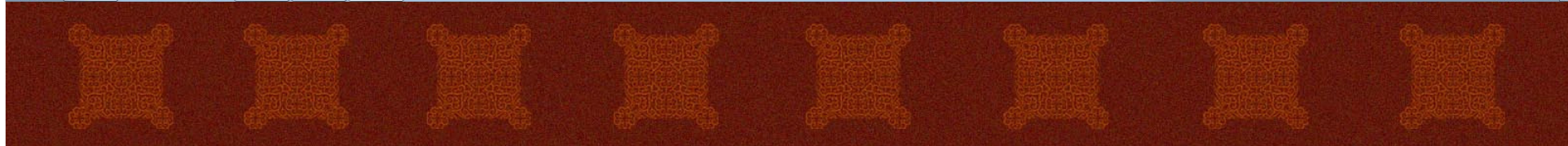
"Point-of-care Ultrasound". This concept was what allowed taking Ultrasonography out of obscure, secret and inaccessible labs. Nevertheless, bringing an ultrasound device the closest to the patient was unsustainable until machines became portable and autonomous. The spreading of the knowledge to the medical and paramedical "mass" was then predictable. Educational courses began to appear all over the world through different Medical and sometimes Commercial Societies. Though, experts from different countries joined their energy and explored a different way of thinking: can ultrasound be used in a new and revolutionary manner? More than bringing this technology to the patient, is it possible to integrate it in the everyday practice? Can it help to improve clinical power, enhance diagnostic accuracy, ameliorate patient's care and outcome and finally provide a better medicine particularly in critical scenarios?

"Critical scenarios". As defined by WINFOCUS, these are identifiable when "there is a performance gap between the patient needs and the resources available for decision making and problem solving, typically occurring in the acutely ill patient, and/or where human or technical resources are limited". Knowing if a febrile patient, coming with a lumbar pain in an isolated dispensary, has a renal obstructive lithiasis is critical. Knowing why a patient, trapped in a car after a crash on a motorway, is unstable is critical. Knowing if a patient in cardiac arrest has a cardiac motion is critical. Samples are so many that it can give vertigo. The major point of this concept is that any effective technology, providing fast and reproducible results, can reduce the gap if easy to buy, easy to learn and easy to use. A gap that ultrasound can partly or totally fill, wherever in the world, from high-tech to scarce resourced countries. A gap that can partly or totally be filled by a new concept: "critical ultrasound".

Beyond point-of-care ultrasound, beyond clinical ultrasound, come to discover critical ultrasound by joining our meeting. It will provide exciting courses applicable rapidly in routine medical practice, run by a worldwide cutting-the-edge

Done

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Thank you