



Echocardiographic Innovations for transcatheter mitral valve procedures

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Disclosure Statement of Financial Interest

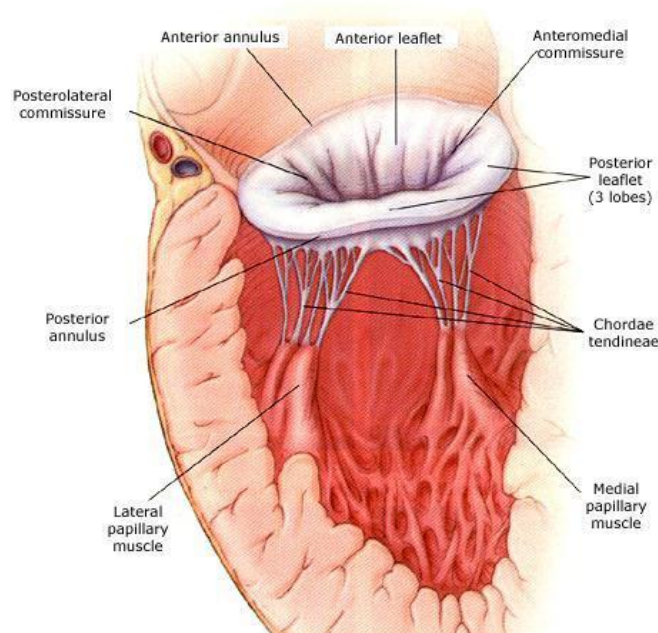
AC, received travel grants from Neochord, Inc., Harpoon Medical, Siemens

AC was proctoring for Neochord, Inc.



Mitral Valve

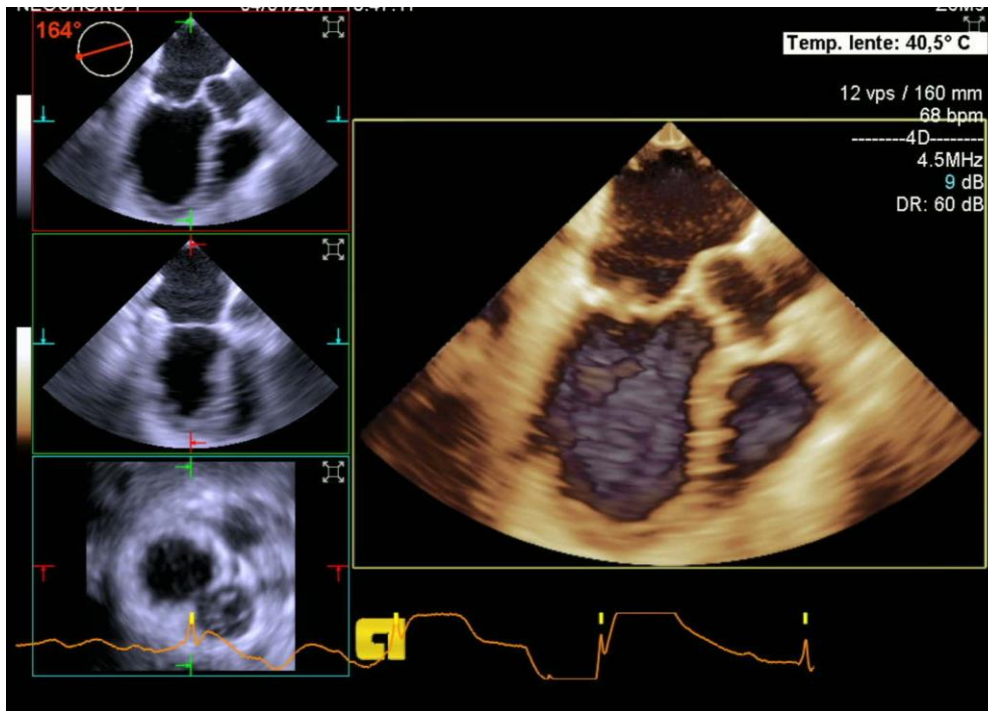
- The MV is a complex structure consisting of the mitral annulus, anterior and posterior leaflets, chordae tendineae, and the papillary muscles.
- A comprehensive understanding of normal mitral anatomy and its alteration in diseased states is fundamental





Mitral Valve

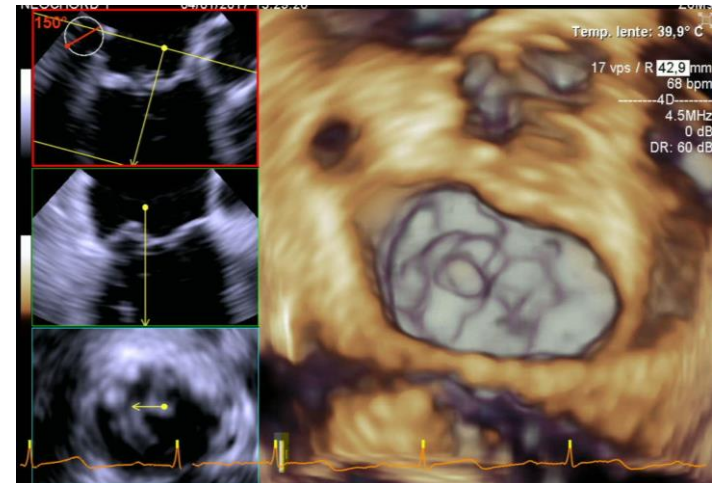
2D and 3D Echocardiography have played a central role in understanding the functional anatomy and dynamics of the MV complex in the normal state and various etiologies of MR including degenerative and functional.





Mitral Valve Imaging Evolution

2D and 3D Echocardiography today gained the central role of procedural guidance of all new Transcatheter/Interventional Mitral Valve procedures



Mitral Valve Transapical Procedures

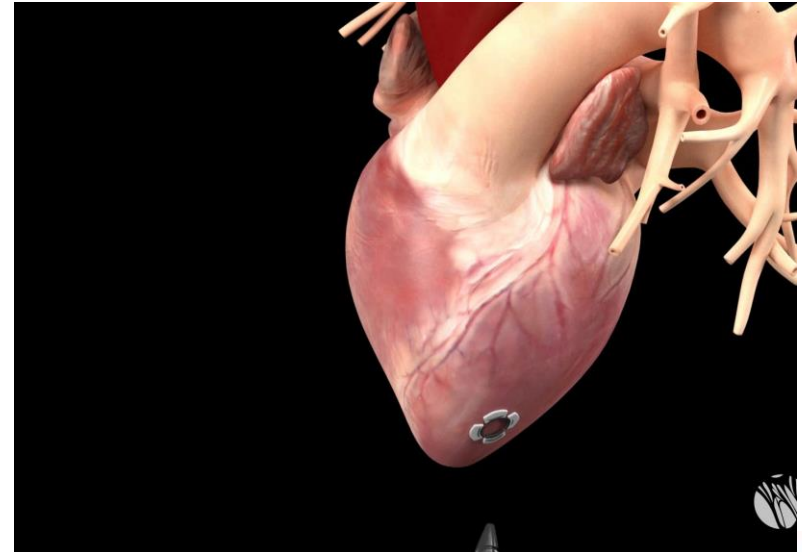
- Neochord Mitral Valve Repair Procedure
- Harpoon Mitral Valve Repair Procedure
- Amend Mitral Valve Annuloplasty Procedure
- TMVR Tiara





NeoChord procedure

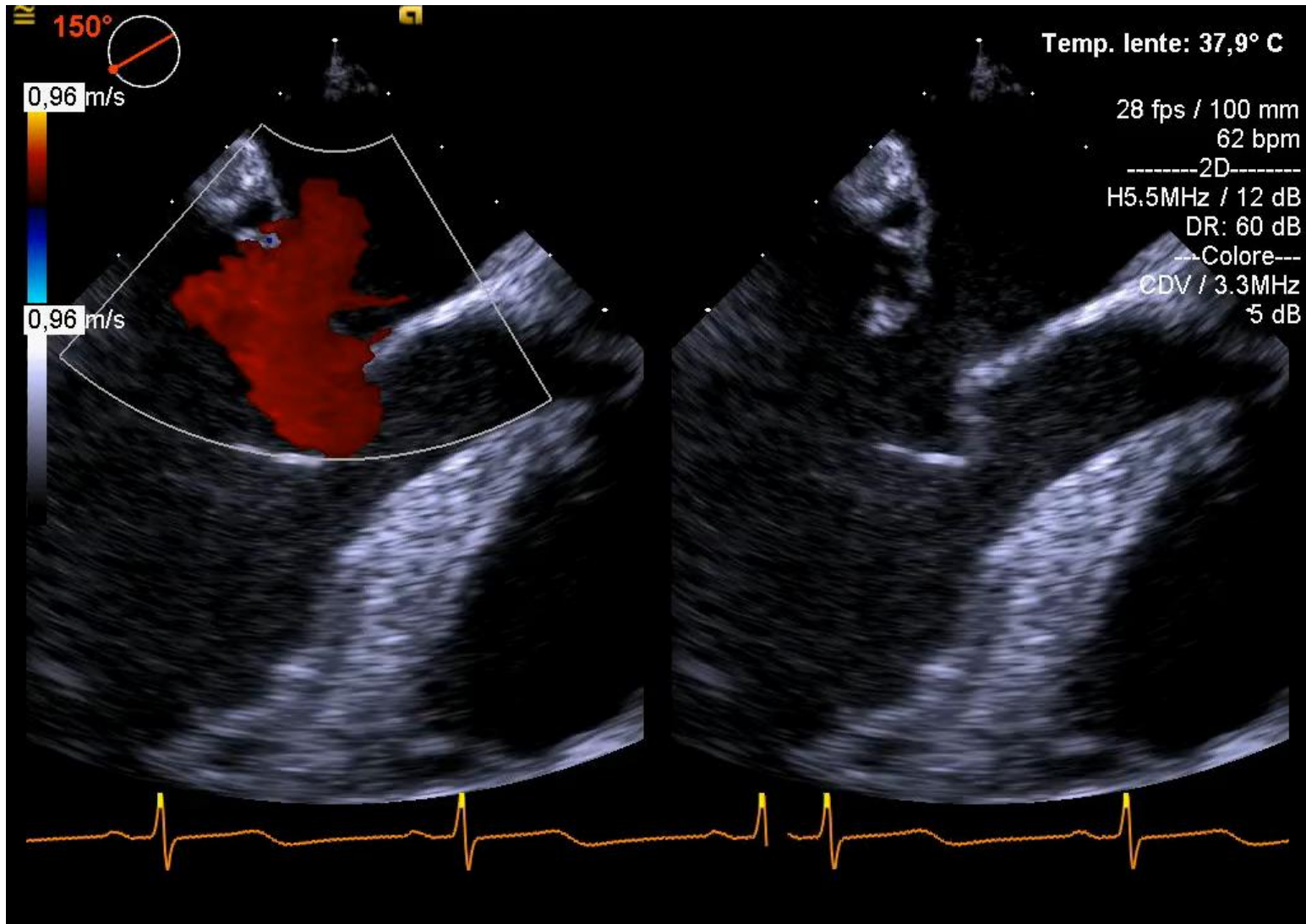
Transapical off-pump mitral valve repair with neochordae implantation (TOP-MINI), also known as **NeoChord Repair**, is a novel transcatheter ECHO-GUIDED procedure to treat patients suffering from severe symptomatic Degenerative MR.





NeoChord Repair

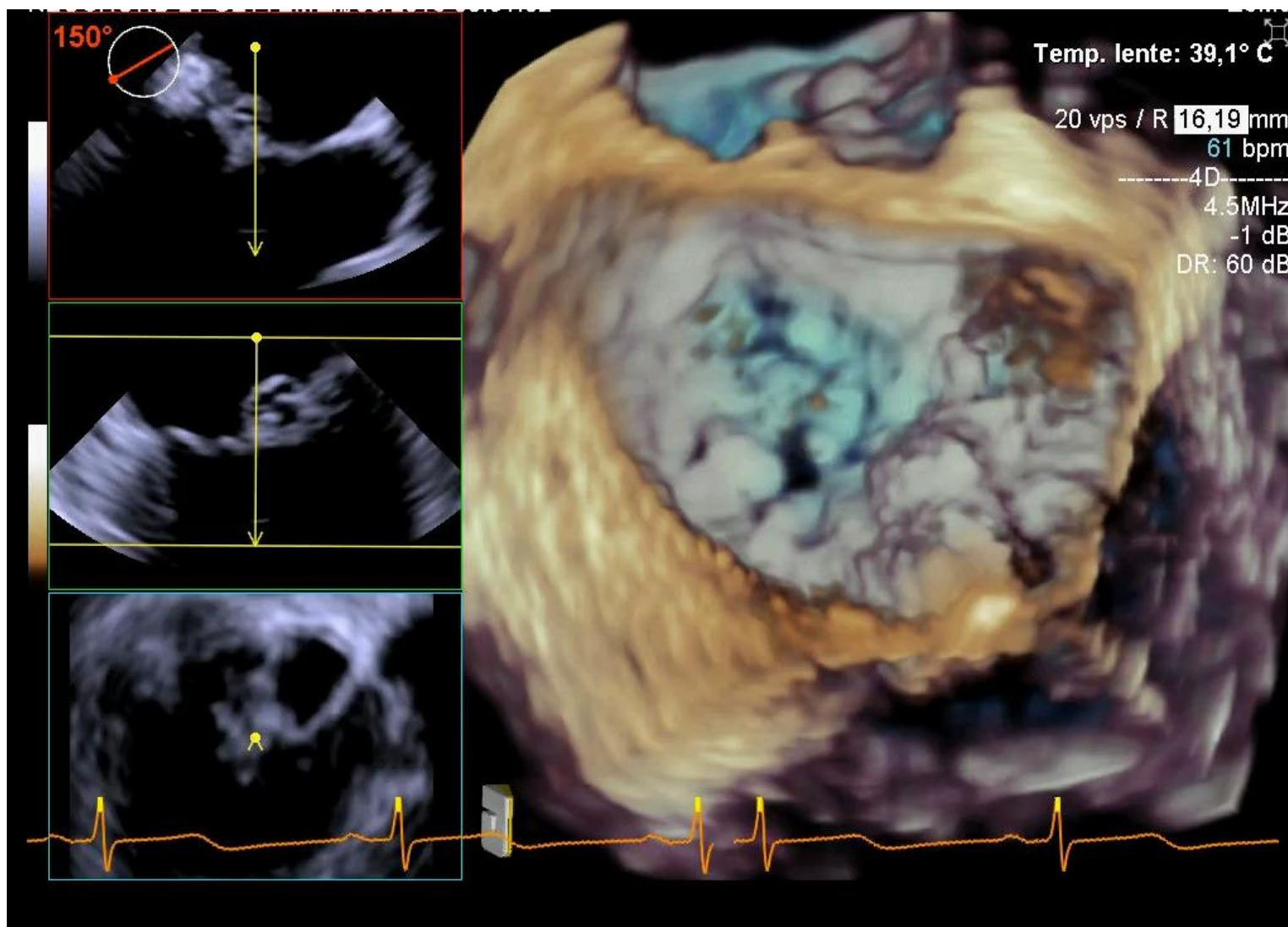
2D TEE Pre Procedure MV assessment





NeoChord Repair

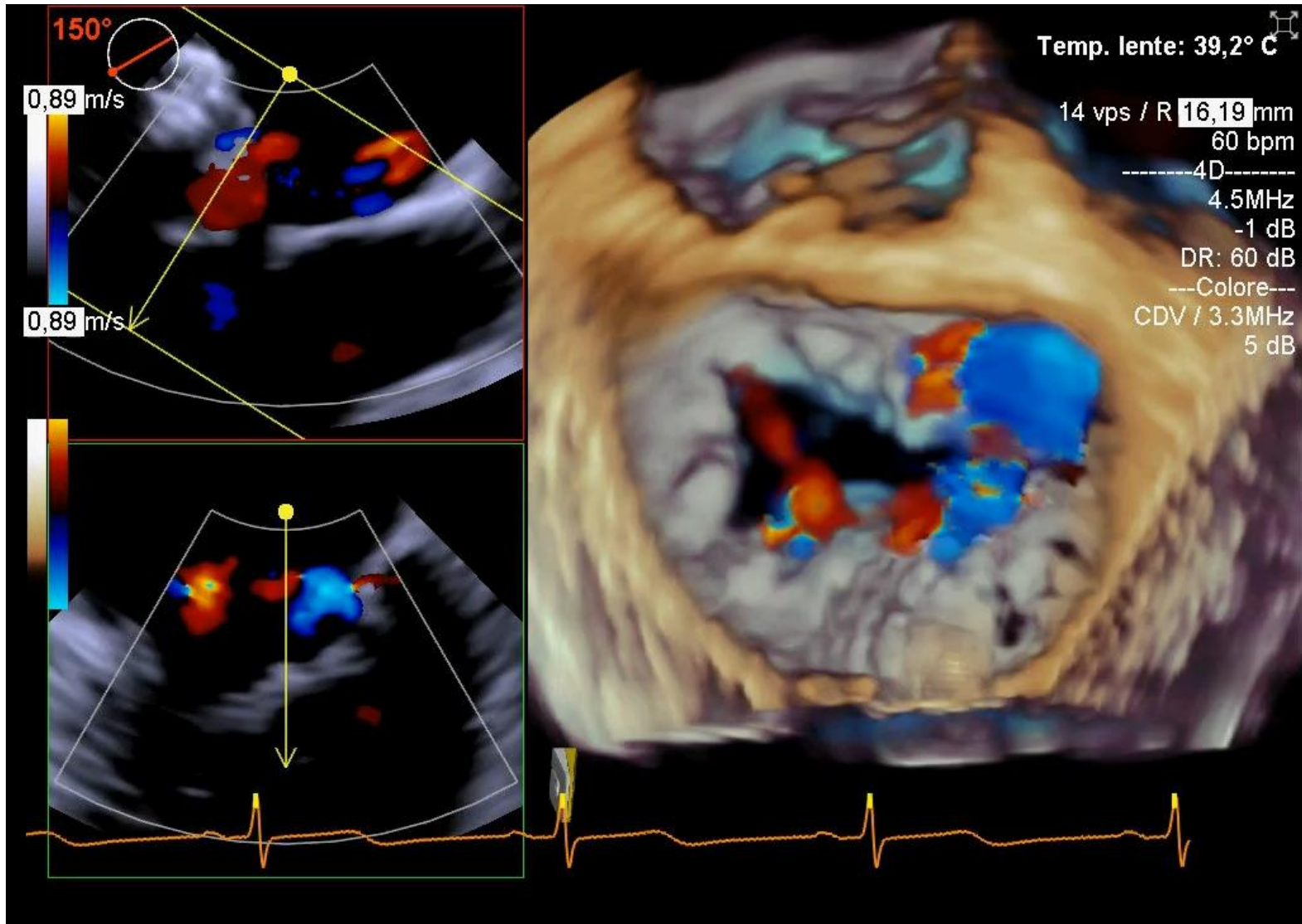
3D TEE Pre Procedure MV assessment





NeoChord Repair

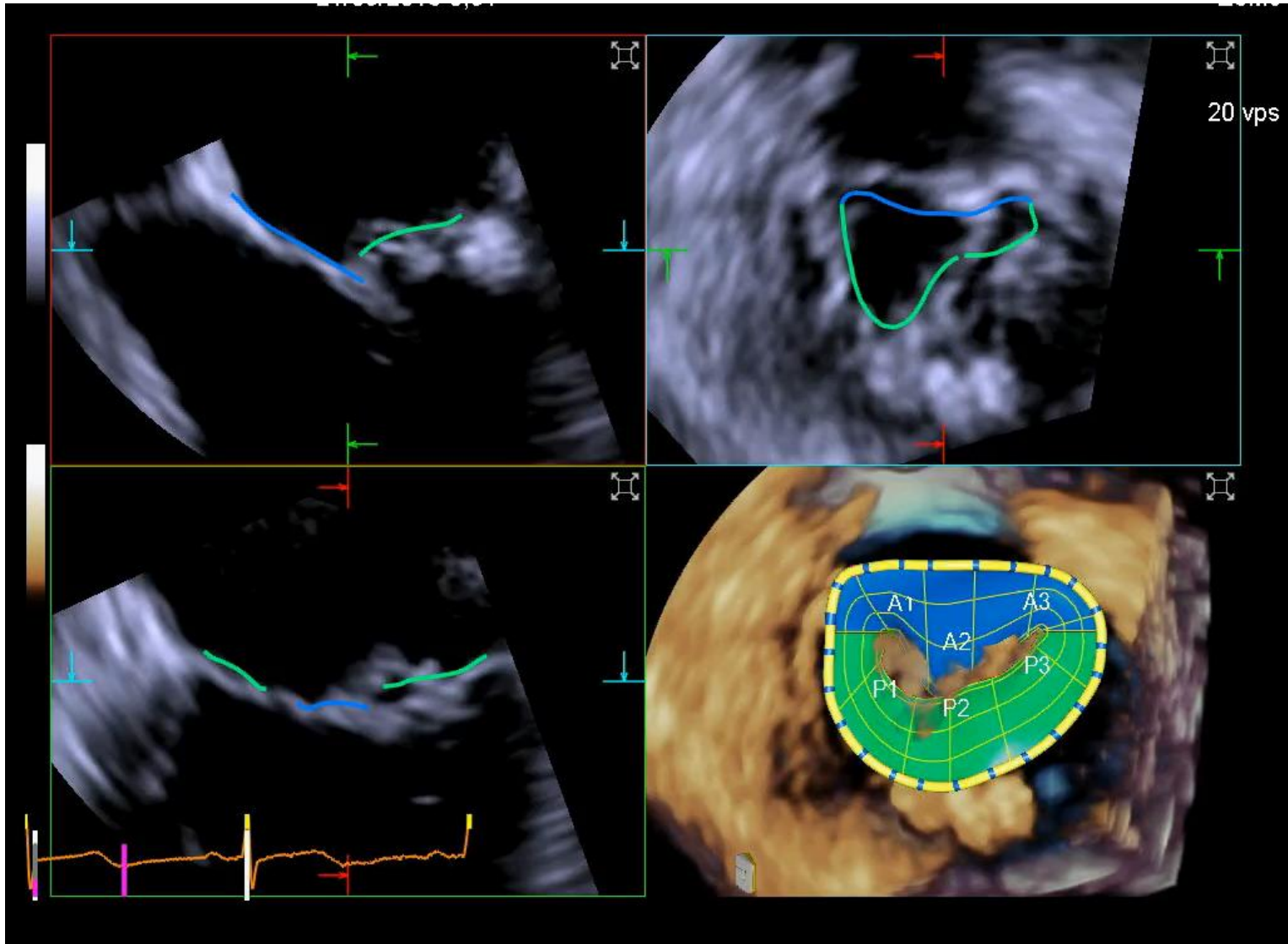
3D color doppler Pre Procedure MV assessment





NeoChord Repair

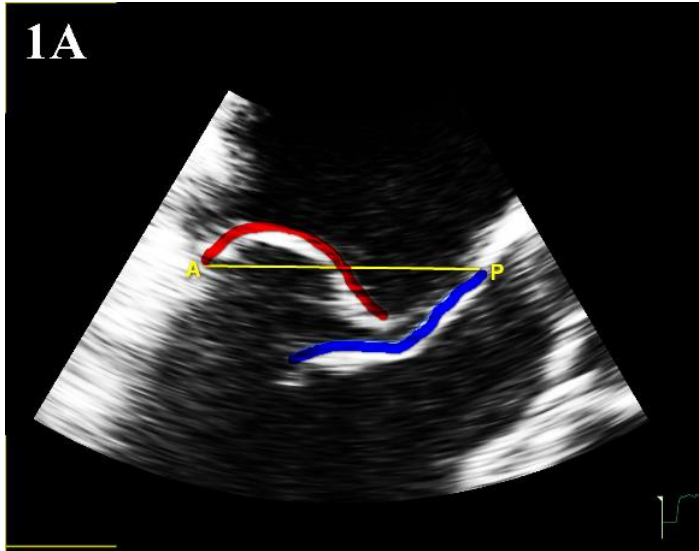
Pre Procedure MV assessment eValve modelling



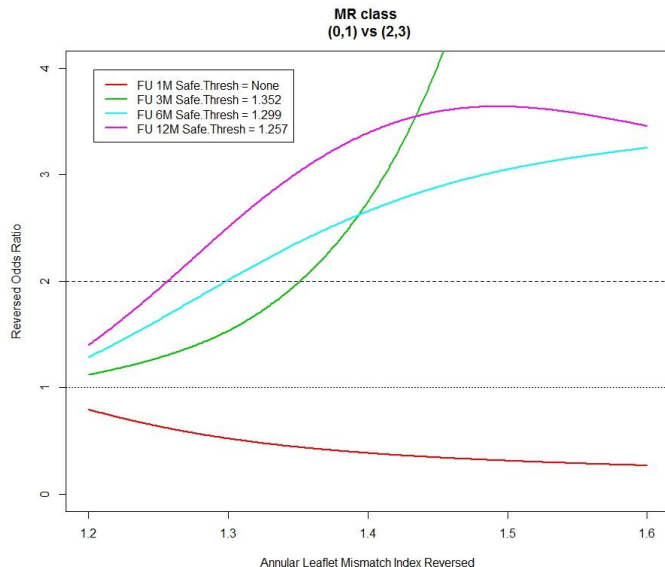


NeoChord Repair

Leaflet-to-Annulus Index (LAI)



$$\frac{PML + AML}{AP}$$



LAI Index >1.25 showed to be positive predictor of MR ≤ Mild at 1y FU



NeoChord Repair

Left antero-lateral mini-thoracotomy and Finger Test

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NeoChord Repair

Apical purse strings

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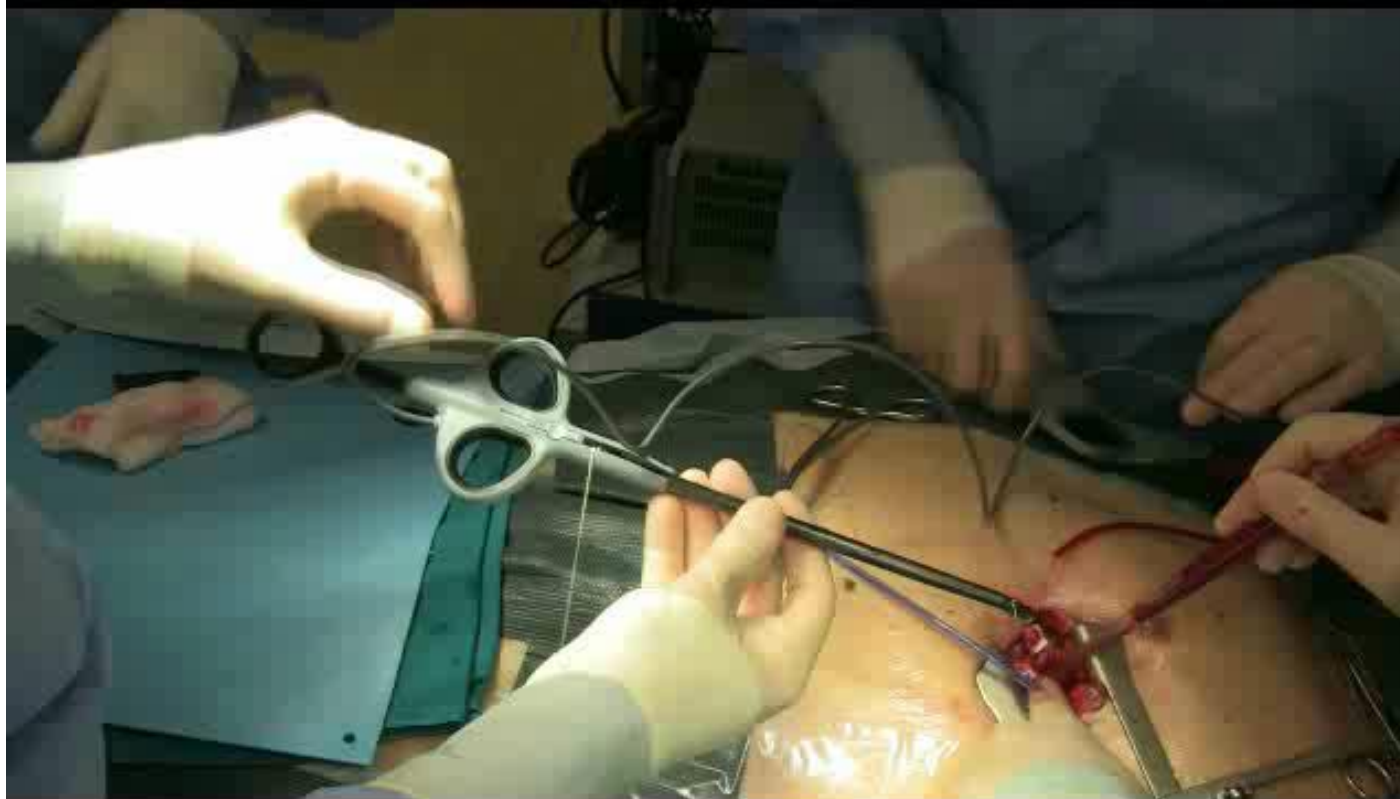




NeoChord Repair

Transapical device insertion

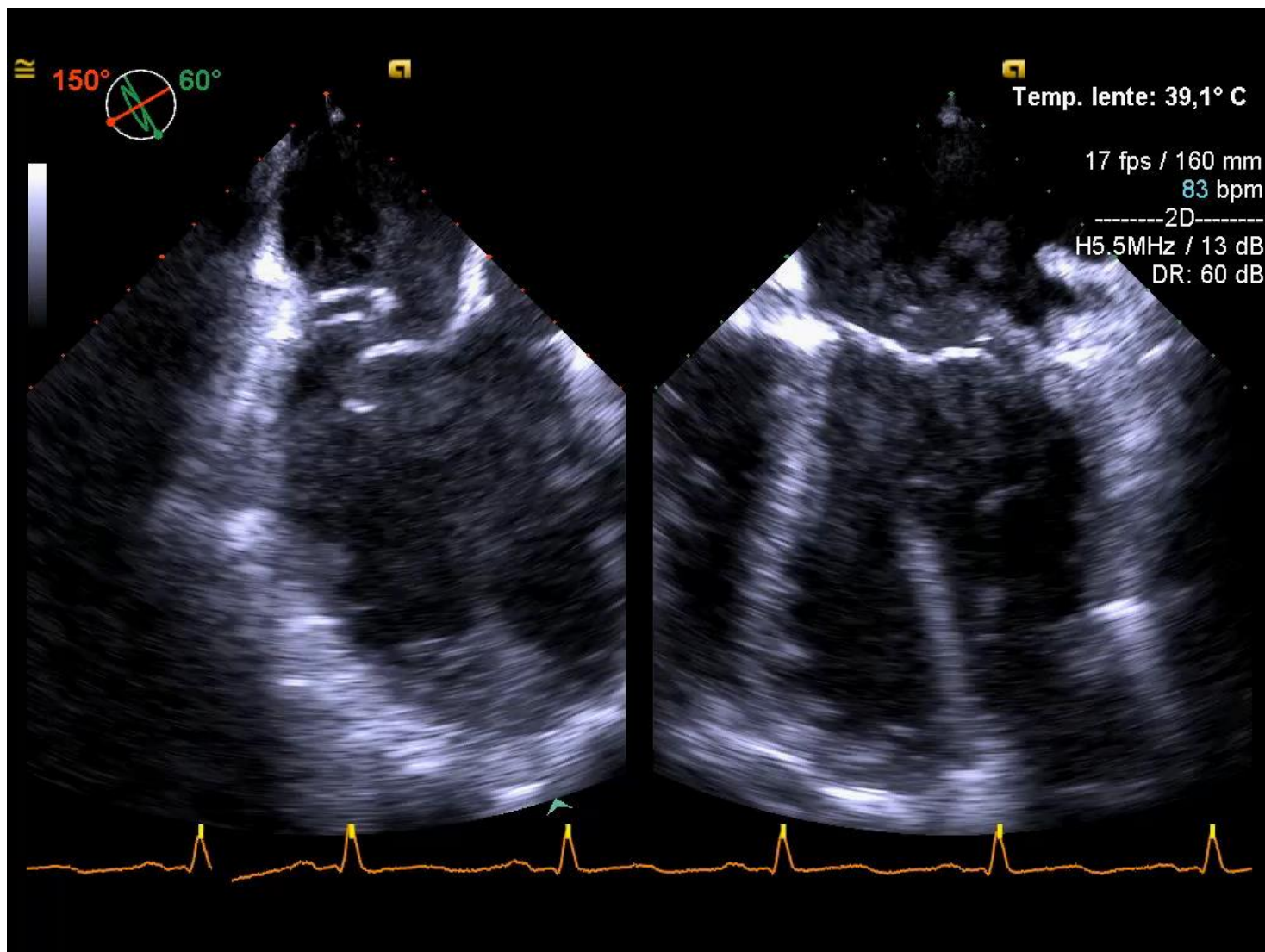
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NeoChord Repair

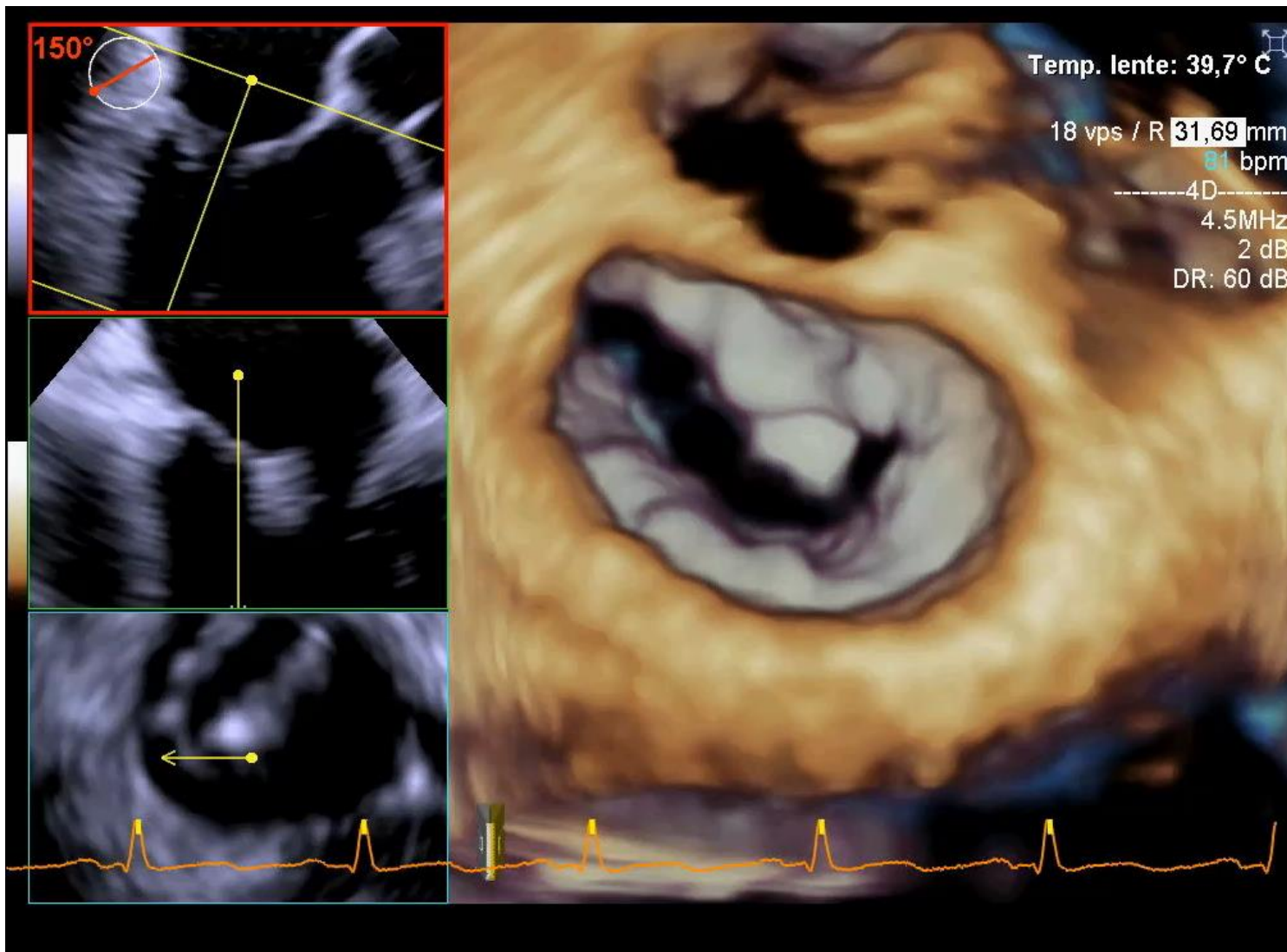
Intraventricular navigation on 2D-TEE





NeoChord Repair

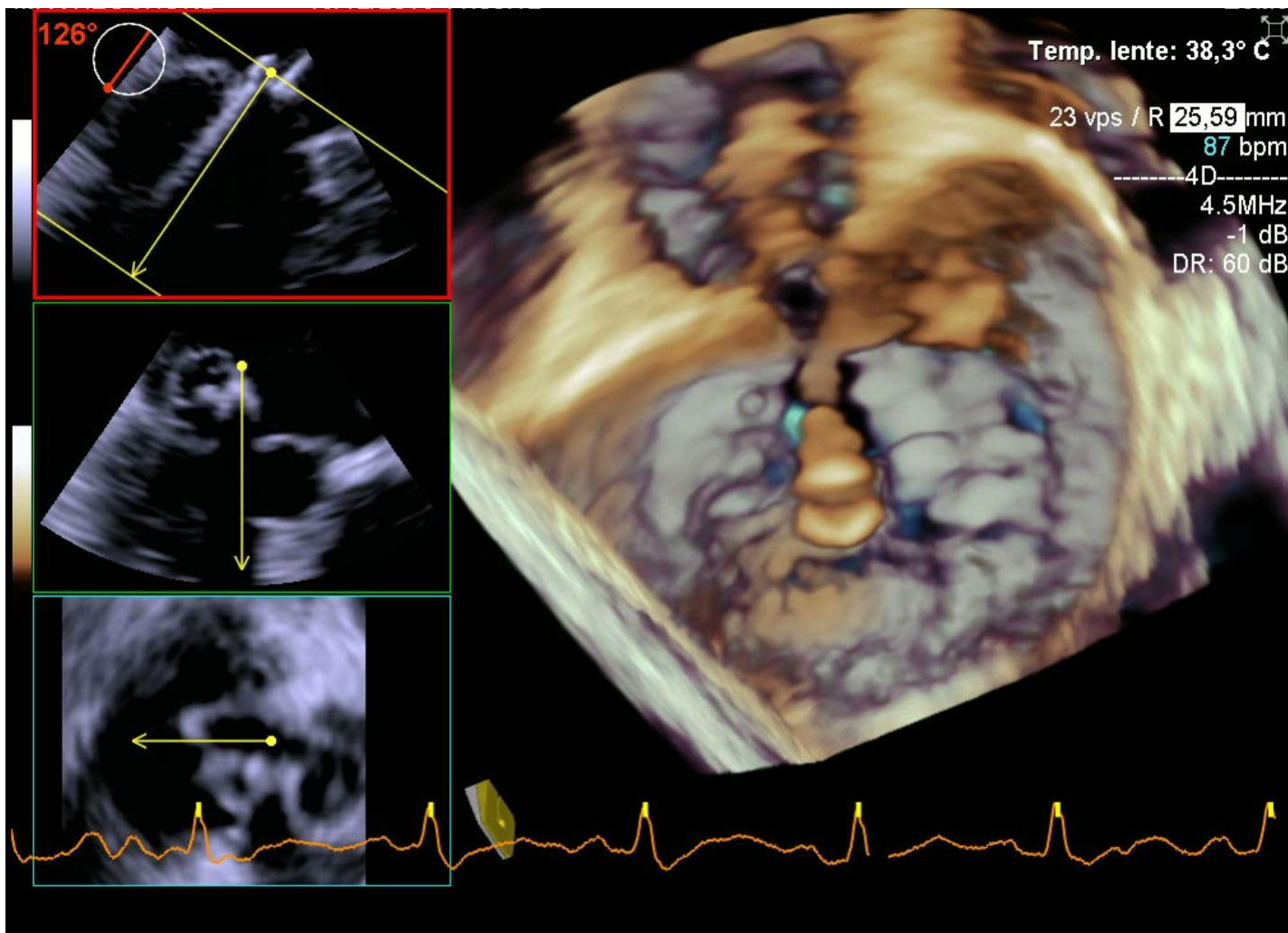
Intraventricular navigation on 2D-TEE





NeoChord Repair

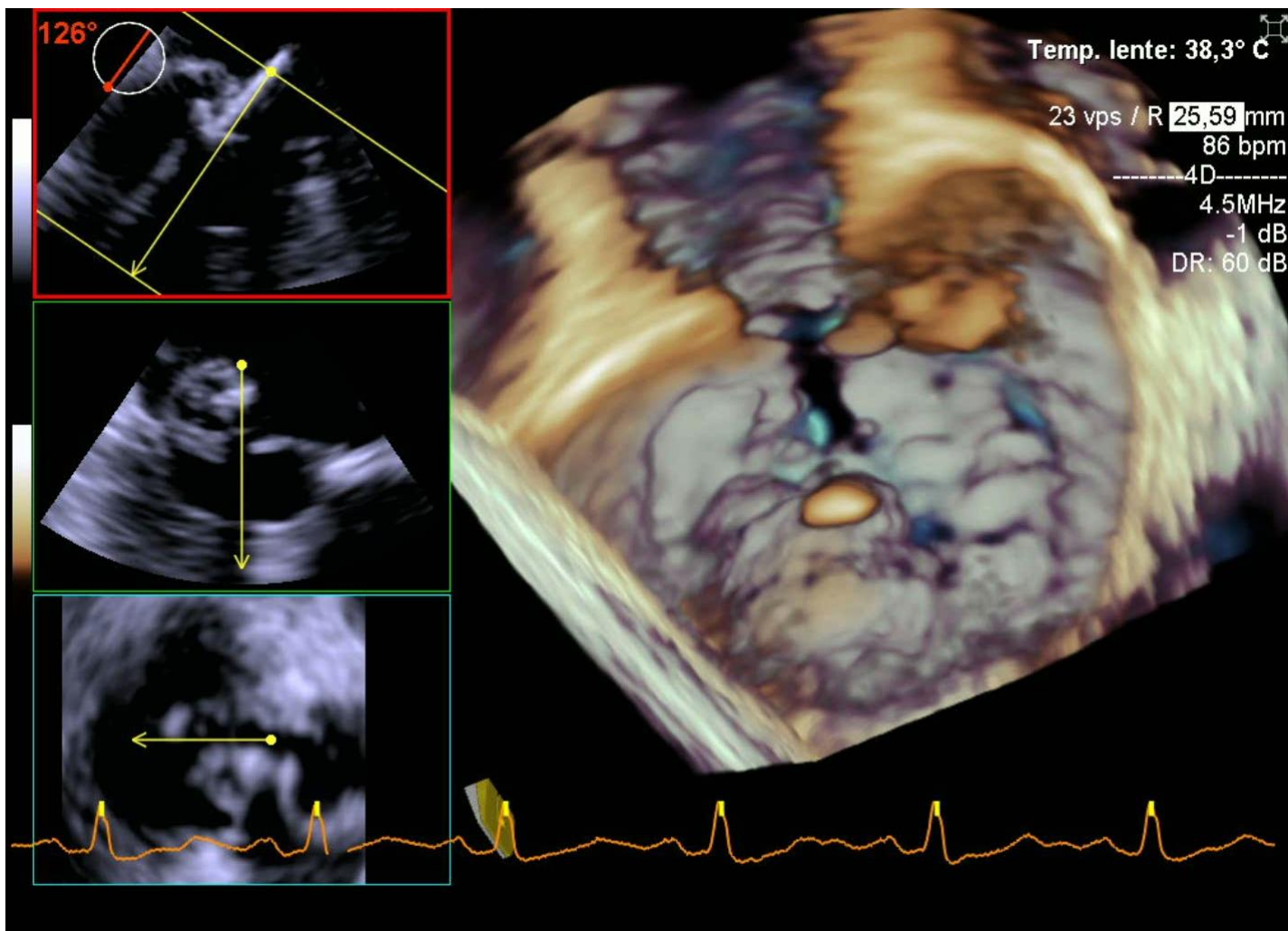
Atrial navigation on 3D-TEE and
Leaflet grasping





NeoChord Repair

Leaflet Grasping on 3D-TEE





NeoChord Repair

Leaflet Grasping on 3D-TEE

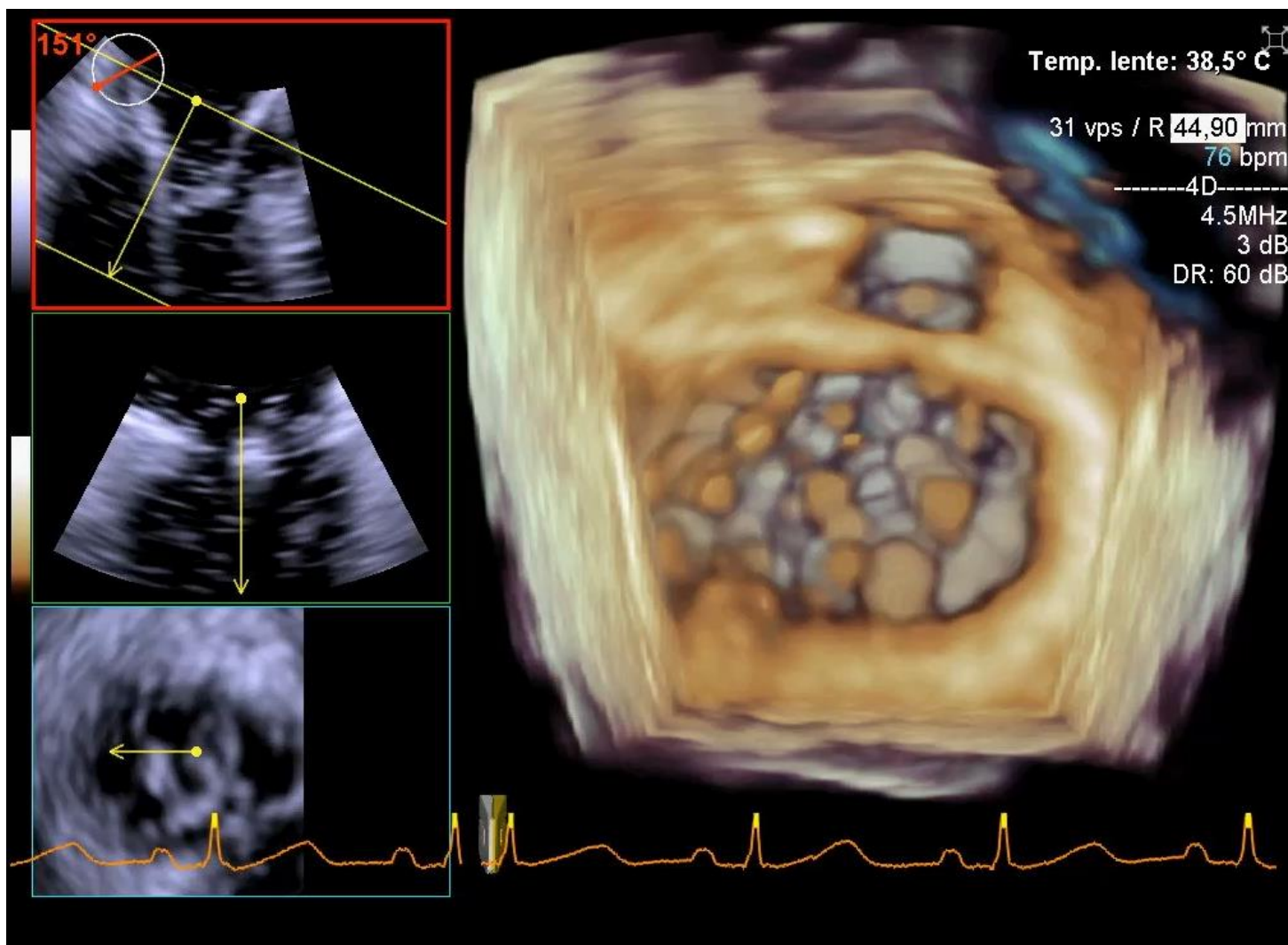
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NeoChord Repair

Leaflet puncture

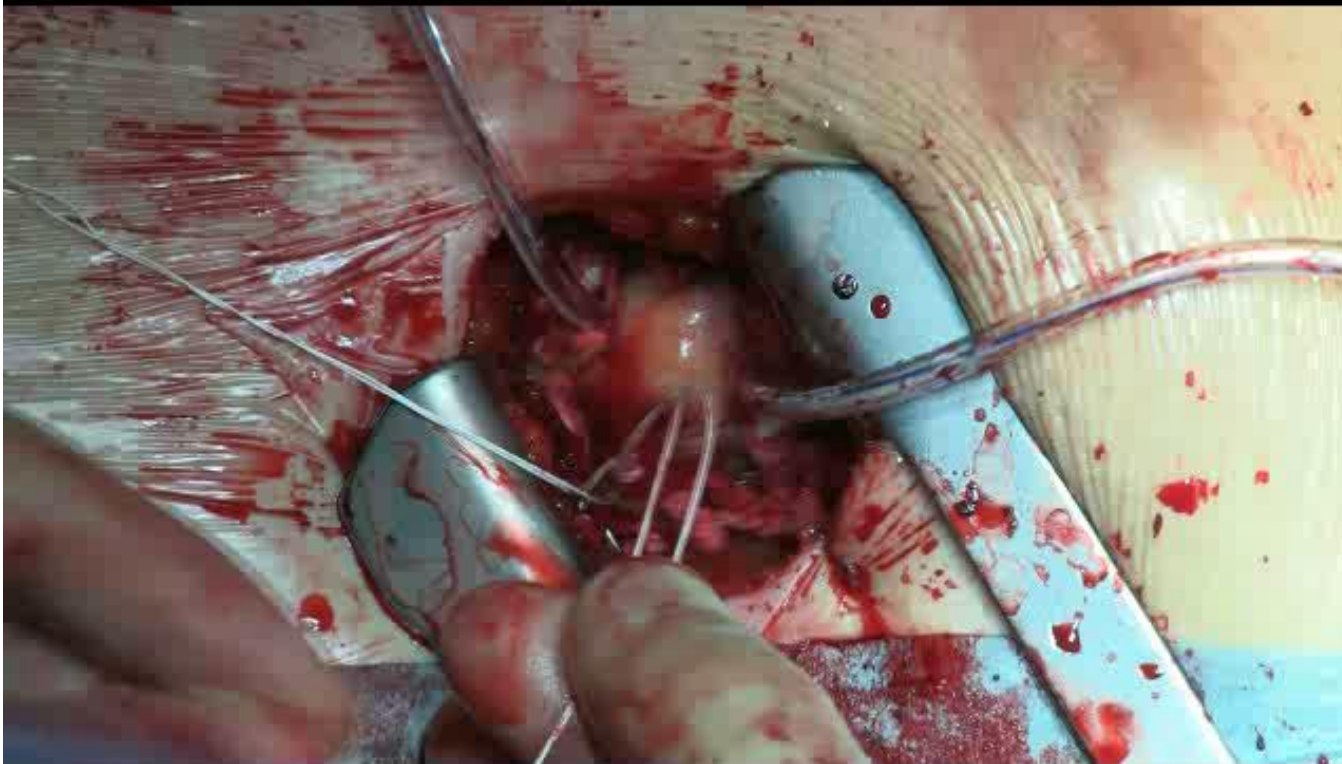




NeoChord Repair

Formation of half-hitch knot on the leaflet
after chord deployment

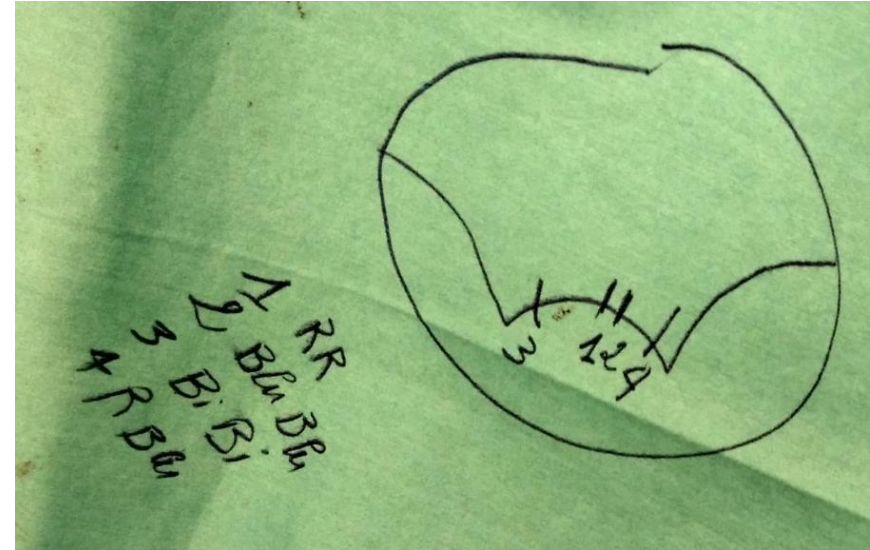
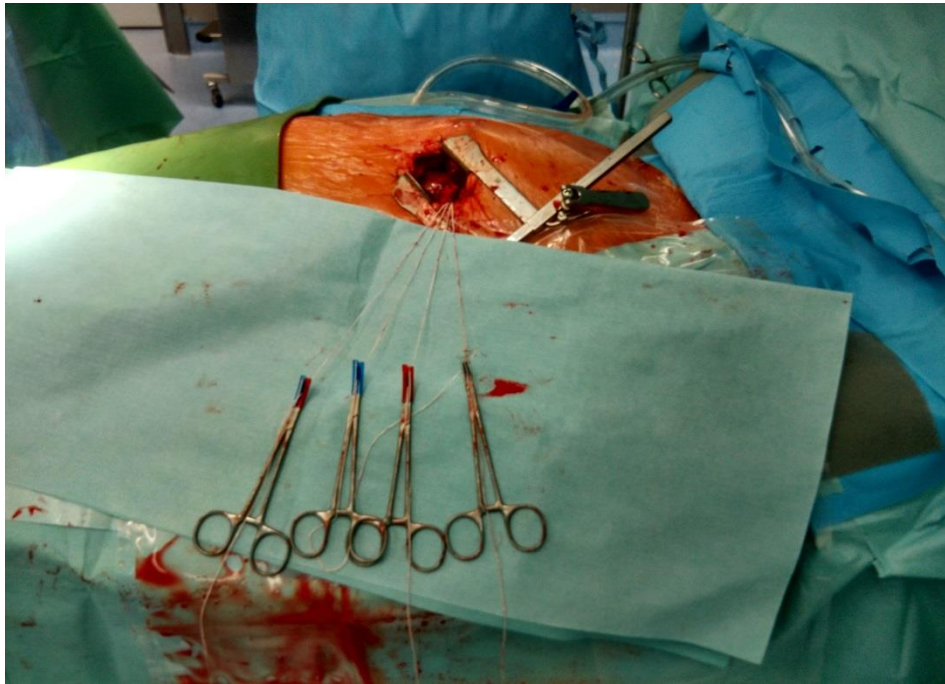
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NeoChord Repair

Neochord tensioning





NeoChord Repair

Neochord manual tensioning

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NeoChord Repair

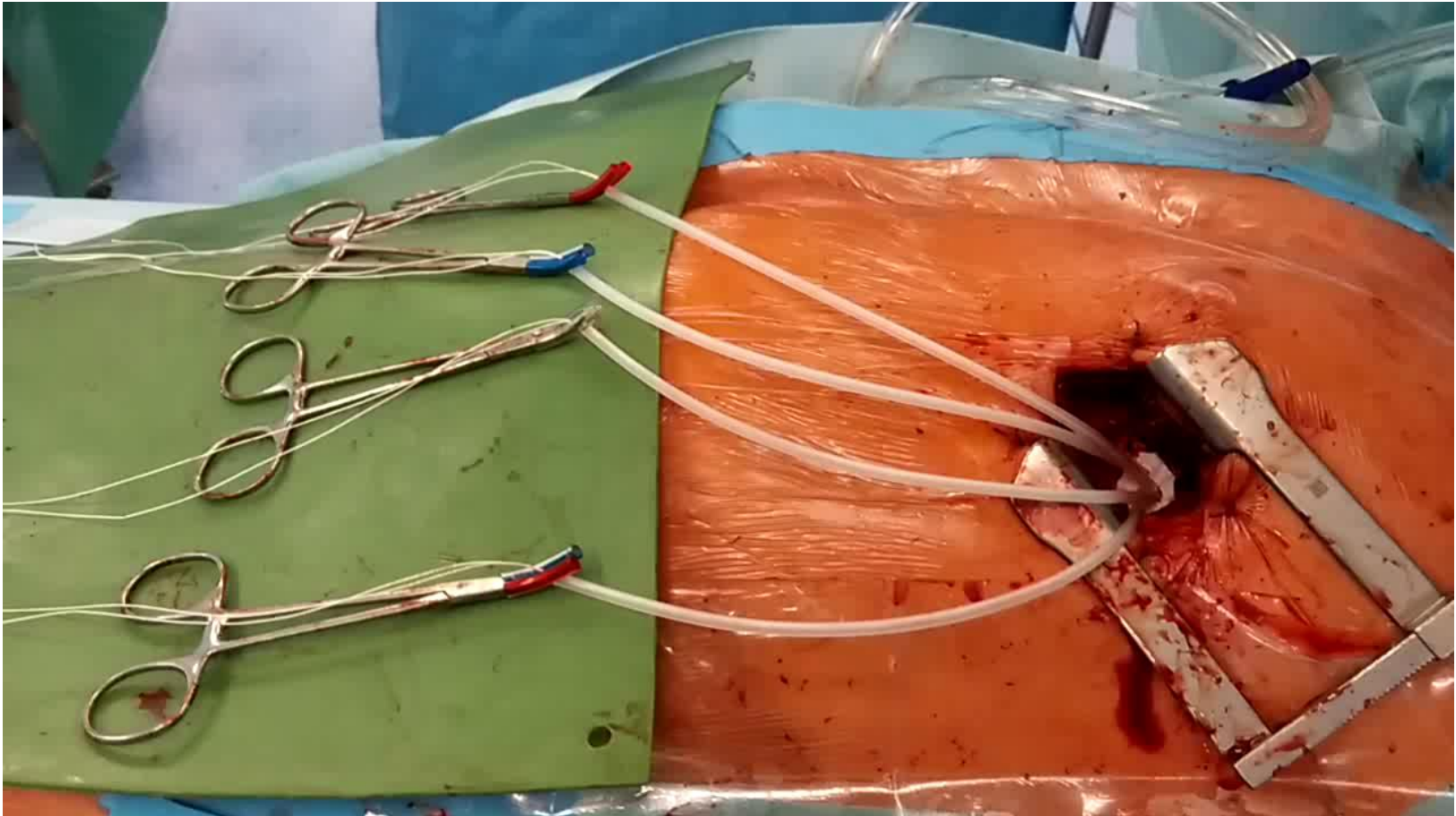
Acute assessment of MV function with REAL TIME 3D-Color Doppler TEE





NeoChord Repair

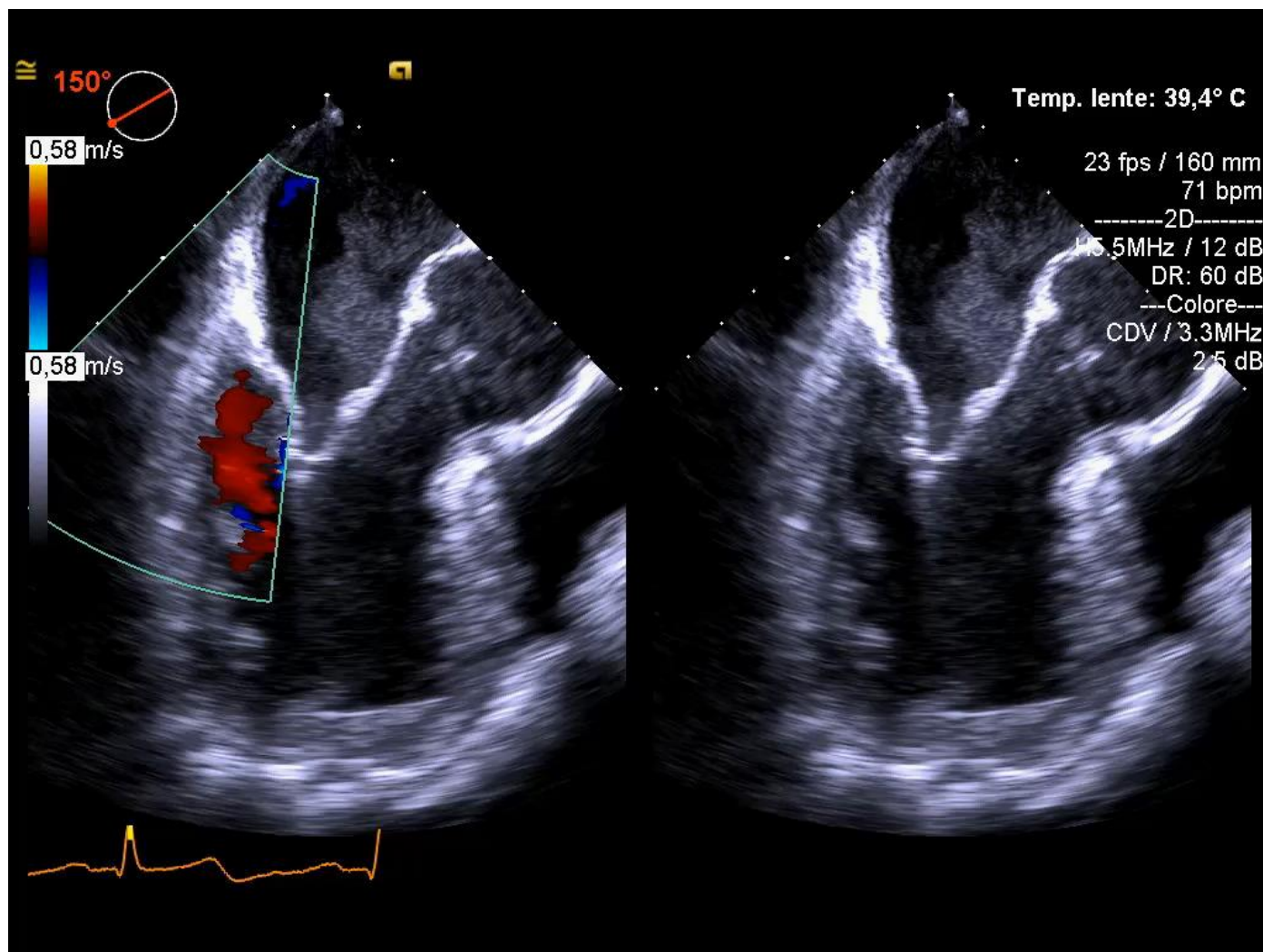
Neochord tourniquet tensioning





NeoChord Repair

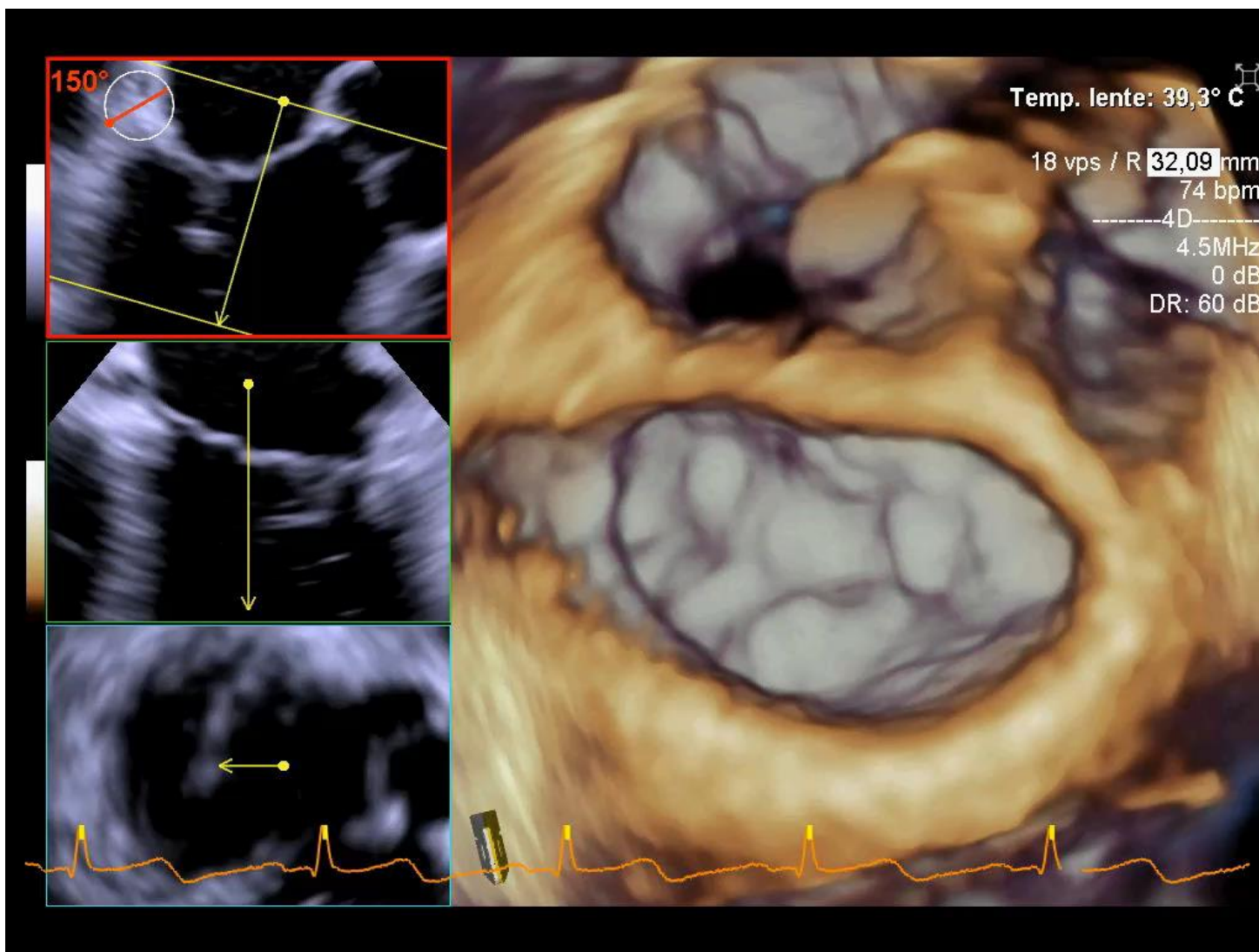
Final assessment of MV function with 2D-TEE





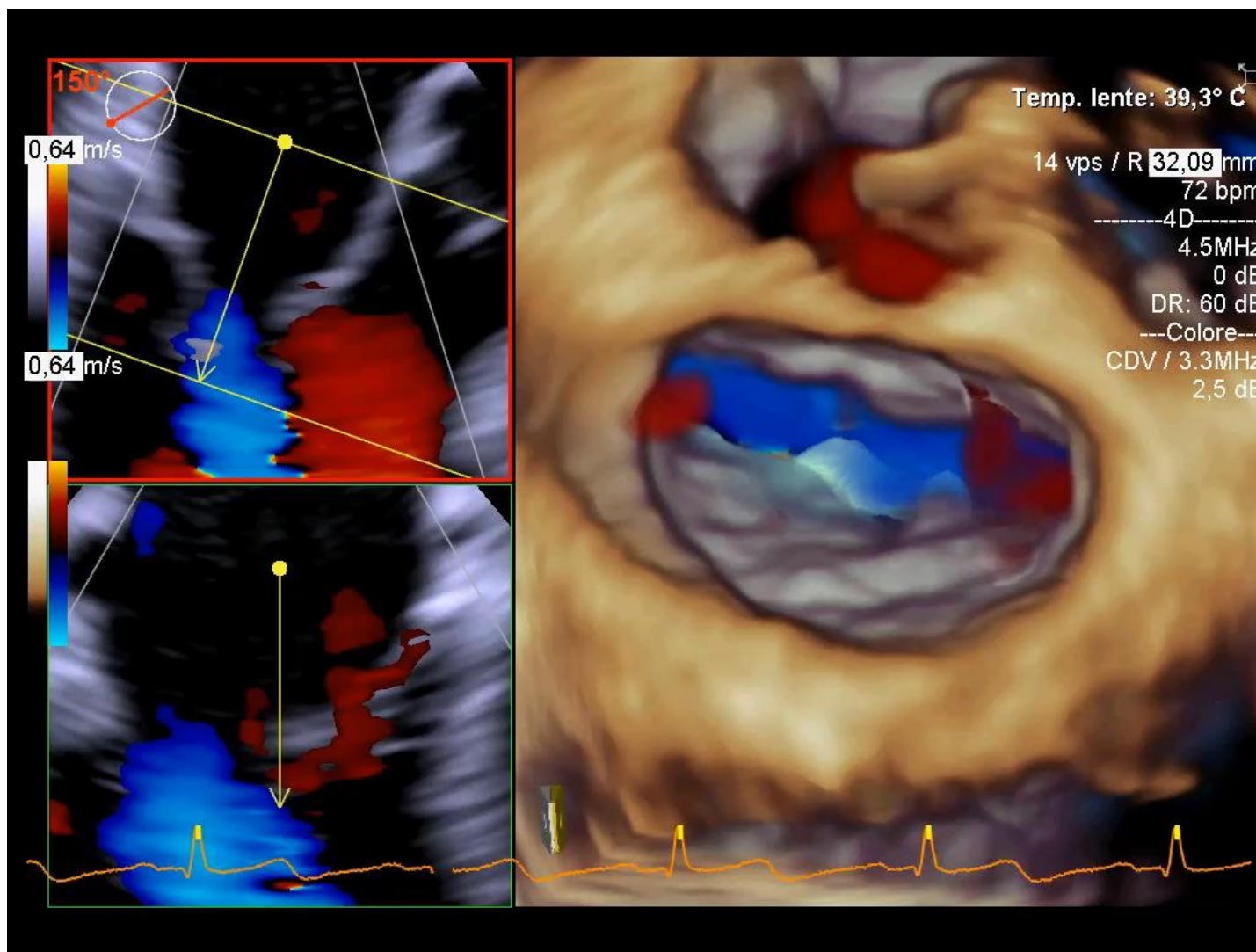
NeoChord Repair

Final assessment of MV function with 3D-TEE



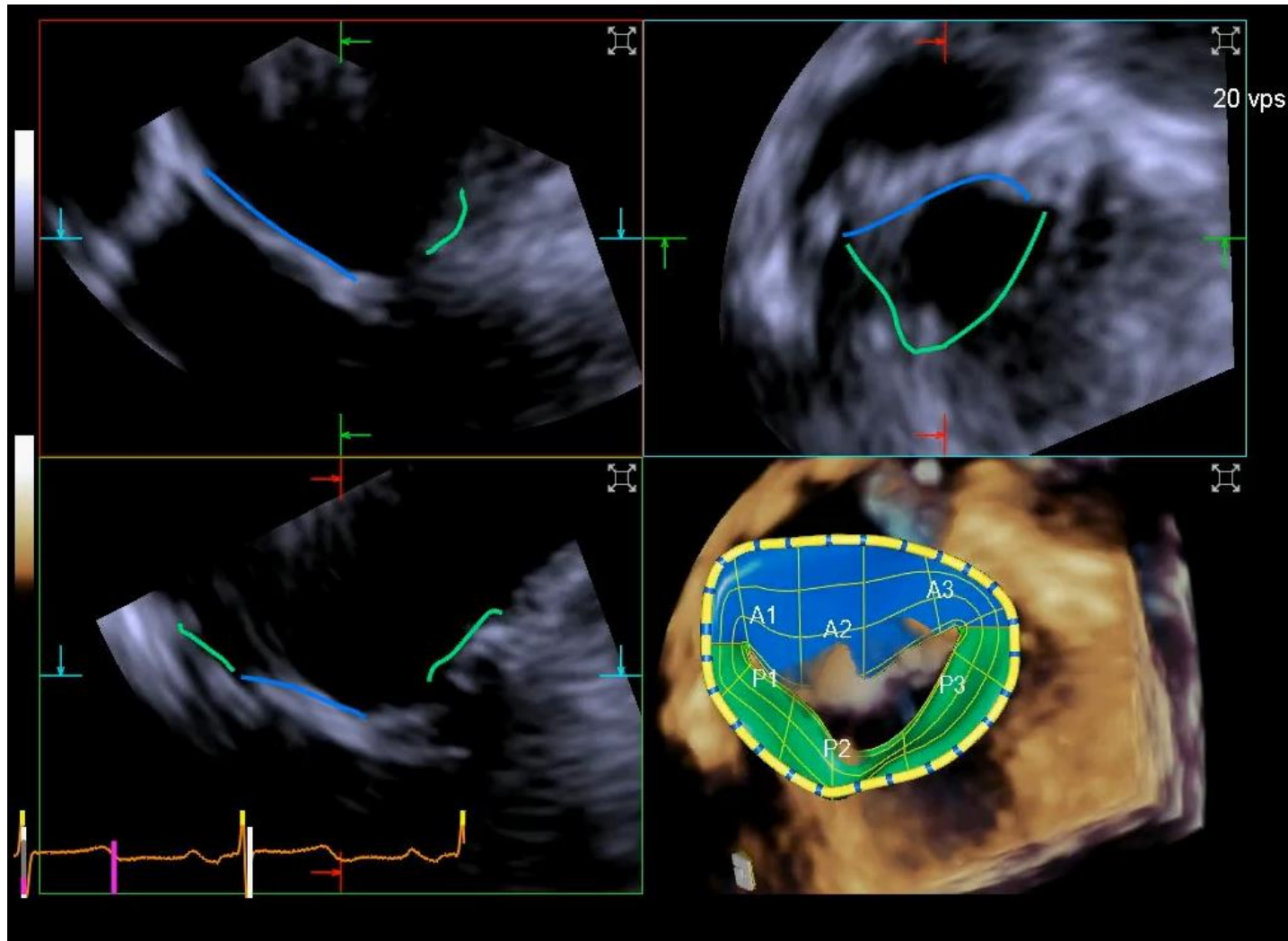
NeoChord Repair

Final assessment of MV function with 3D-TEE



NeoChord Repair

Final assessment of MV function with 3D-TEE

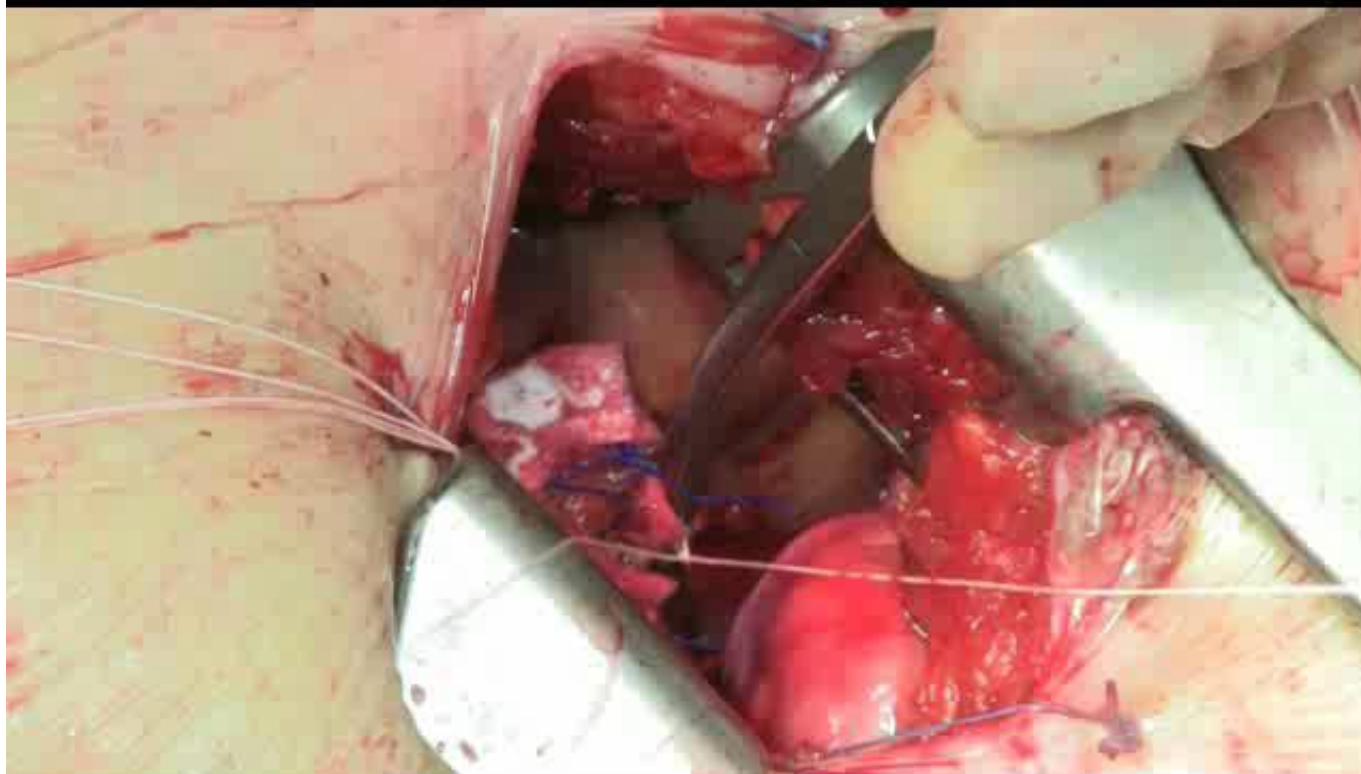




NeoChord Repair

Anchoring of the NeoChords on the epicardium

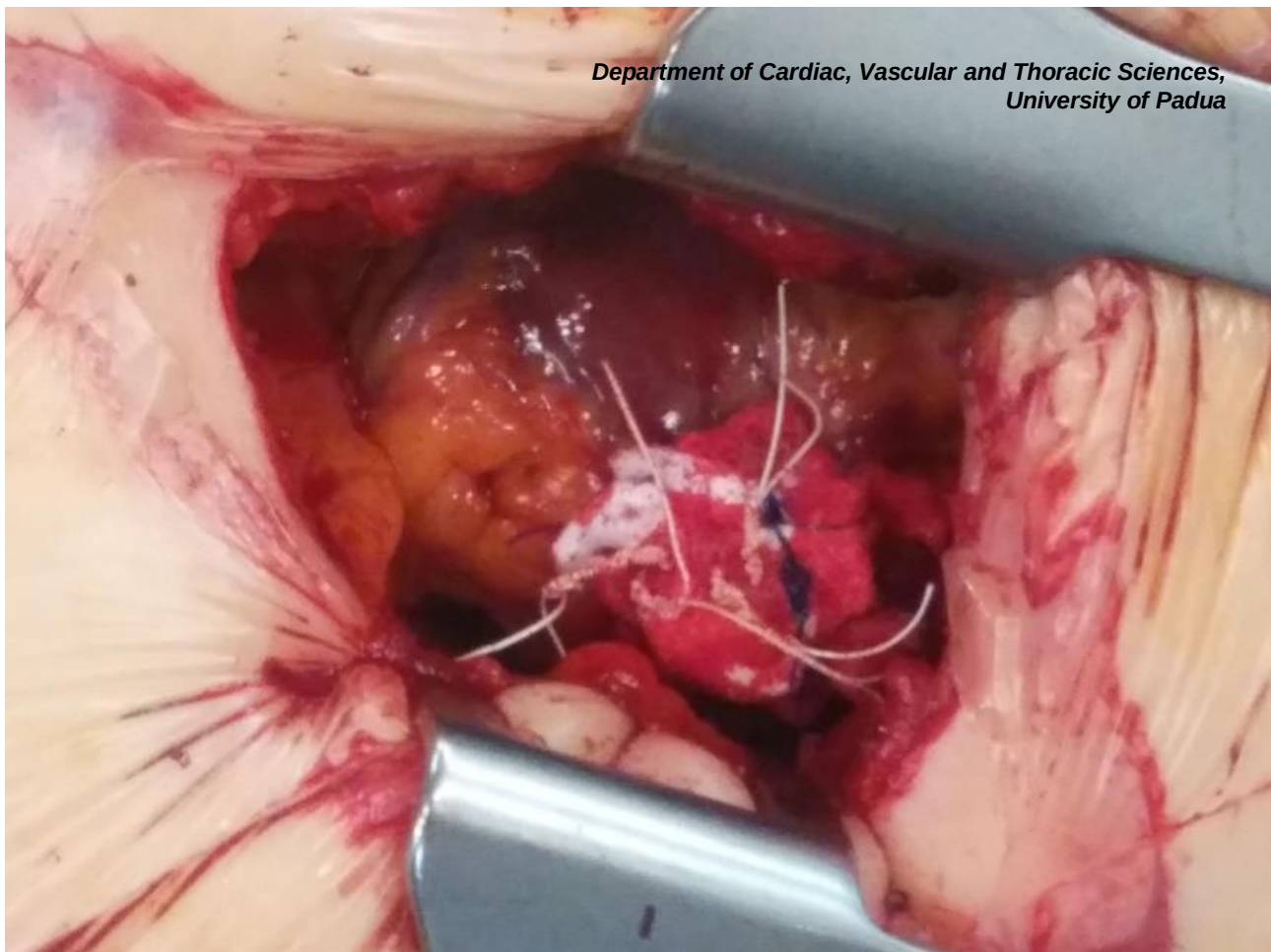
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NeoChord Repair

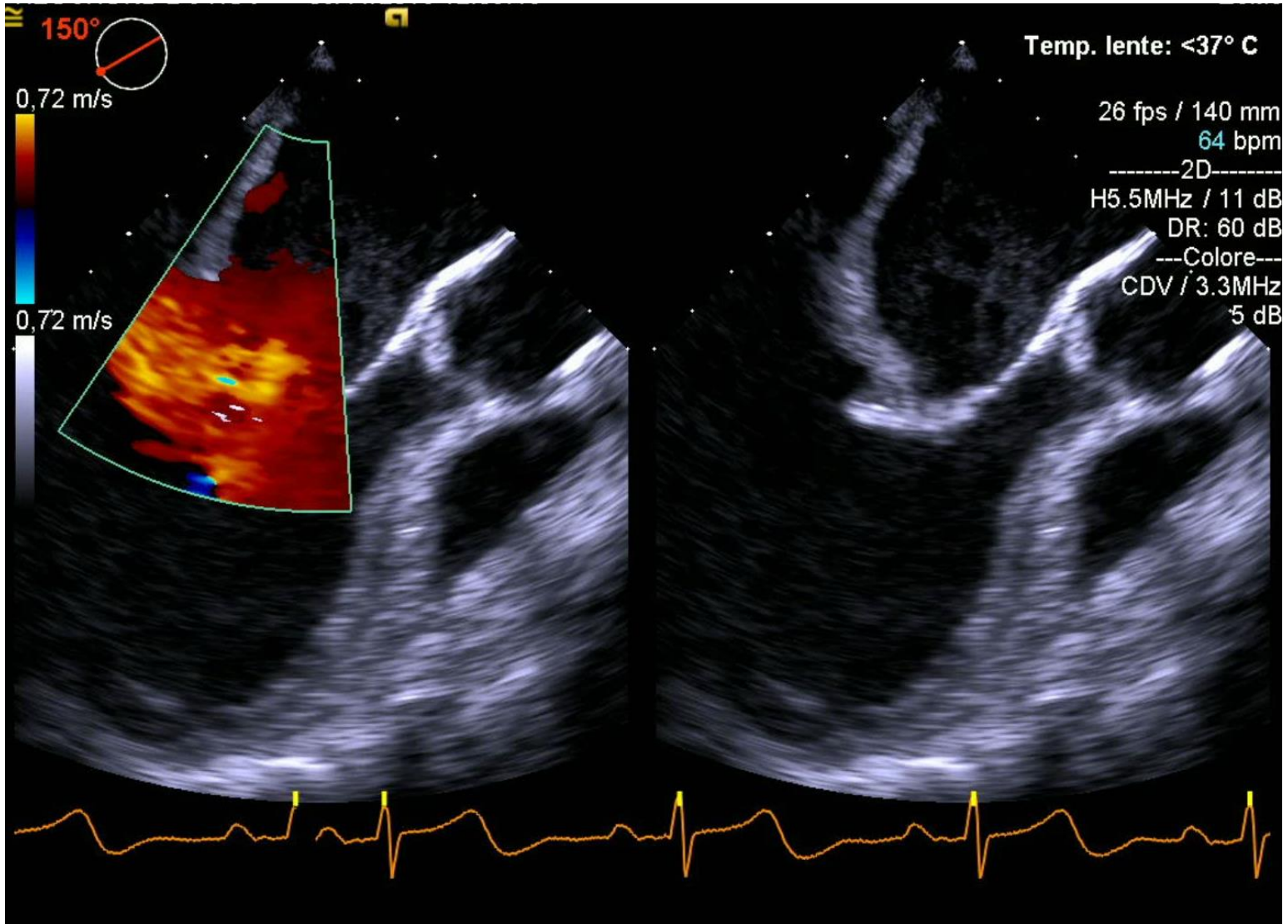
Neochord passed into a round apical teflon pledget





NeoChord Repair

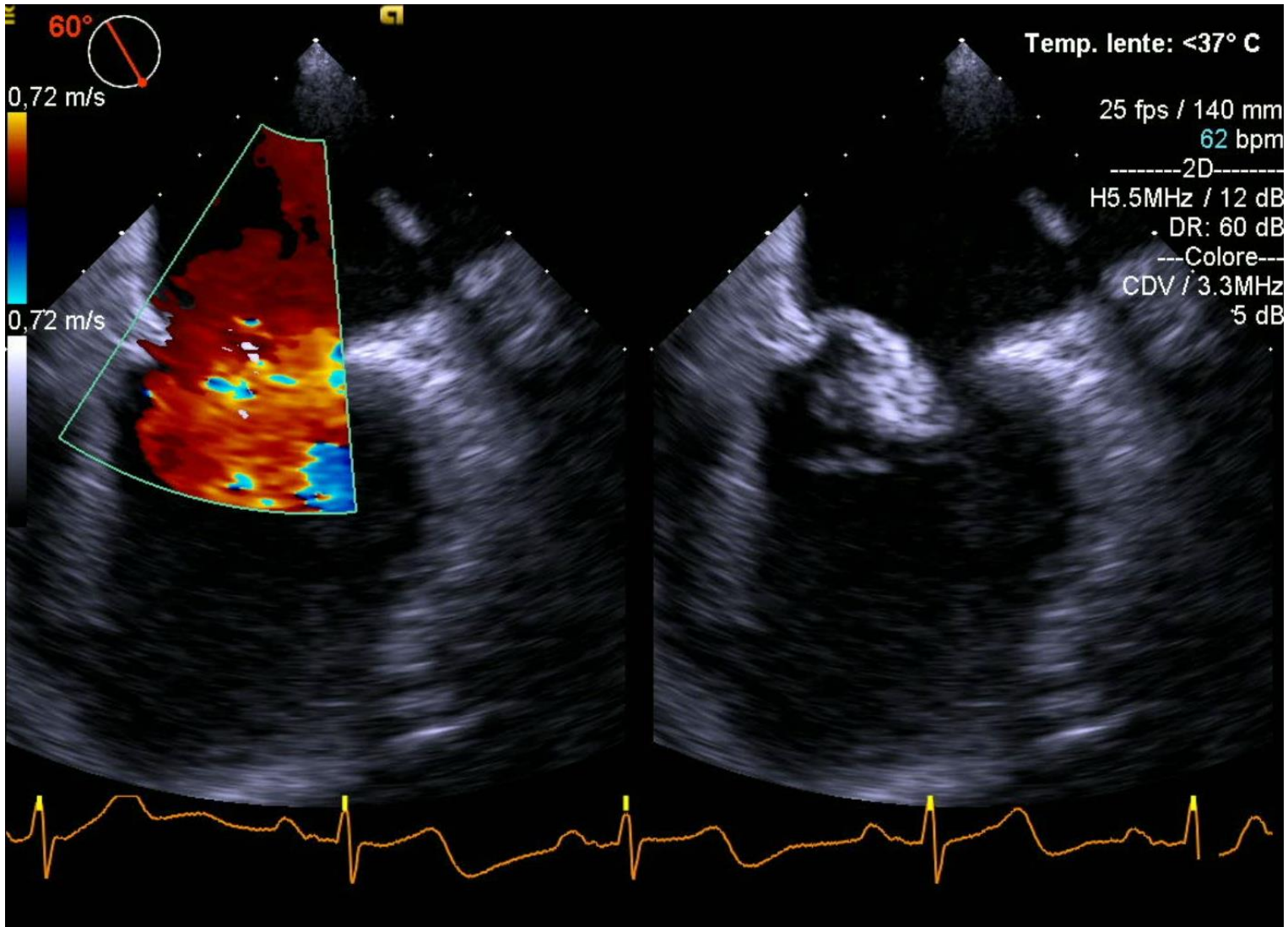
Complex Bileaflet MV





NeoChord Repair

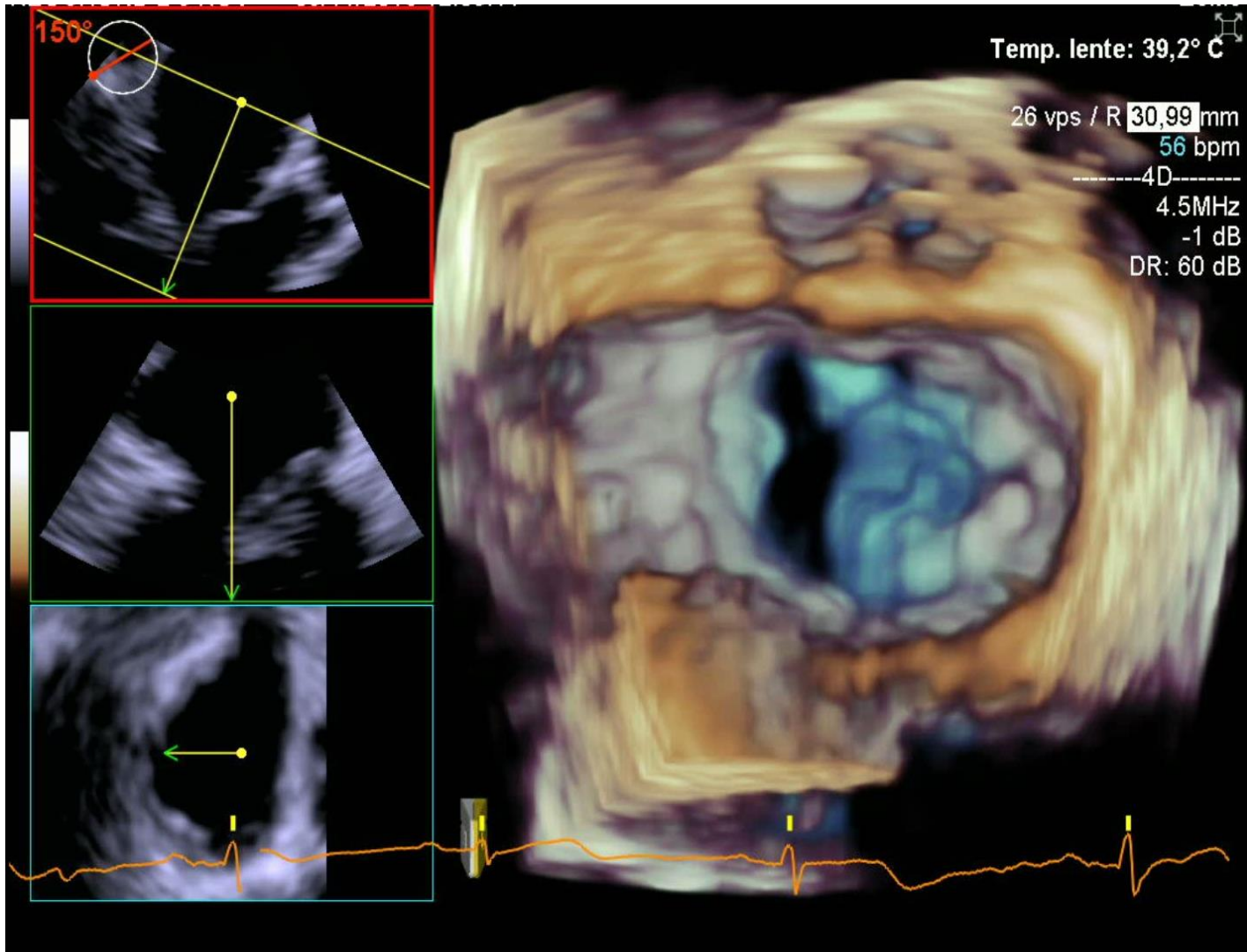
Complex Bileaflet MV





NeoChord Repair

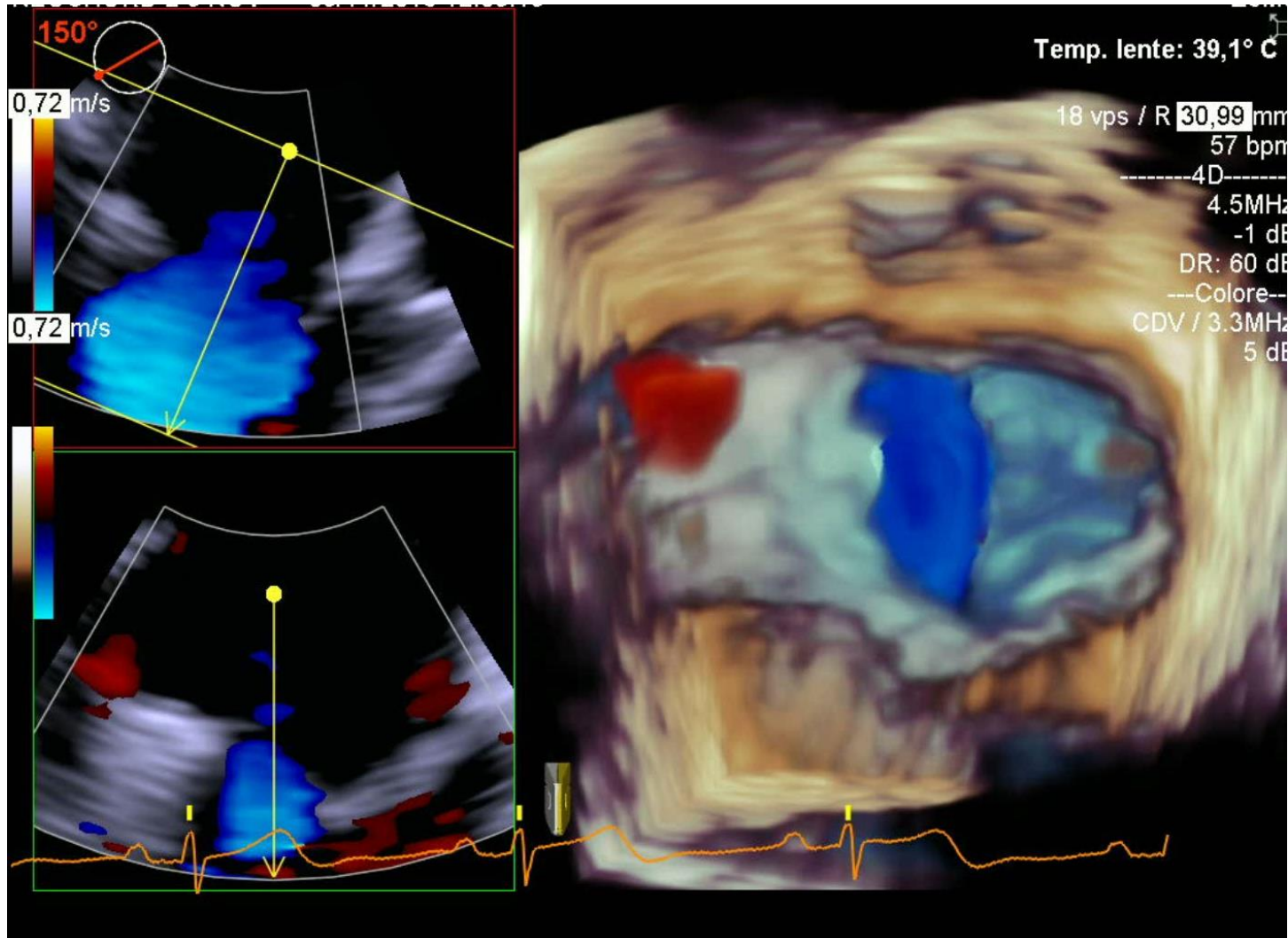
Complex Bileaflet MV





NeoChord Repair

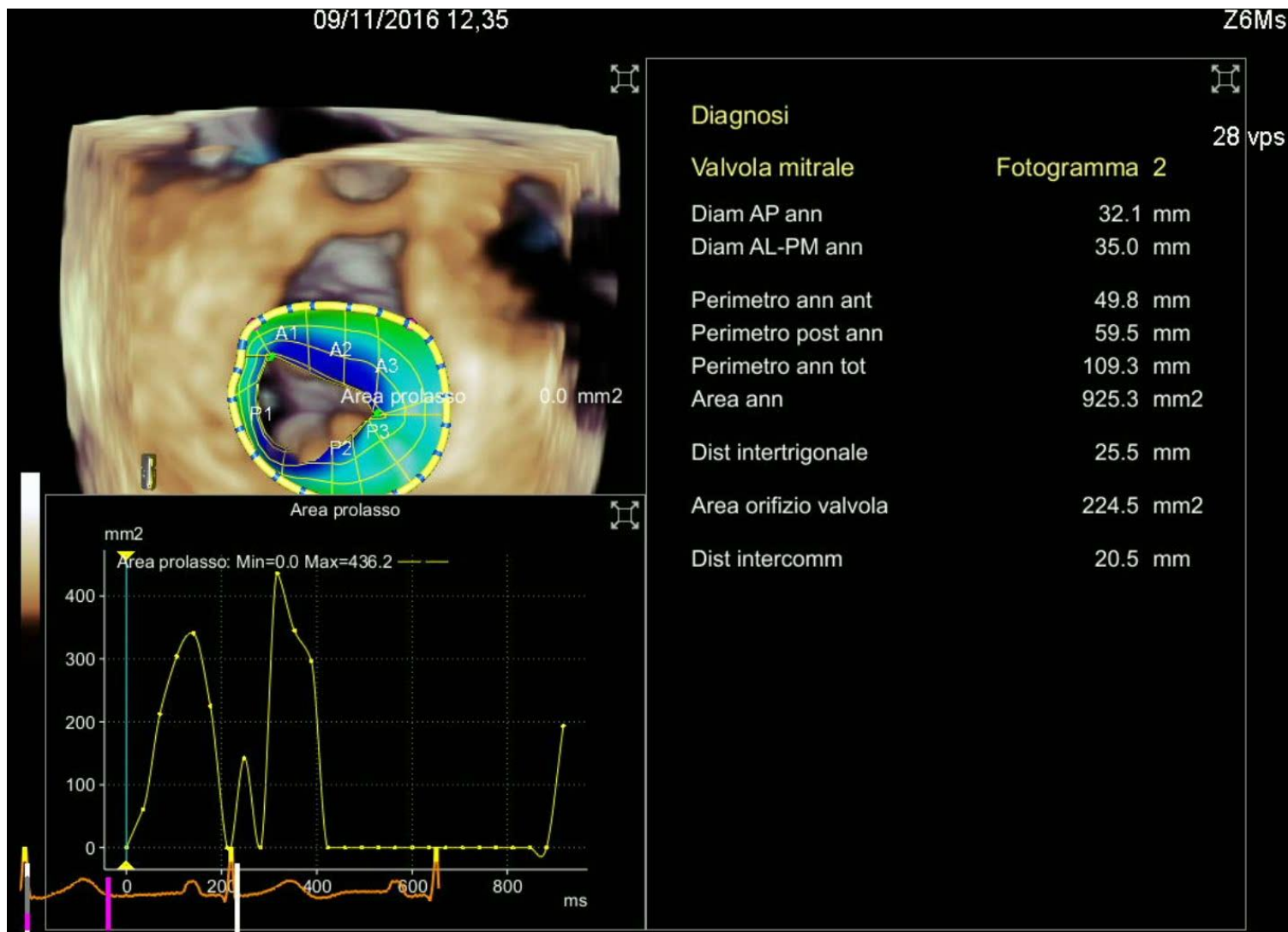
Complex Bileaflet MV





NeoChord Repair

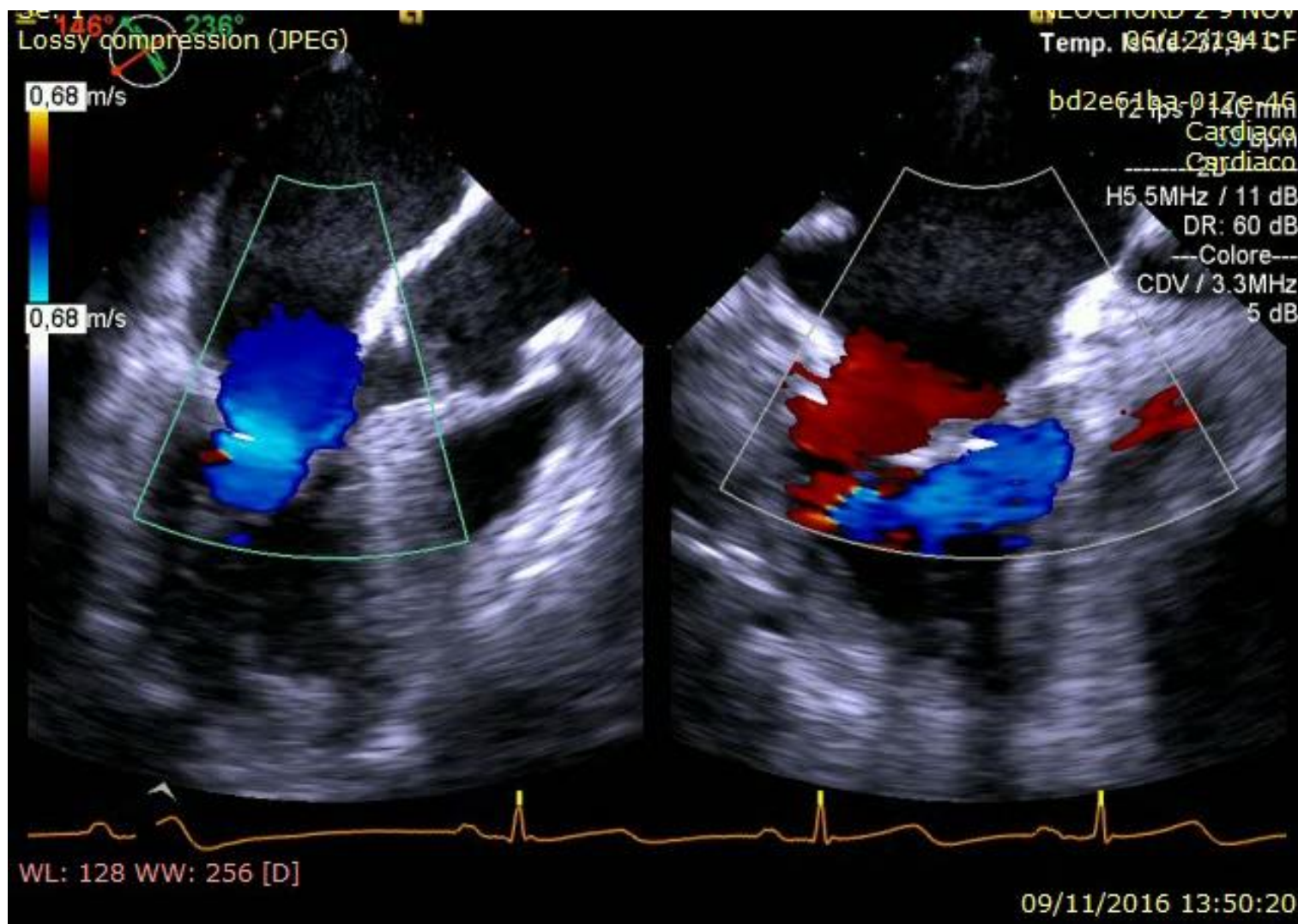
Complex Bileaflet Repair





NeoChord Repair

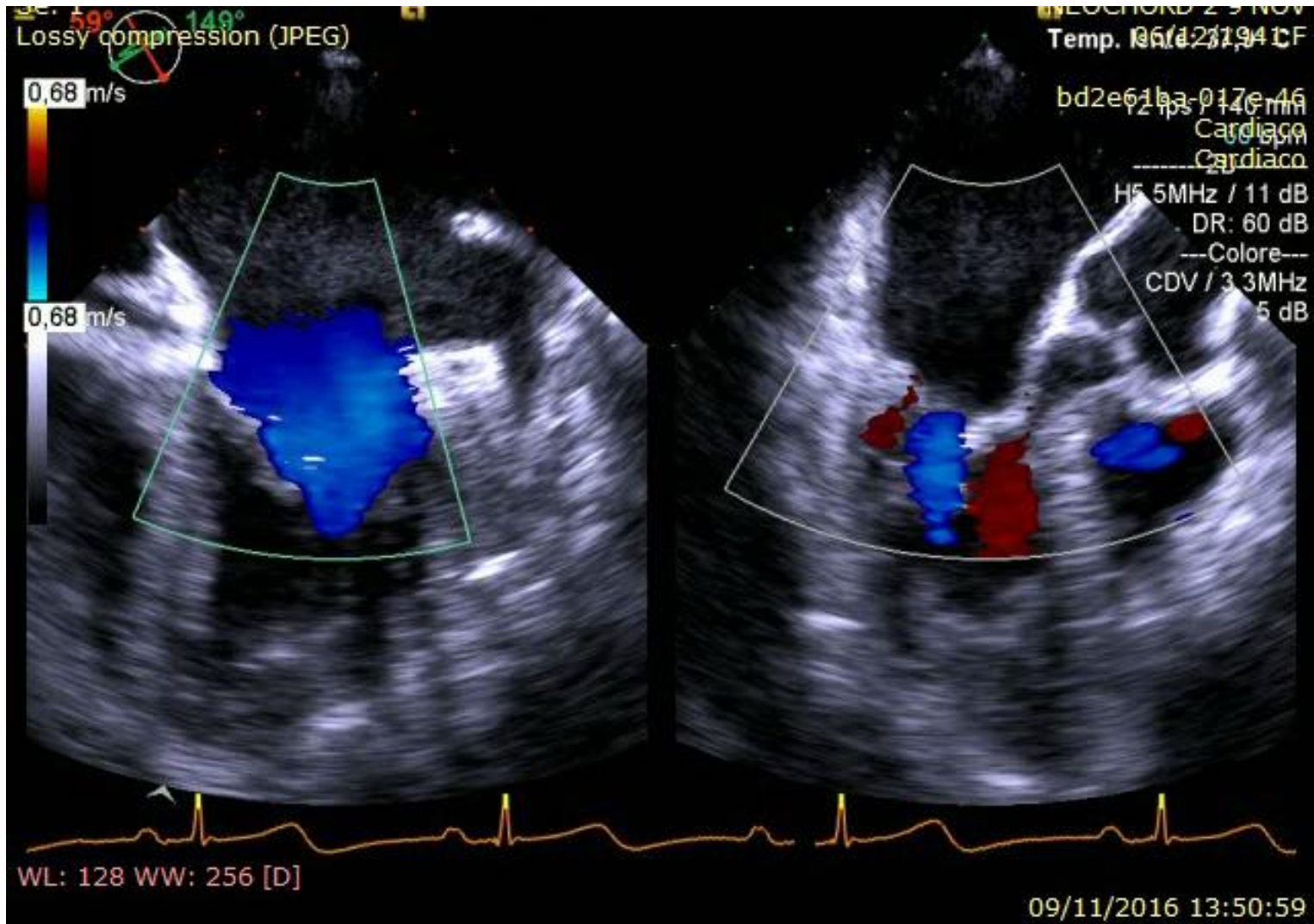
Postoperative assessment of Complex Bileaflet MV





NeoChord Repair

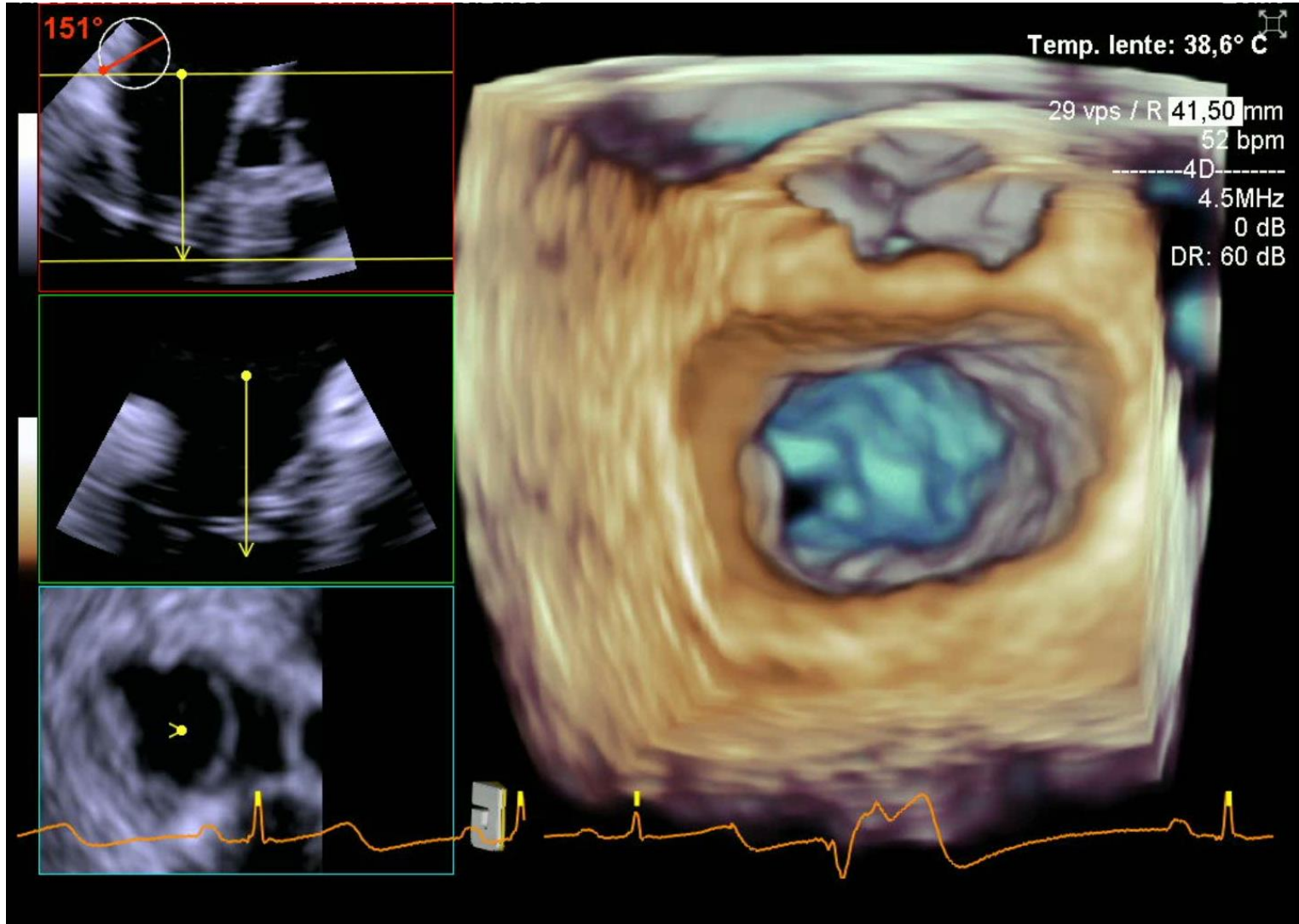
Postoperative assessment of Complex Bileaflet MV





NeoChord Rrepair

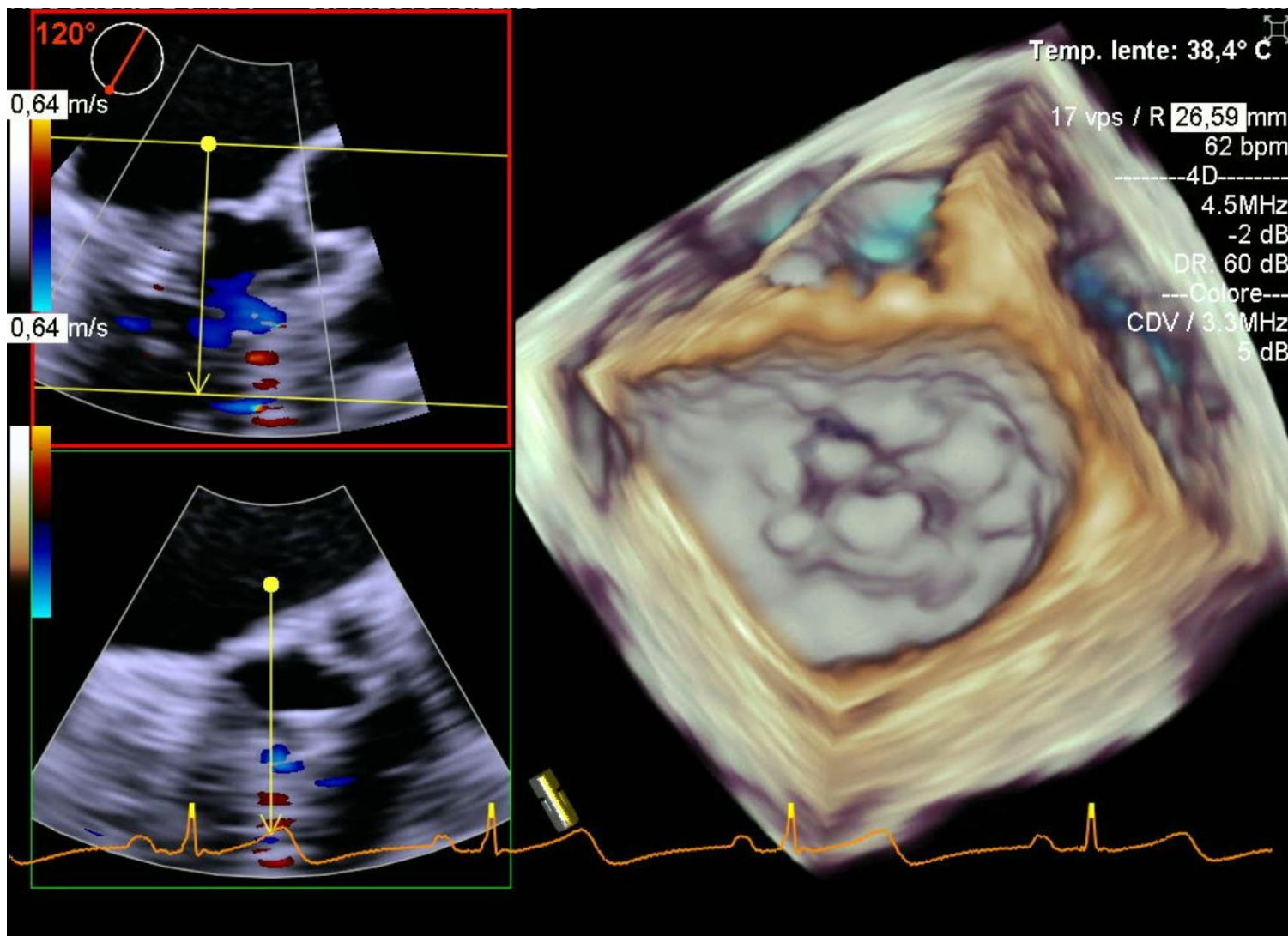
Postoperative assessment of Complex Bileaflet MV





NeoChord Repair

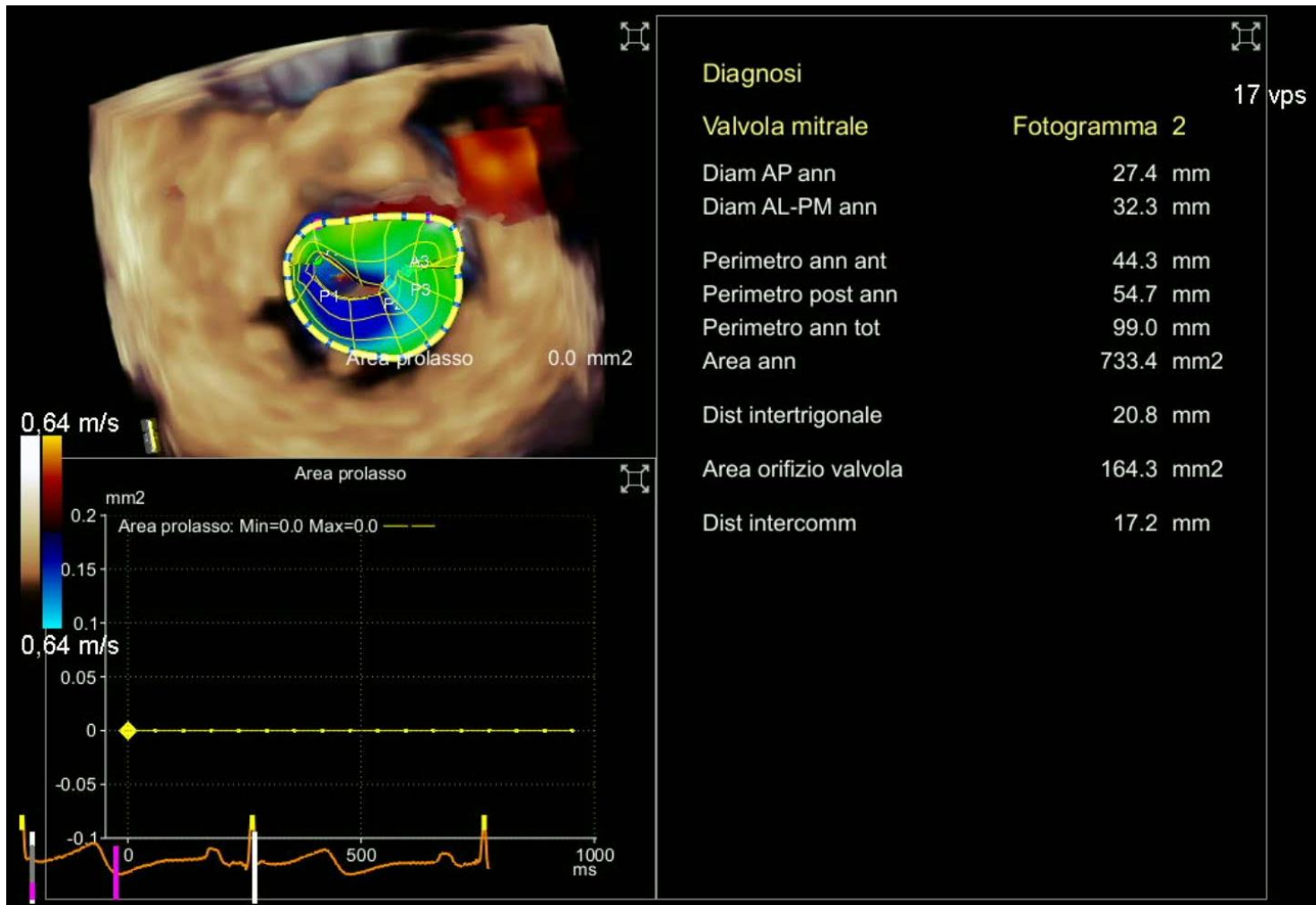
Postoperative assessment of Complex Bileaflet MV





NeoChord Repair

Postoperative assessment of Complex Bileaflet MV





NeoChord Repair

The NeoChord procedure is now technically standardized and reproducible

- **Patient Selection Criteria:** Leaflet-to-Annulus Index, MV Morphology classification
- **Access site:** Postero-Lateral, modifications based on Leaflet-to-Annulus Index evaluation
- **Echocardiographic guidance protocol**
- **Tensioning protocol:** Tourniquets, Overtensioning, 3D-Color Doppler Real Time



NeoChord Repair

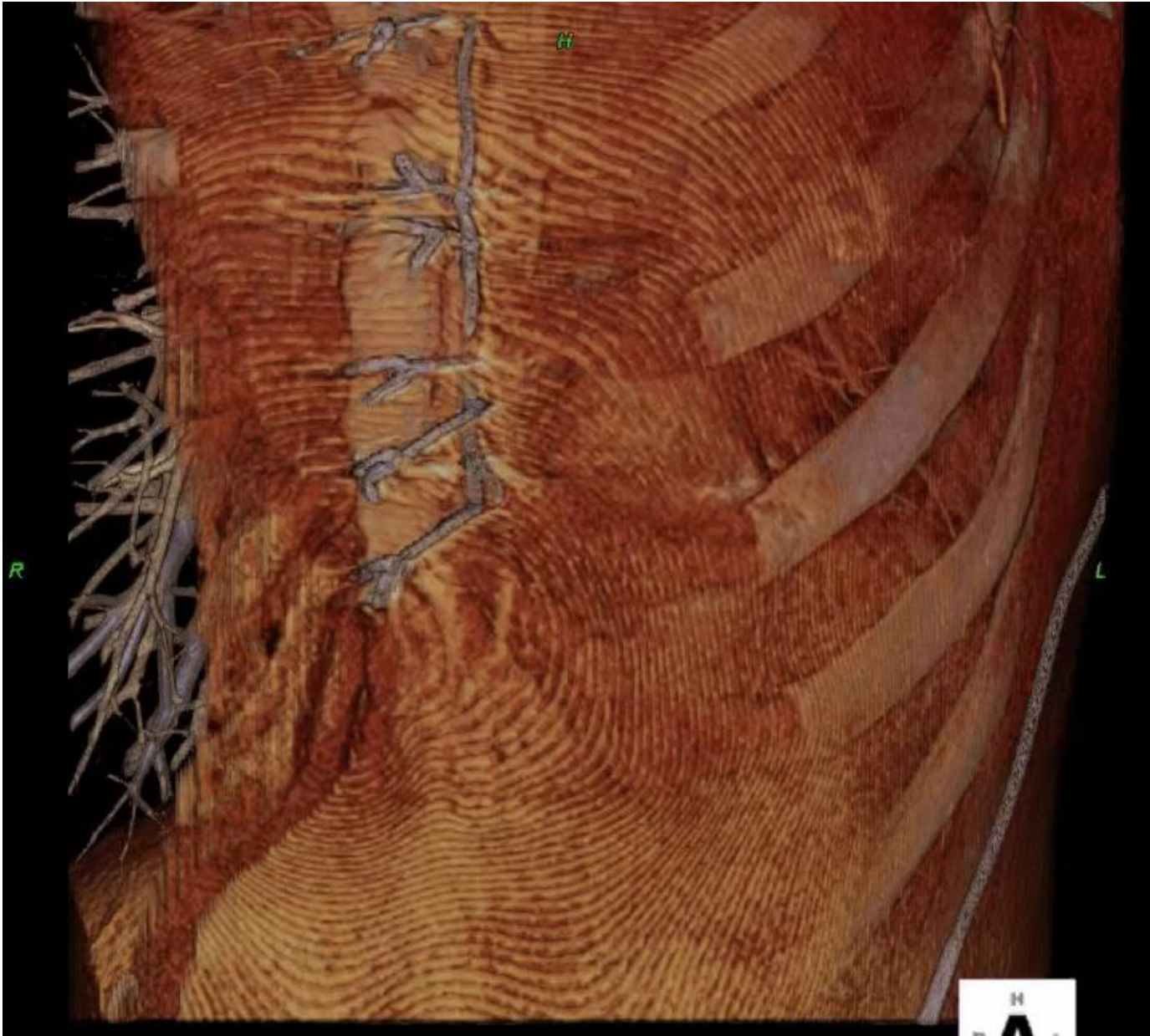
Multimodality Imaging to improve the procedure

Ventricular access site we need to be between the papillary muscles, not interfering with the MV subvalvular apparatus, preserving physiology, reducing skin incision, reducing risk of coronary injuries, preserving the best symmetry between chords...



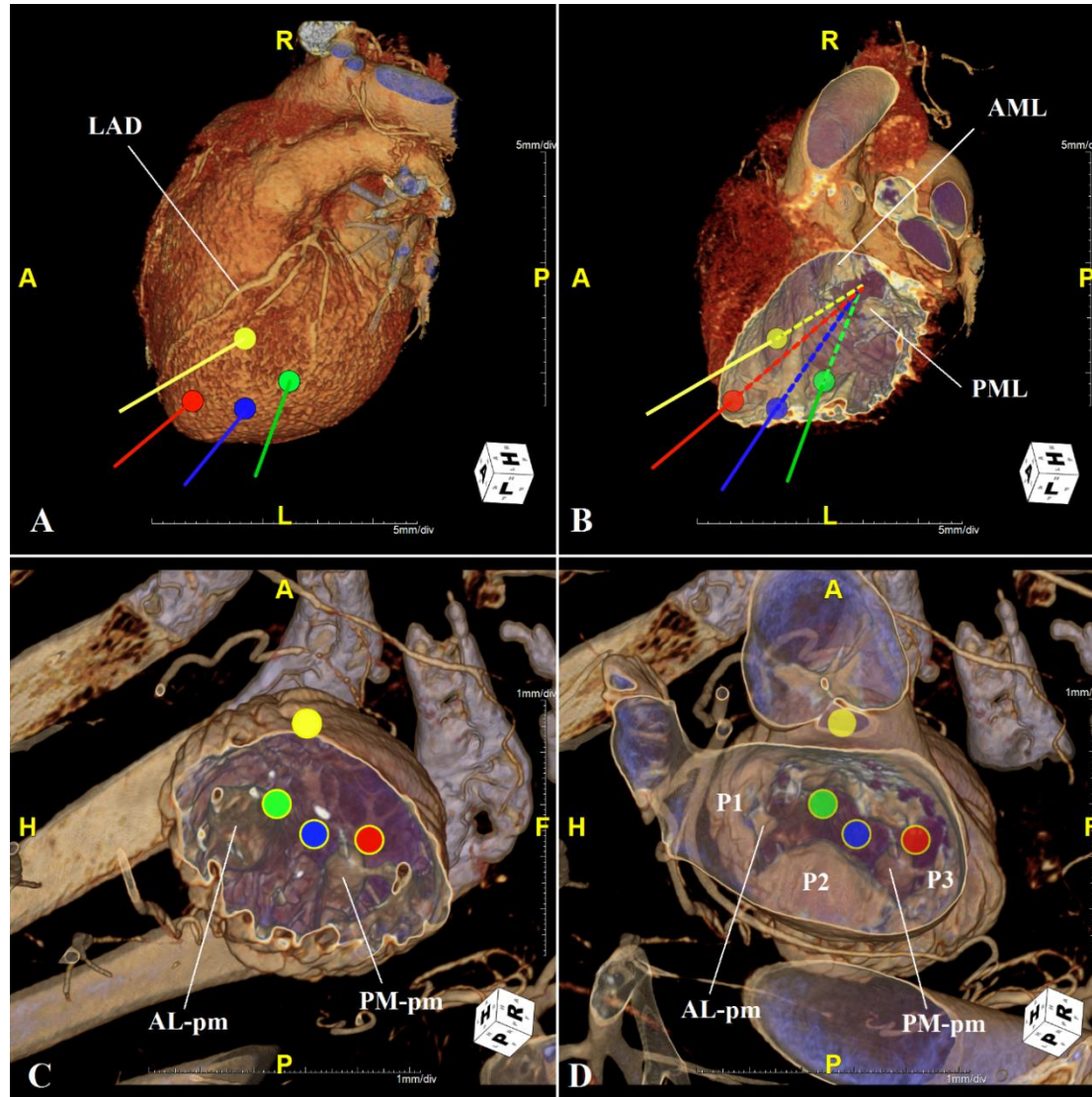


Preoperative 4D CTA



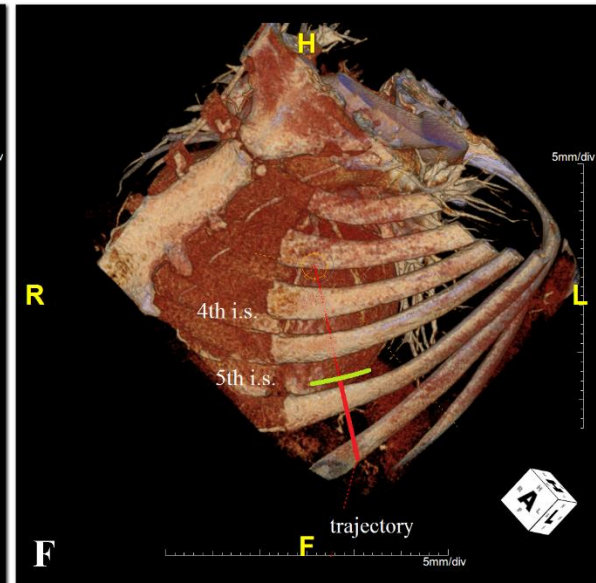
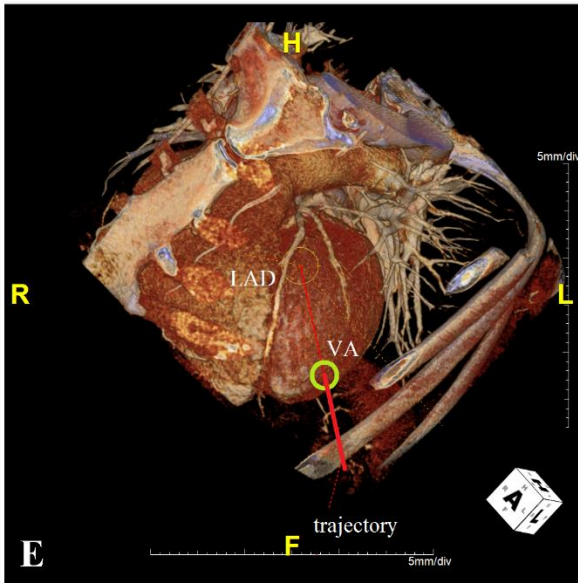
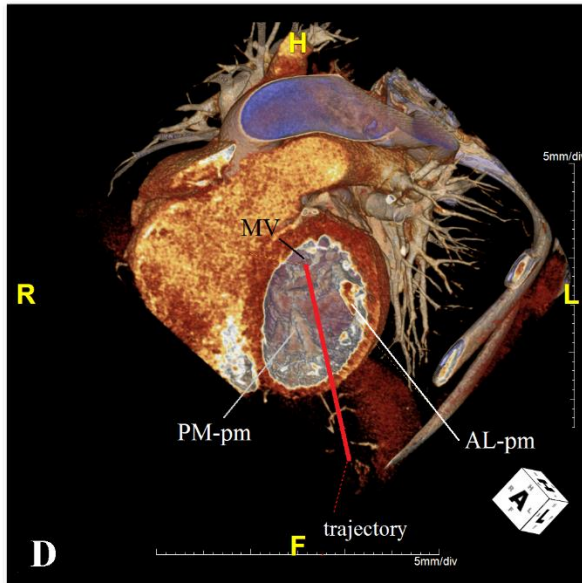
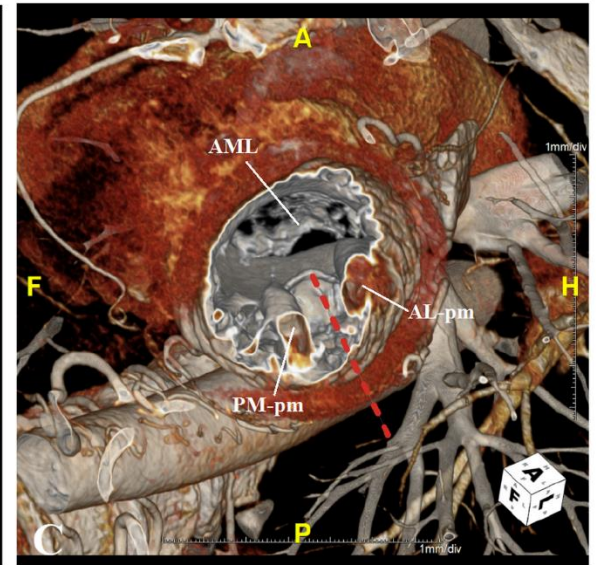
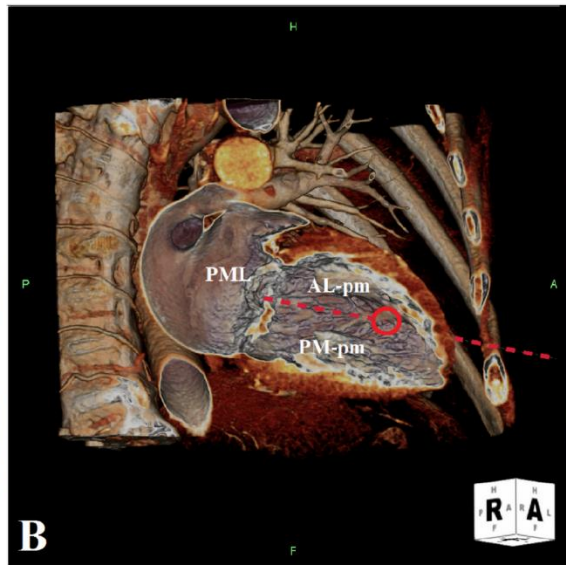
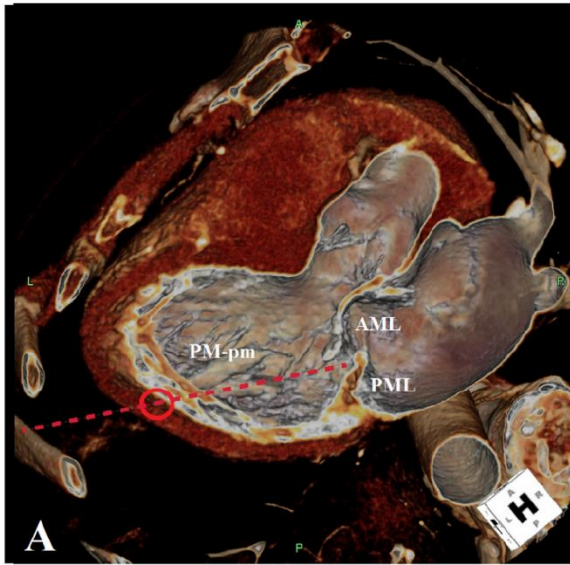


Ventricular access sites for Transapical NeoChord Repair



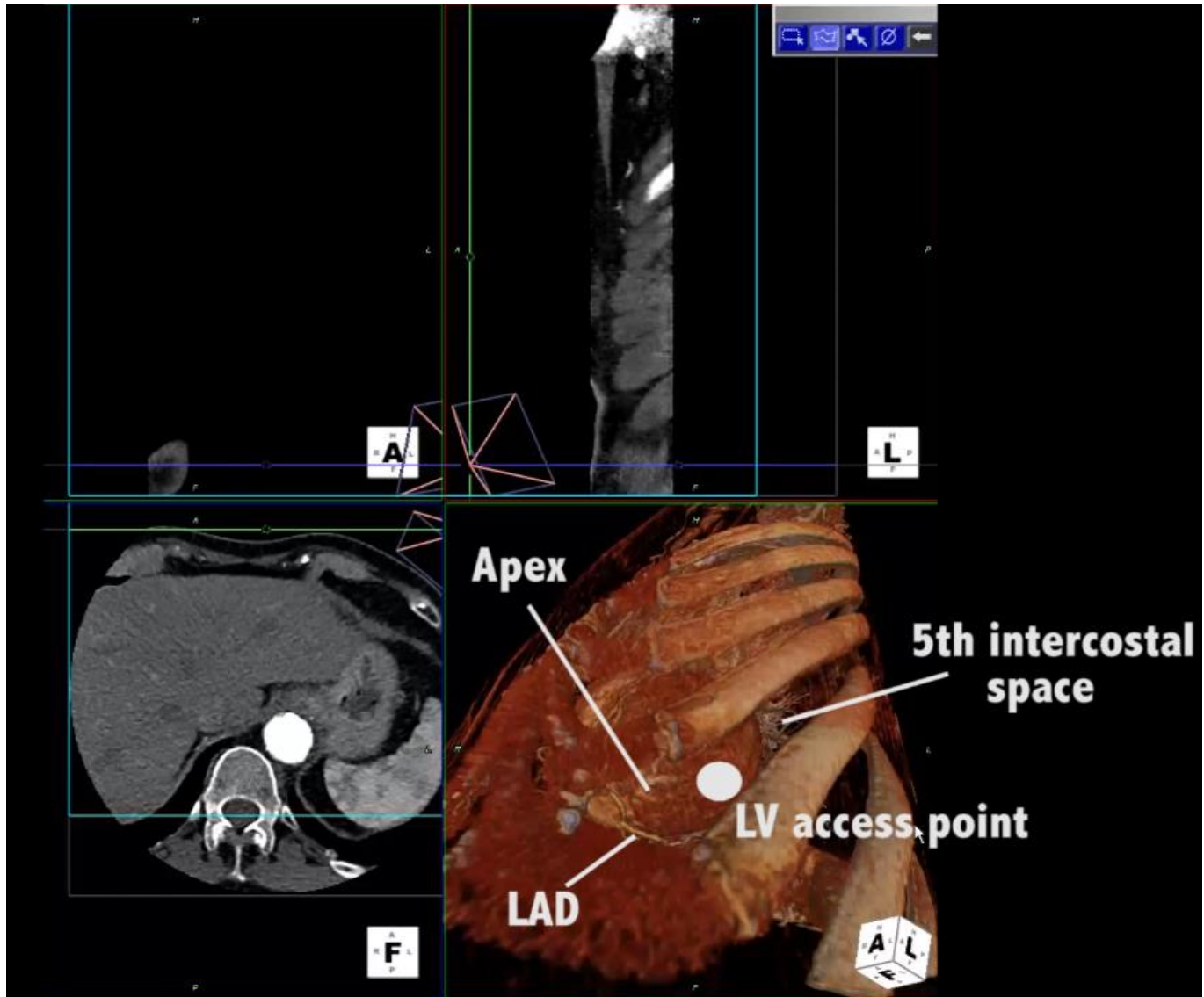


Ideal Ventricular access site



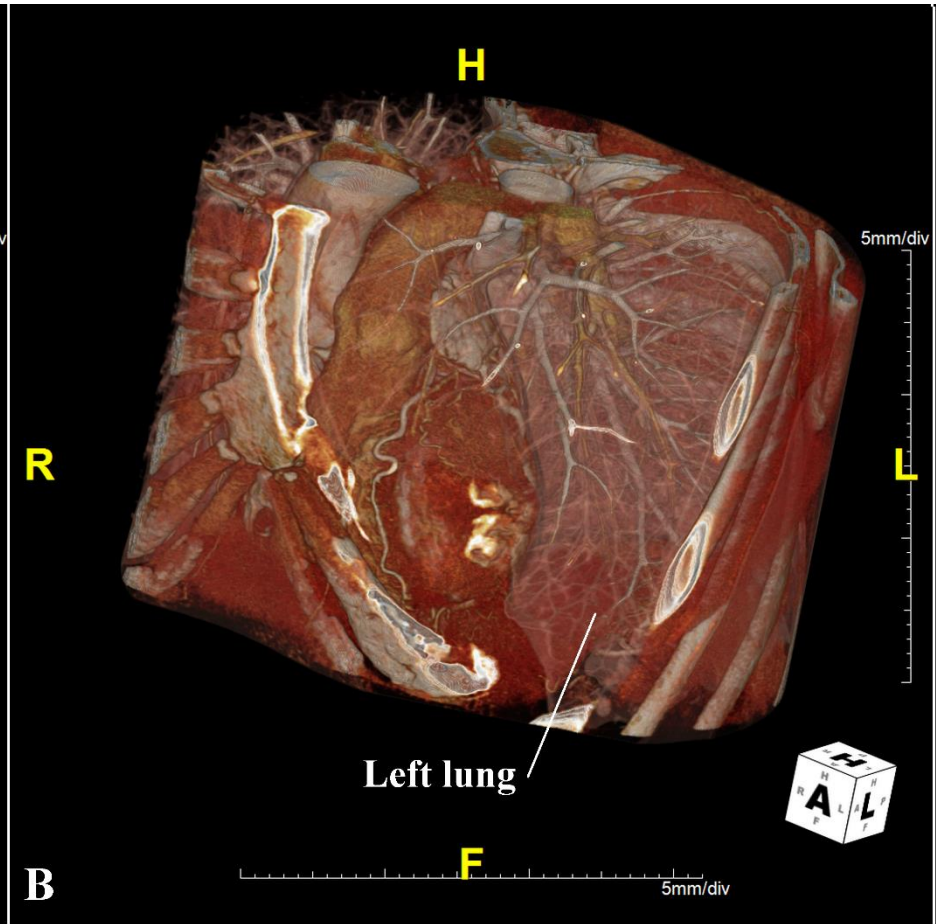
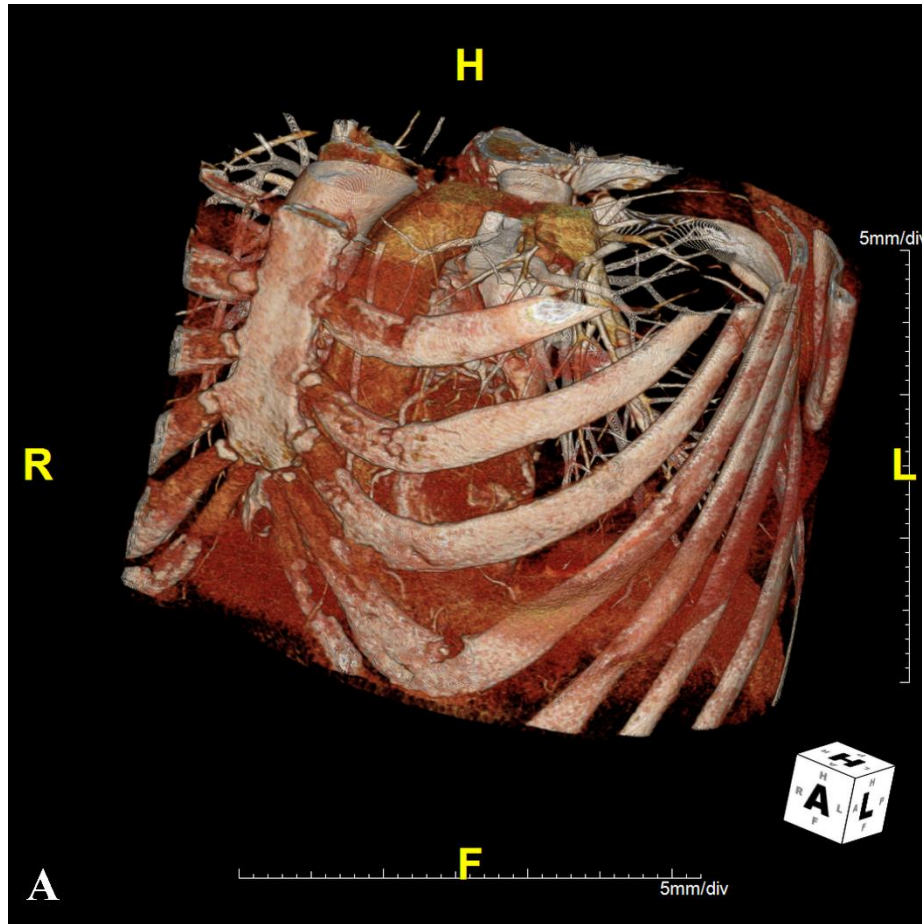


NeoChord device Trajectory 4D CTA Simulation



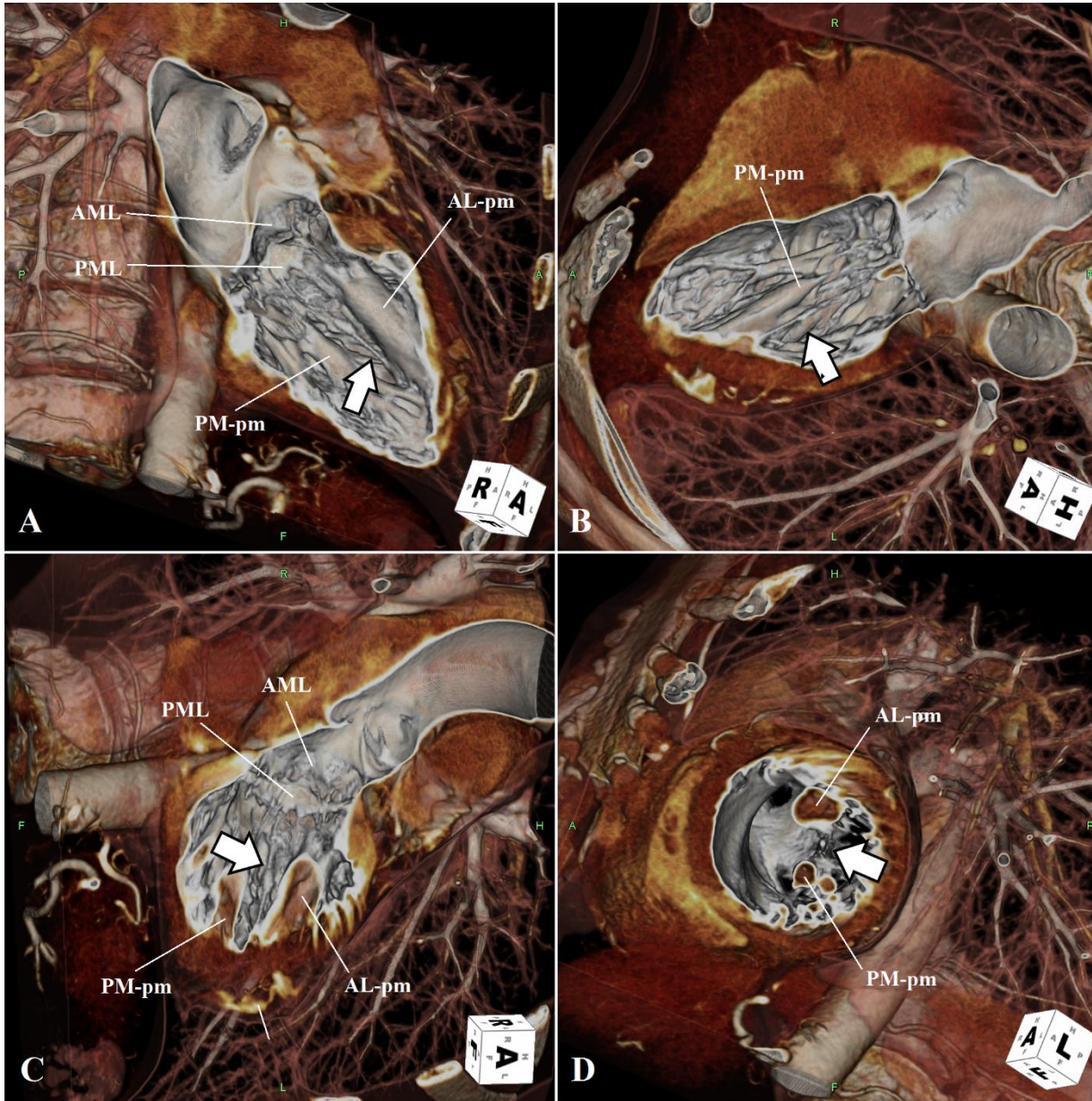


Postoperative Ventricular access site



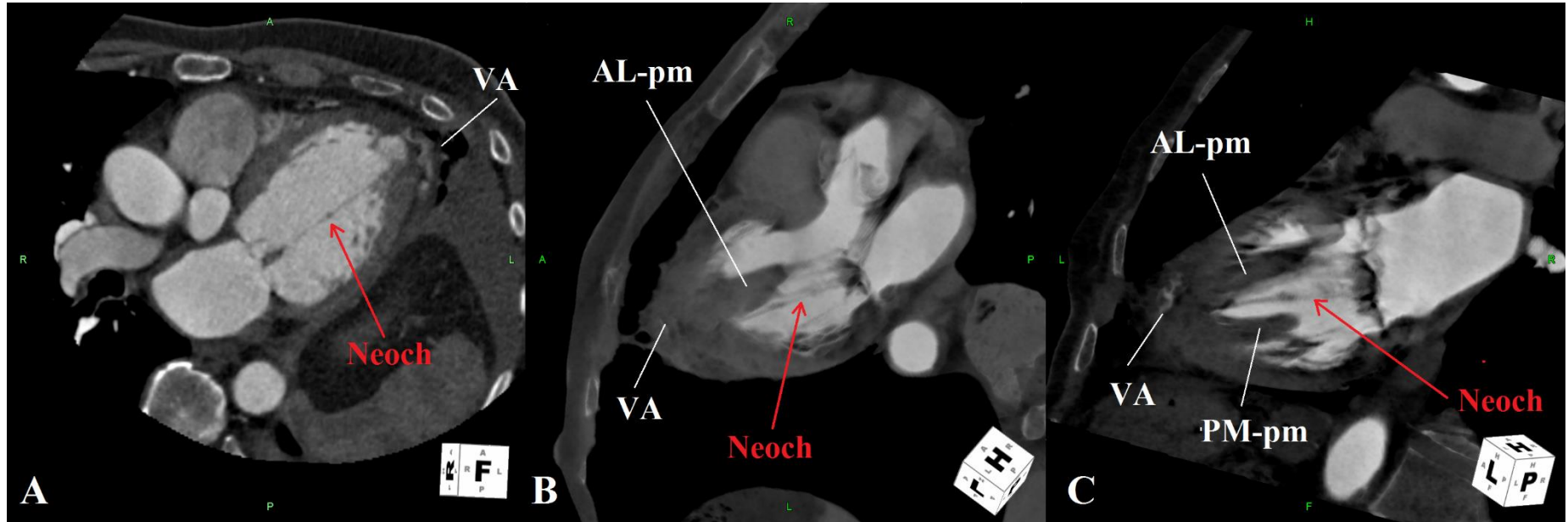


Postoperative NeoChord



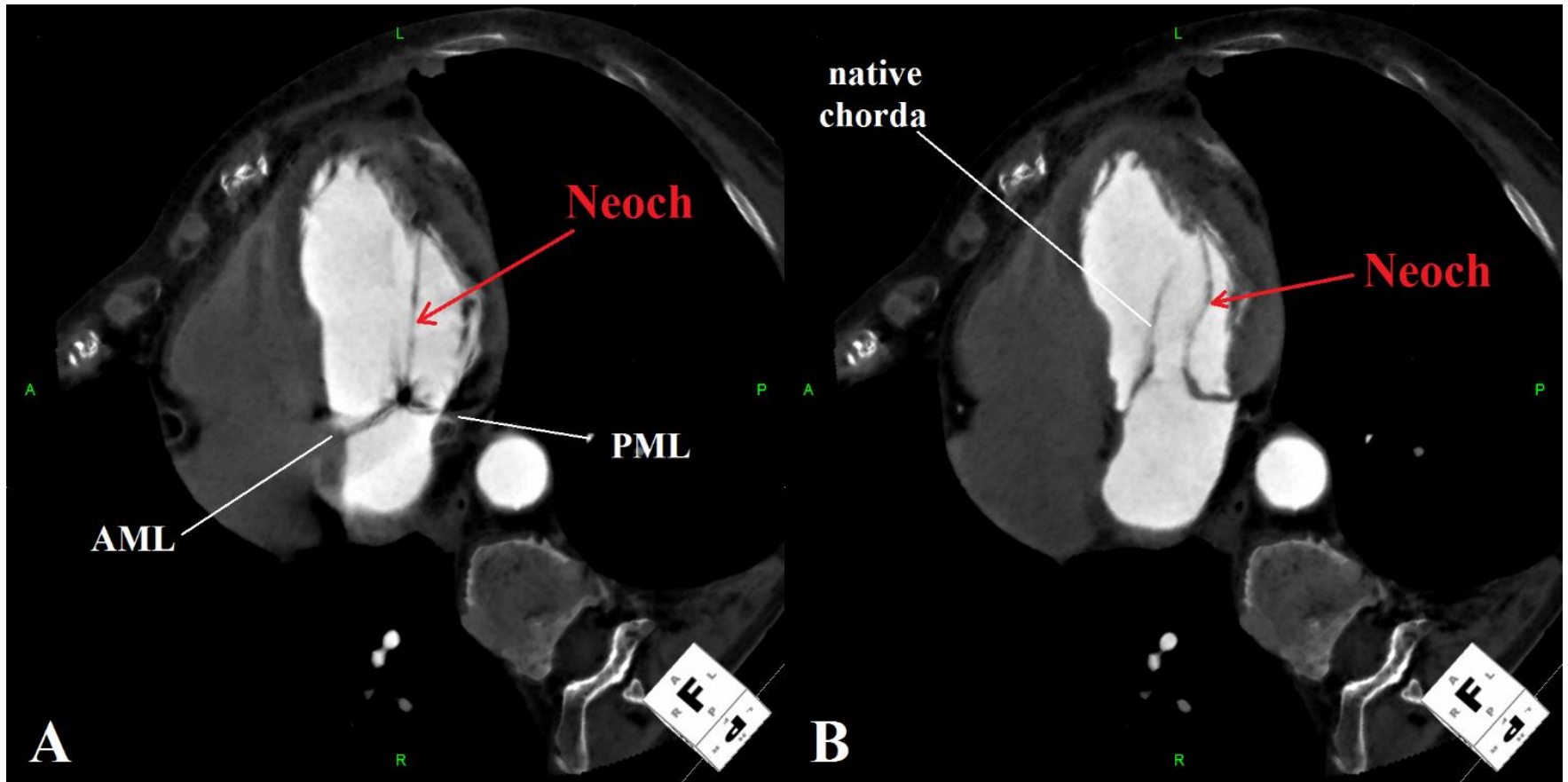


Postoperative NeoChord



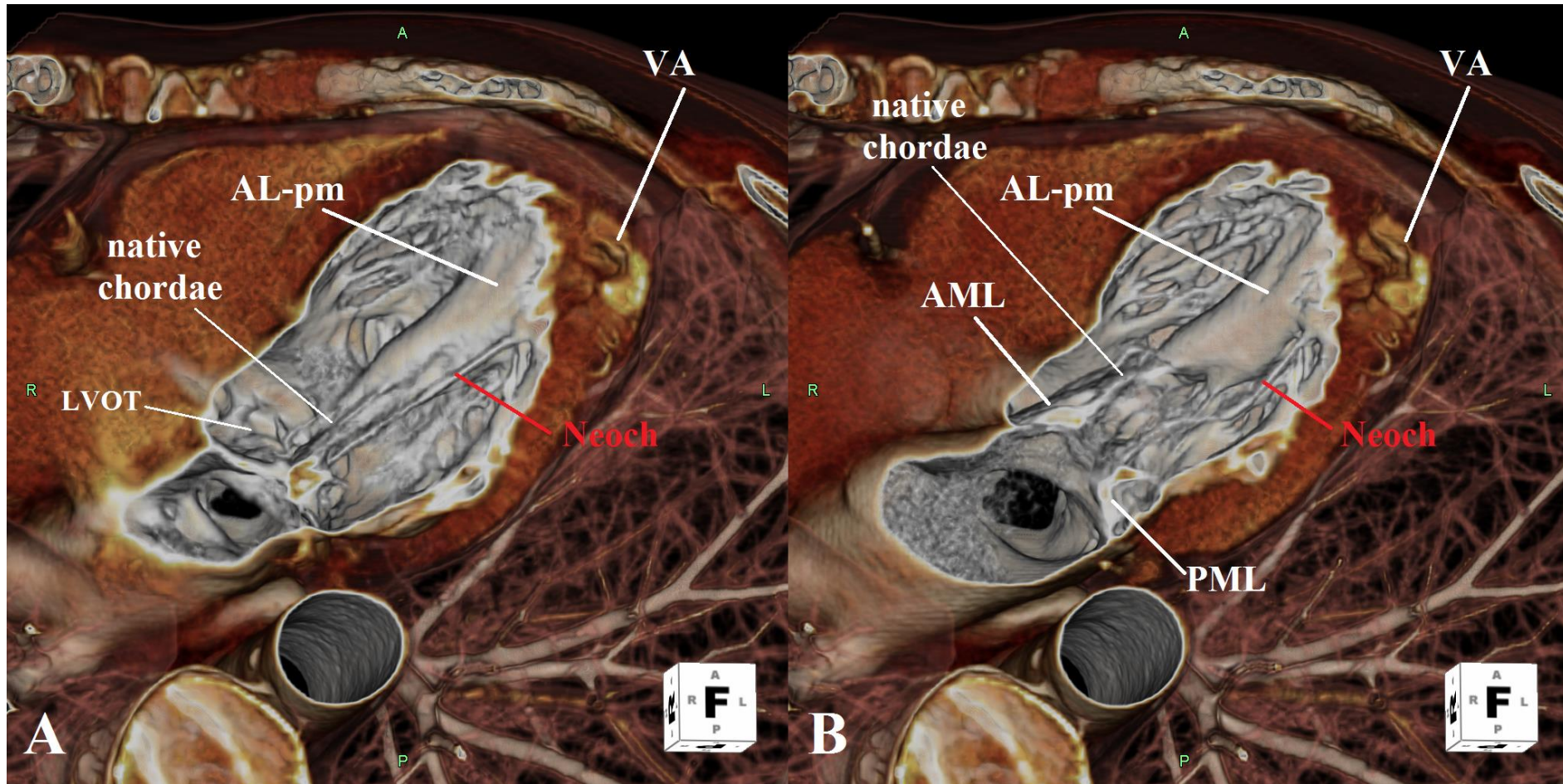


Postoperative NeoChord





Postoperative NeoChord



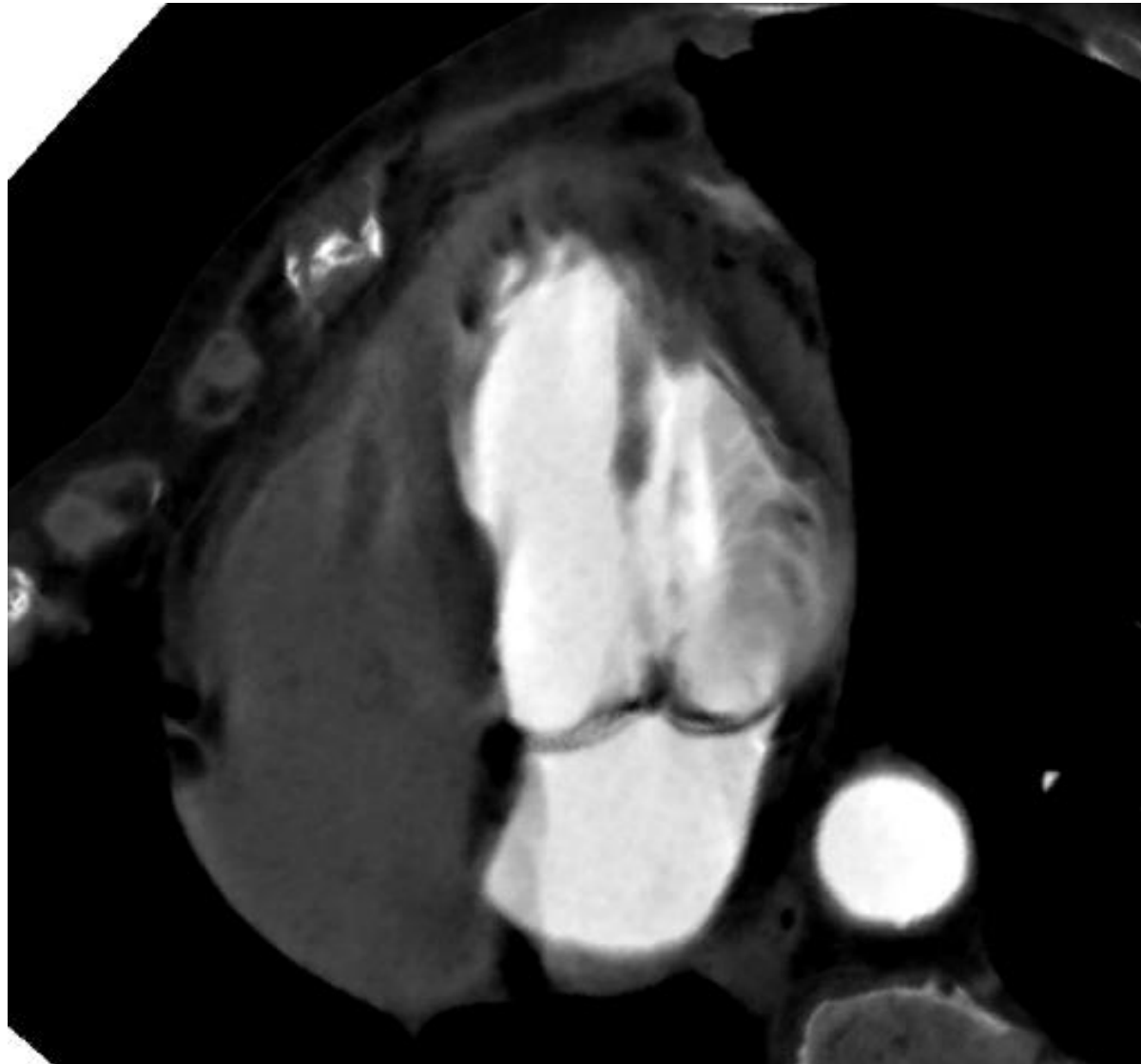


Postoperative NeoChord





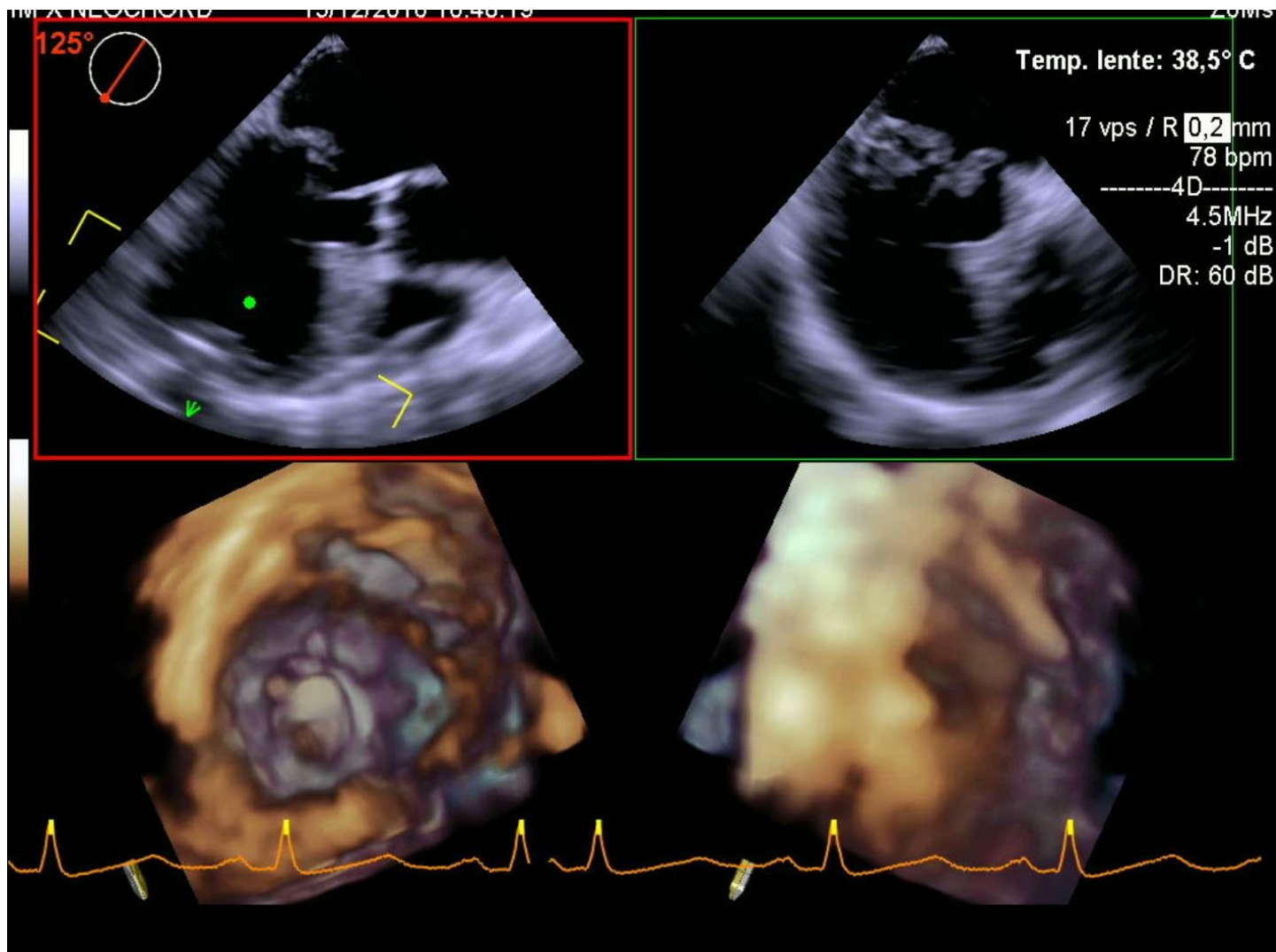
Postoperative NeoChord





NeoChord Repair

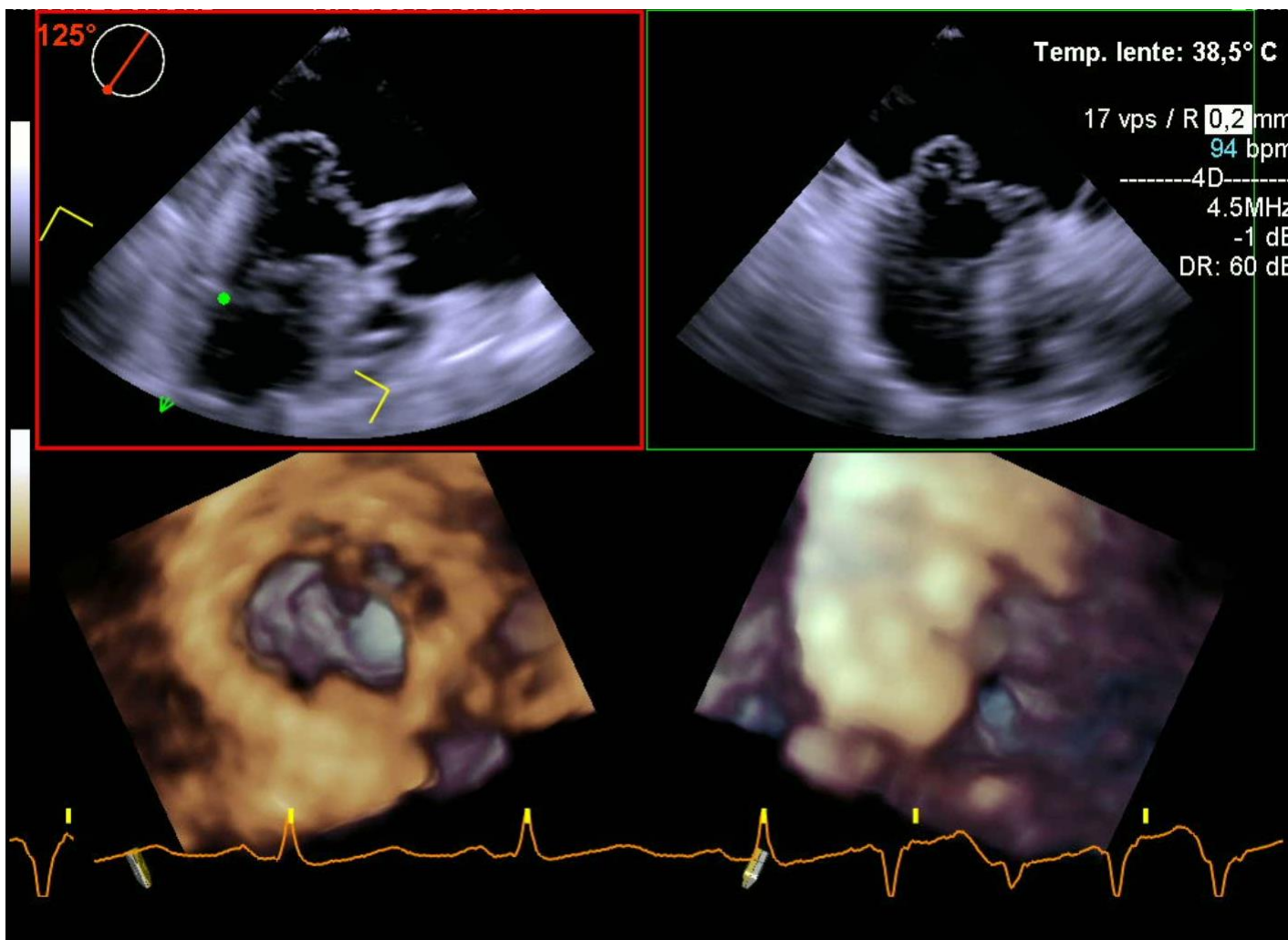
Central Finger Test





NeoChord Repair

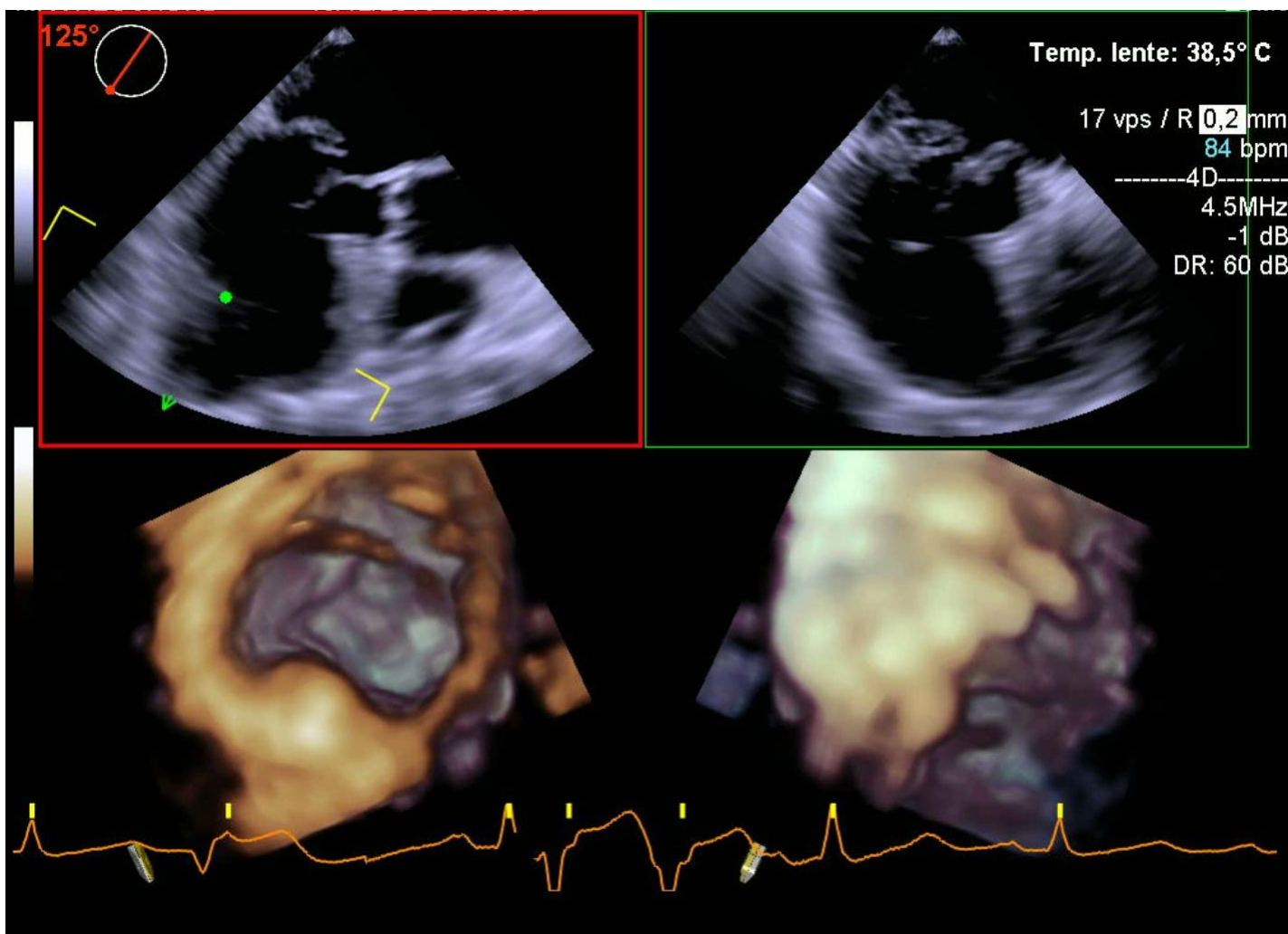
Posterior Finger test





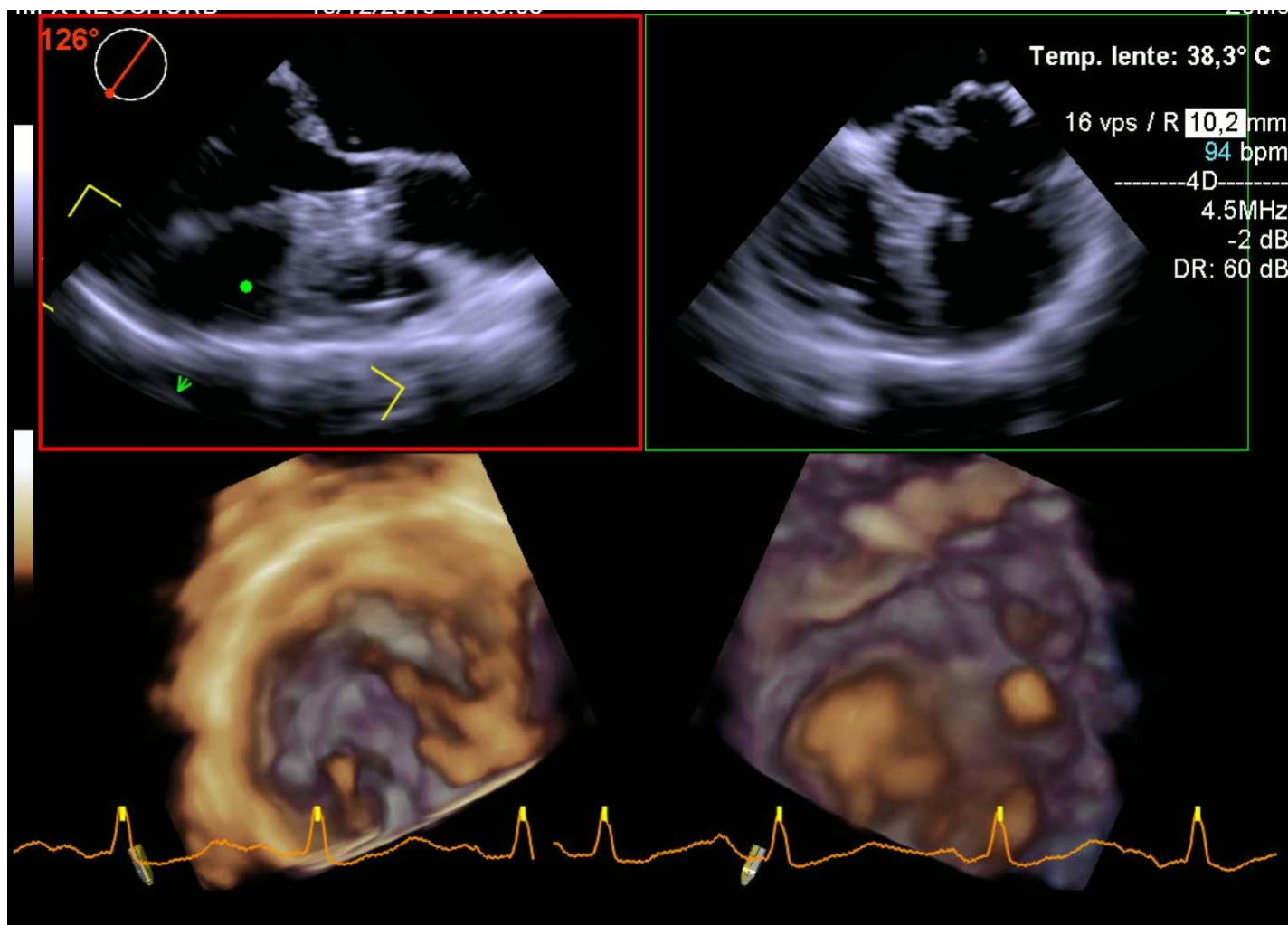
NeoChord Repair

Anterior Finger Test



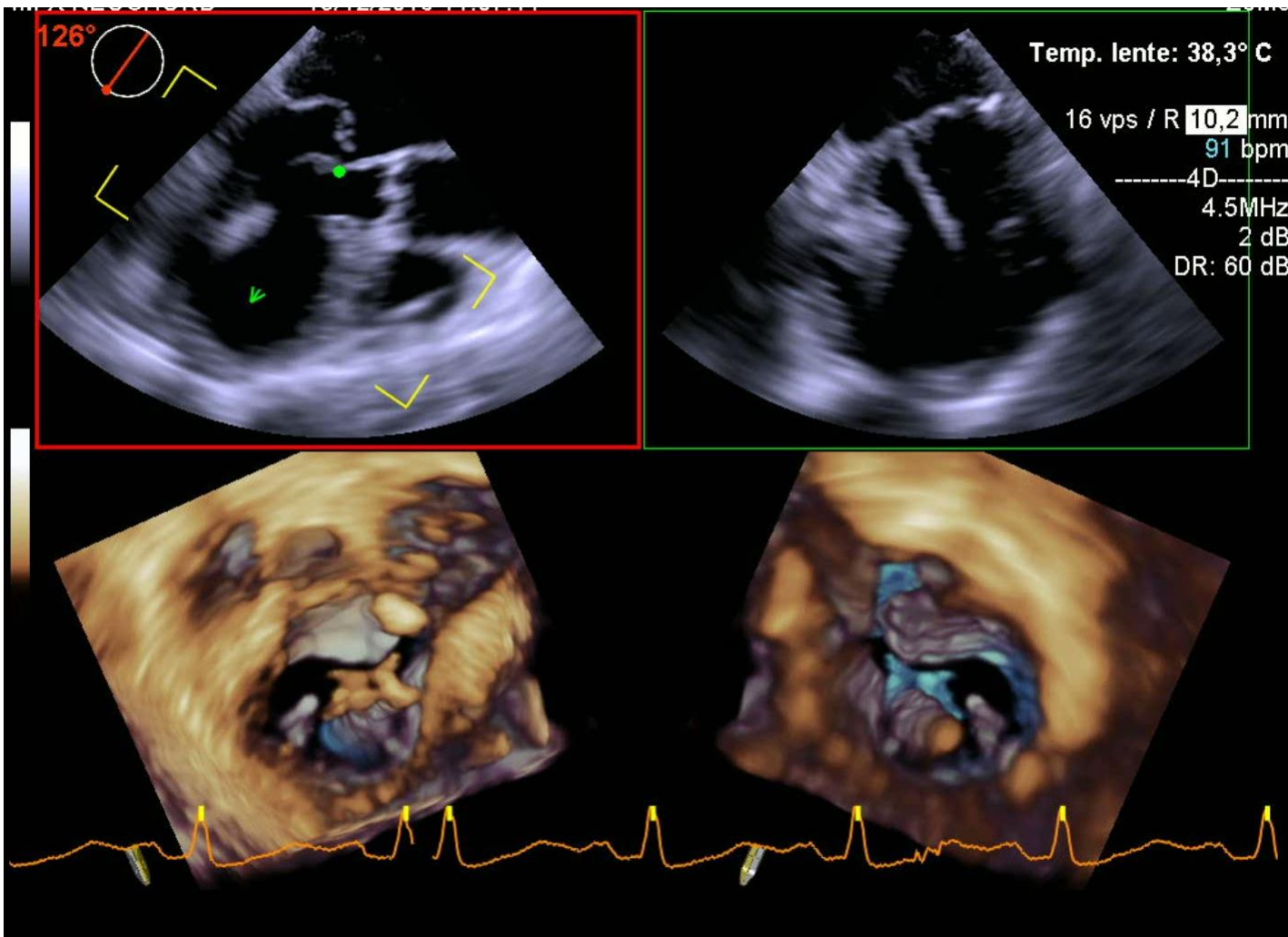
NeoChord Repair

Ventricular navigation



NeoChord Repair

Ventricular Navigation and MV crossing

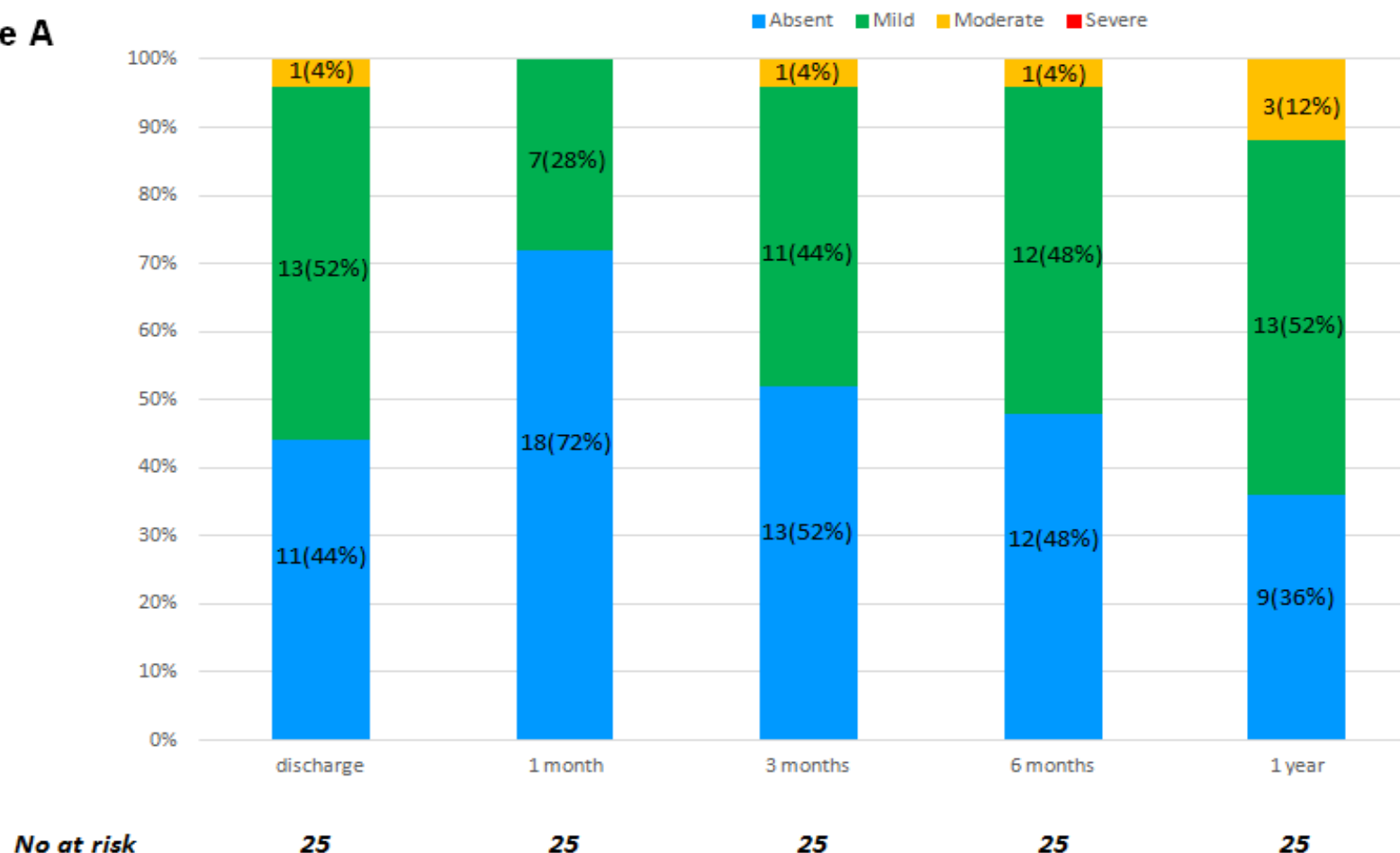




NeoChord Repair

1-year results of Isolated Central posterior flail/prolapse

Type A

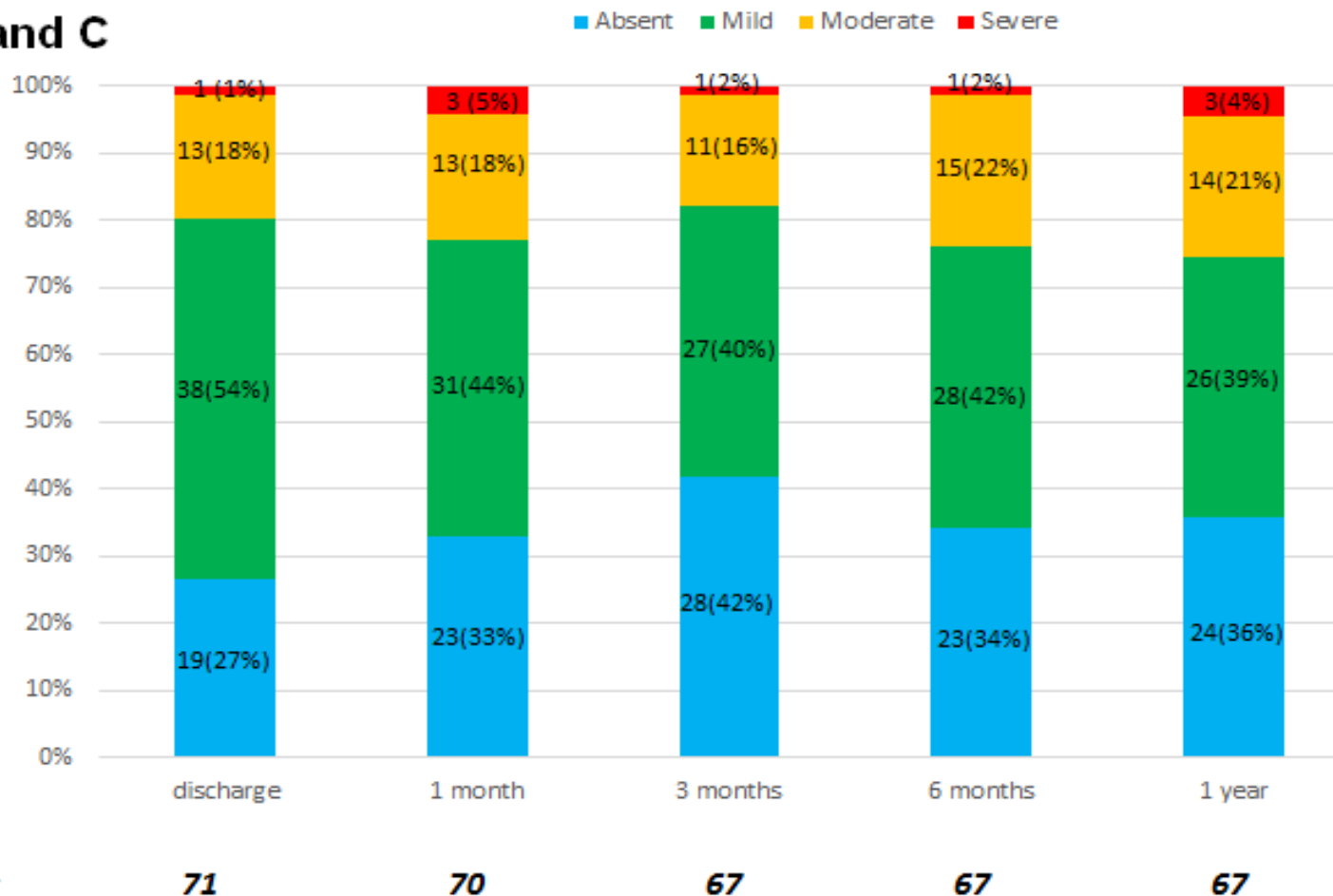




NeoChord Repair

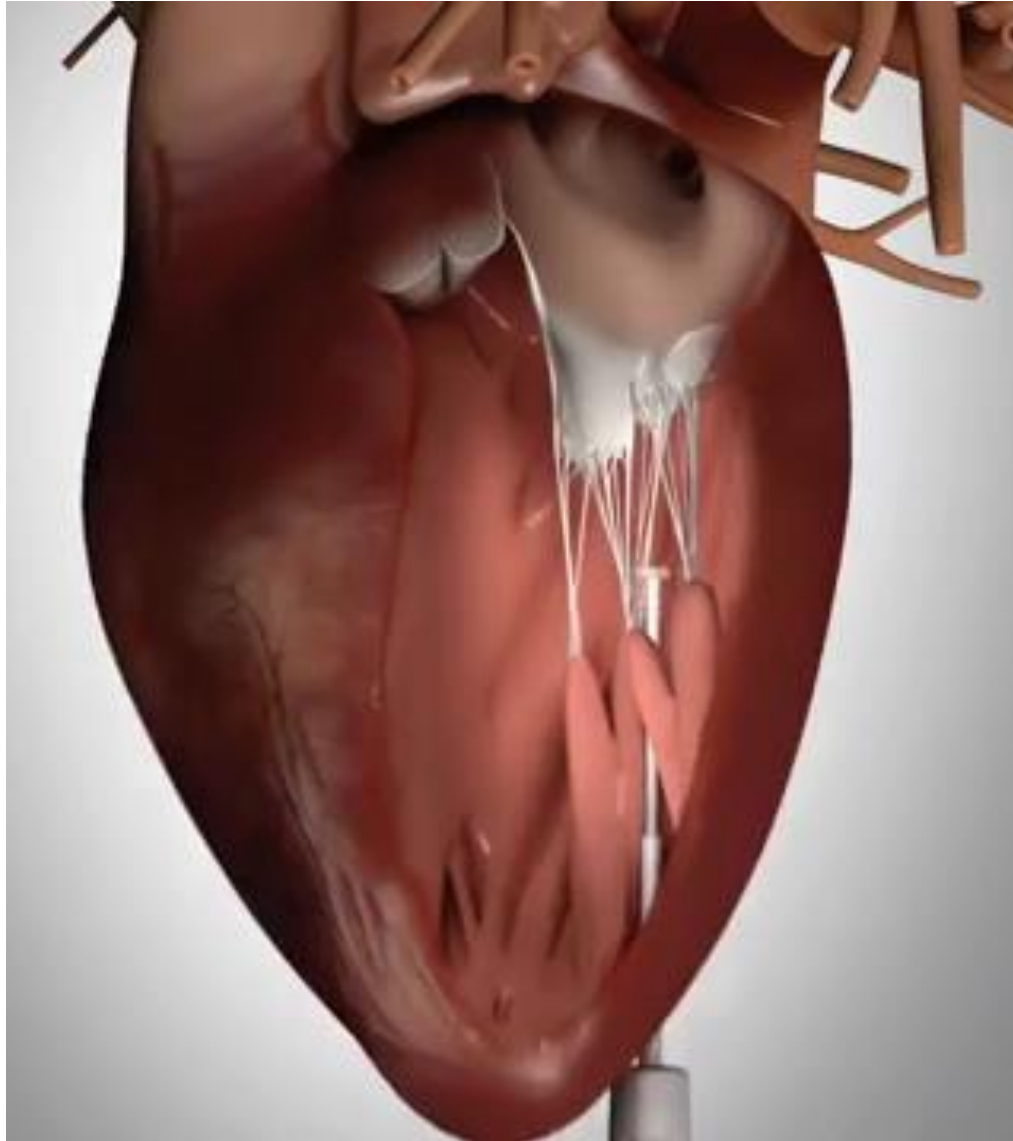
1-year results of complex MV

Type B and C

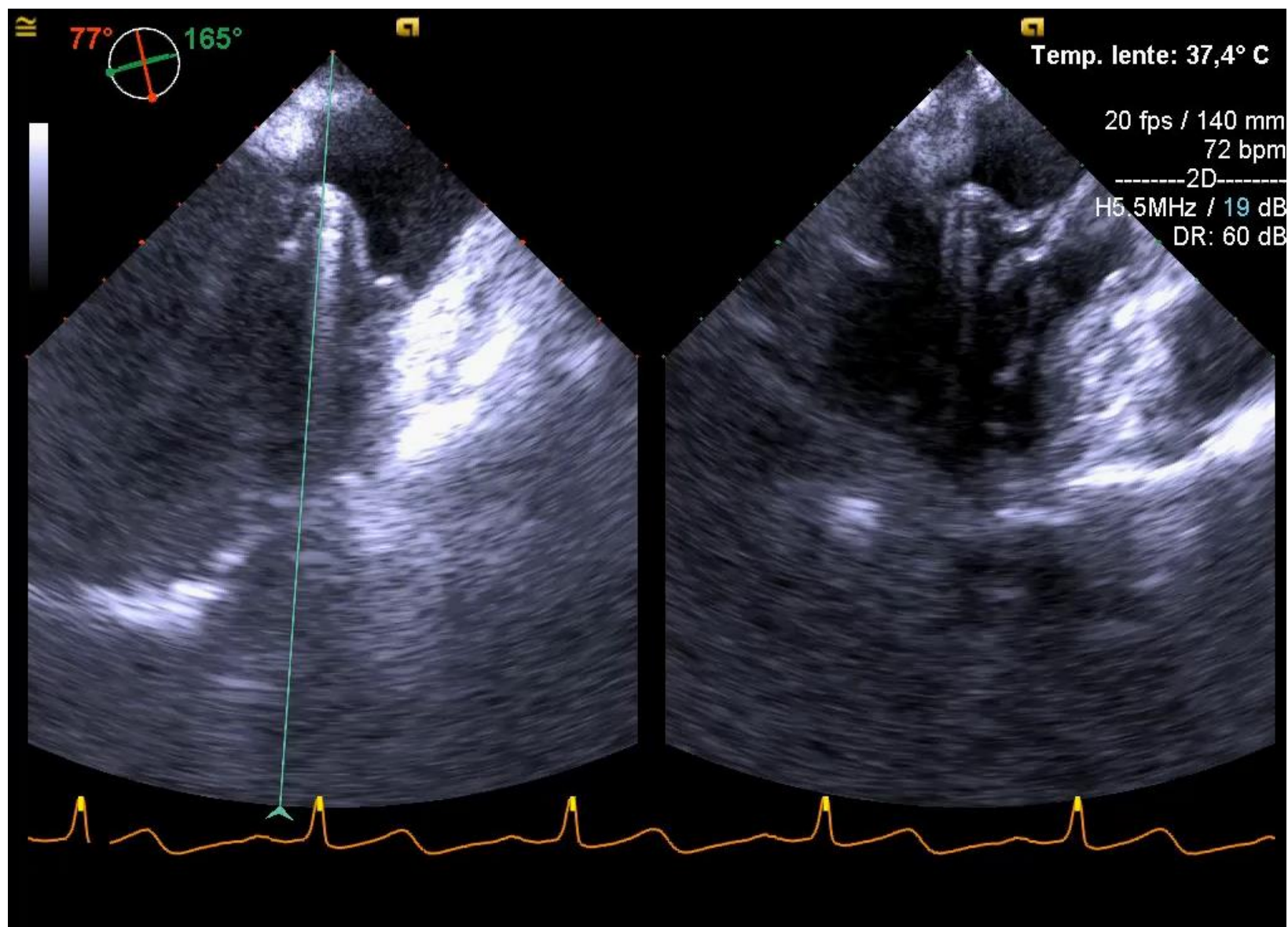




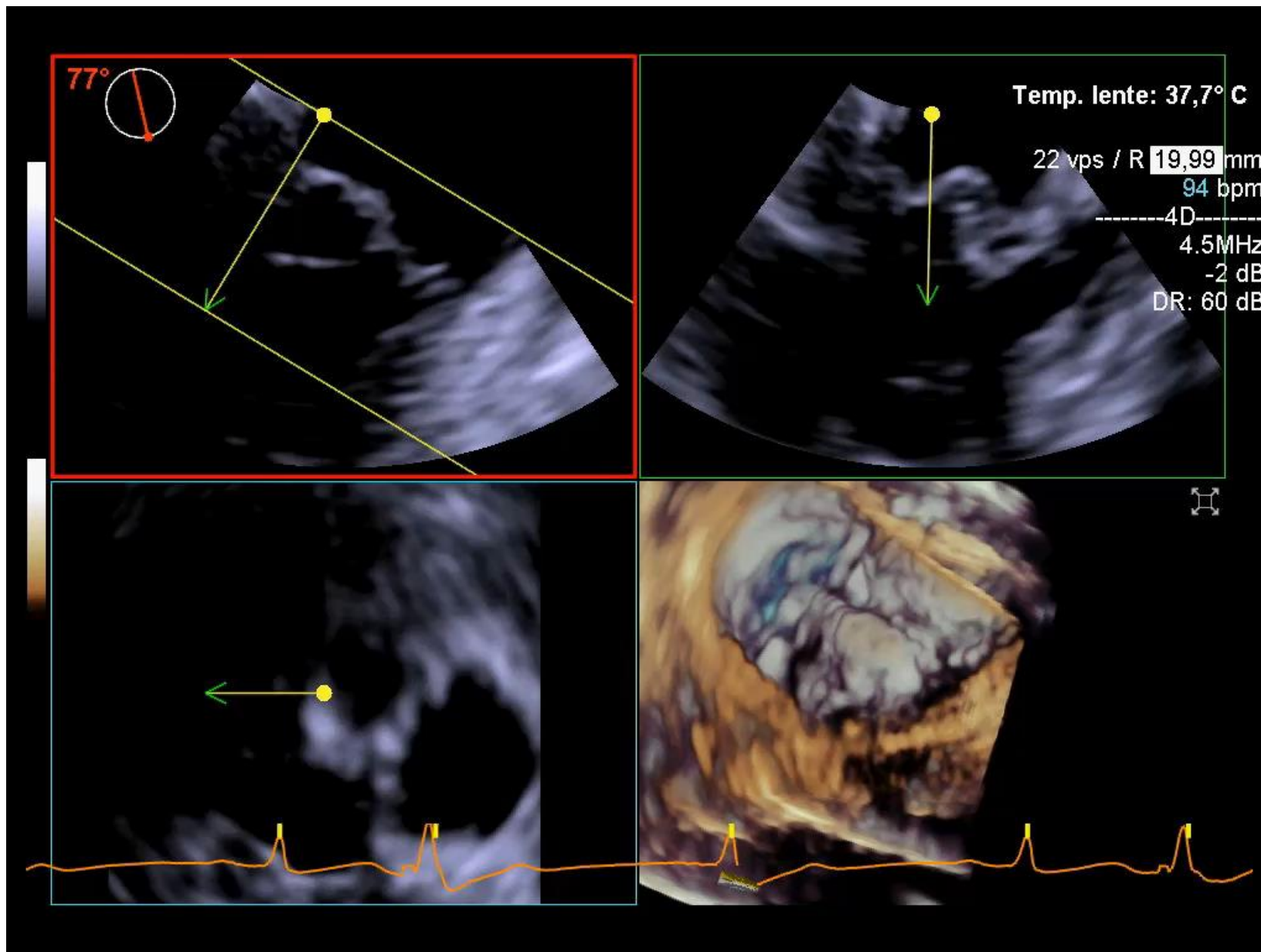
Harpoon Repair



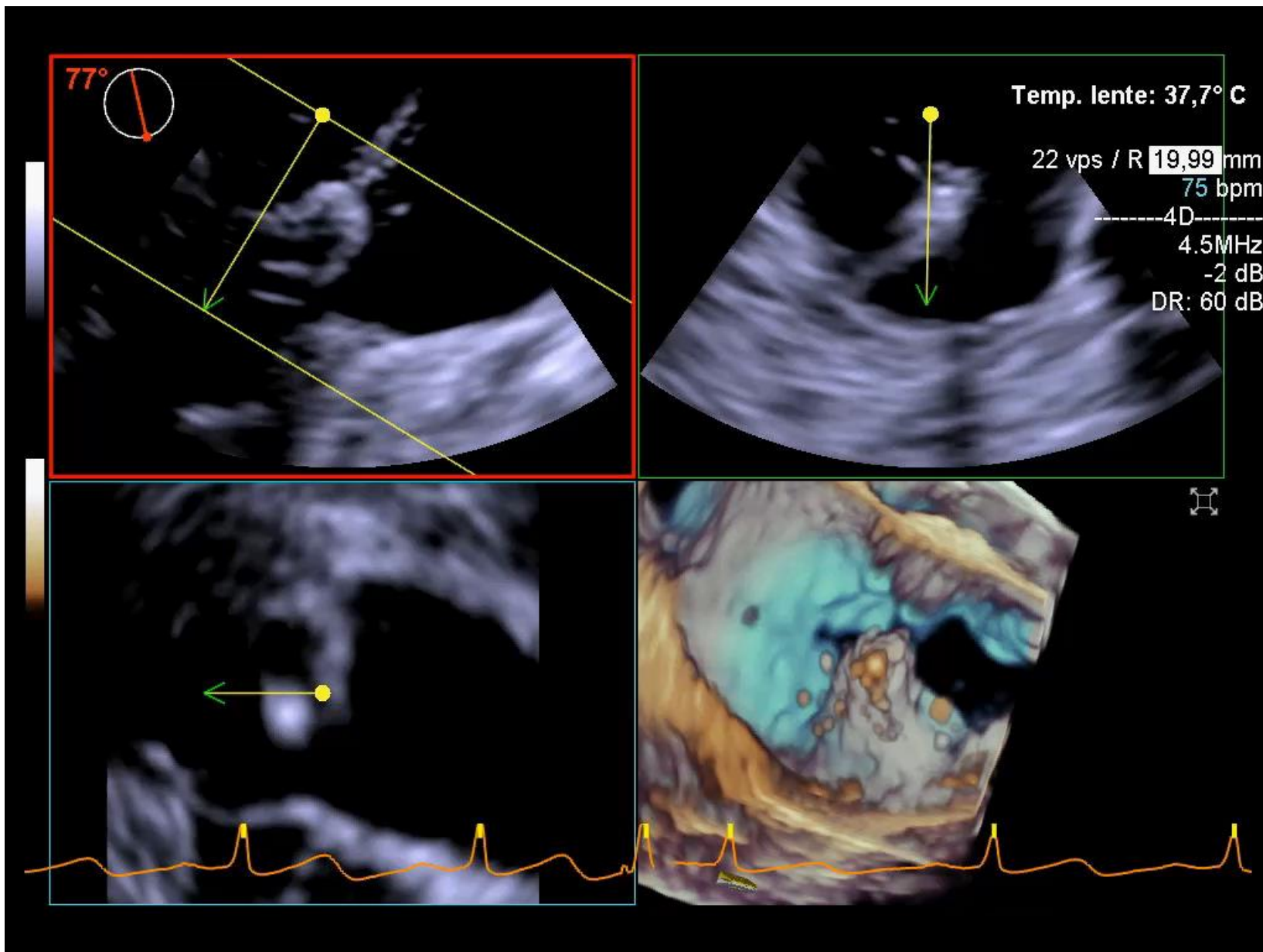
Harpoon Repair



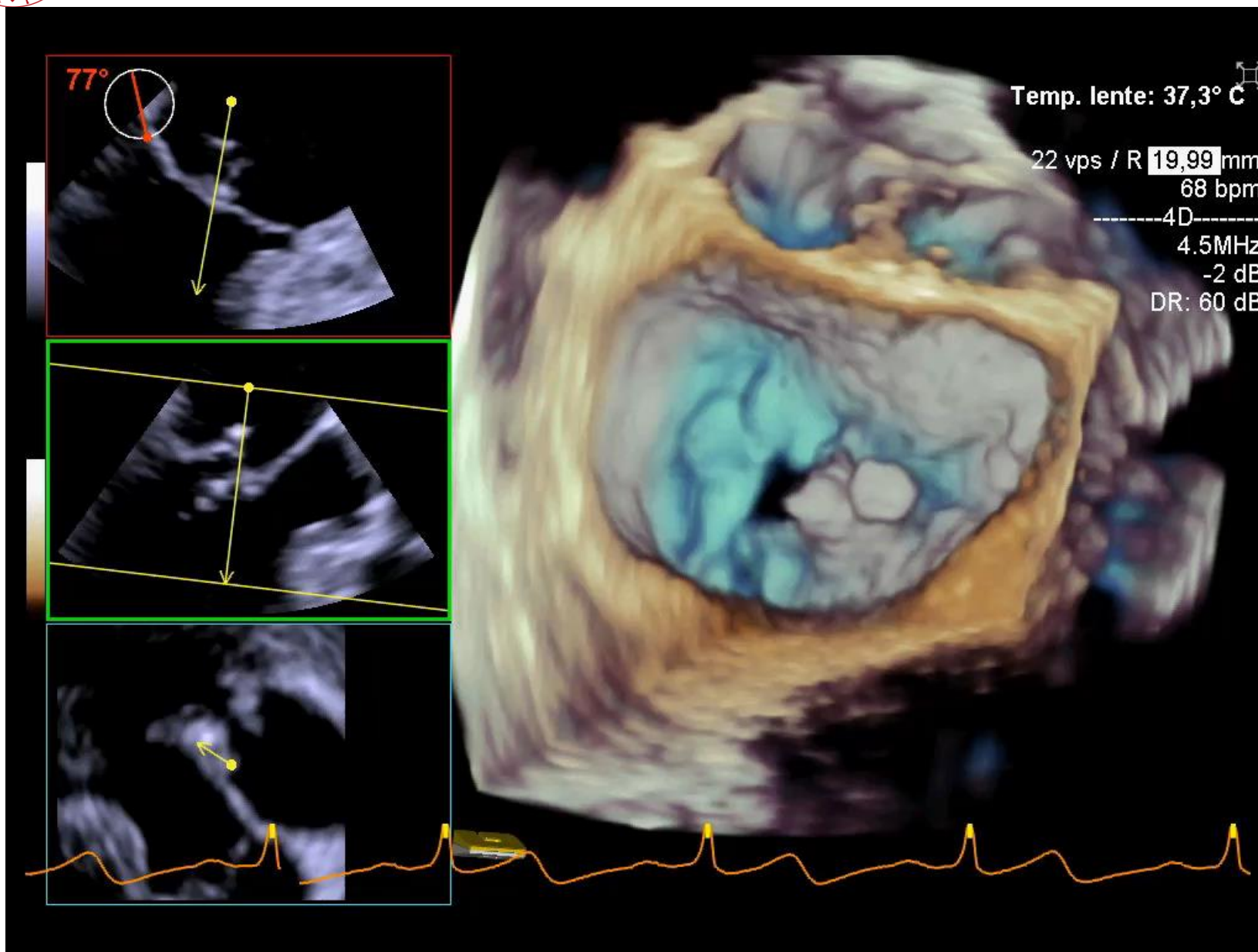
Harpoon Repair



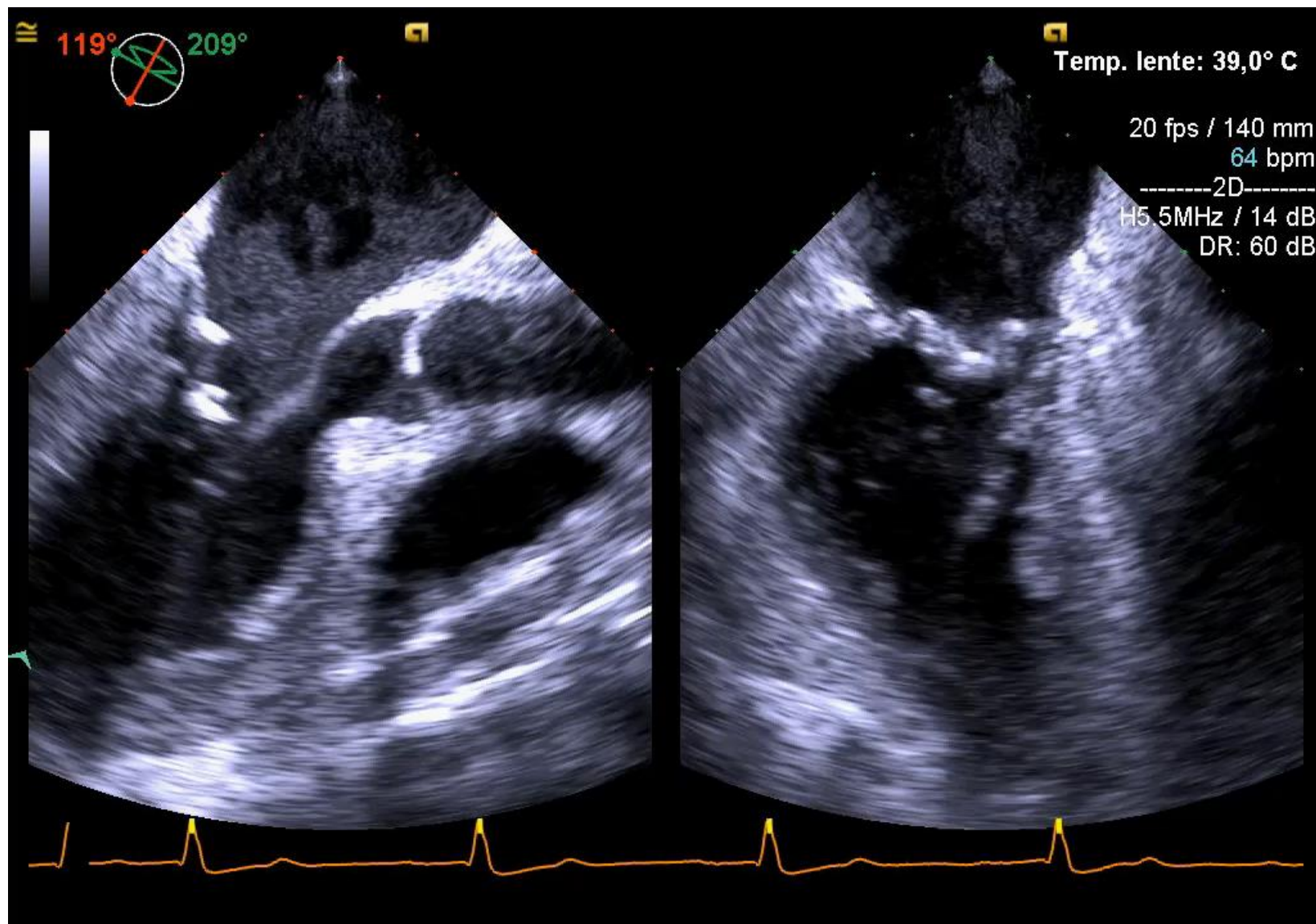
Harpoon Repair



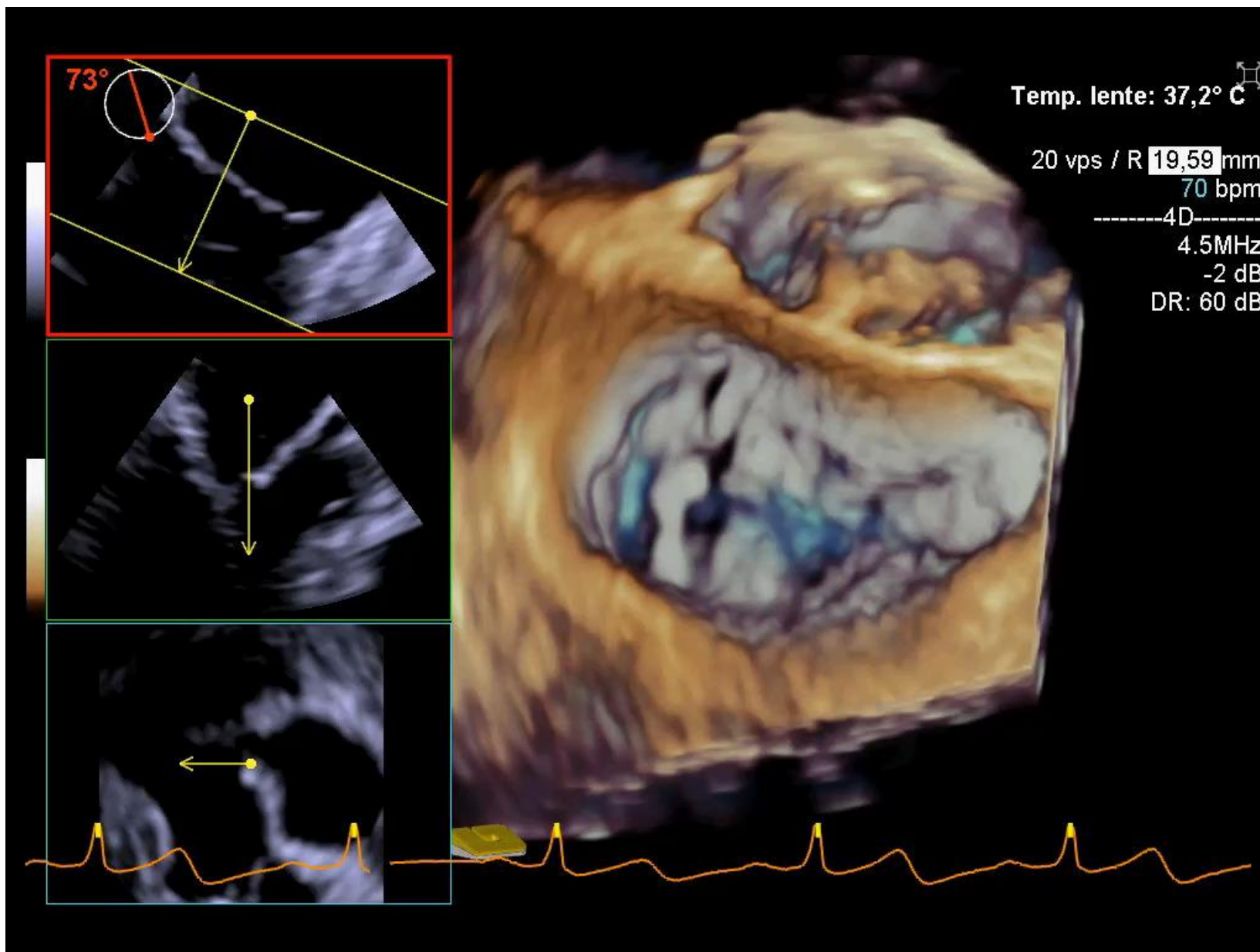
Harpoon Repair



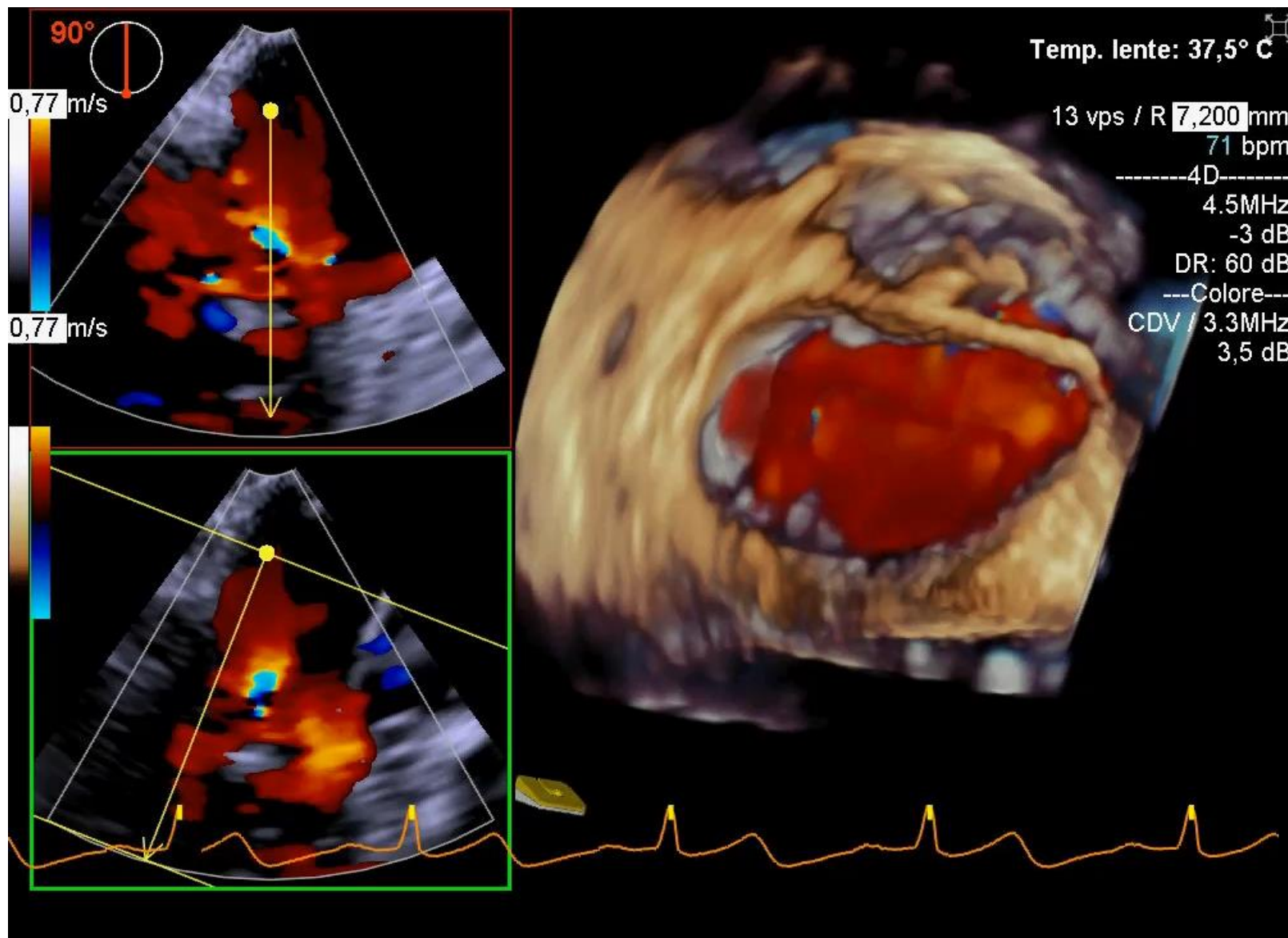
Harpoon Repair



Harpoon Repair



Harpoon Repair





Amend Annuloplasty Repair

Ring deploys



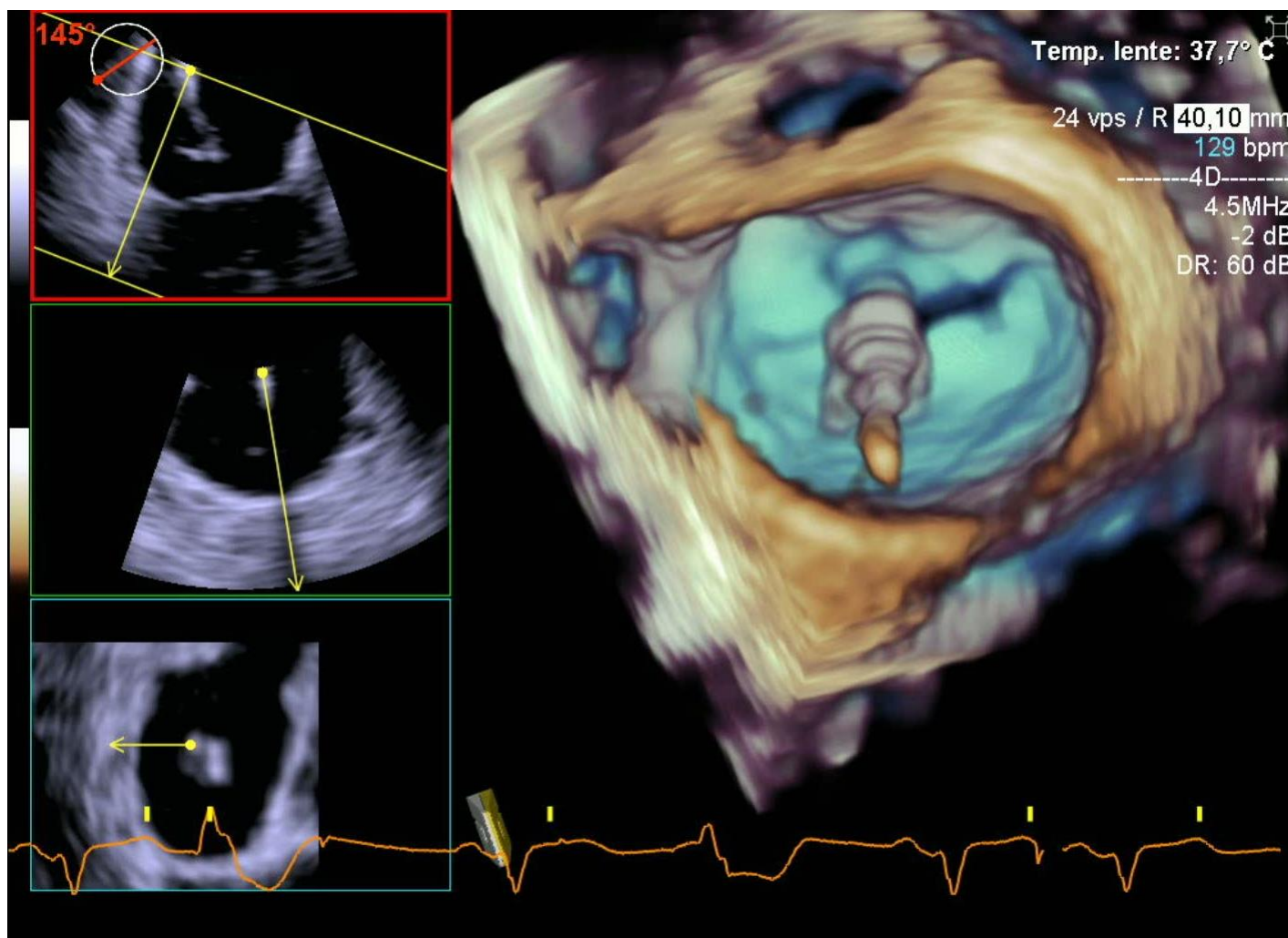
VALCARE
Innovation at Heart





Amend Annuloplasty Repair

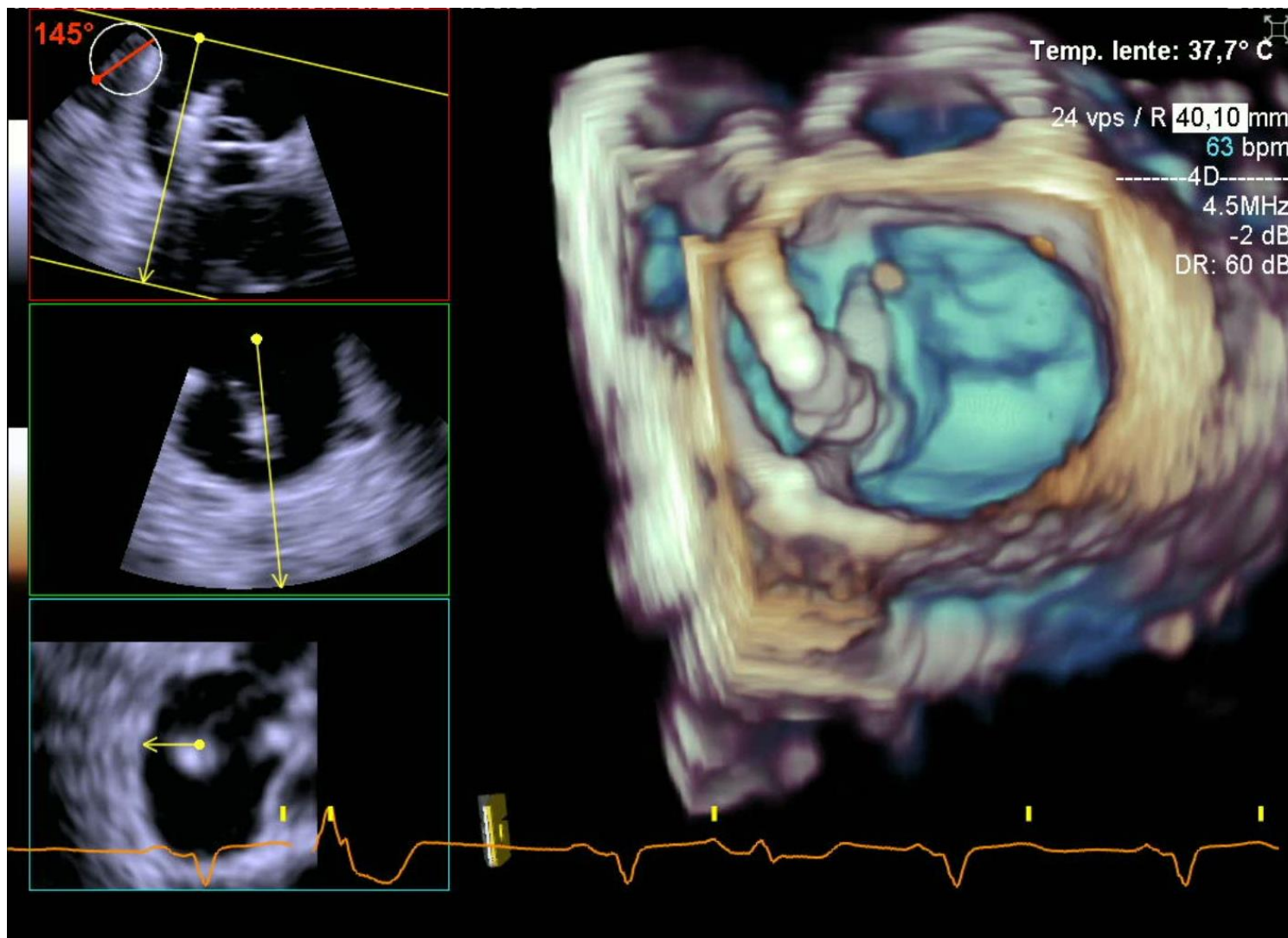
Ring is unsheathed





Amend Annuloplasty Repair

Ring is unsheathed





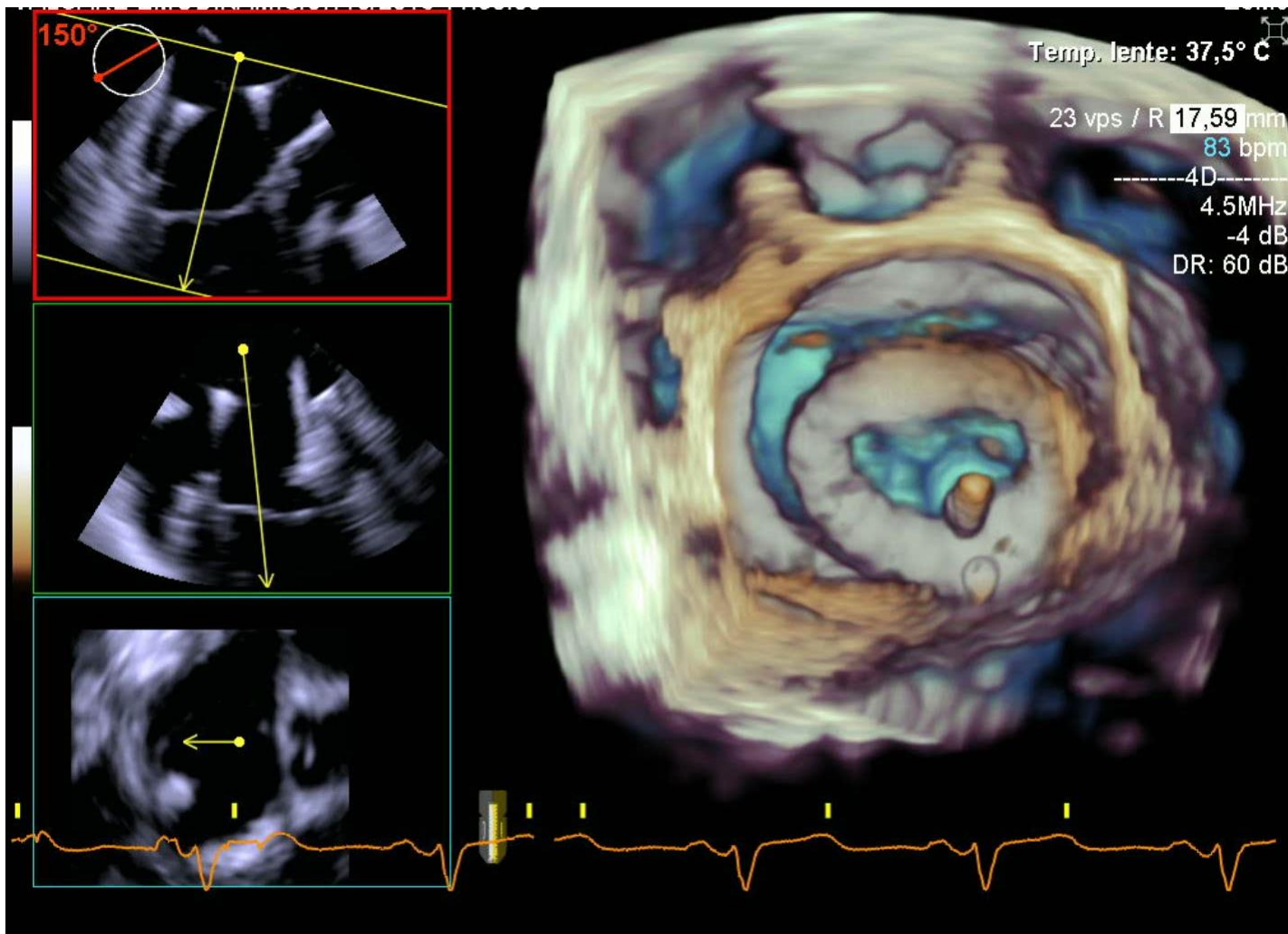
Ring is unsheathed





Amend Annuloplasty Repair

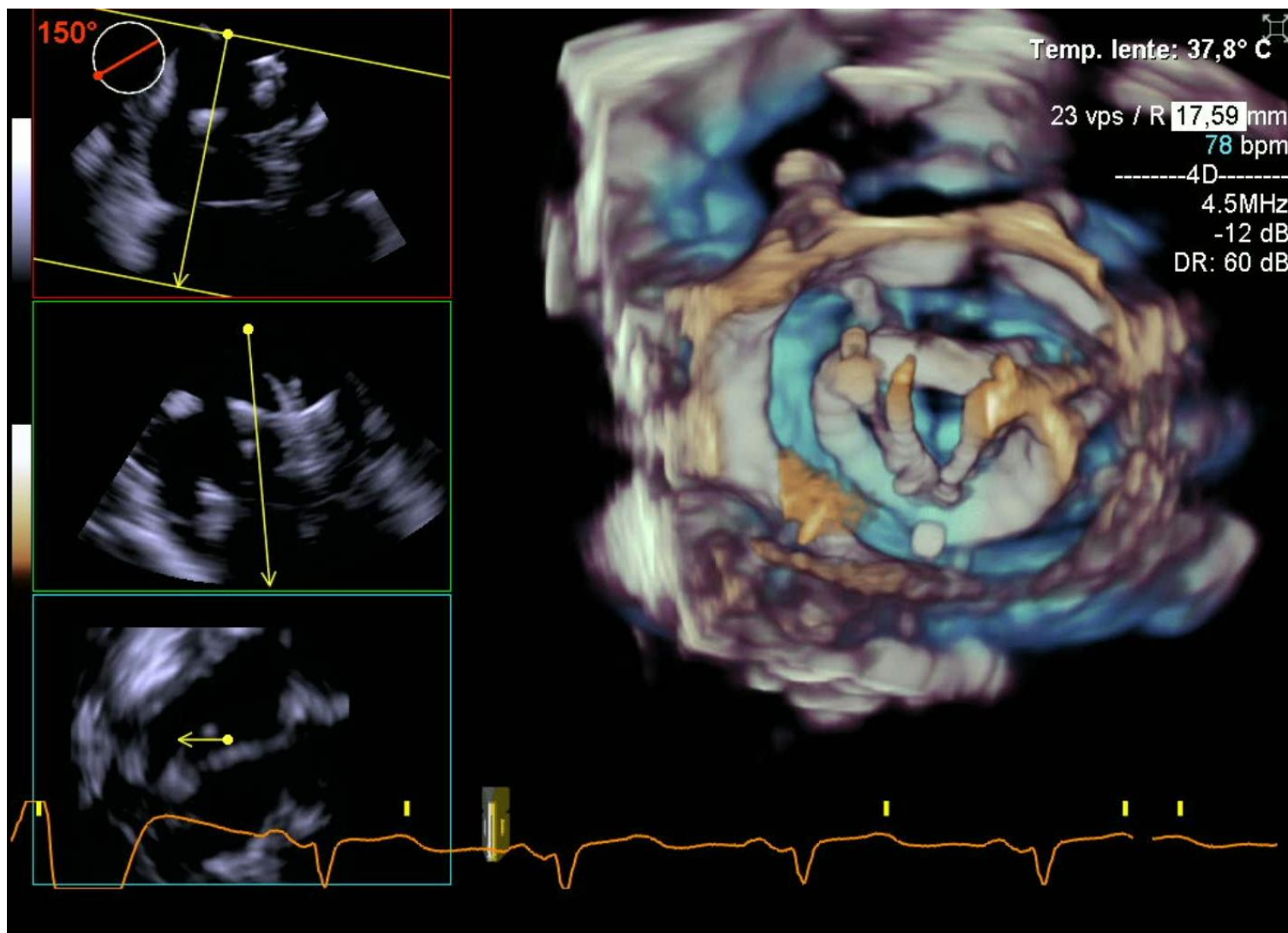
D shape regained





Amend Annuloplasty Repair

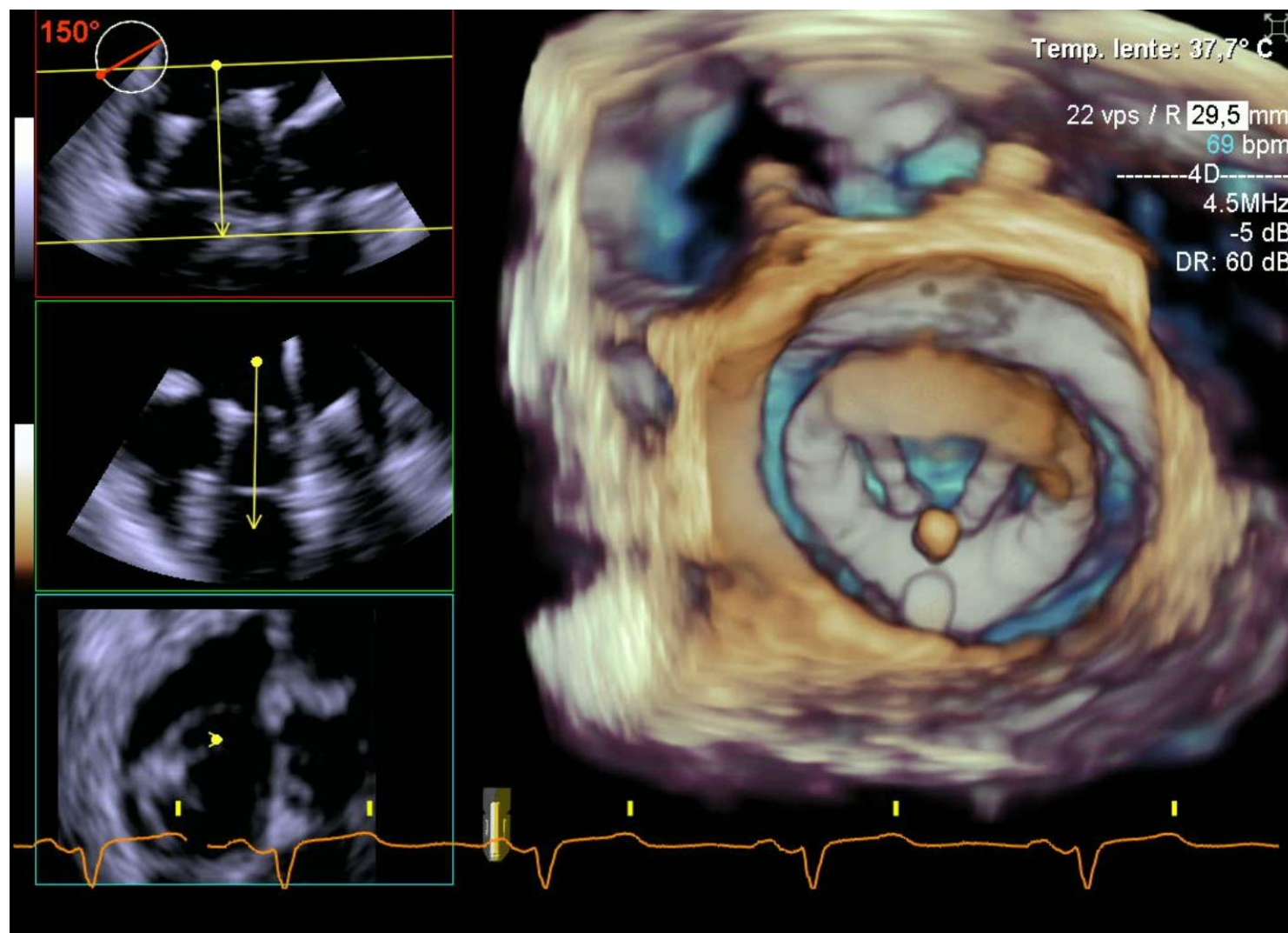
Stabilizing tool unsheathed





Amend Annuloplasty Repair

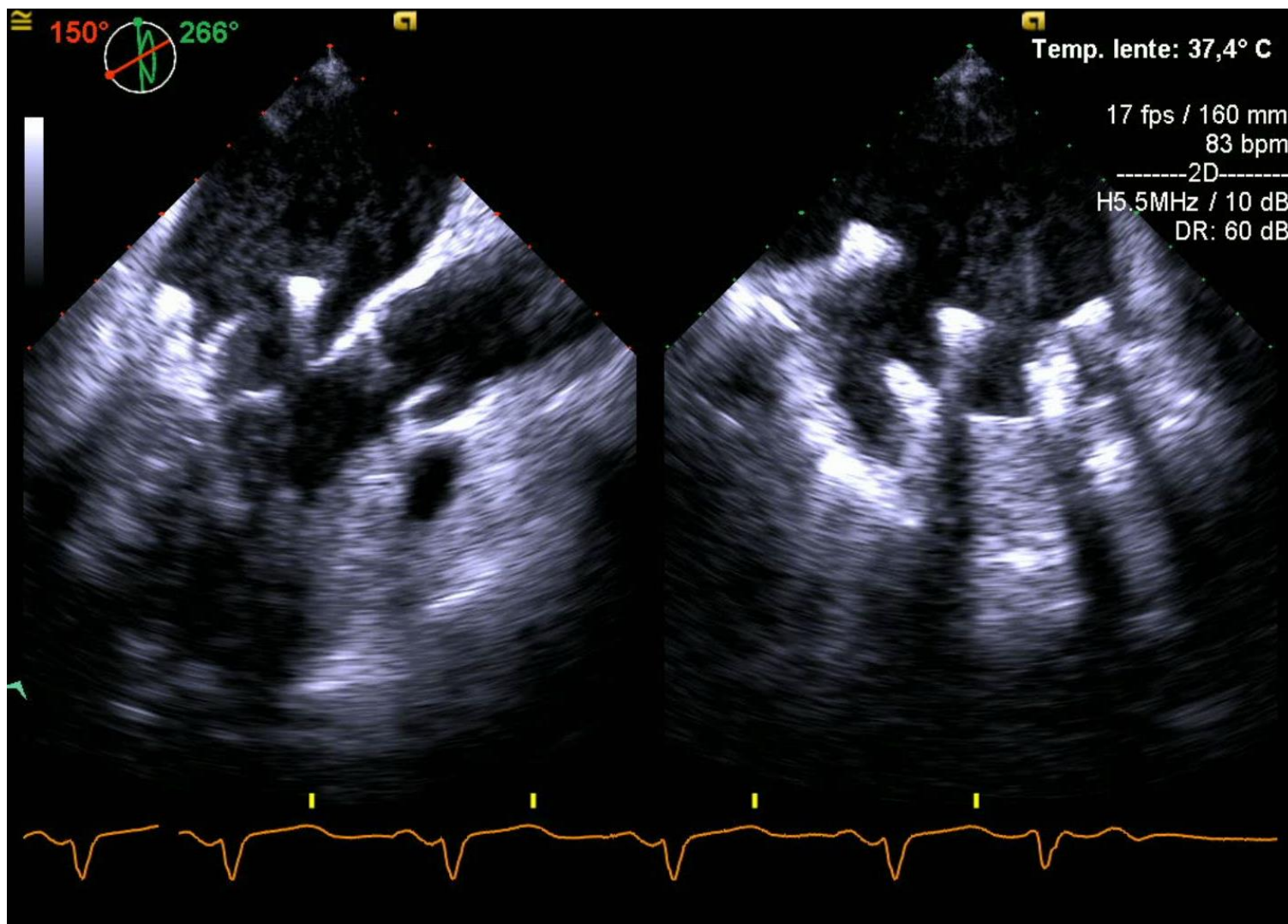
Ring orientation in the atrium





Amend Annuloplasty Repair

Creating ring to posterior annulus Intimate contact





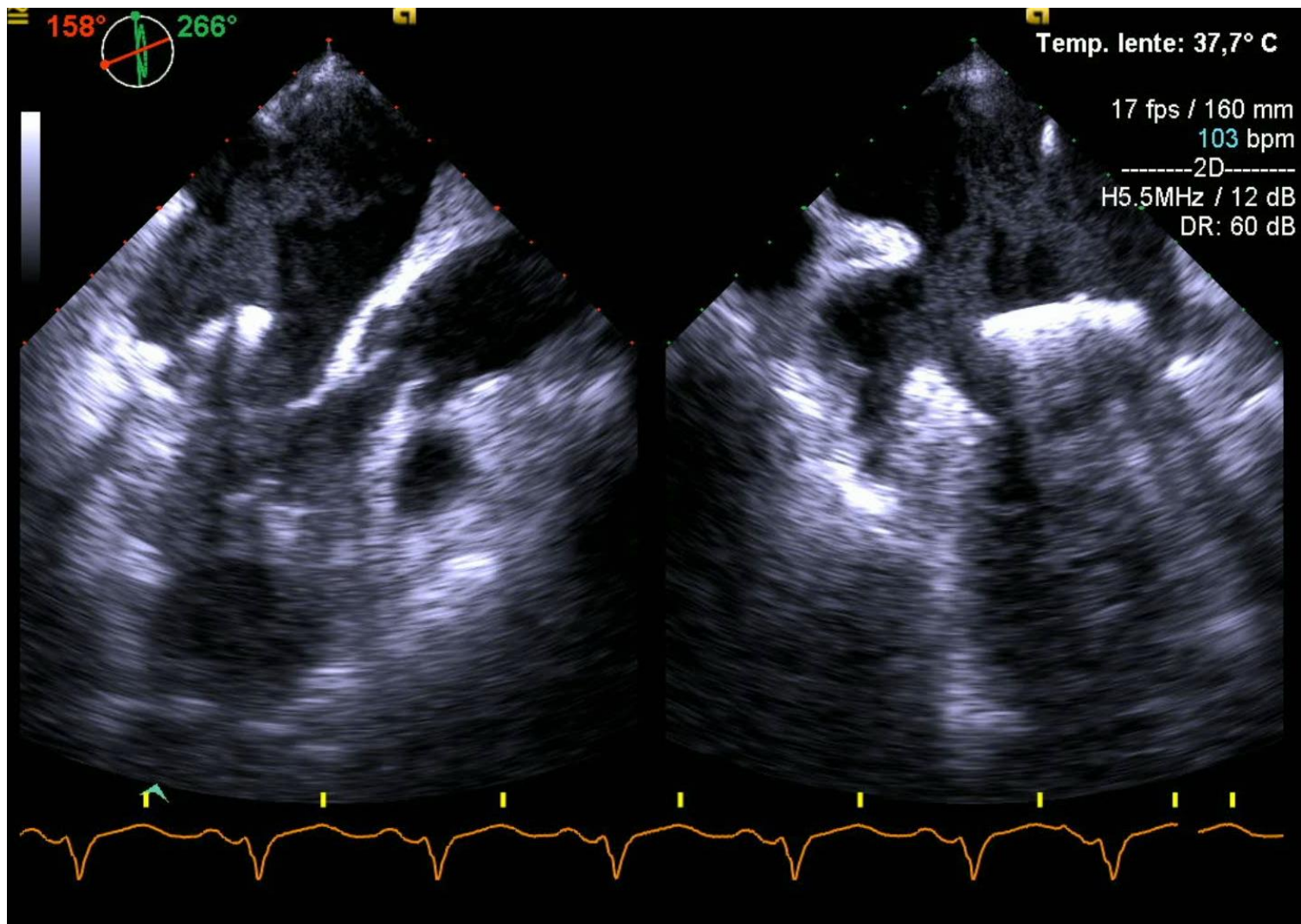
Posterior positioning





Amend Annuloplasty Repair

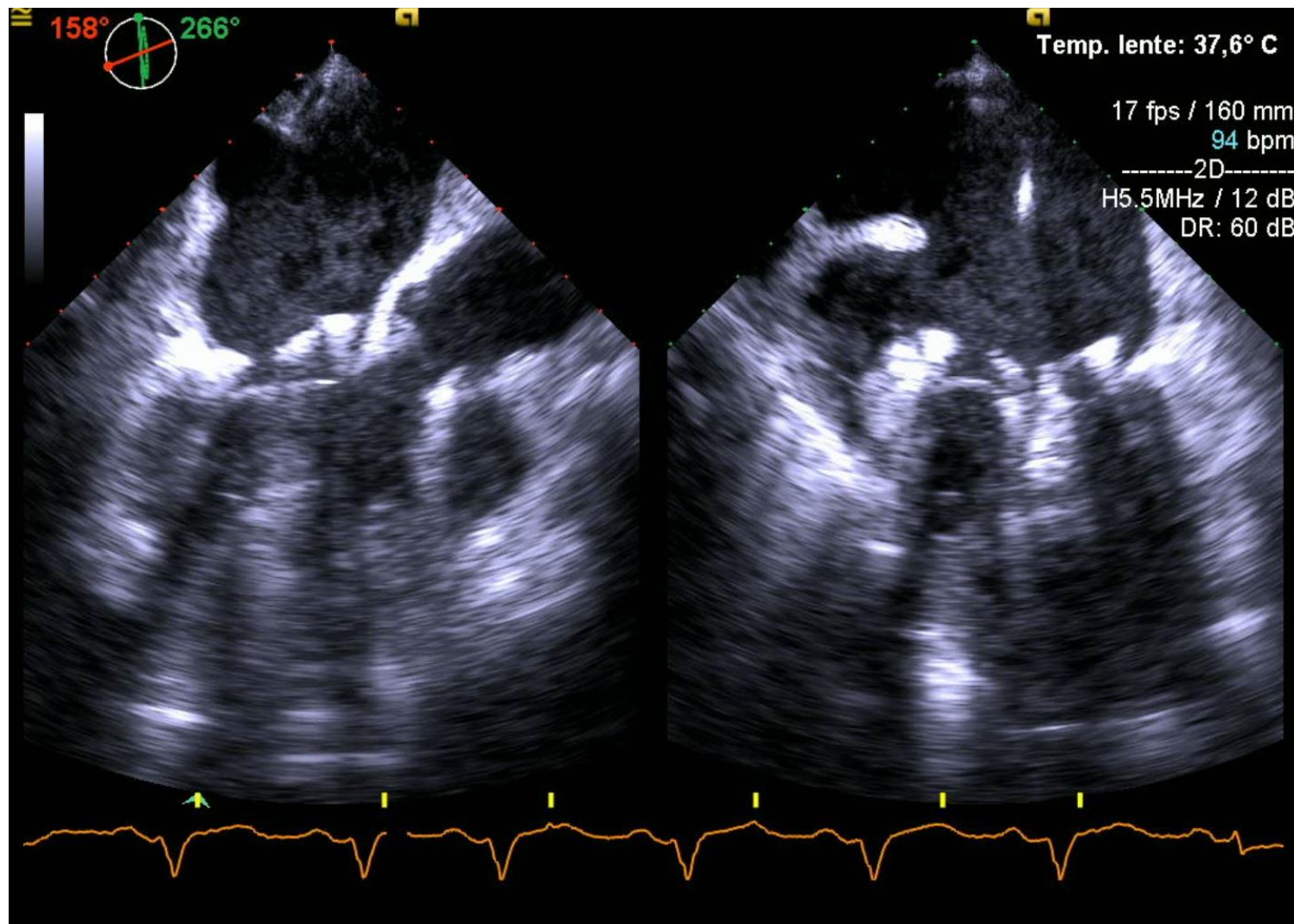
Moving the ring anteriorly





Amend Annuloplasty Repair

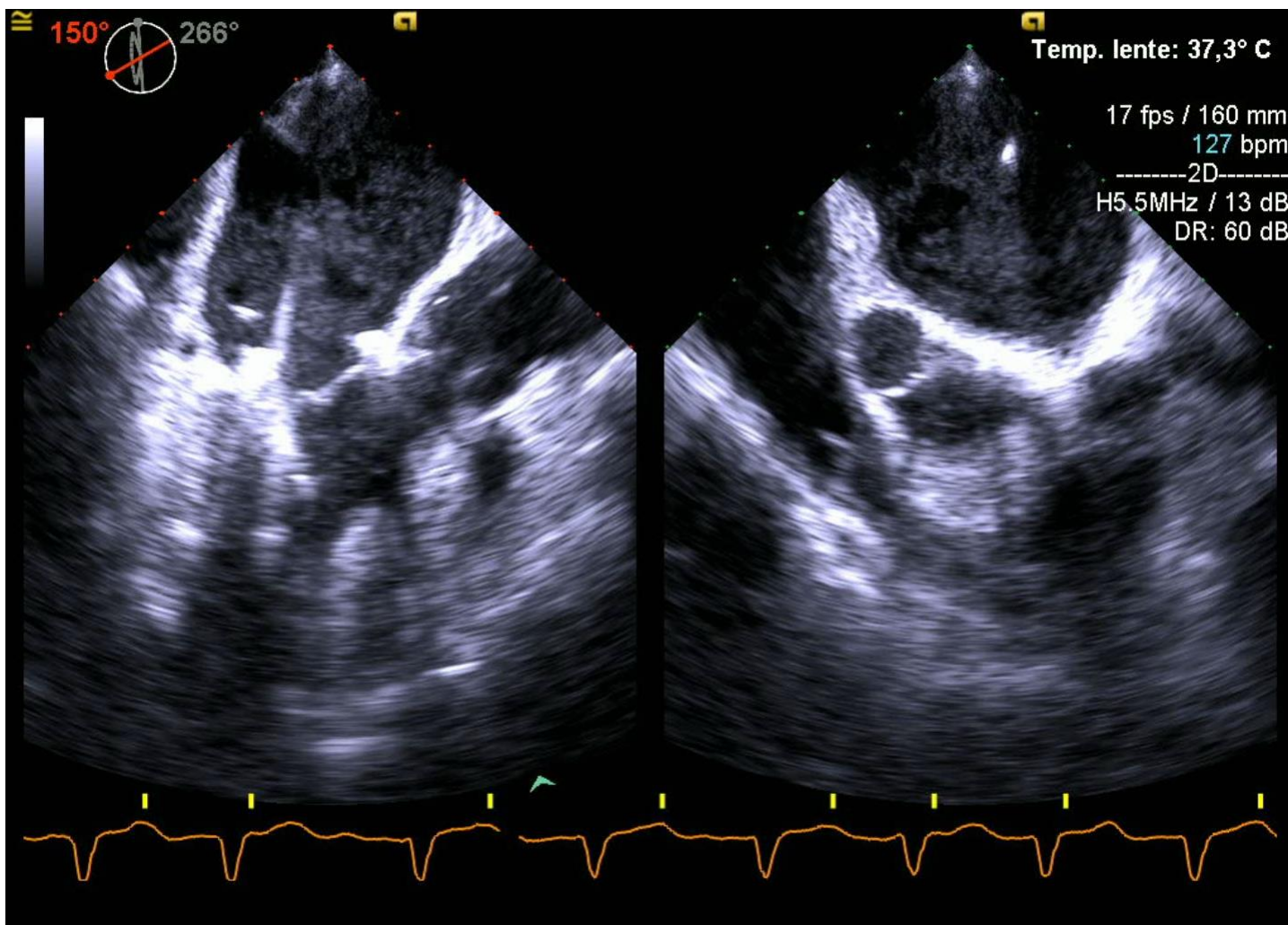
Moving the ring anteriorly





Amend Annuloplasty Repair

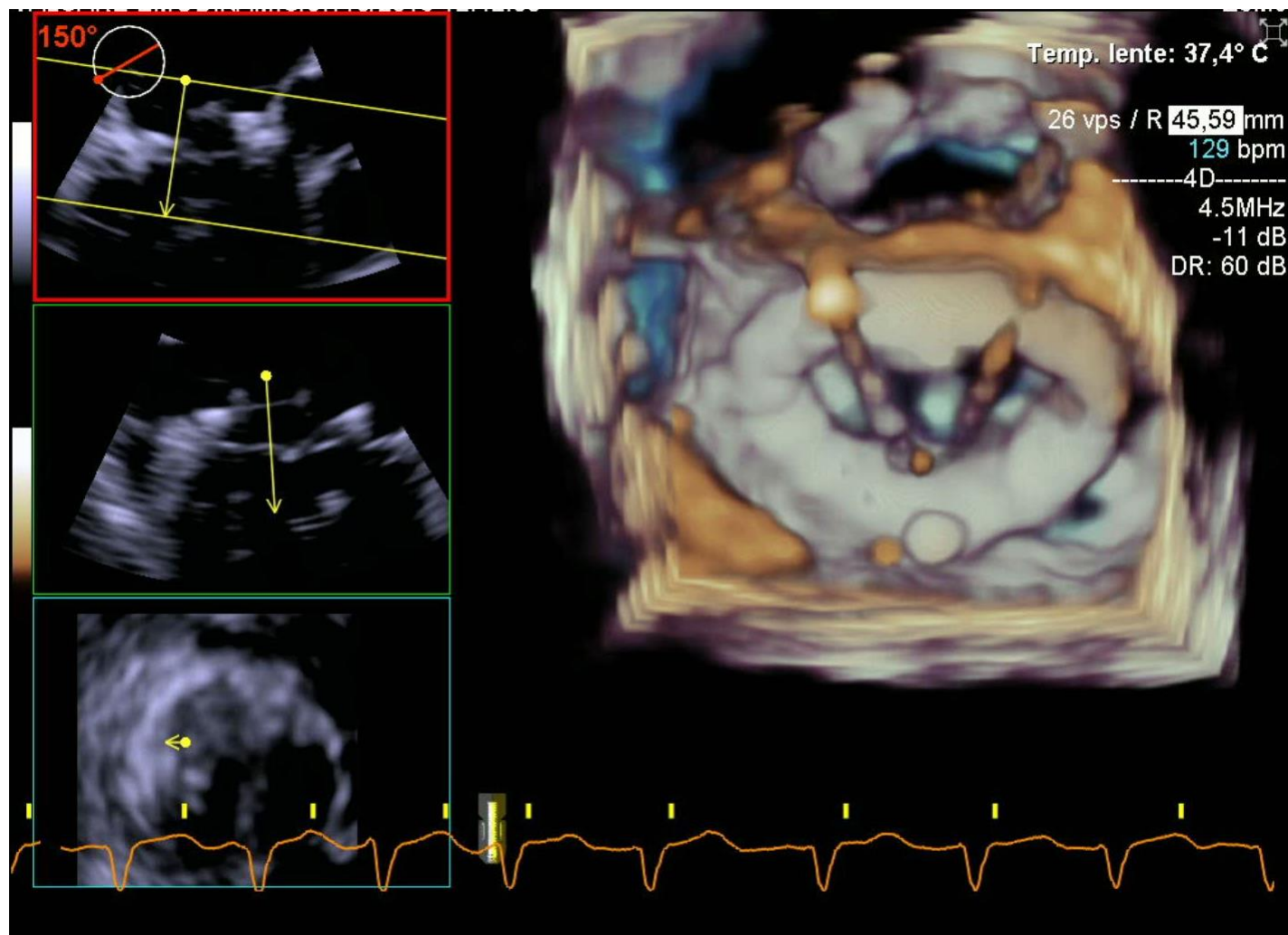
Moving the ring anteriorly





Amend Annuloplasty Repair

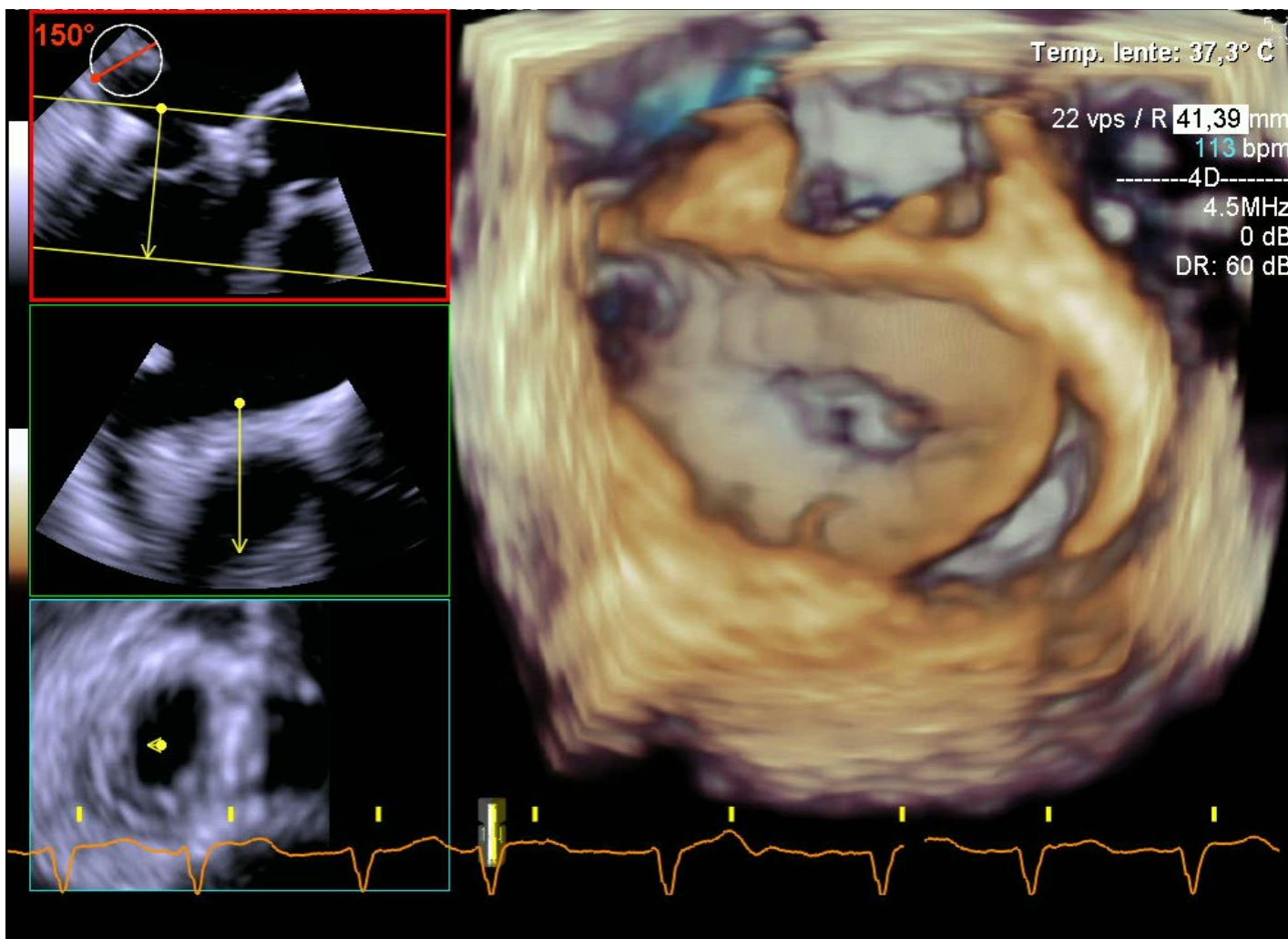
Fine adjustment of the Stabilizing tool to improve anterior contact





Amend Annuloplasty Repair

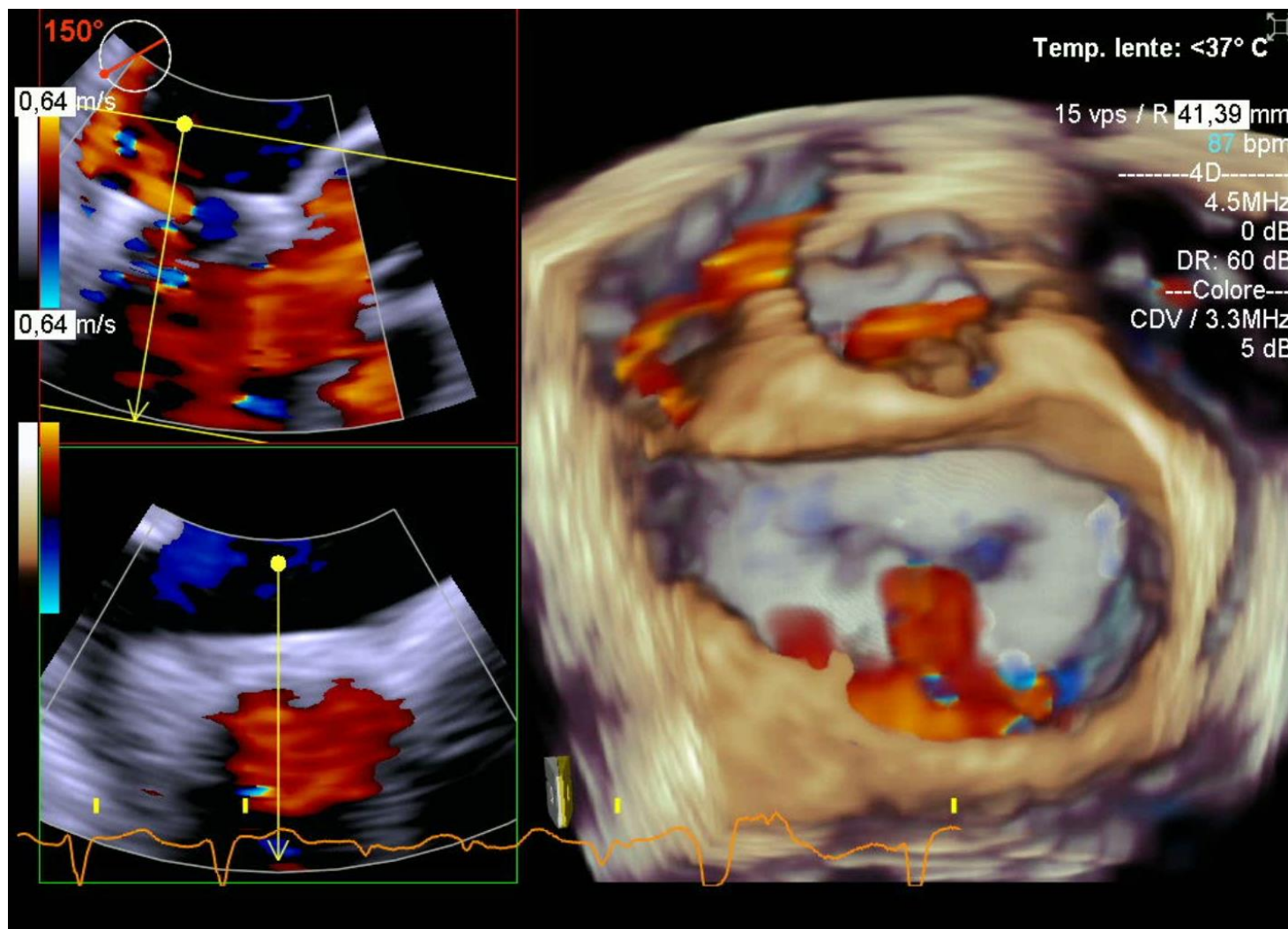
Final 3D assessment





Amend Annuloplasty Repair

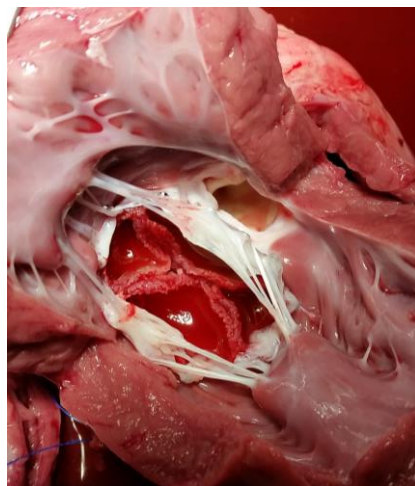
Final 3D color Doppler assessment





Corona TMVR

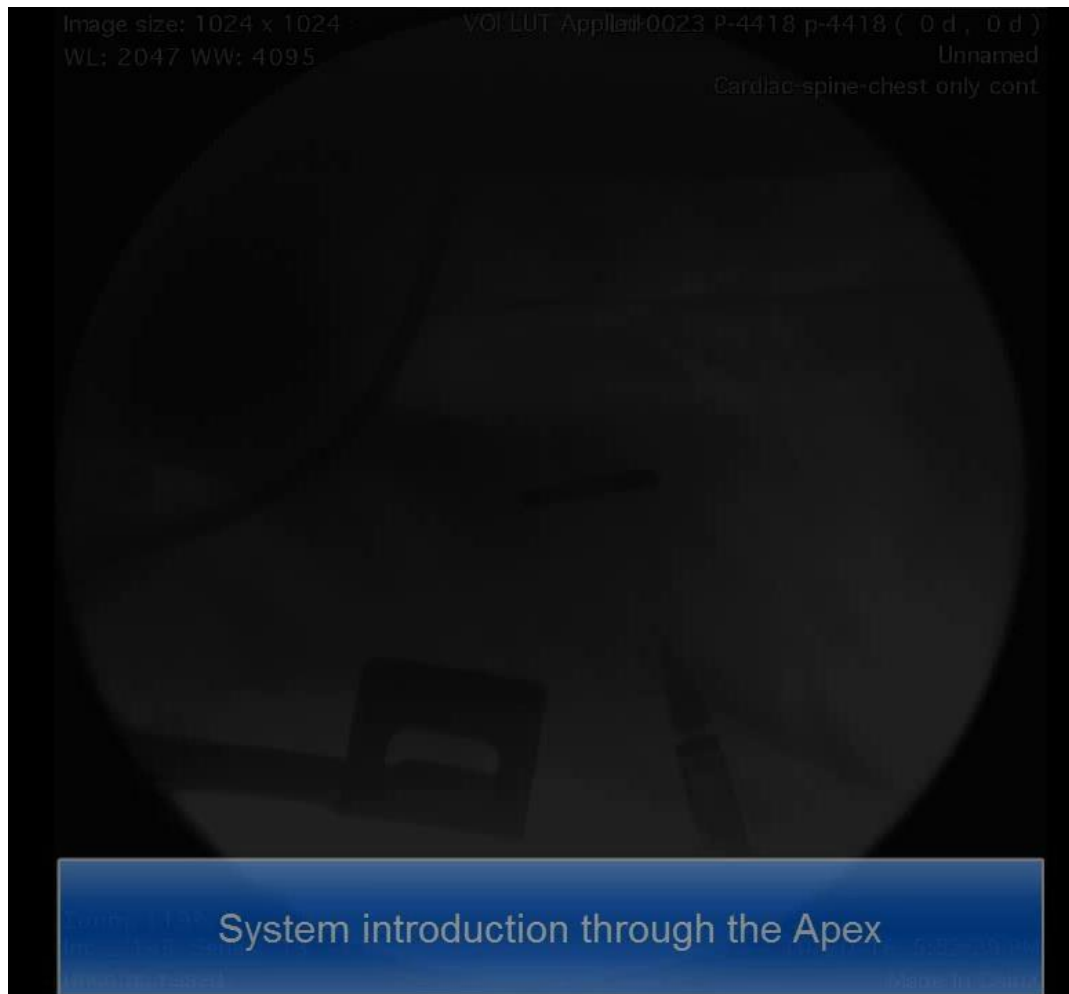
- D-shaped self-expanding stent-based valve
- 4-Leaflet concept
- Uses AMEND Ring as landing zone
 - Preservation of native geometry
 - No PVL
 - Low profile with minimal protrusion to LV and LA





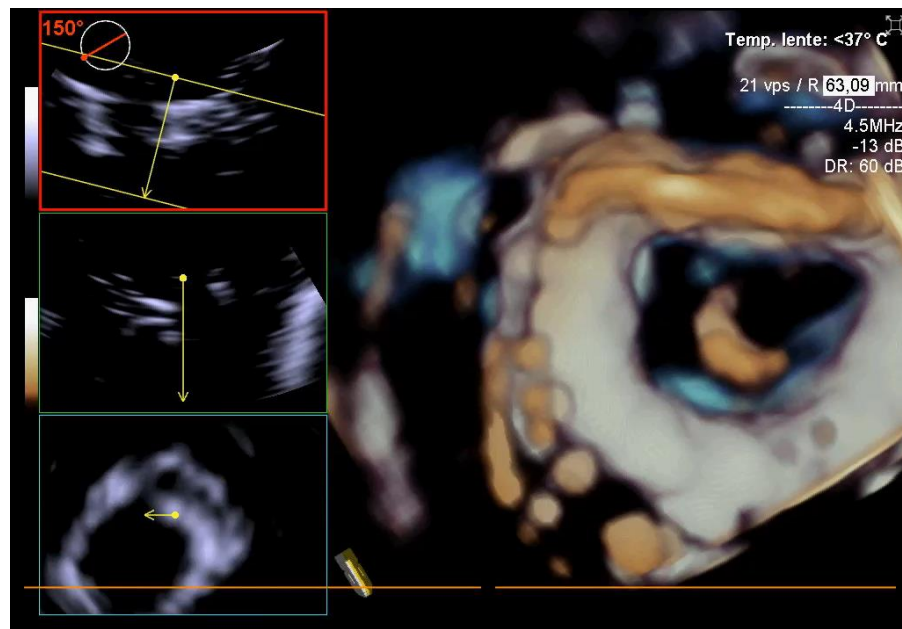
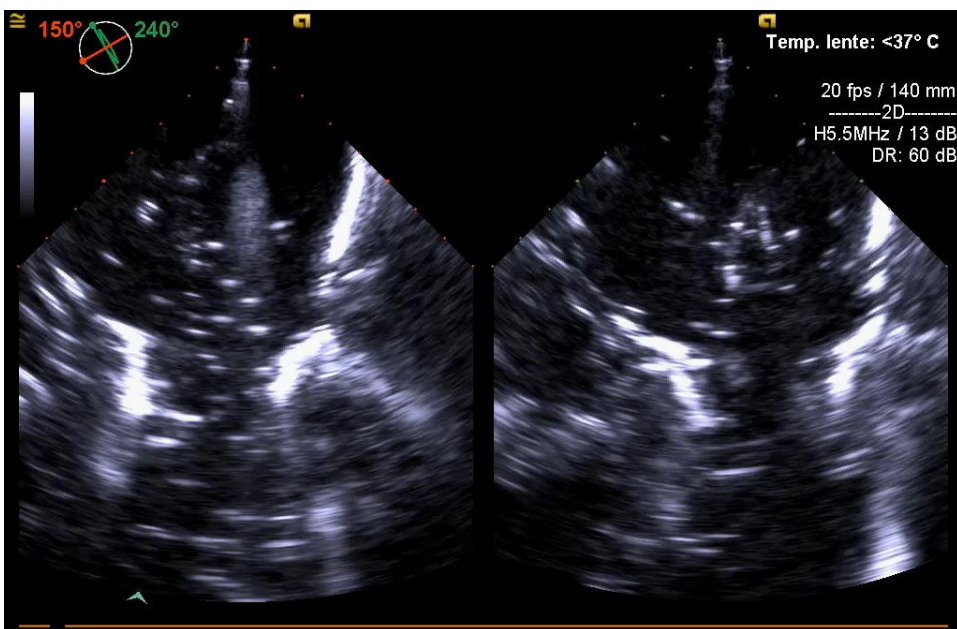
Corona Mitral Valve Replacement

Amend Ring Implanted



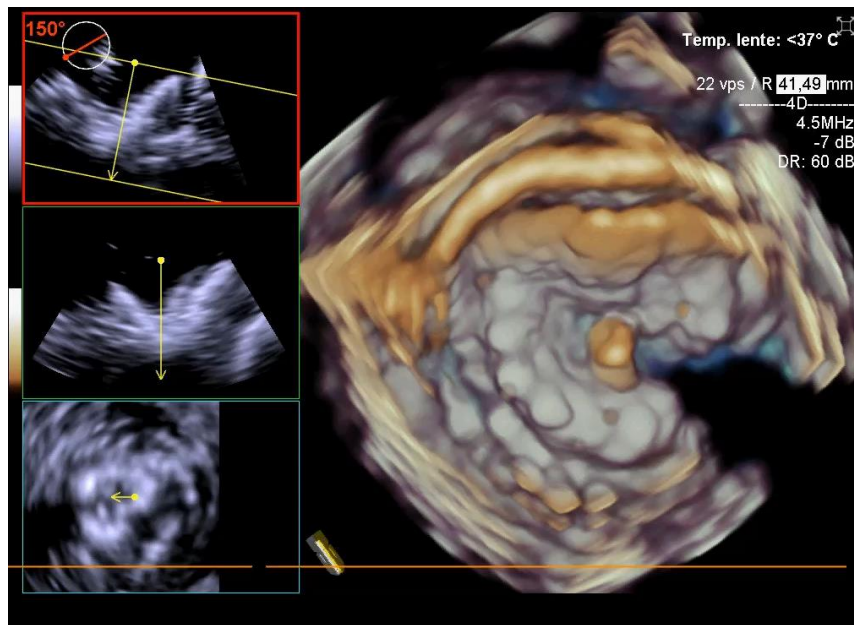
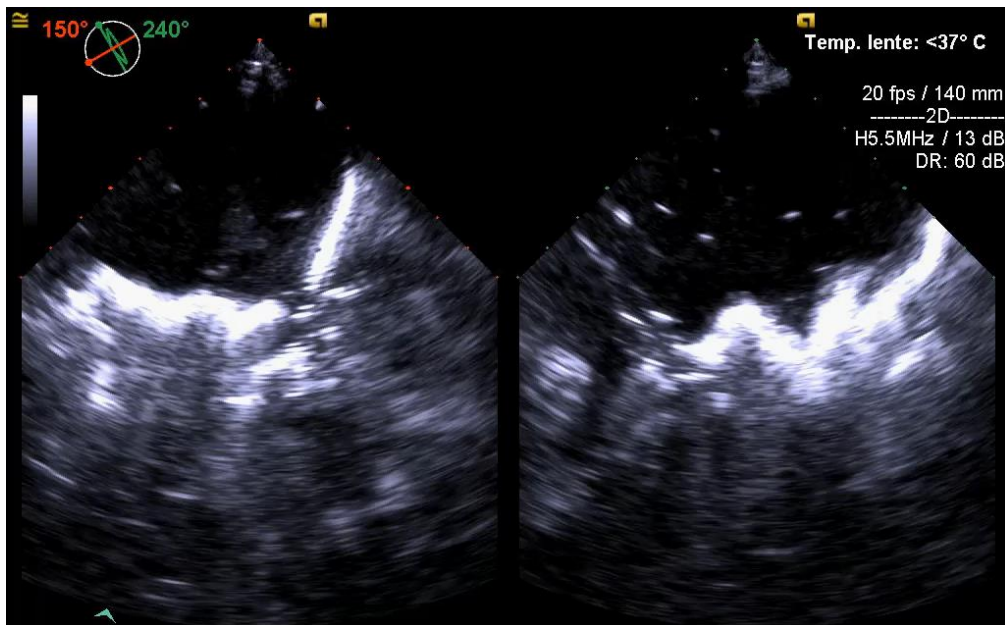


Tiara TMVR



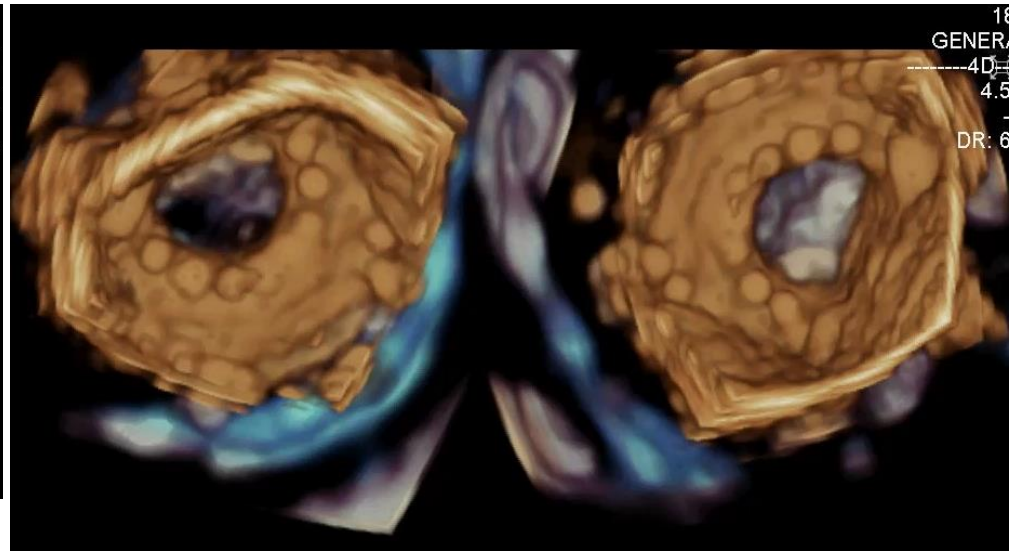
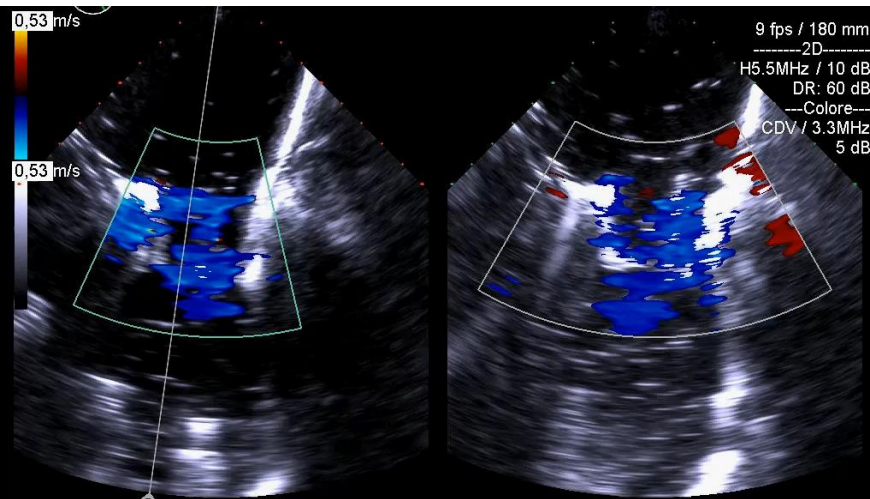


Tiara TMVR





Tiara TMVR





Conclusion

The full integration of the REAL TIME 3D ECHOCARDIOGRAPHY with Interventional procedures is mandatory today in order to improve the clinical outcomes





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