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The role of ultrasound during a MitraClip procedure

Clinical Case Study

ACUSON SC2000 ultrasound system

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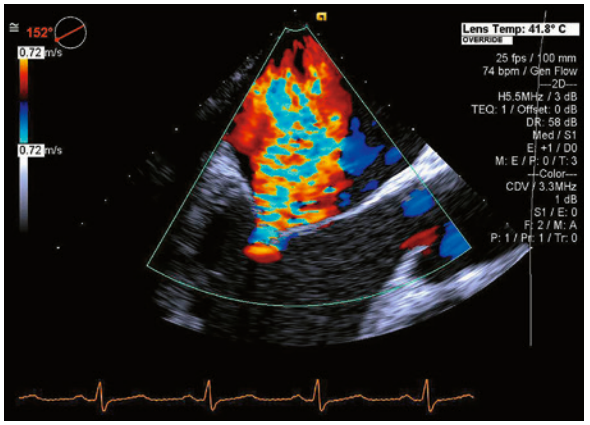
SIEMENS Healthineers

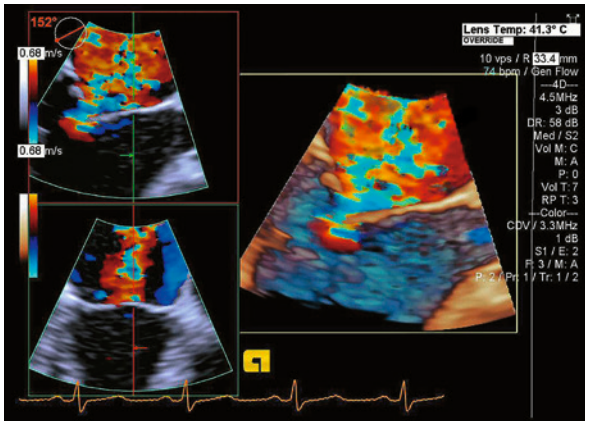
Clinical Case

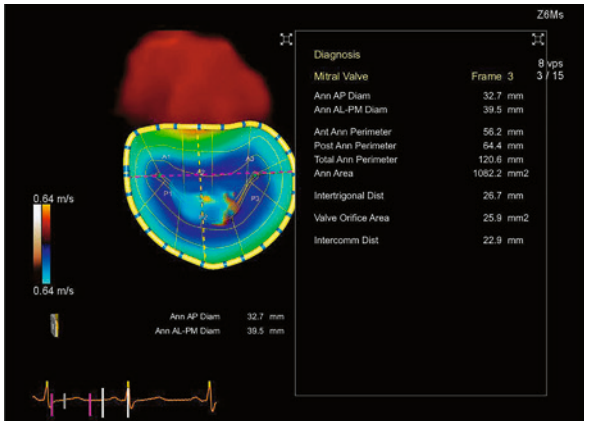
A 65-year-old male who was previously diagnosed with severe mitral regurgitation was seen at Yale-New Haven Hospital, Connecticut, USA. The indication was mitral clip procedure.

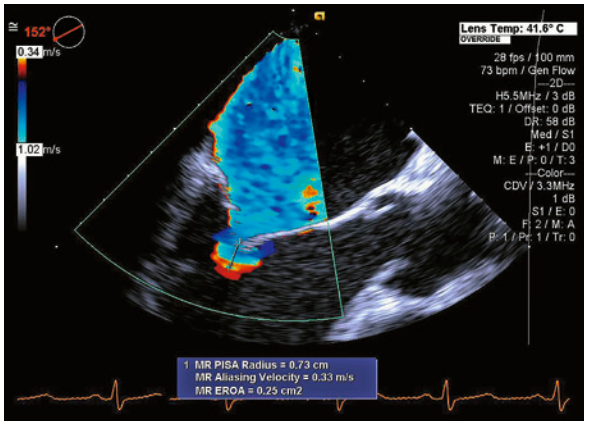
Pre-Procedure

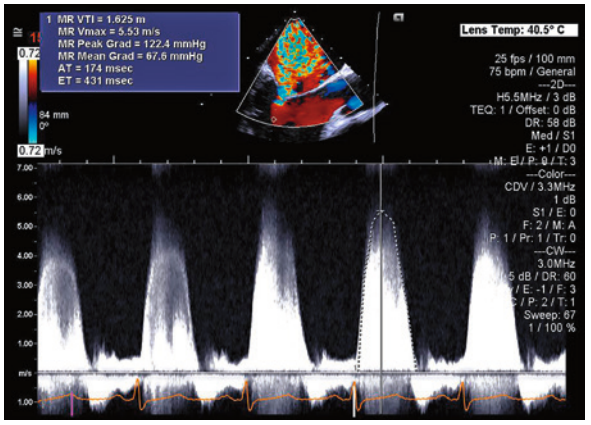
The baseline transesophageal echocardiography (TEE) exam shows severe mitral regurgitation (MR) with two jets. The effective regurgitant orfice (ERO) area by proximal isovelocity surface area (PISA) using 2D transthoracic echocardiography (TTE) is 0.25 cm^2. The MR mean gradient is 67.6 mmHg. 3D modeling of mitral valves using the eSie Valves analysis package was also performed. Also, systolic flow reversal is seen in the pulmonary veins.

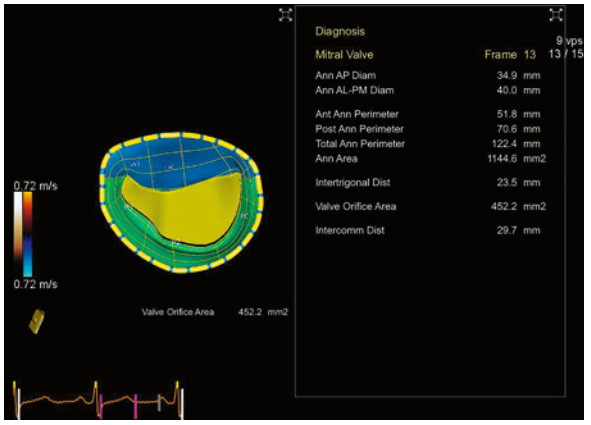

Lens Temp: 41.8° C
OVERRIDE
25 fps / 100 mm
74 bpm / Gen Flow
---2D---
H5.5MHz / 3 dB
TEQ: 1 / Offset: 0 dB
DR: 58 dB
Med / S1
E: +1 / D0
M: E / P: 0 / T: 3
---Color---
CDV / 3.3MHz
1 dB
S1 / E: 0
F: 2 / M: A
P: 1 / Pr: 1 / Tr: 0

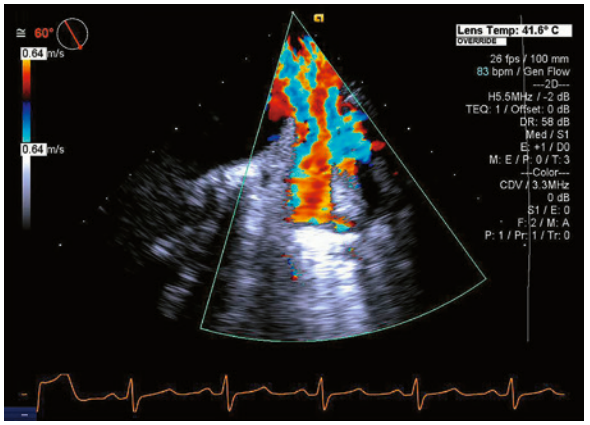

Lens Temp: 41.3° C
OVERRIDE
10 vps / R 33.4 mm
74 bpm / Gen Flow
---4D---
4.5MHz
3 dB
DR: 58 dB
Med / S2
Vol M: C
M: A
P: 0
Vol T: 7
RP T: 3
---Color---
CDV / 3.3MHz
1 dB
S1 / E: 2
F: 3 / M: A
P: 2 / Pr: 1 / Tr: 1 / 2


Z6Ms
Diagnosis
8 vps
Mitral Valve
Frame 3
3 / 15
Ann AP Diam 32.7 mm
Ann AL-PM Diam 39.5 mm
Ant Ann Perimeter 56.2 mm
Post Ann Perimeter 64.4 mm
Total Ann Perimeter 120.6 mm
Ann Area 1082.2 mm2
Intertrigonal Dist 26.7 mm
Valve Orifice Area 25.9 mm2
Intercomm Dist 22.9 mm


Lens Temp: 41.6° C
OVERRIDE
28 fps / 100 mm
73 bpm / Gen Flow
---2D---
H5.5MHz / 3 dB
TEQ: 1 / Offset: 0 dB
DR: 58 dB
Med / S1
E: +1 / D0
M: E / P: 0 / T: 3
---Color---
CDV / 3.3MHz
1 dB
S1 / E: 0
F: 2 / M: A
P: 1 / Pr: 1 / Tr: 0
1 MR PISA Radius = 0.73 cm
MR Aliasing Velocity = 0.33 m/s
MR EROA = 0.25 cm2

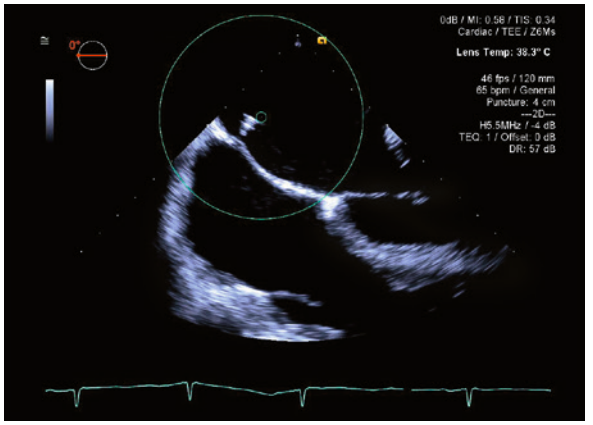

1 MR VTI = 1.625 m
MR Vmax = 5.53 m/s
MR Peak Grad = 122.4 mmHg
MR Mean Grad = 67.6 mmHg
AT = 174 msec
ET = 431 msec
Lens Temp: 40.5° C
25 fps / 100 mm
75 bpm / General
---2D---
H5.5MHz / 3 dB
TEQ: 1 / Offset: 0 dB
DR: 58 dB
Med / S1
E: +1 / D0
---Color---
CDV / 3.3MHz
1 dB
S1 / E: 0
F: 2 / M: A
P: 1 / Pr: 1 / Tr: 0
---CW---
3.0MHz
Sweep: 87
1 / 100 %

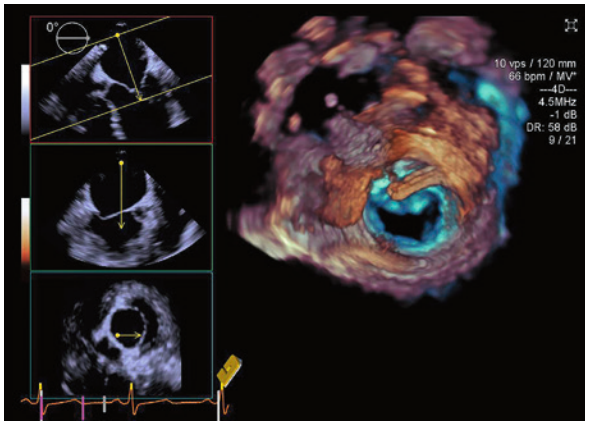

Diagnosis
8 vps
Mitral Valve
Frame 13
13 / 15
Ann AP Diam 34.9 mm
Ann AL-PM Diam 40.0 mm
Ant Ann Perimeter 51.8 mm
Post Ann Perimeter 70.6 mm
Total Ann Perimeter 122.4 mm
Ann Area 1144.6 mm2
Intertrigonal Dist 23.5 mm
Valve Orifice Area 452.2 mm2
Intercomm Dist 29.7 mm

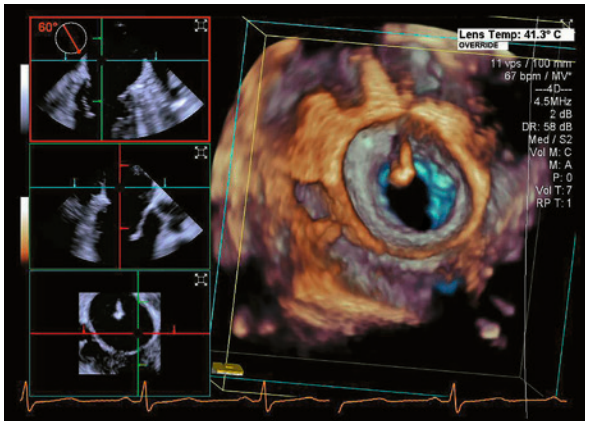

Lens Temp: 41.6° C
OVERRIDE
26 fps / 100 mm
83 bpm / Gen Flow
---2D---
H5.5MHz / -2 dB
TEQ: 1 / Offset: 0 dB
DR: 58 dB
Med / S1
E: +1 / D0
M: E / P: 0 / T: 3
---Color---
CDV / 3.3MHz
0 dB
S1 / E: 0
F: 2 / M: A
P: 1 / Pr: 1 / Tr: 0

Trans-Septal Puncture

Septal guide provides real-time guidance when crossing the septum. Catheter positioning can also be seen with real-time full volume imaging using the D'art navigation tool.

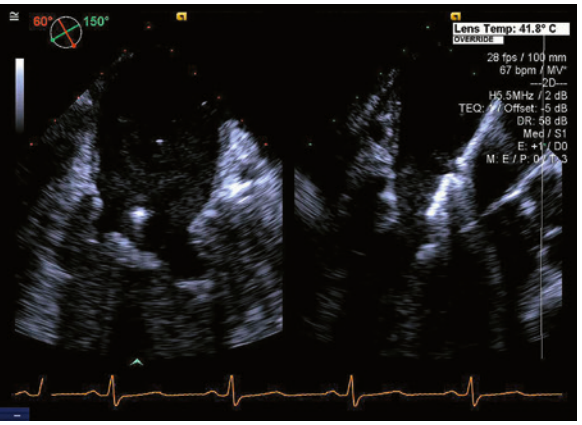


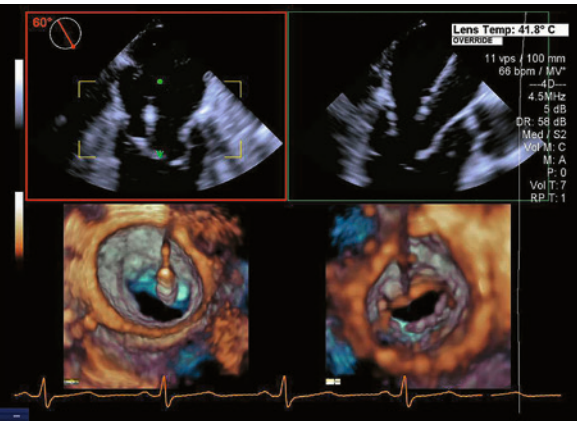


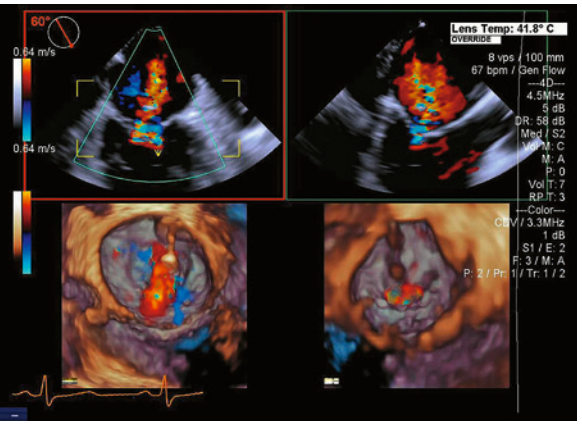


1st MitraClip Pre-Deployment

The MitraClip® crosses the mitral valve and grasps the anterior and posterior leaflets. A 3D visualization of the device is possible in real-time from both ventricular and atrial perspectives using Dual V. Additionally, real-time regurgitation can be observed using volume color Doppler.

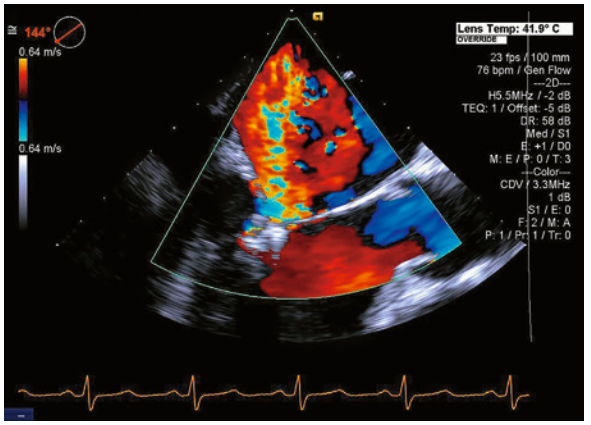


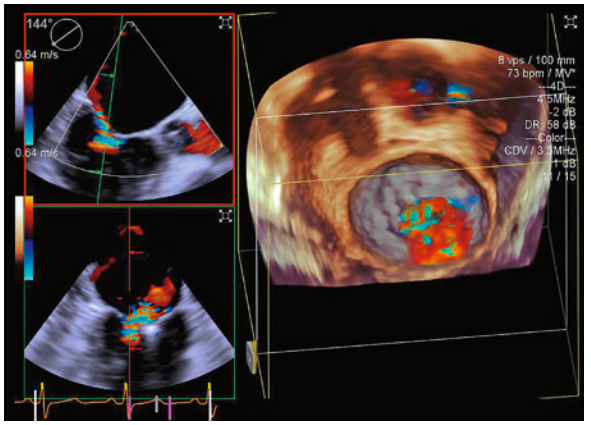




1st MitraClip Post-Deployment

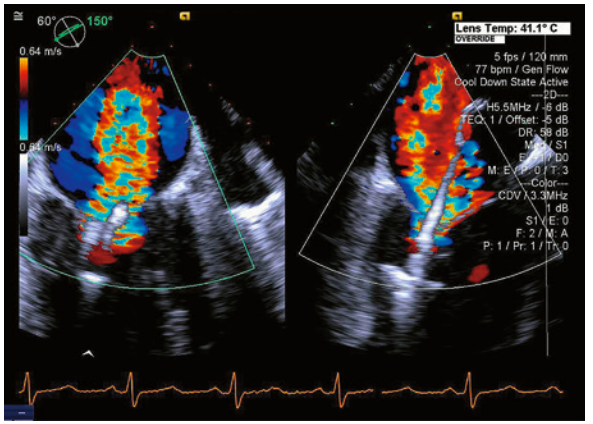
After deployment of the first clip, significant residual mitral regurgitation can be observed in 2D and real-time 3D with volume color Doppler. It is determined that a second MitraClip is needed.

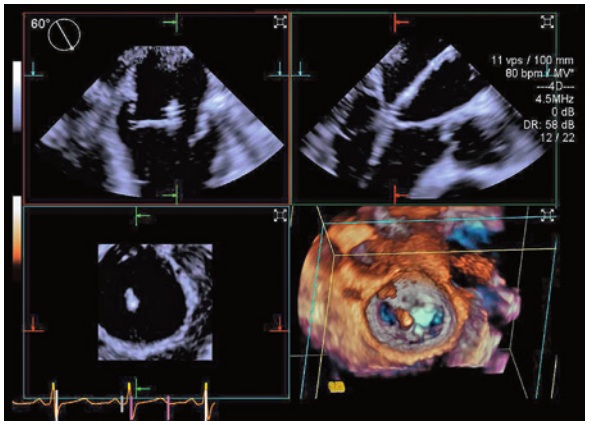




2nd MitraClip Pre-Deployment

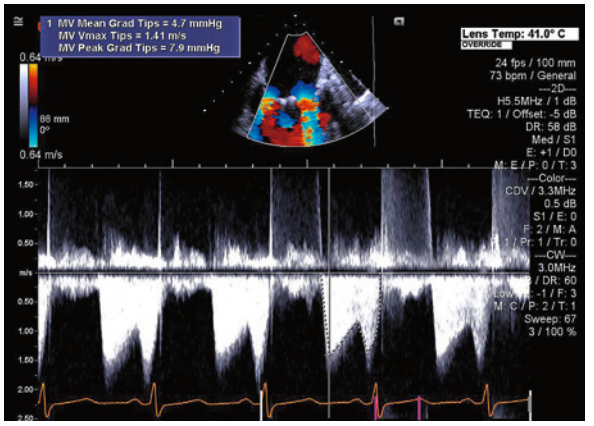
The second clip is positioned, and grasps the anterior and posterior leaflets with confirmation by real-time full volume imaging and volume color Doppler.

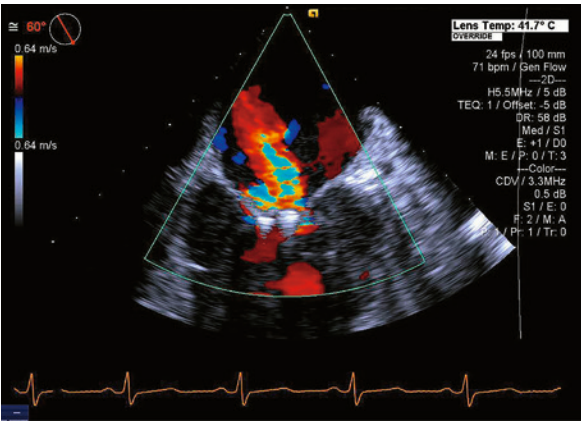


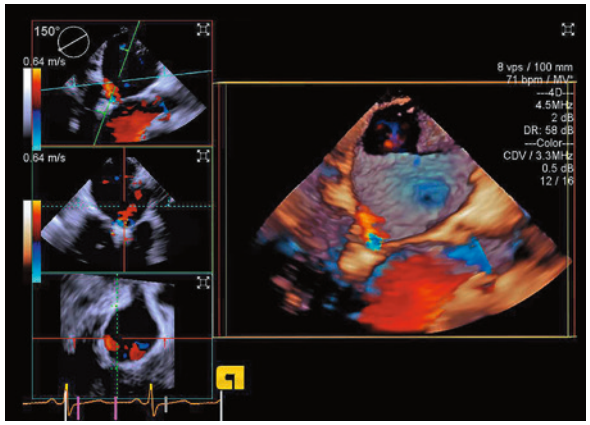


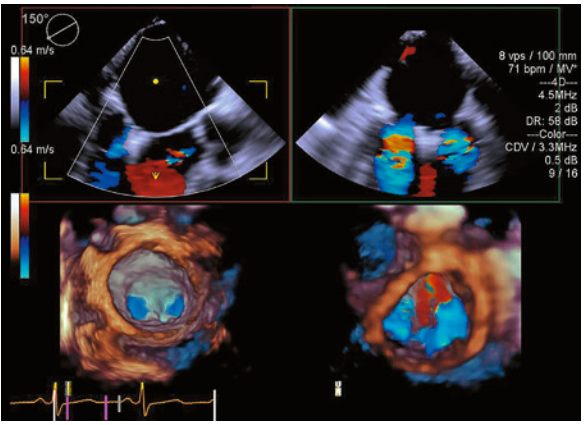
2nd MitraClip Post-Deployment

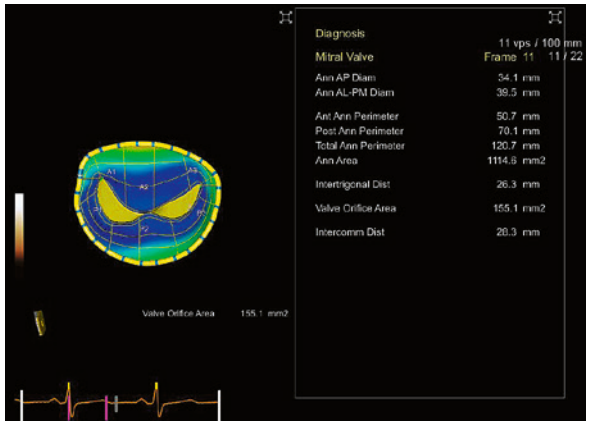
The second MitraClip is placed on the P2-A2 segment. As a result, there are two orifices with a mean gradient of 4.7 mmHg. The mitral valve 3D model obtained in one click shows the valve orifice area post-clip using the eSie Valves package. Significant reduction in mitral regurgitation is observed. No pulmonary vein flow reversal is observed.

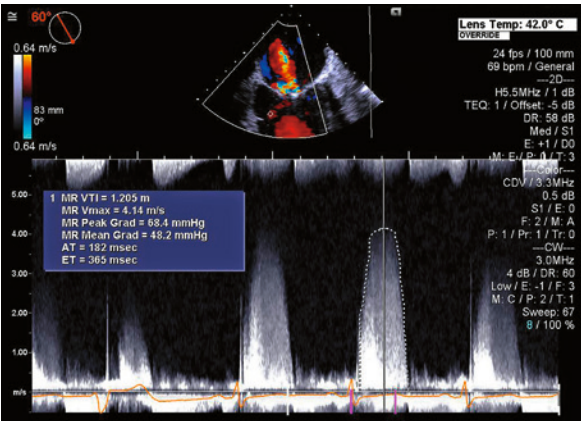


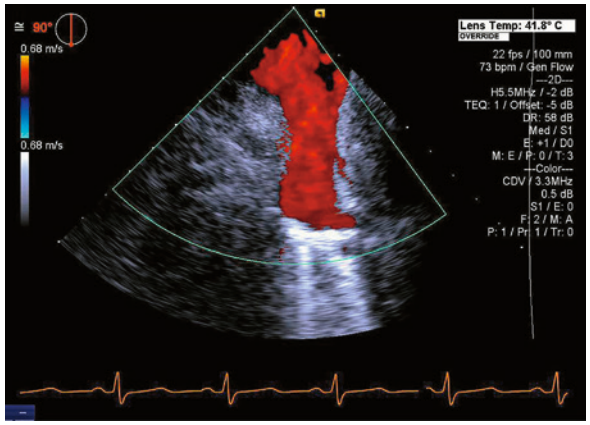












Results

The true volume TEE transducer (Z6Ms) on the ACUSON SC2000 defines the leading edge of 4D imaging with high volume rates and real-time continuous imaging.

During pre-procedure the ACUSON SC2000 was able to accurately and efficiently quantify MR with 2D PISA analysis and model the mitral valve in one click with eSie Valves package. During this MitraClip procedure, the physicians were able to see the regurgitation in real-time without stitching. Crossing the septum was easier using the septal guide that provided real-time navigation.

After deployment of the first clip, it was determined that there is a need for a second clip in this case. After deployment of the second clip, satisfactory reduction in regurgitation was accomplished.

The true volume TEE transducer (Z6Ms) allows physicians to operate on a wider variety of patients due to better visualization of form, flow and function. During the procedure, physicians have better visualization in real-time available to them, helping them to have more confidence in determining the status of the procedure. The ability to see the heart in real-time and visualize the regurgitation before, during and after the MitraClip was deployed, may increase the success of a procedure.

The products/features mentioned in this document may not be commercially available in all countries. Due to regulatory reasons their future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

Standalone clinical images may have been cropped to better visualize pathology.

Siemens Healthineers offers three shared service cardiovascular products: ACUSON P500, ACUSON S Family and ACUSON X700 ultrasound systems. The ACUSON SC2000 PRIME is the only dedicated premium cardiovascular ultrasound offering in Siemens Healthineers cardiology segment.

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Published by Siemens Medical Solutions USA, Inc. · Order No. A91US-416-1C-4A00 · Printed in Germany · 5832 01180.2 ·