Why Intensivists Should Perform Their Own Echocardiography

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Some Disclosures

- Some of my best friends are cardiologists
- They trained me to do echocardiography
- I call them to perform echocardiography on a regular basis in the MICU
- Yes, but for stable “cardiology” cases
- If the patient is in shock or has severe respiratory failure, my team does the echo

Critical Care Echocardiography

- Hemodynamic failure is a common problem in the ICU
- Respiratory failure may be a manifestation of cardiac failure
- Echocardiography has obvious application in evaluation of the critically ill with cardio-pulmonary failure

A Different Mindset

- Image acquisition and interpretation are key elements of critical care echocardiography
- In addition, it is for immediate, repeated, sometimes goal directed bedside use
- This requires cognitive training in the application of the results to critical illness

Cardiologists Take Care of Hearts
Intensivists Care of Patients

- Shock, respiratory failure, multi-organ failure
- Ethics issues
- Invasive procedures, airway management, ventilator management
- We will naturally use echocardiography as a bedside clinical management

Intensivists See Echo Differently than Cardiologists

- It is done immediately to establish diagnosis of life threatening illness
- It is done repeatedly in order to observe the trajectory of disease and treatment
- It is may be done in goal directed fashion
- It is interpreted and applied at the bedside of the patient

The Cardiology Approach to Echocardiography

- It is a discrete imaging procedure
- It is not repeated
- It is always a complete study; limited echocardiography is not permitted
- The echocardiographer is separate from the clinician
- There is a time delay between performance and interpretation

Echocardiography in the ICU Three Approaches

- Cardiology does the echo, the intensivist applies the results
- The intensivist develops screening capability for goal directed study and calls cardiology as needed
- The intensivist develops full capability in echocardiography

Cardiology Does the Echo You Apply the Results

- Standard of care in the United States
- It is still important to have a complete knowledge of what the cardiologist might be able to accomplish with echocardiography
- But this leads to conflict….

Cardiology vs. Intensivist

- Read hours later
- What is the EF?
- Clinical disassociation
- Is there ischemia or valve disease?
- Diastolic dysfunction by MV inflow
- Does this patient need a cath?

- Needs result now
- What is the SV?
- At the bedside
- Why is this patient in shock and/or in respiratory failure?
- Diastolic function by tissue/color M mode
- Why is this patient dying?

Further Questions for the Cardiologist

- Estimates of LAP, LVEDP, PAOP
- Is the patient preload sensitive?
- What is the response to therapy (inotropes, afterload agents, volume challenge)?
- If the study is truly suboptimal, how about performing a TEE immediately?

Special Circumstances

- Tamponade
- Echo guided pericardiocentesis
- Hyperdynamic LV with outflow obstruction and shock
- RV dilitation with shock
- Acute MV/AV failure

The Second Alternative

- The intensivist develops screening capability for goal directed study and calls cardiology as needed

Goal Directed Echocardiography

- Limited examination to evaluate etiology of shock state: LV function, LV/RV size, tamponade, major valve failure, volume responsiveness
- Emphasis on ruling out causes of shock that are life threatening
- Guiding volume/inotrope use
- Full echo may still follow

Goal Directed Echocardiography Does it work?

- Manansia et al (TTE) Manasia/Oropello Feasibility and potential clinical utility of goal-directed transthoracic echocardiography J Cardiothorac Vasc Anesth.2005 Apr;19:155-9
- Benjamin et al (TEE)
- Substantial literature that non specialists can learn important aspects of echo with minimal training

Manansia/Oropello

- 6 full-time intensivists trained by cardiologist
- 10 one hour training sessions
- Hands-on image acquisition training
- Interpretation of standard tapes/patient studies
- Exact sequence of views not described
- Emphasis on LVF and volume status

Results

- Feasability: excellent
- Correlation with cardiology: excellent
- Clinical application: excellent
- Time of study:10.5 minutes

The Third Alternative

- The intensivist as fully trained echocardiographer
- Critical care echocardiography shares many features of cardiology echocardiography
- It has unique features that require specialized training

2-D Echocardiography

- Parasternal long
- RV inflow
- Parasternal short (LV, MV, AV)
- Apical 4 (and 5)
- Apical 2
- Apical 3
- Subcostal
- Specialized views
- TTE/TEE

TTE vs. TEE

- TTE will resolve most issues in the MICU
- TEE should be used routinely in situations where TTE cannot answer the clinical question
- Obesity, hyperinflation, dressings, cardiac surgery favor TEE

Doppler

- Valve function (color)
- PAS/PAD
- RA pressure
- LA pressure
- LVEDP
- PAOP
- Tamponade
- Constriction
- Volume responsiveness
- Stroke volume
- Derived values (SV)
- dp/dt
- Diastolic function (MV/PV inflow, tissue Doppler)
- Quantitation of Regurge/stenosis
- Artificial valves

A Simple Solution

- Critical care echocardiography should be a standard part of critical care training
- The choice of training level is yours to make: goal directed vs. full training

Some Definitions: Limited Goal Directed Echo

- LGDE: Several standard 2-D views to define LV/RV size and function, pericardial effusion with minimal Doppler
- May or may not be followed by a full echo

Some Definitions: Full Training in Echo (Relevant to the USA)

- Level II according to AHA/ACC definition
- Pass the echo boards
- Able to function at the same level as a fully trained cardiologist when it comes to echo

What is known?

- Intensivists can readily learn to perform limited scope goal directed echocardiography (LGDE) and
- LGDE by intensivists impacts positively on patient care

Obviously….

- The intensivist who is fully trained in echo can perform LGDE
- Conversely, the Intensivist who is trained only to LGDE level cannot perform or interpret a full echo study

Therefore, the LGDE intensivist Cannot Measure….

- Stroke volume (SVI, CO, CI or any of the derived values)
- Dynamic respiratory variation of aortic velocity/VTI to assess volume sensitivity in shock states
- Dynamic respiratory variation of SVC size to assess volume sensitivity in shock states

And Let's not forget….

- E/E' for estimate of PAOP
- LAP from MR peak velocity
- Dp/Dt of LV and RV
- Diastolic function from DTI or Vp
- Quantification of stenosis/regurgitaion
- Full sophisticated assessment of RV function
- Tamponade/constriction

And Let's not forget….

- All those vegetations and thrombi that the LGDE will definitely miss
- The problems of translational, rotational, and torsional artifacts intrinsic to 2-D echo
- The danger of image artifacts and the wide range of normal on 2-D
- Confusing color Doppler

If the Intensivist is Interested….

- Don’t stop at LGDE
- Forget about those PA catheters
- Broaden your horizons
- Go for full training

Are You a….

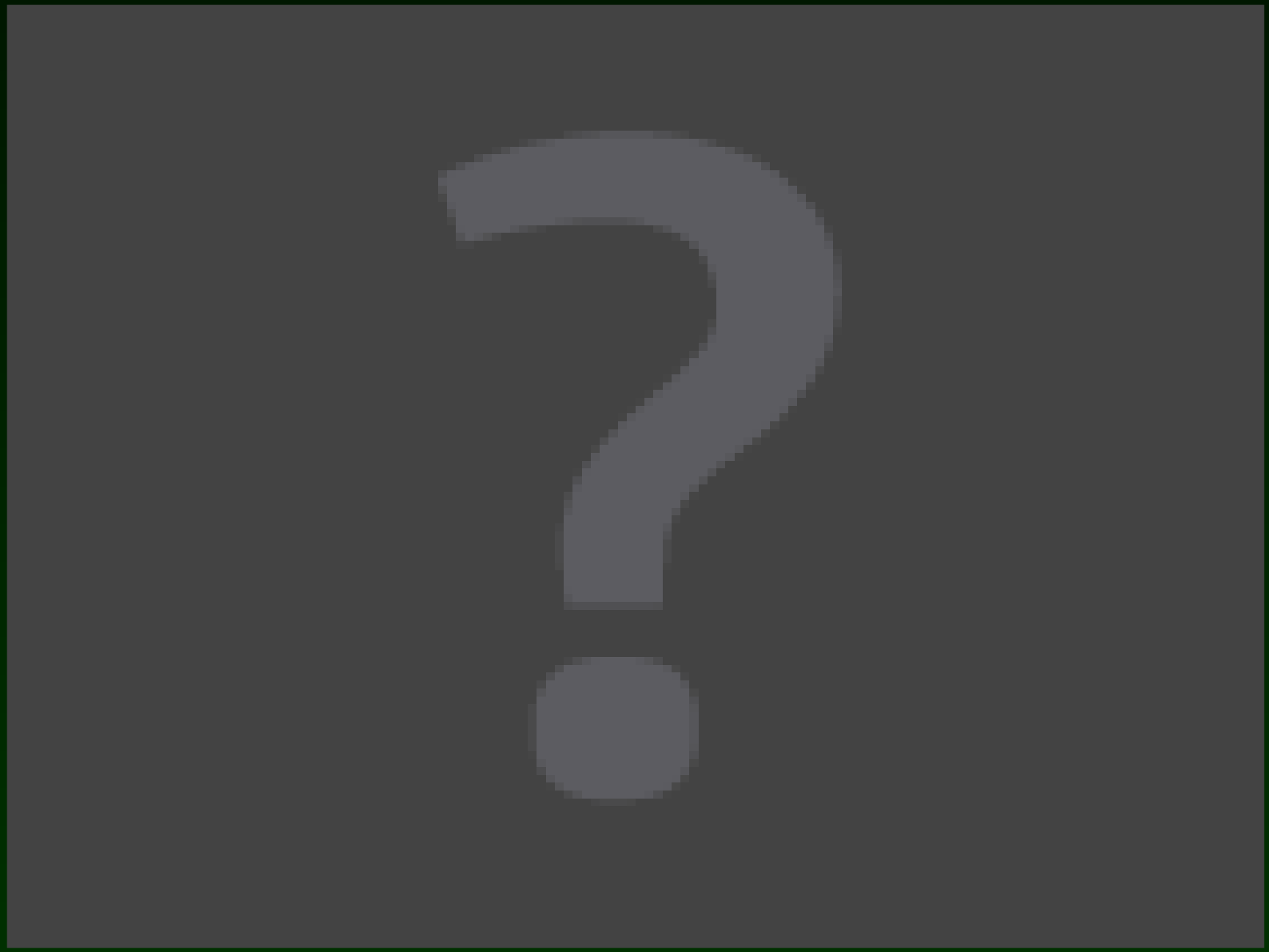
- Little LGDE dog?

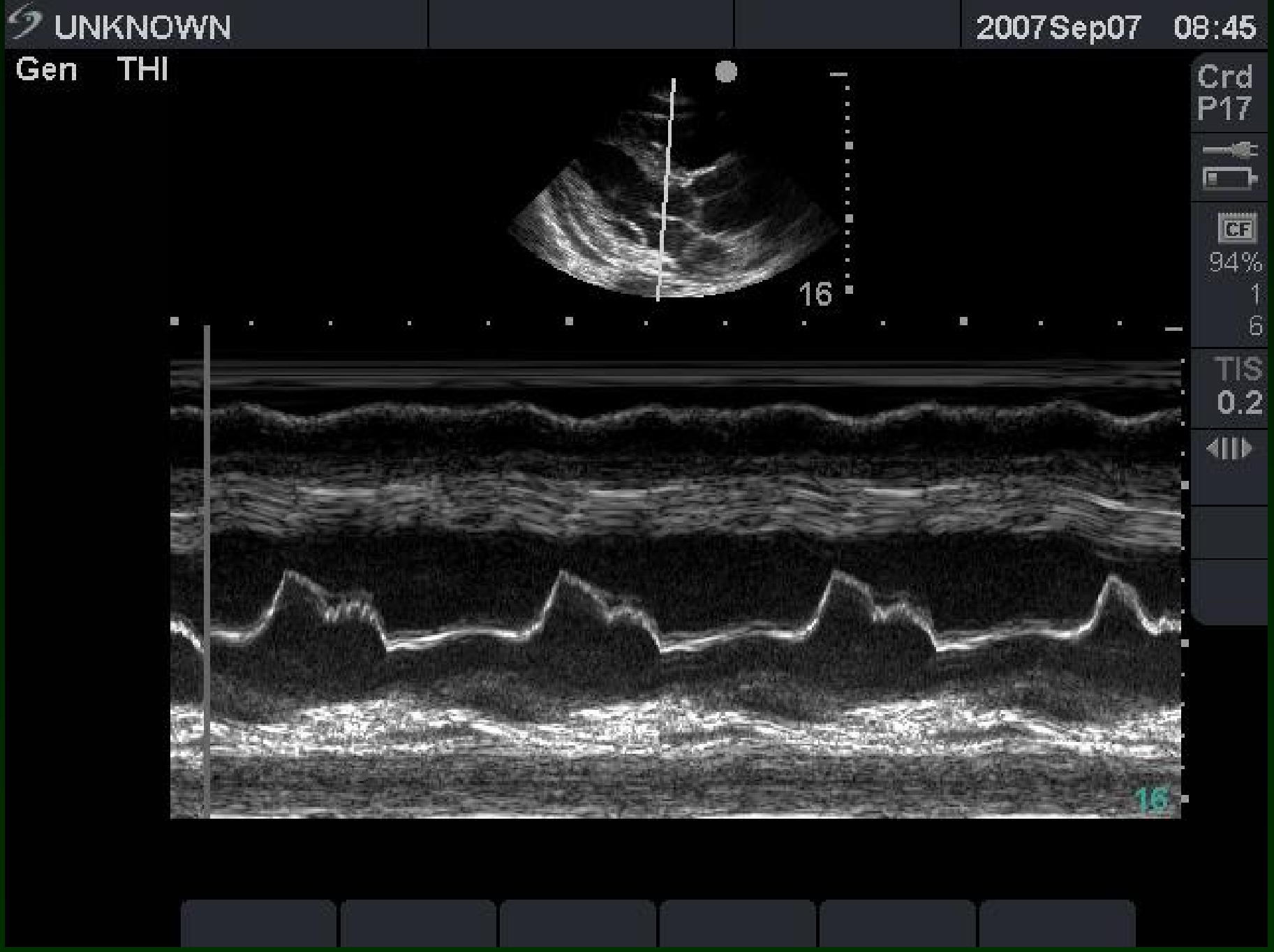
A BIG LEVEL II DOG!!!!

I Rest My Case

- Fellows: train to advanced level during fellowship
- Attendings: solve the time and political constraints….and train to at least LGDE level….and have one or two Big Dogs on your team to back you up
- You will never regret it

A Tough Case in the MICU

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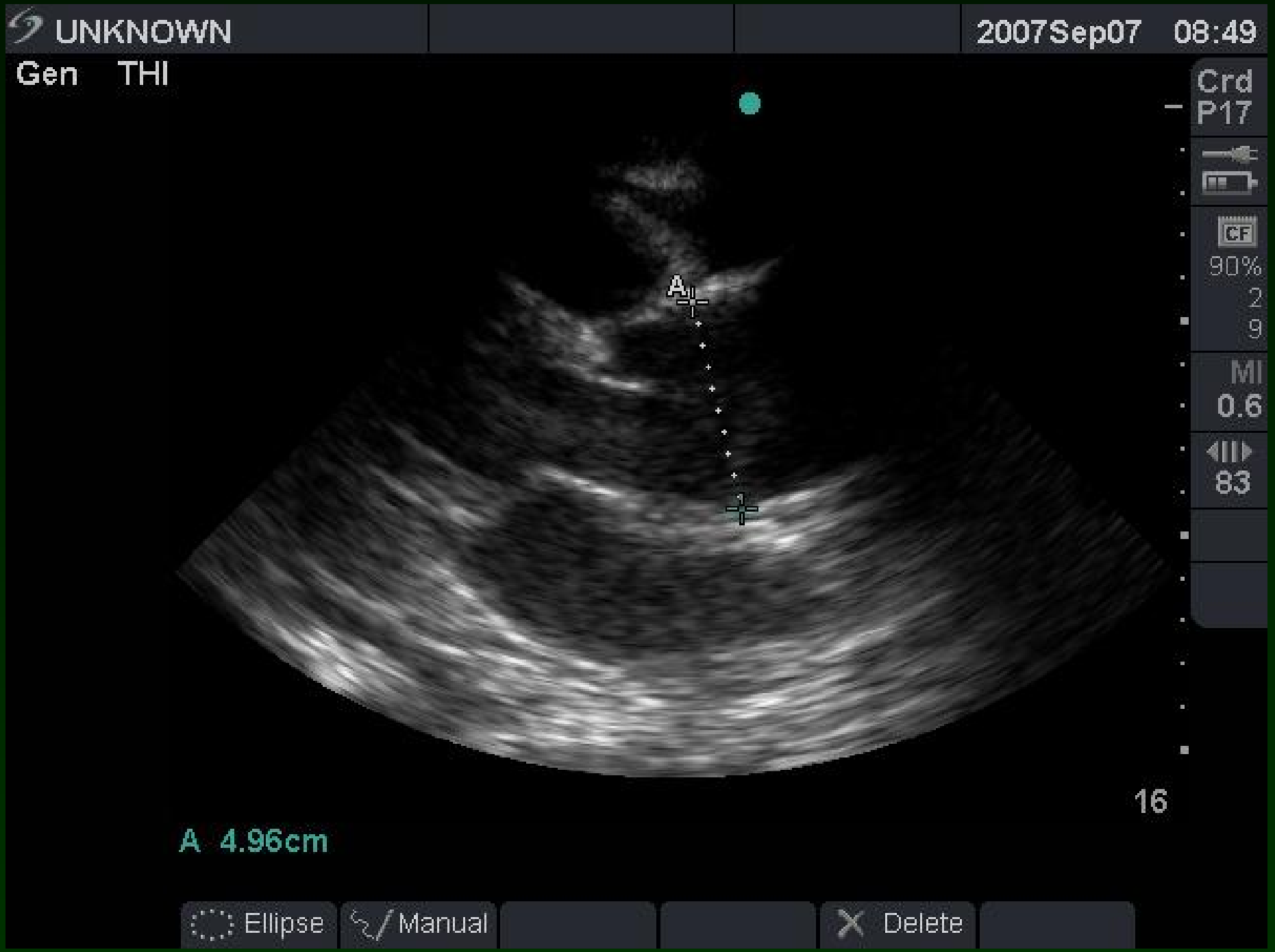
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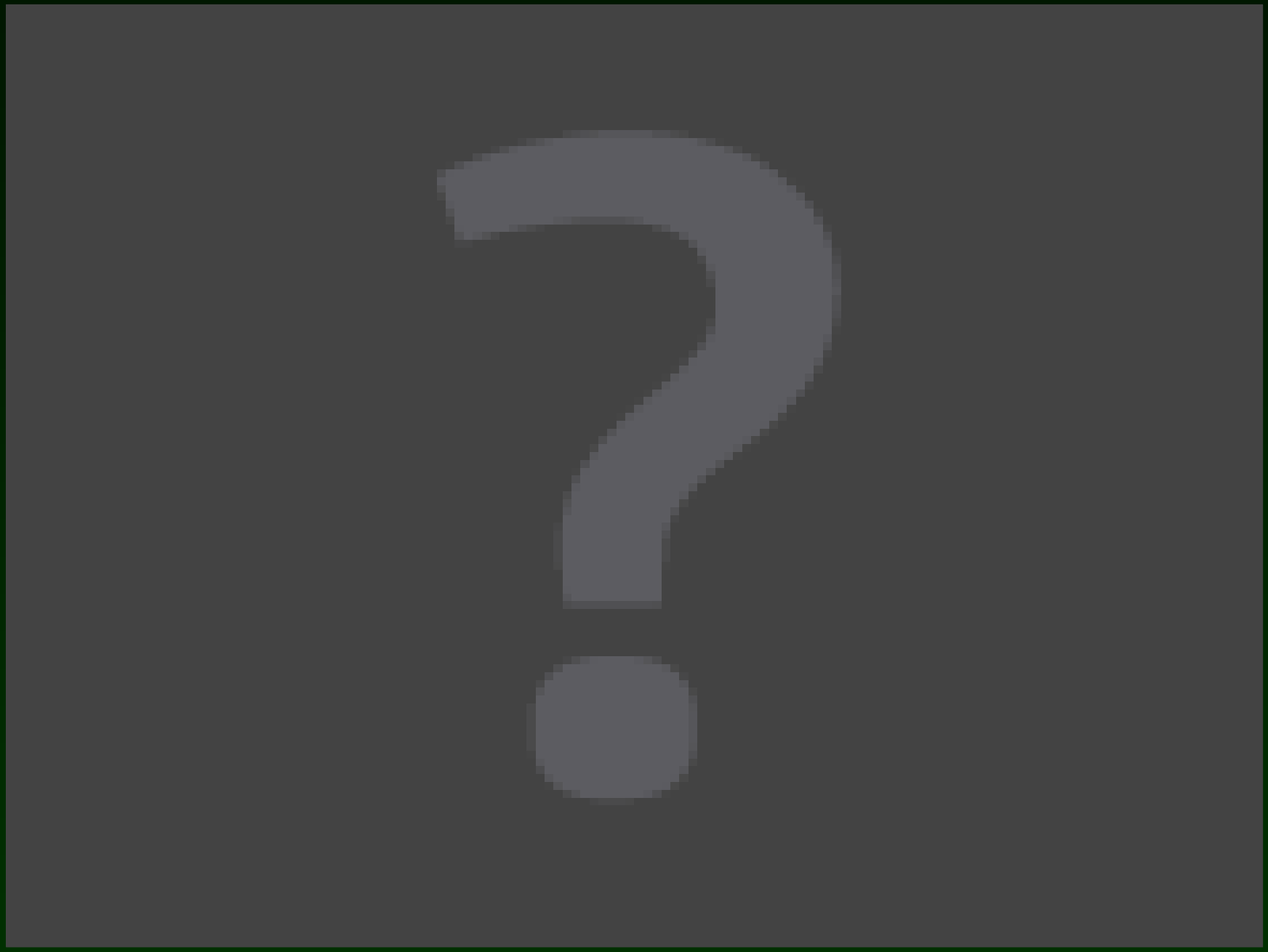

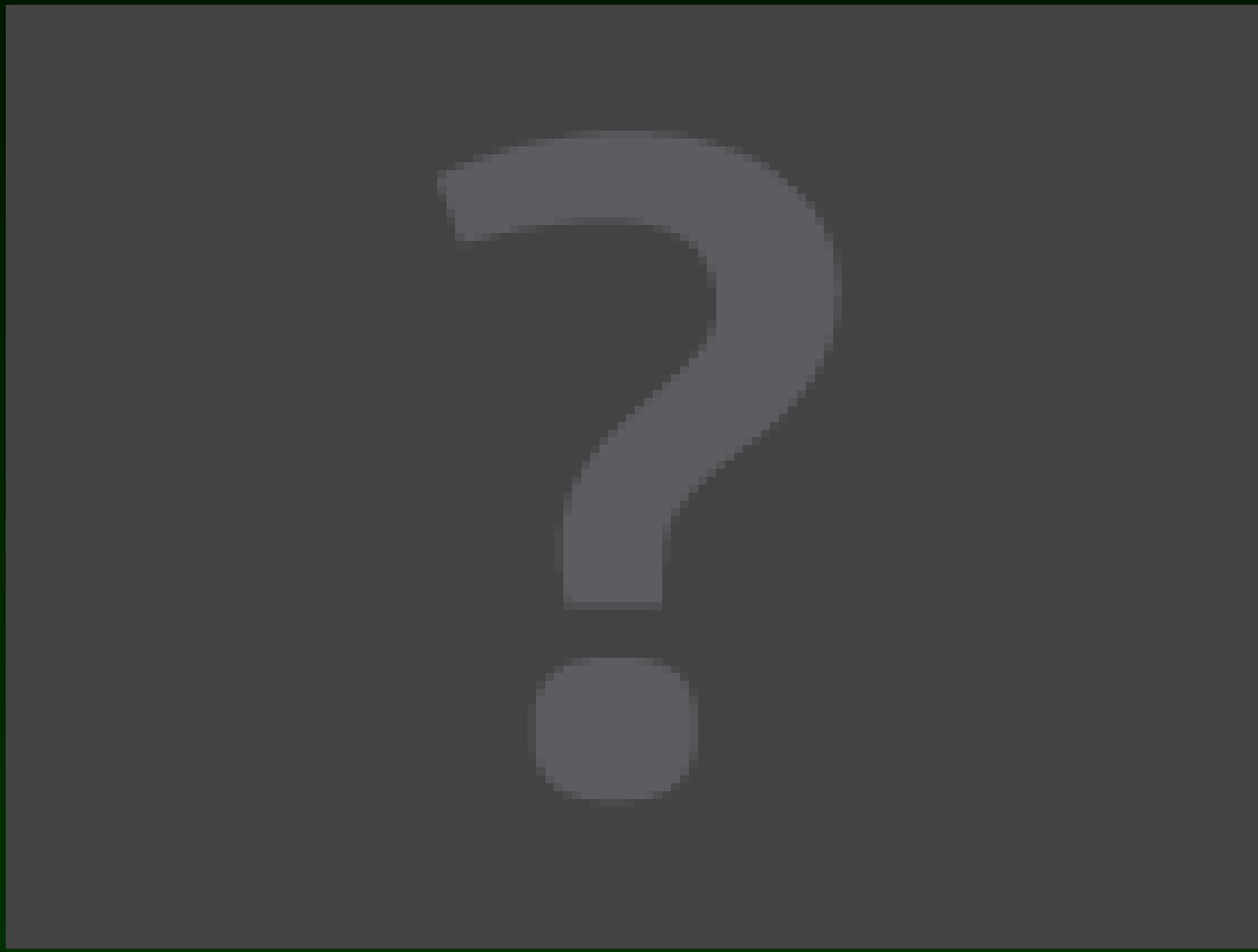

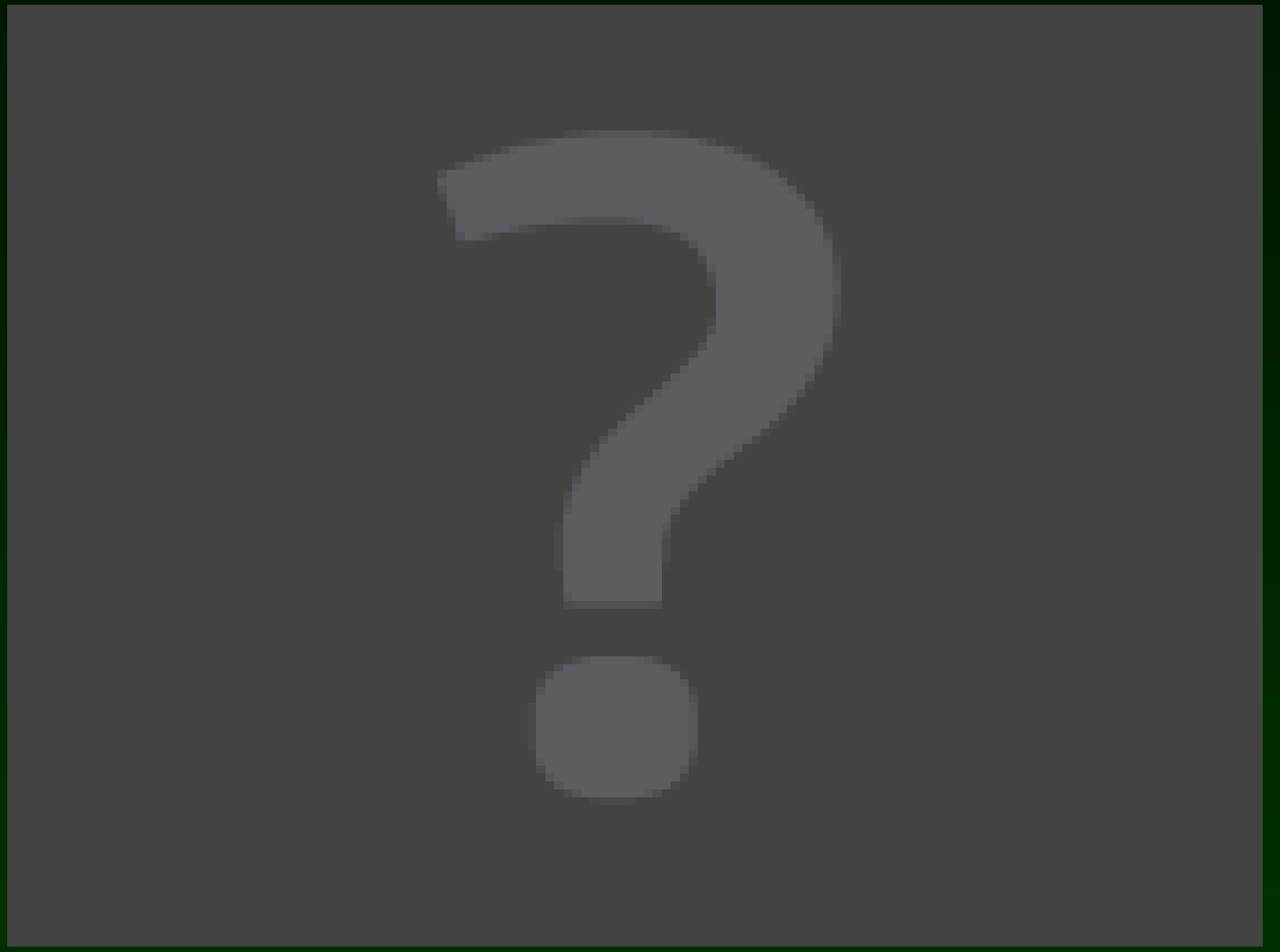


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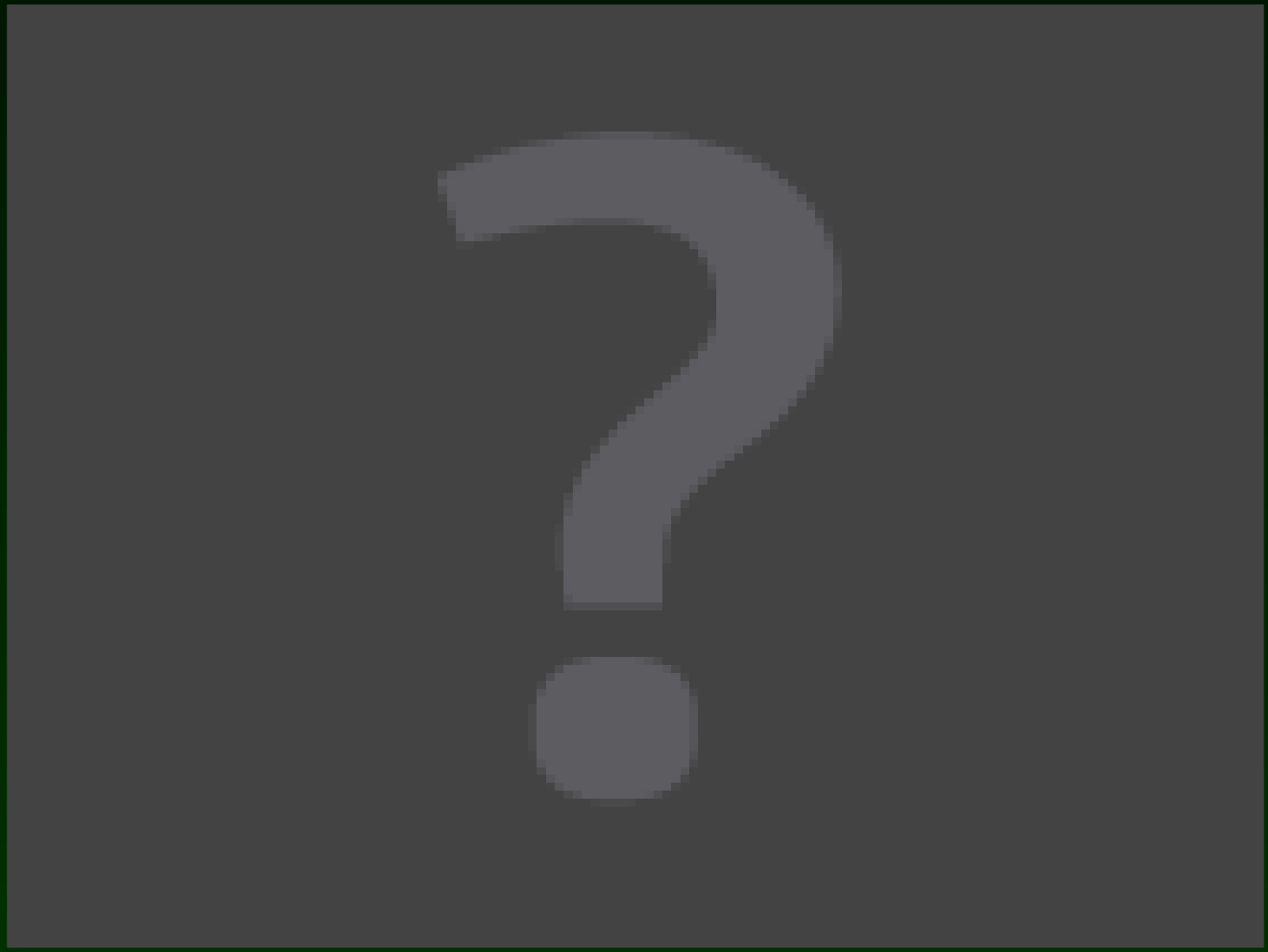

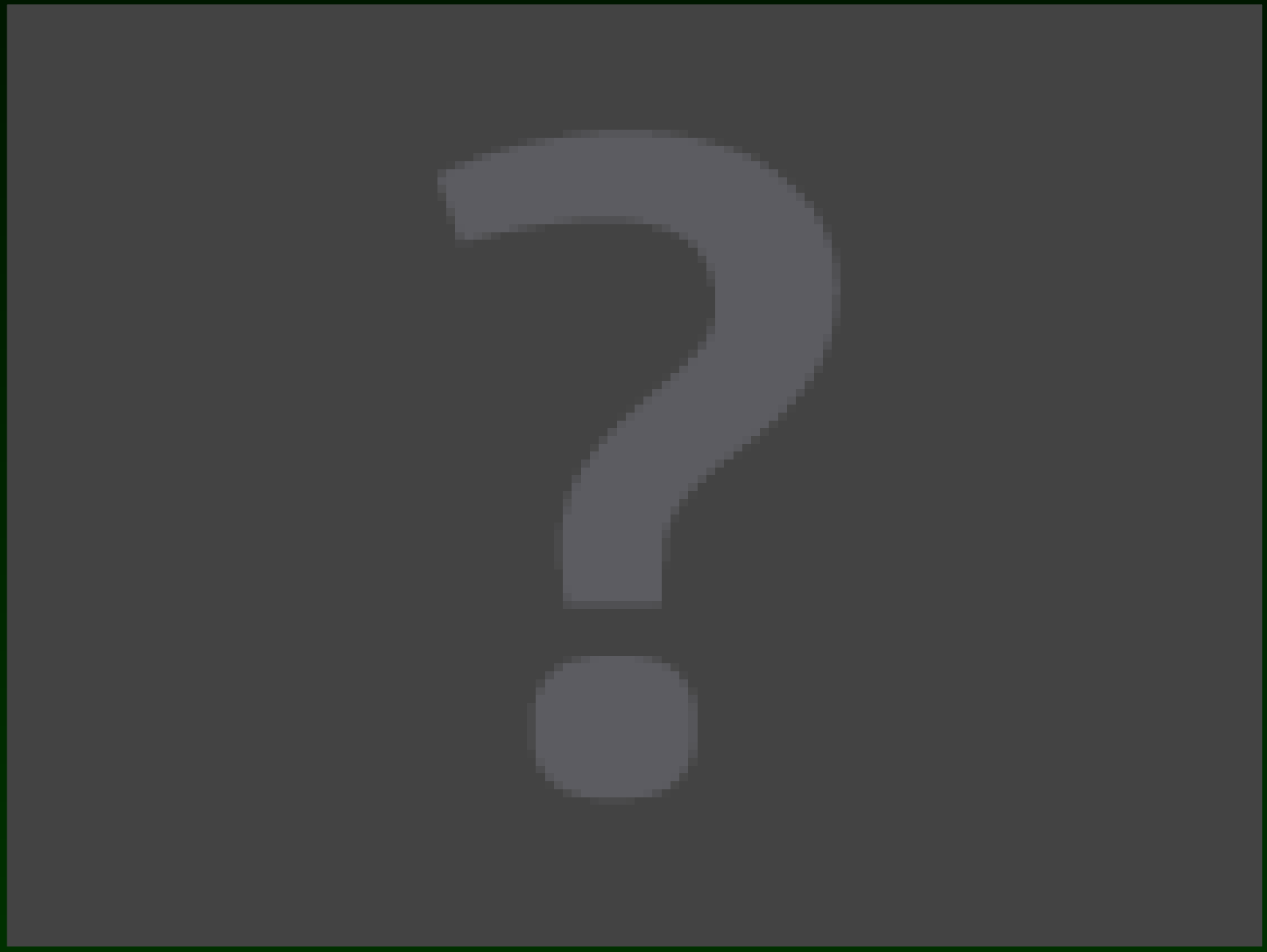

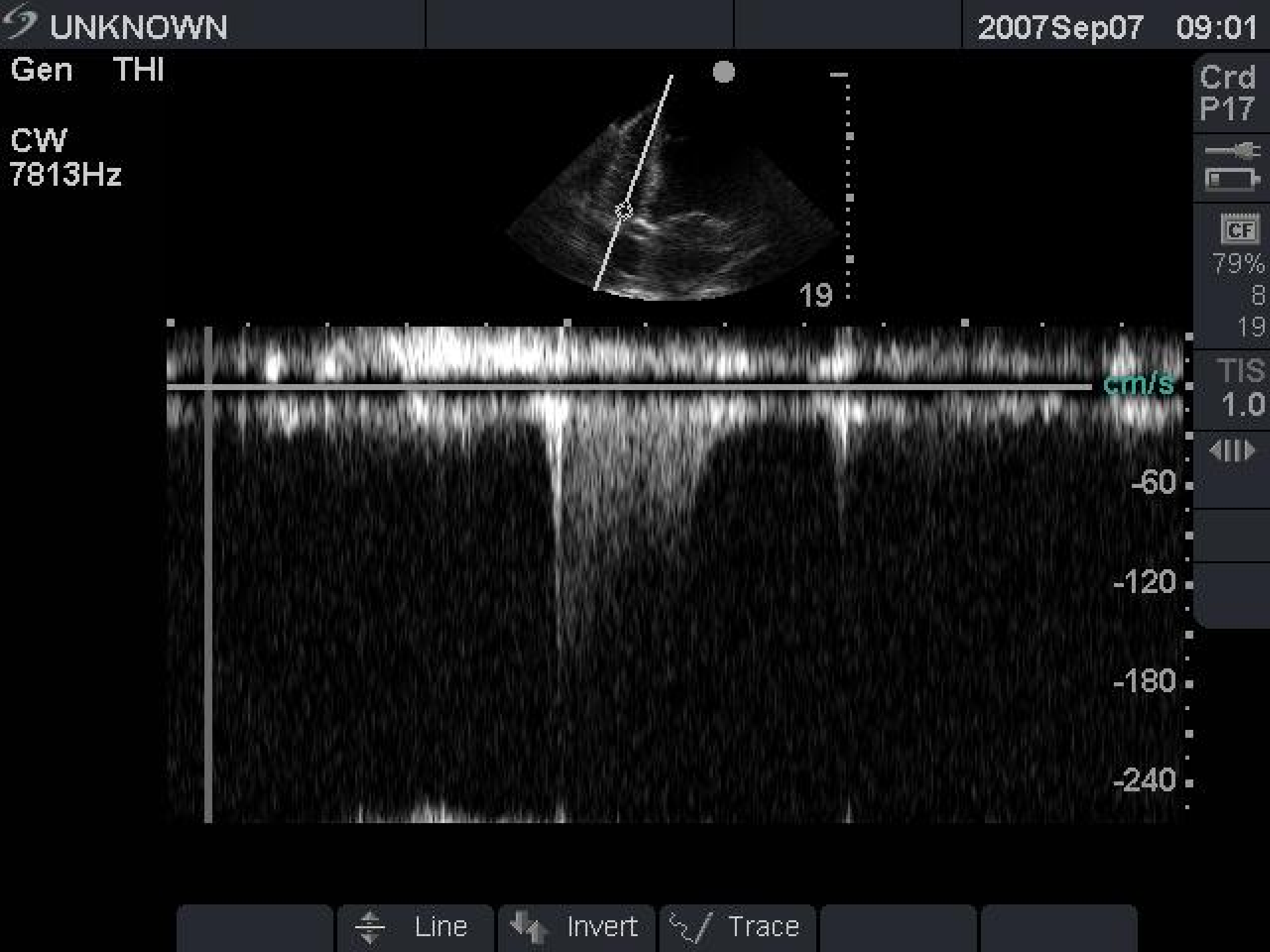
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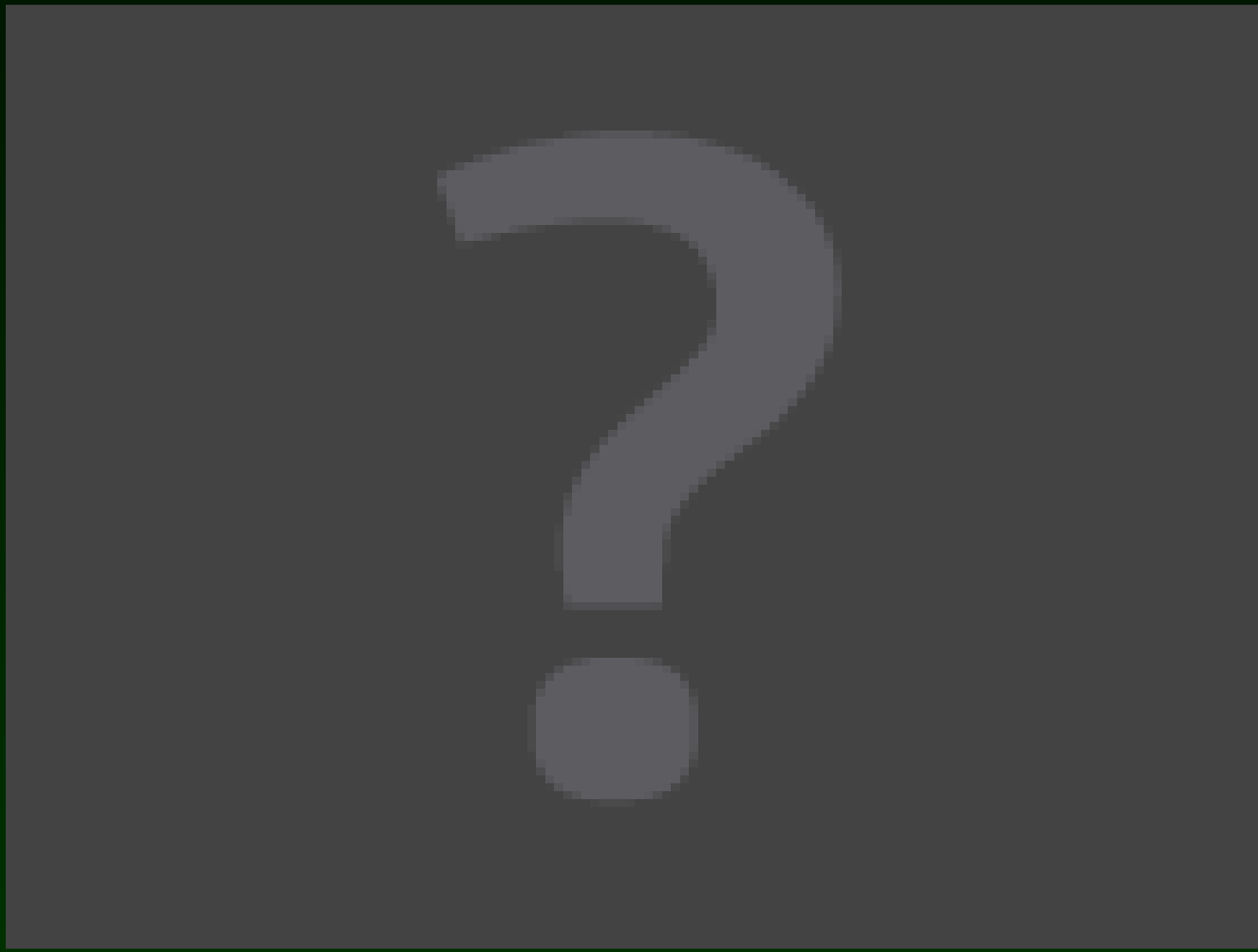

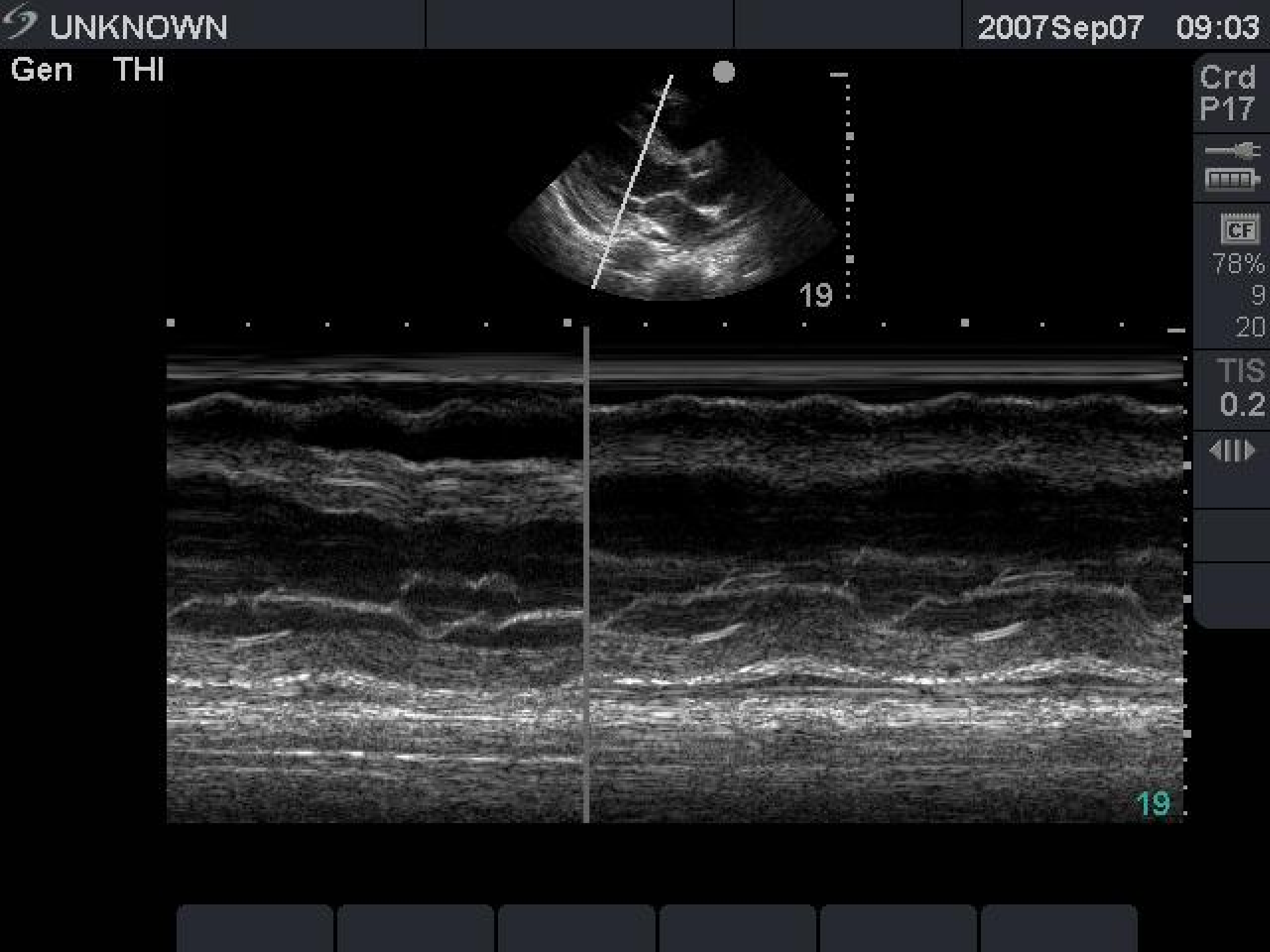
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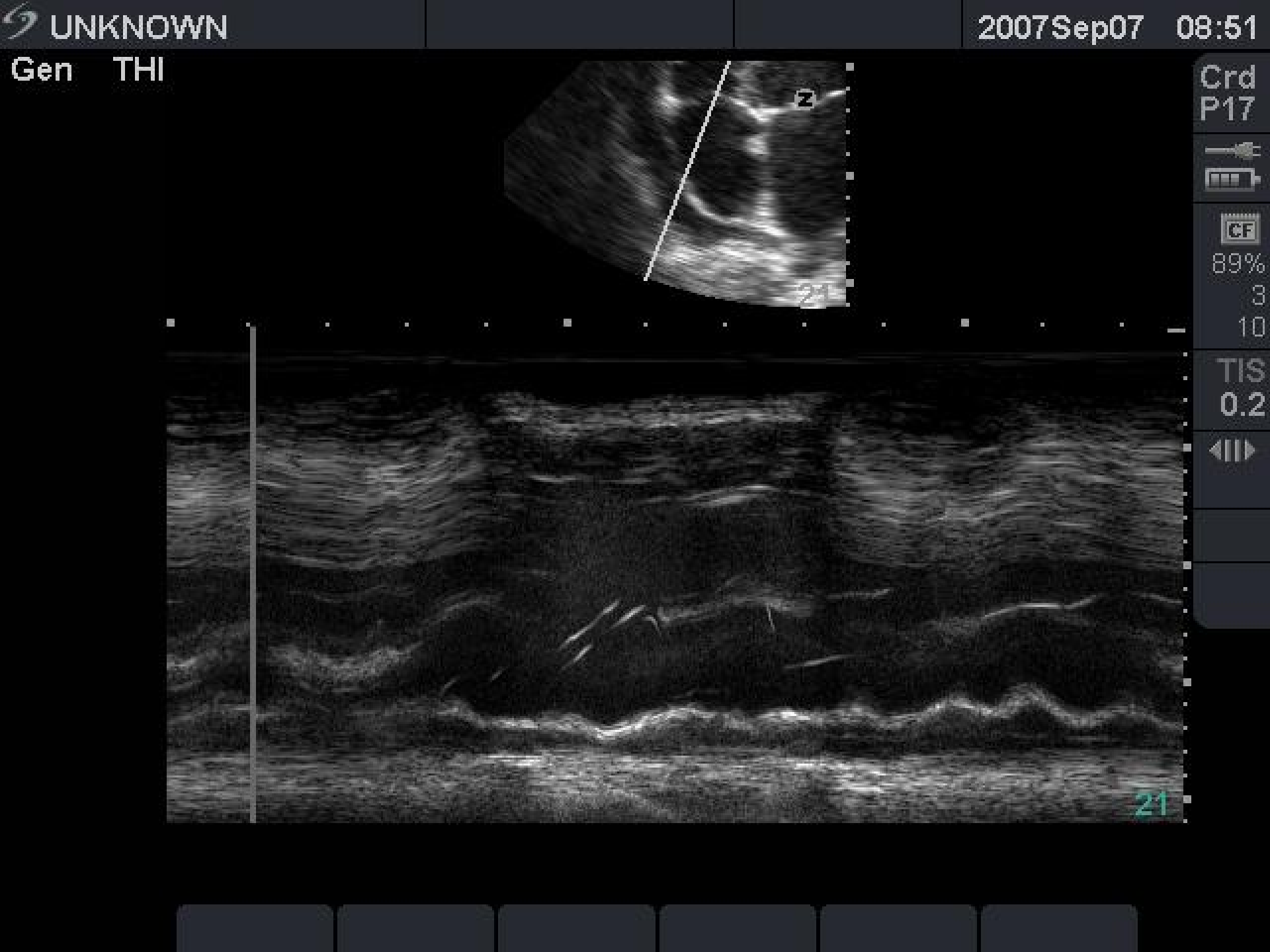
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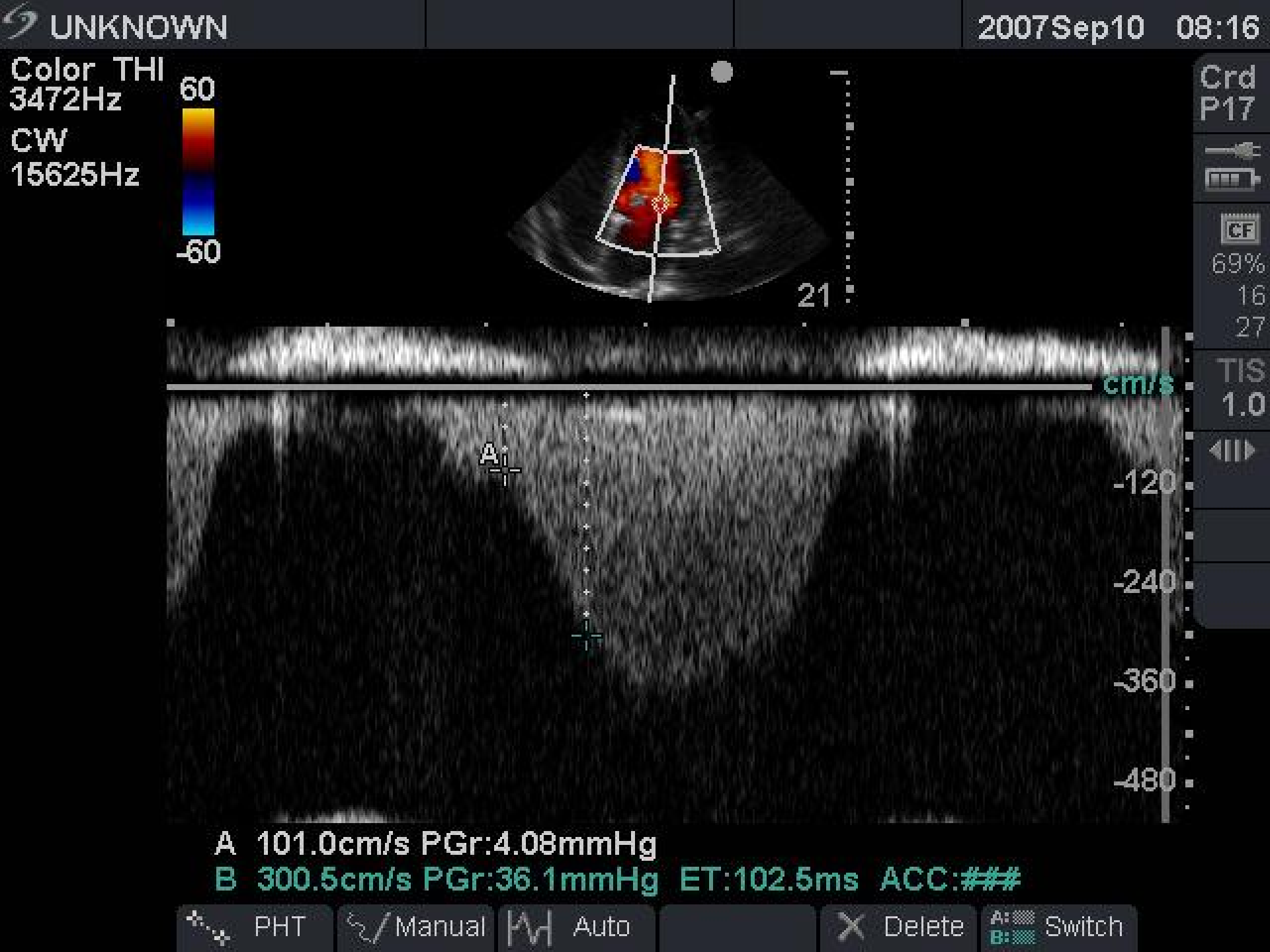
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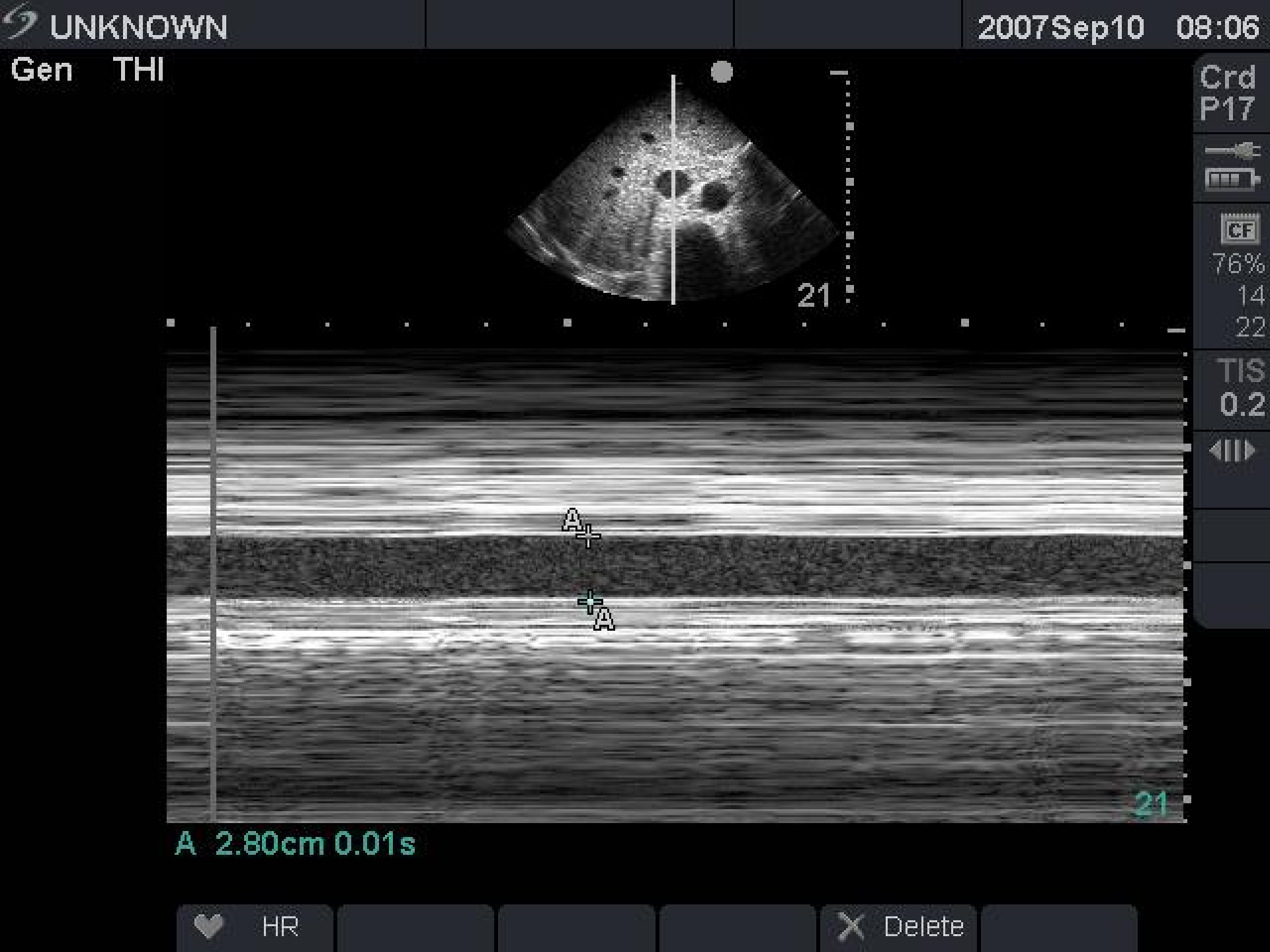
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