Procedure

Type of Study: Stress Procedure

Procedure Date/Time: 2/28/2023 8:48:00 AM

Indication	Reason for Ending

Clinical Data

Protocol: Lexiscan
Total Exercise Time: 01:00
Max HR: 110 % Max HR Achieved: 85%
Max BP: 156/70/156/70
METS: 1.0 HRxBP: 0.67

Rest ECG

Normal Sinus Rhythm
T wave inversion III, Nonspecific ST changes aVF

Stress ECG

CP with lexiscan
No ST Changes Consistent with Ischemia

Symptoms

Arrhythmias

Conclusions

T wave inversion III, aVF, nonspecific changes with lexiscan, CP with lexiscan, The Nuclear portion of the study is reported separately.

[redacted]

Patient Information

2/28/2023 8:48:19 AM
Lexiscan

[redacted]

Angina: Unknown
History of MI: Unknown
Prior CABG: Unknown
Prior Cath: Unknown
Diabetic: Unknown
Smoking: Unknown
Family History: Unknown

Referring Physician:
Location:
Procedure Type: TWIN CITY STRESS TEST CARDIAC TRACING ONLY

Attending Phy:
Technician:
Target HR: 149 bpm (85%)
Max HR(%MPHR): 110 bpm (62%)
Reasons for end:
Symptoms:

Diagnosis

Notes

Conclusions

Reviewed by:
Signed by:
Date:

UNCONFIRMED REPORT

[redacted]

Exam Summary

2/28/2023 8:48:19 AM
Lexiscan

Summary
Exercise Time: 01:00
Leads with 100uV ST: ---
PVCs: 0

Max Values
Speed: 0 MPH
Grade: 0 %
METs: 1.0
HR*BP: 14352 BPM * mmHg
ST/HR Index: 0.67 uV/bpm in aVR at 00:40
HR: 110 BPM 62% of MPHR (175 bpm)
SBP: 156/70 mmHg
DBP: 156/70 mmHg

Max ST
ST elevation: 0.6 mm in V2 at 00:10
ST depression: -0.5 mm in III at 00:20

Max ST Changes
ST elevation change: 0.2 mm in III at 00:50
ST depression change: -0.3 mm in V2 at 01:00

MINUTE SUMMARY

ST measurement based on J+60ms

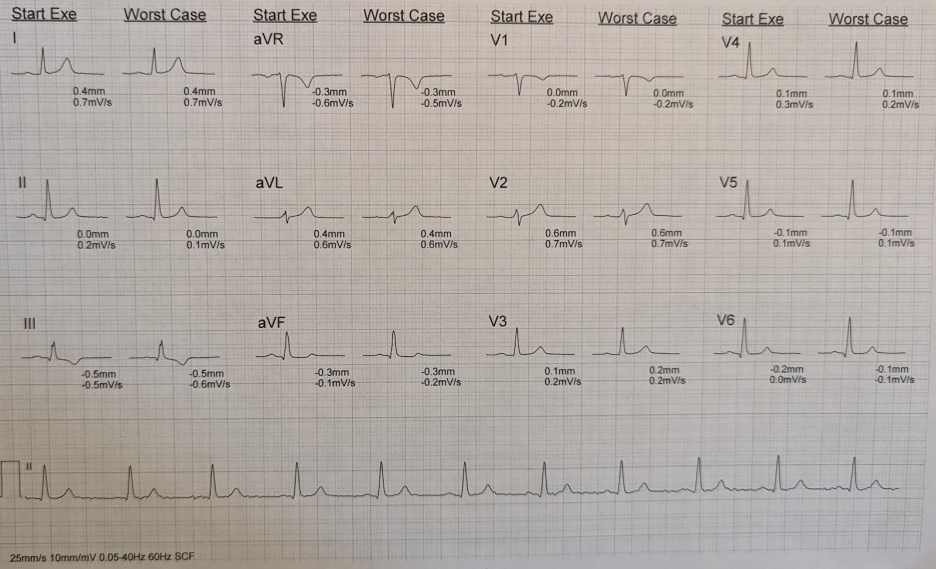
		Speed (MPH)	Grade (%)	HR (BPM)	BP (mmHg)	METs	HR*BP	ST LEVEL (mm) I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6
BP	PRE-X	0.0	0.0	66	144/100	-	9504	0.5	0	-0.5	-0.4	0.5	-0.2	-0.1	0.6	0.2	0.1	0	-0.1
BP	PRE-X	0.0	0.0	62	142/93	-	8804	0.5	0	-0.6	-0.3	0.5	-0.3	-0.1	0.6	0.1	0.1	-0.1	-0.2
	PRE-X	0.0	0.0	65	-	-	-	0.4	0	-0.5	-0.3	0.4	-0.3	0	0.6	0.1	0.1	-0.1	-0.2
START EXE	EXE 00:00	0.0	0.0	65	-	-	-	0.4	0	-0.5	-0.3	0.4	-0.3	0	0.6	0.1	0.1	-0.1	-0.2
Peak	EXE 01:00	0.0	0.0	110	-	1.0	-	0.3	0.1	-0.3	-0.3	0.3	-0.1	0	0.5	0.2	0.1	0	-0.1
	REC 00:00	0.0	0.0	110	-	1.0	-	0.2	-0.1	-0.3	-0.2	0.2	-0.2	0	0.4	0	-0.1	-0.1	-0.2
	REC 01:00	0.0	0.0	93	-	1.0	-	0.5	0	-0.5	-0.3	0.4	-0.2	0	0.6	0.2	0.1	-0.1	-0.2
BP	REC 01:42	0.0	0.0	92	156/70	1.0	14352	0.4	0	-0.4	-0.3	0.3	-0.2	0	0.6	0.1	0	-0.1	-0.2
	REC 02:00	0.0	0.0	90	-	1.0	-	0.4	0	-0.4	-0.3	0.3	-0.2	0	0.5	0.1	0.1	-0.1	-0.2
	REC 03:00	0.0	0.0	80	-	1.0	-	0.3	-0.1	-0.4	-0.2	0.3	-0.2	0	0.6	0.2	0.1	-0.1	-0.2
BP	REC 03:45	0.0	0.0	78	152/68	1.0	11856	0.3	0	-0.3	-0.2	0.2	-0.2	0	0.5	0.2	0.1	0	-0.1
END REC	REC 03:51	0.0	0.0	79	-	1.0	-	0.3	0	-0.3	-0.3	0.3	-0.1	0	0.5	0.2	0.1	0	-0.1

[redacted]

Exam Start: 2/28/2023 8:48:19 AM
Event Time: 2/28/2023 8:58:09 AM
Date of Birth: 5/22/1977
Gender: Male

00:20 EXER 0 MPH
00:20 STAGE 1 0 %

HR: 64
BP: 142/93
PRE-EXE 02:52



Worst Case Average

Q-Stress 6.3.0.63634

Hospital name here...

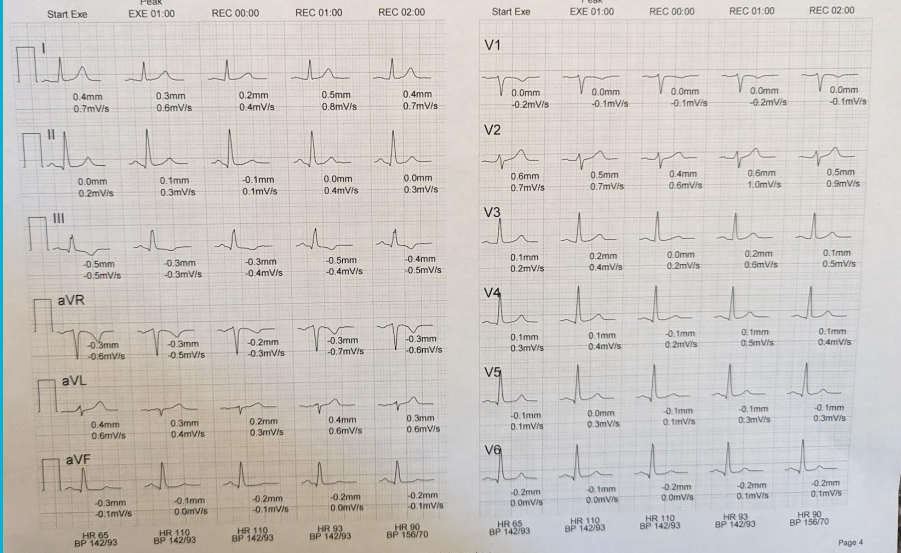
Page 3

[redacted]

Periodic Averages

2/28/2023 8:48:19 AM
Lexiscan

BY MINUTE: ST measurement based on J+ 60 ms (mm)
25mm/s 10mm/mV



Q-Stress 6.3.0.63634

Hospital name here...

Page 4

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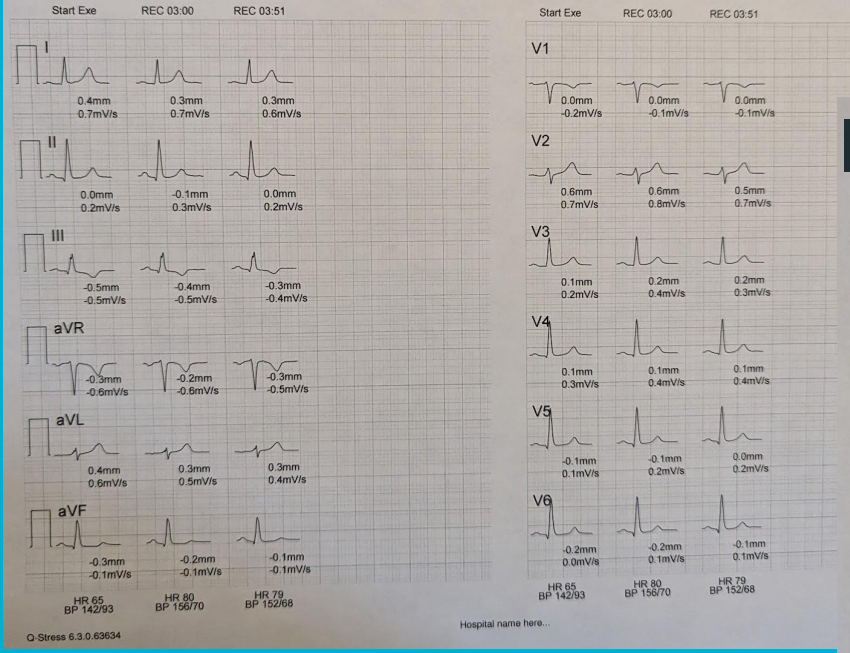
Periodic Averages

2/28/2023 8:48:19 AM
Lexiscan



Hospital name here...

Q-Stress 6.3.0.63634

[redacted]

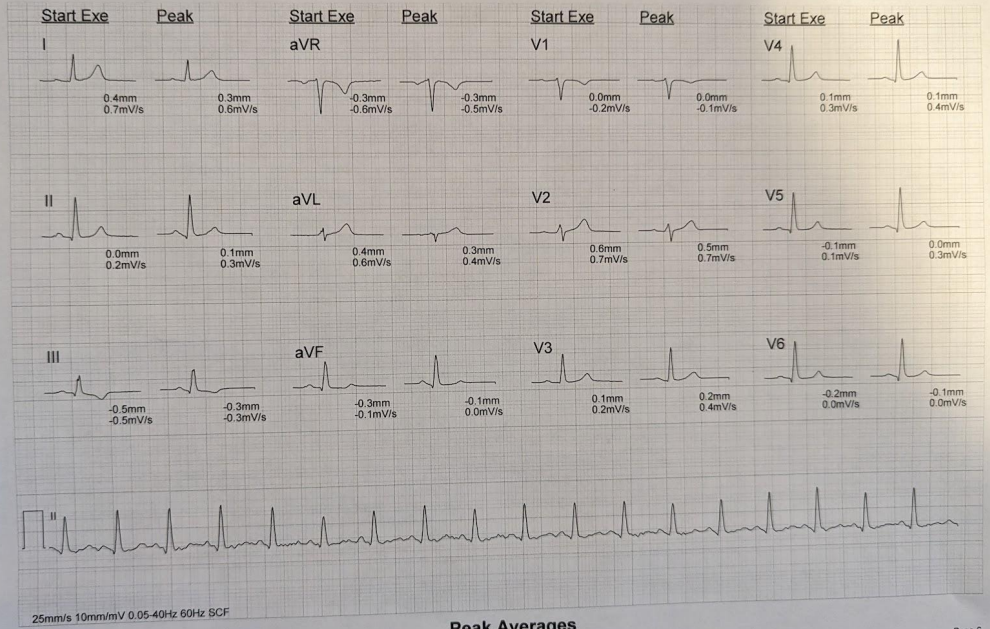
Lexiscan

Exam Start: 2/28/2023 8:48:19 AM
Event Time: 2/28/2023 8:58:49 AM

[redacted]

01:00 EXER 0 MPH
01:00 STAGE 1 0 %

HR: 110
BP: 142/93
PRE-EXE 02:52



25mm/s 10mm/mV 0.05-40Hz 60Hz SCF

Peak Averages

Hospital name here...

Page 6

Q-Stress 6.3.0.63634

Results

NM CARDIAC PERF STRESS/PHARM (Acc#SYNGO-147804551-E14043953623-MERCYH) (Order 2038648280)

[redacted]

Results-Findings

* * *Final Report* * *

DATE OF EXAM: Aug 4 2023 11:40AM

RHN 0006 - NM CARDIAC PERF STRESS/PHARM / ACCESSION # 147804551

PROCEDURE REASON: Chest pain/anginal equiv, intermediate CAD risk, not treadmill candidate

* * * * Physician Interpretation * * * *

Stress ECG Report:
Mercy Hospital
Date of service: 8/3/2023 8:58:17 AM
Accession #: 147804551
Ordering physician: TAMMY S ALVERSON
Exercise specialist: Yulia Landis
Interpreting physician: Makilzhan Shanmugam MD

[redacted]

Height: 182.88 cm BSA: 2.35 m²
Weight: 108.86 kg BMI: 32.6 kg/m²

Indication: Chest pressure / Chest tightness

Stress ECG Conclusion:
Conclusion: Non-diagnostic due to abnormal resting ECG and inadequate HR response
Comments: 59-year-old gentleman with a history of right bundle branch block, carotid artery disease, status post coronary artery bypass surgery in 2018, hypertension, obesity presents with atypical chest pain

Baseline EKG is sinus rhythm with first-degree AV block right bundle branch block and left axis deviation and inferior wall myocardial infarction age undetermined

Baseline heart rate is 80 beats minute baseline blood pressure 150/90

Patient experienced dyspnea with Lexiscan infusion. No chest pain reported.

EKG changes were nondiagnostic of myocardial ischemia with Lexiscan infusion.
No significant arrhythmias.

Nuclear images are pending and to be reported separately

Stress ECG Summary:
The patient's resting heart rate was 78 bpm and blood pressure was 159/109 mmHg. The patient received regadenoson 0.4 mg IVP over approximately 15 seconds followed immediately by injection of nuclear isotope. The test was terminated due to end of protocol. Other symptoms during the test included SOB and nausea. The maximum heart rate was 144 bpm, which is 90% of the predicted heart rate for age. Peak blood pressure was 140/88 mmHg. The double product achieved was 20160.
Previous cardiovascular interventions:
CABG

MI History:

Date	Description
	Unknown

Medications:

	Last Used
SEE EPIC	

Resting ECG: Normal Sinus Rhythm, 1st Degree AV block, RBBB and Left Ventricular Hypertrophy
Symptoms at rest: No symptoms

Pharmacologic Protocol: Regadenoson

Stress Exercise Table:

Stage	HR	SYS	DIA
1	134	77	67

2	127	117	86
3	112	140	88

	HR	SYS	DIA
Final	144	140	88

Stress Observations:

Resting HR: 78 bpm
Peak HR: 144 bpm (90% MPHR)
Resting BP: 159 / 109 mmHg
Peak BP: 140 / 88 mmHg
Rate Pressure Product (RPP): 20160
Stress Exercise Observations:
Reason for test termination: end of protocol,
Symptoms during test: Other symptoms during the test included SOB and nausea and
Blood pressure response: Normal BP response

Electronically signed by Makilzhan Shanmugam MD on 8/4/2023 at 4:06:44 PM

* * * Final * * *

[redacted]

CONCLUSIONS:
1. There is mild (<10%) ischemia in the territory of the LAD.
2. There is a small (<10%) fixed perfusion defect in the LAD territory.
3. This is an intermediate risk scan due to area of scar/ischemia.

	Gated Stress FBP	Gated Rest FBP
LVEF %	48	53

Prior Study Comparison No prior nuclear cardiology exam available for comparison.

Stress test on August 4, 2023
Small area infarction in the left ventricular apex with minimal peri-infarct ischemia
Ejection fraction is 48% with septal hypokinesis and apical hypokinesis.
Nuclear Med Report:2-Day Gated SPECT Myocardial Perfusion with Regadenoson Stress: Myocardial perfusion imaging was performed at rest, 30 to 60 minutes following the IV injection of the radiotracer. The patient received 0.4 mg of intravenous regadenoson over 10 seconds, and was injected IV with the radiotracer at 30 seconds. Gated post stress tomographic imaging was performed 30 to 60 minutes later. See administered radiotracer and doses below.
Mercy Hospital
Date of service: 8/3/2023 8:58:17 AM
Accession #: 147804551
Ordering Physician: TAMMY S ALVERSON.
Requesting Physician:
Indication: CP - ECG uninterpretable OR unable to exercise and Assessment for known CAD
Interpreting physician: Makilzhan Shanmugam MD

Previous Cardiovascular Interventions:
CABG

[redacted]

	Rest	Stress
Exam Type:		Stress
Radiopharm:	Tc-99m Tetrofosmin	Tc-99m Tetrofosmin
Dosage(mCi):	13.3	34.4
Atten Correction:	not performed	not performed
Stress Agent:		Regadenoson 0.4mg Supply provided from
		Central Pharmacy

Resting Blood Press: 159/109 mmHg

Image Quality
The overall study imaging quality was deemed to be good.

FINDINGS:

	Stress FBP Gated	Stress FBP Gated	Rest FBP

LVEF:		48 %	53 %
ED Volume:		145 ml	147 ml
ES Volume:		76 ml	69 ml
TID:	0.88		

Perfusion Findings
Stress FBP - Summed Score=4
There is a moderate perfusion defect in the apical lateral segment. There is a
mild perfusion defect in the apical septal segment and apical anterior segment.
All remaining scored segments show normal perfusion.
Rest FBP - Summed Score=5
There is a moderate perfusion defect in the apical lateral segment. There is a
mild perfusion defect in the posterior wall and apical septal segment. All remaining scored segments show normal perfusion.

Stress FBP	Rest FBP
Summed Score=4	Summed Score=5

Electronically signed by Makilzhan Shanmugam MD on 8/4/2023 at 4:04:50 PM

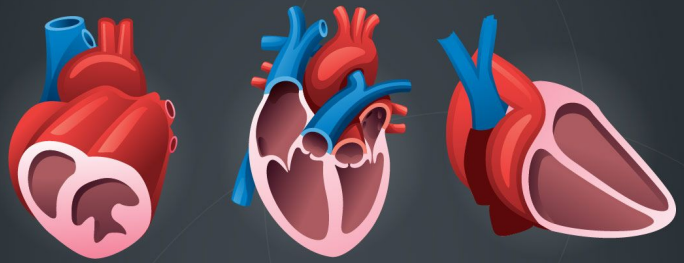
* * * Final * * *

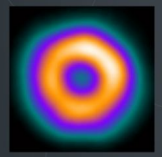
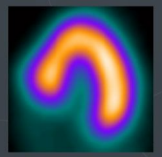
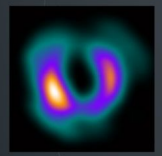
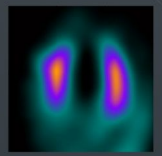
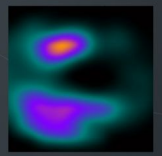
[redacted]

The supervising physician was in the department and immediately available.

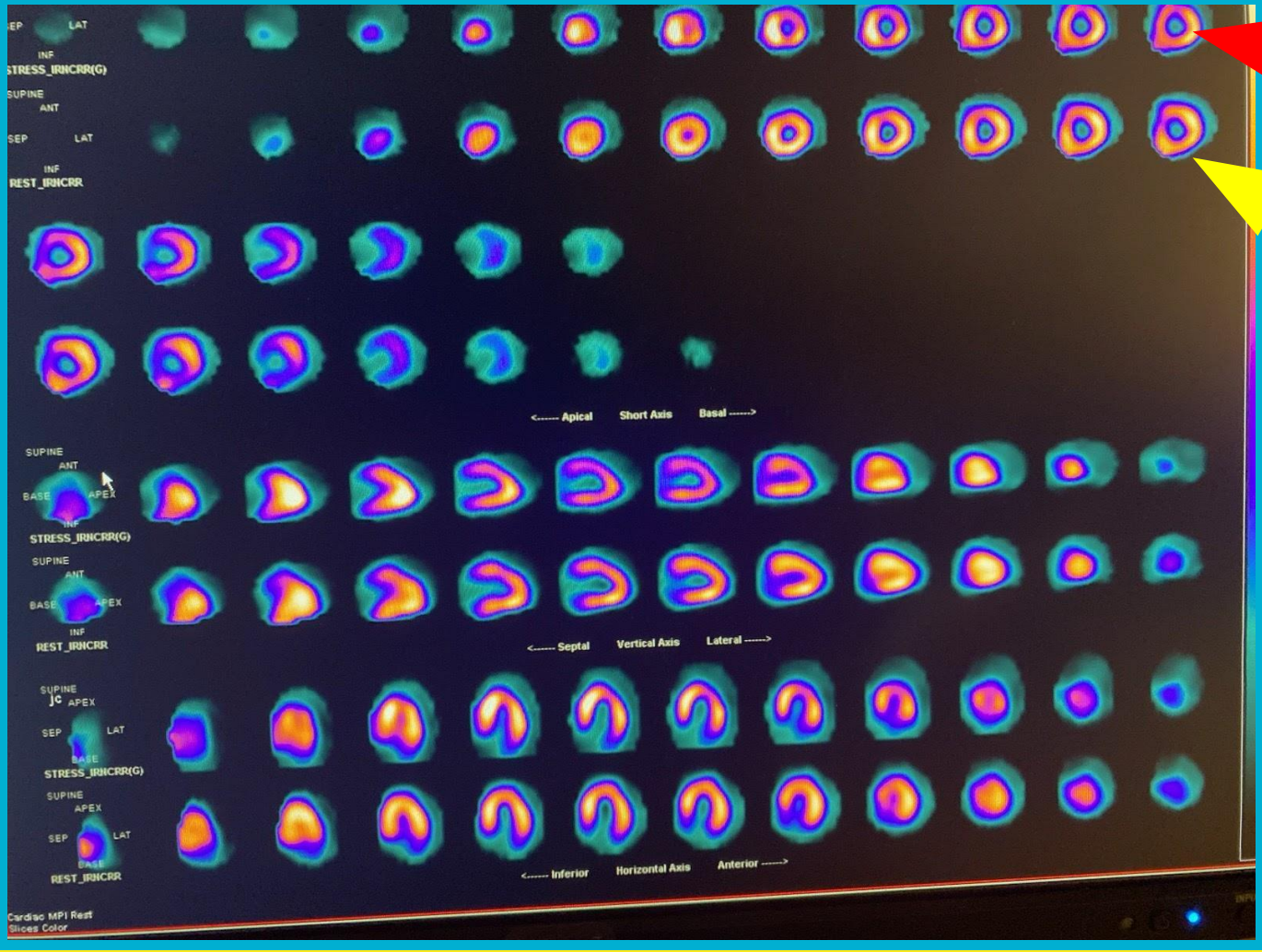
Understanding Your Nuclear Medicine Stress Test

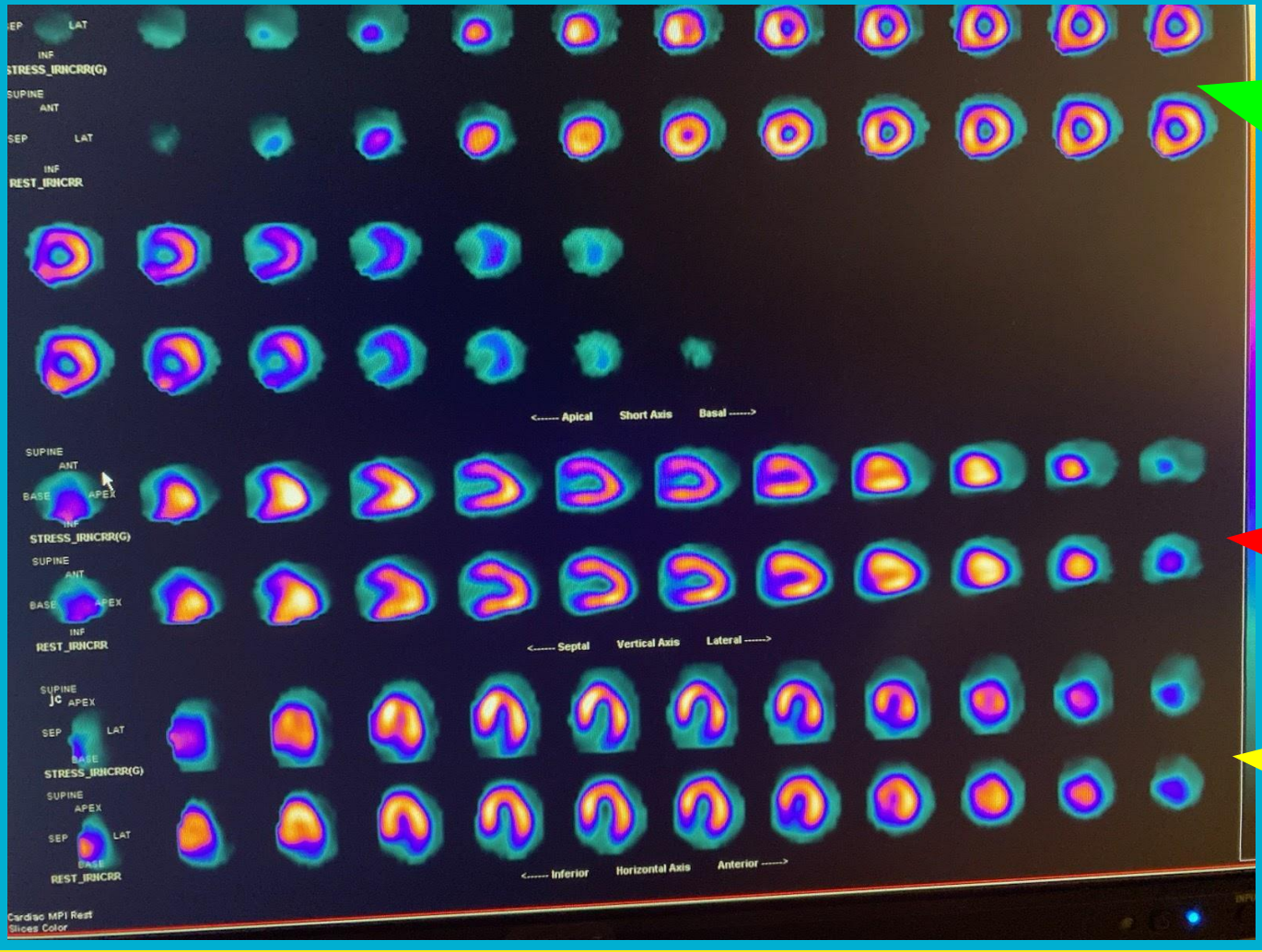
Digirad



	SHORT AXIS	HORIZONTAL LONG AXIS	VERTICAL LONG AXIS
NORMAL			
ABNORMAL			

LEARN MORE AT WWW.DIGIRAD.COM

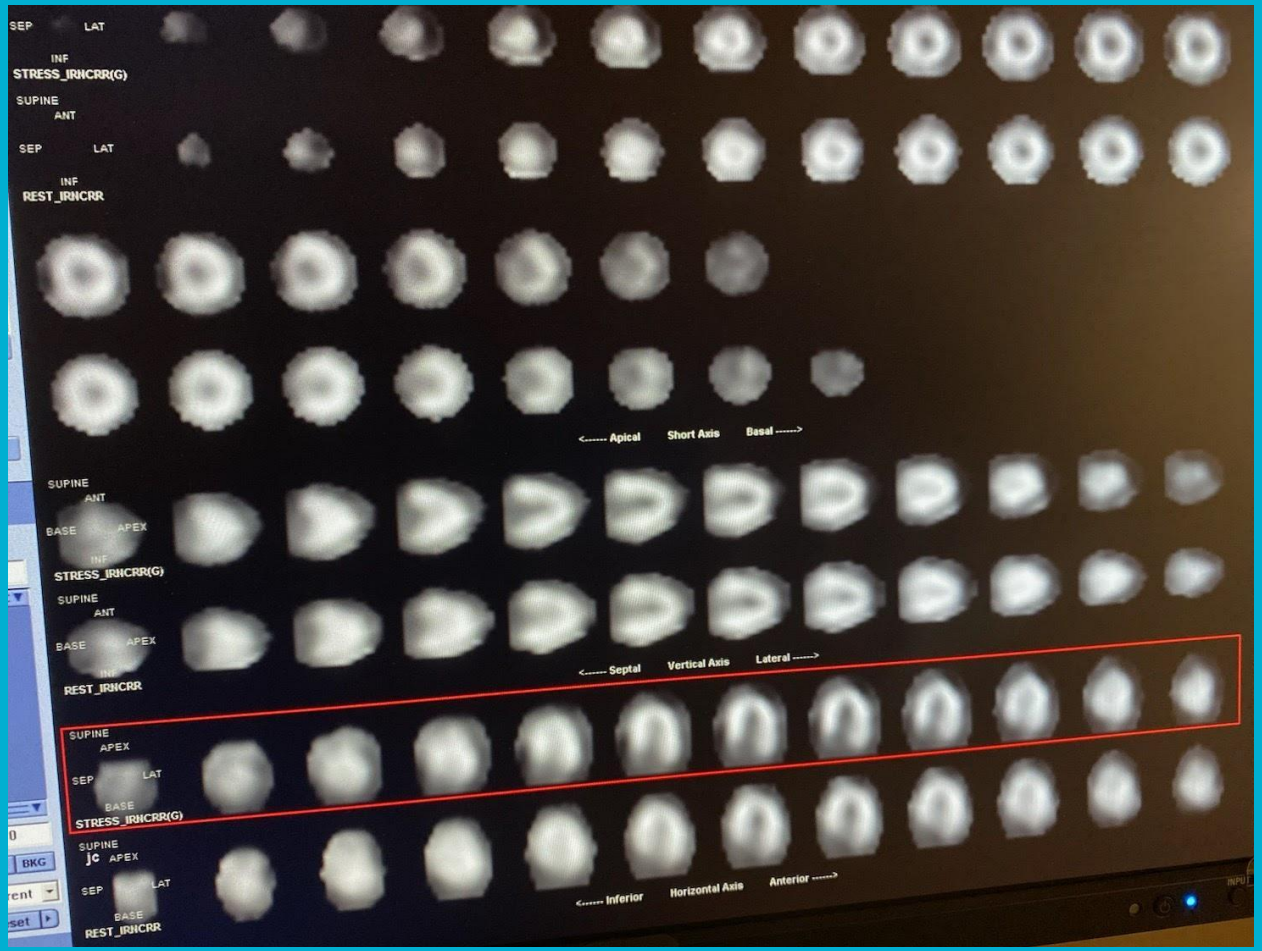

Exercise
Rest
<------ Apical Short Axis Basal ------>
<------ Septal Vertical Axis Lateral ------>
<------ Inferior Horizontal Axis Anterior ------>



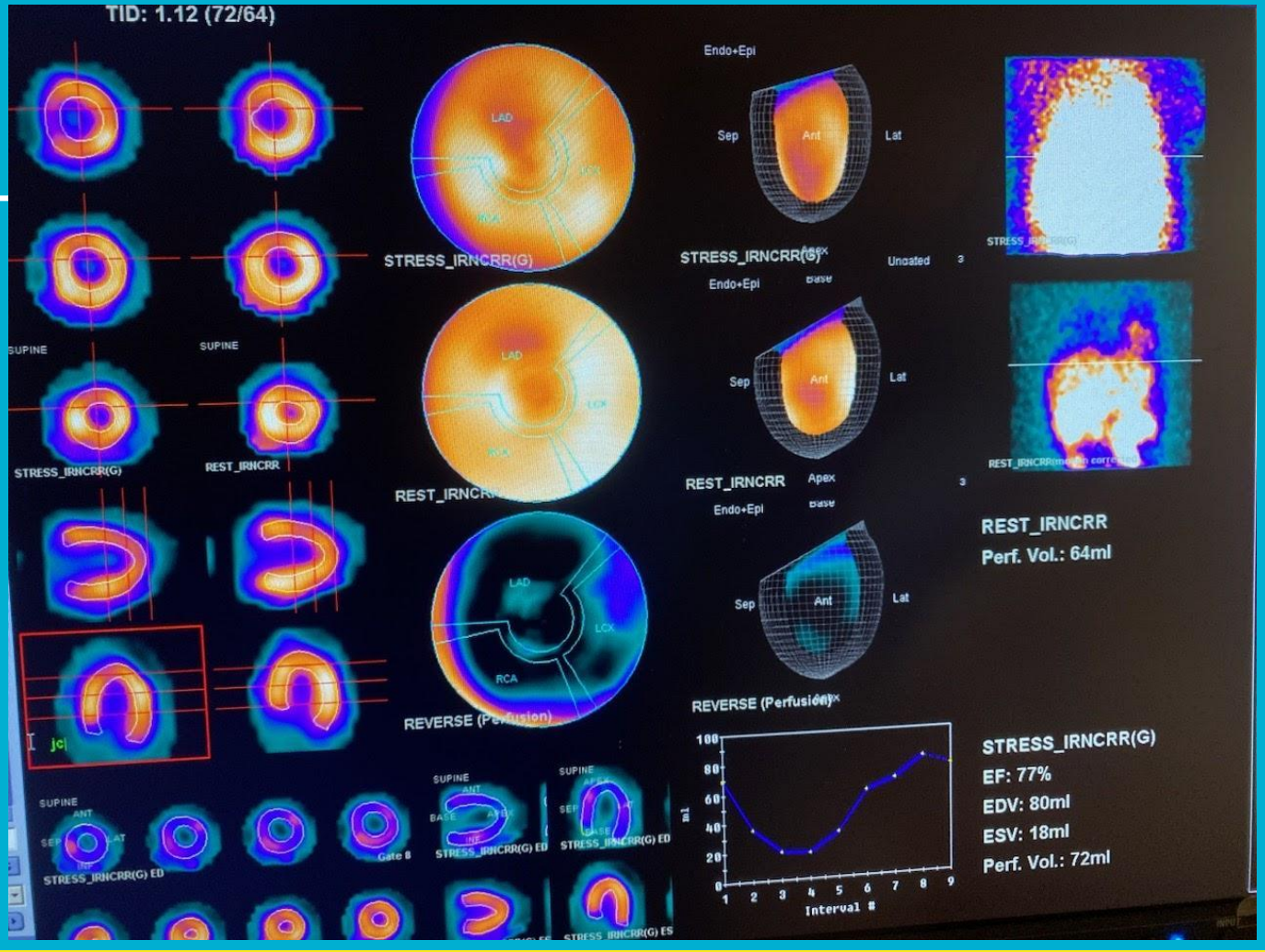
Inferior wall

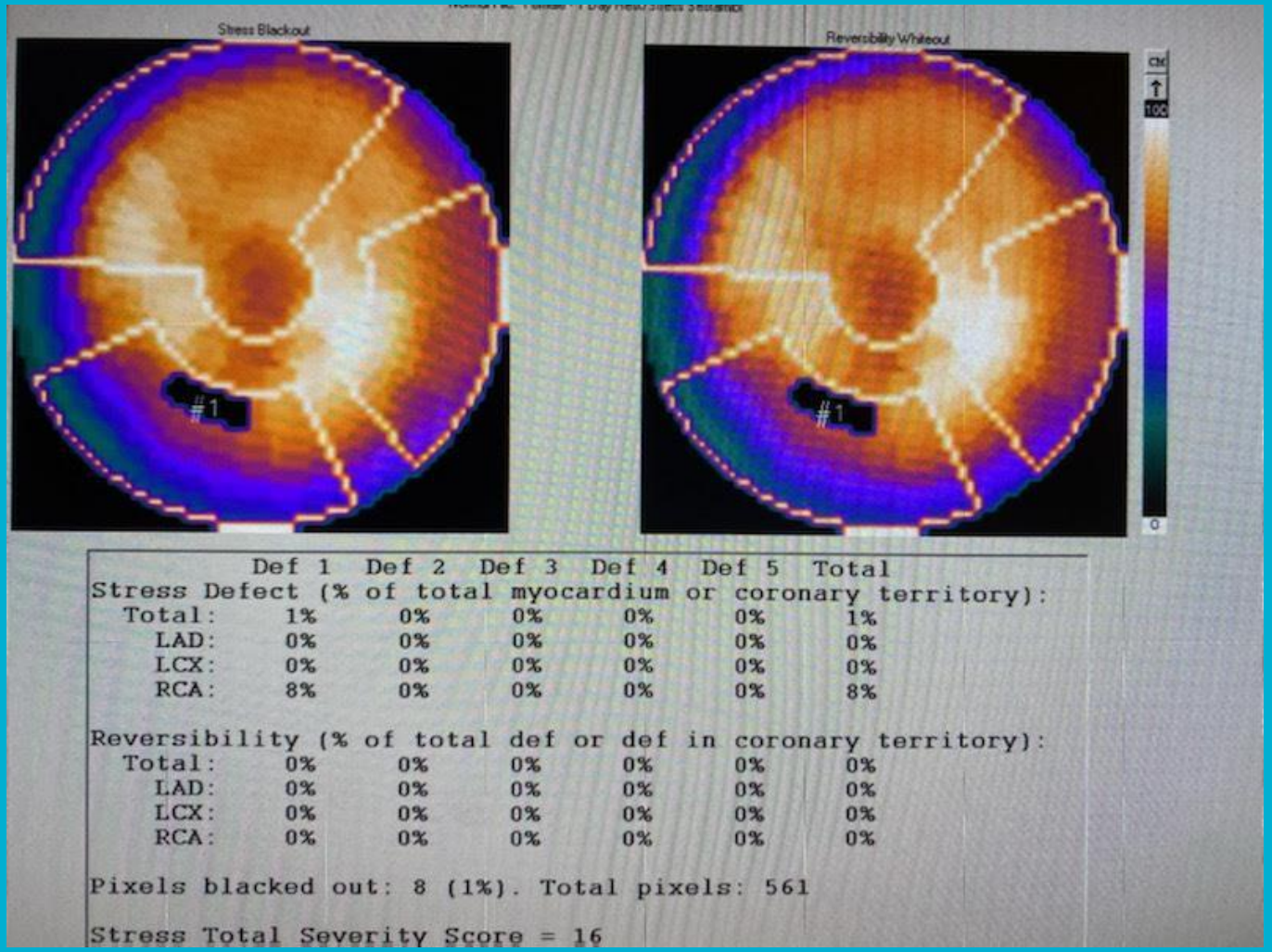
Lateral wall

Anterior wall



Images come in different shades of colors that can help further delineate whether they are normal or abnormal.

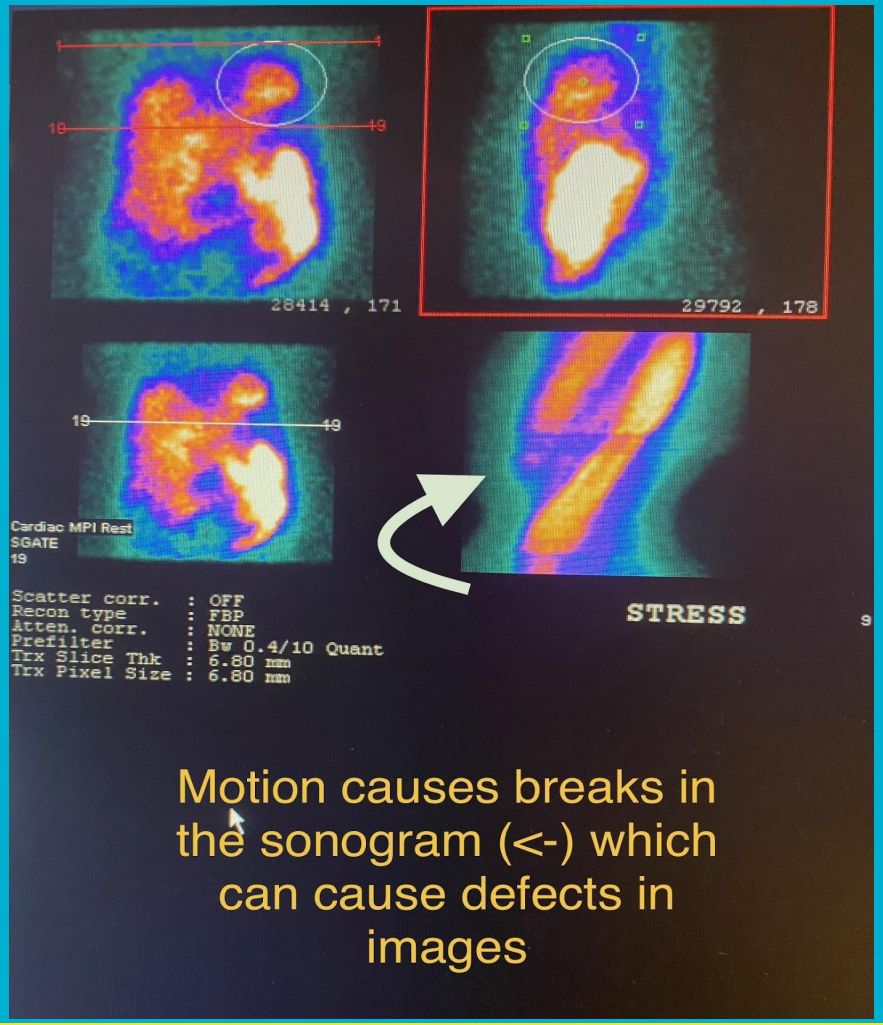

TID: 1.12 (72/64)
SUPINE
SUPINE
STRESS_IRNCRR(G)
REST_IRNCRR
LAD
LCX
RCA
STRESS_IRNCRR(G)
REST_IRNCR
REVERSE (Perfusion)
Endo+Epi
Sep
Ant
Lat
STRESS_IRNCRR(G)
Endo+Epi
Base
Unrated
REST_IRNCRR
Apex
Endo+Epi
Base
REVERSE (Perfusion)
REST_IRNCRR
Perf. Vol.: 64ml
STRESS_IRNCRR(G)
EF: 77%
EDV: 80ml
ESV: 18ml
Perf. Vol.: 72ml
ml
Interval #
STRESS_IRNCRR(G) ED
Gate 8



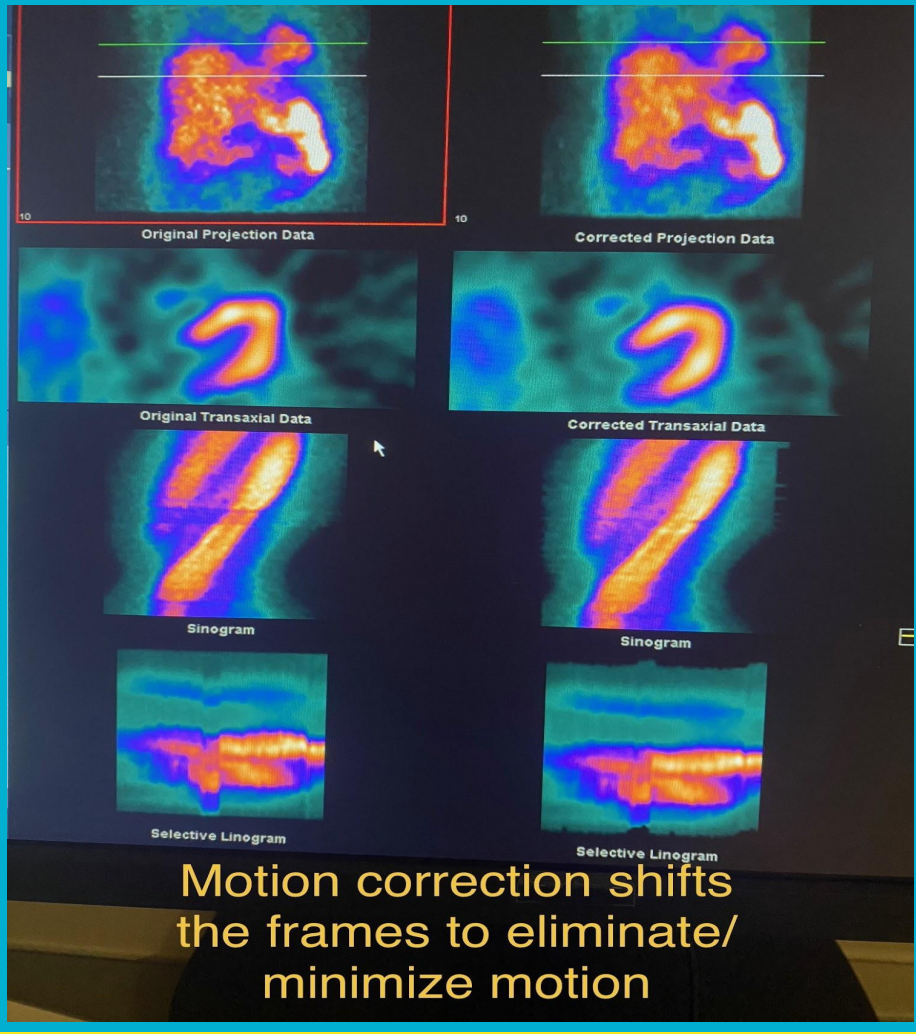
	Def 1	Def 2	Def 3	Def 4	Def 5	Total
Stress Defect (% of total myocardium or coronary territory):						
Total:	1%	0%	0%	0%	0%	1%
LAD:	0%	0%	0%	0%	0%	0%
LCX:	0%	0%	0%	0%	0%	0%
RCA:	8%	0%	0%	0%	0%	8%
Reversibility (% of total def or def in coronary territory):						
Total:	0%	0%	0%	0%	0%	0%
LAD:	0%	0%	0%	0%	0%	0%
LCX:	0%	0%	0%	0%	0%	0%
RCA:	0%	0%	0%	0%	0%	0%

Pixels blacked out: 8 (1%). Total pixels: 561

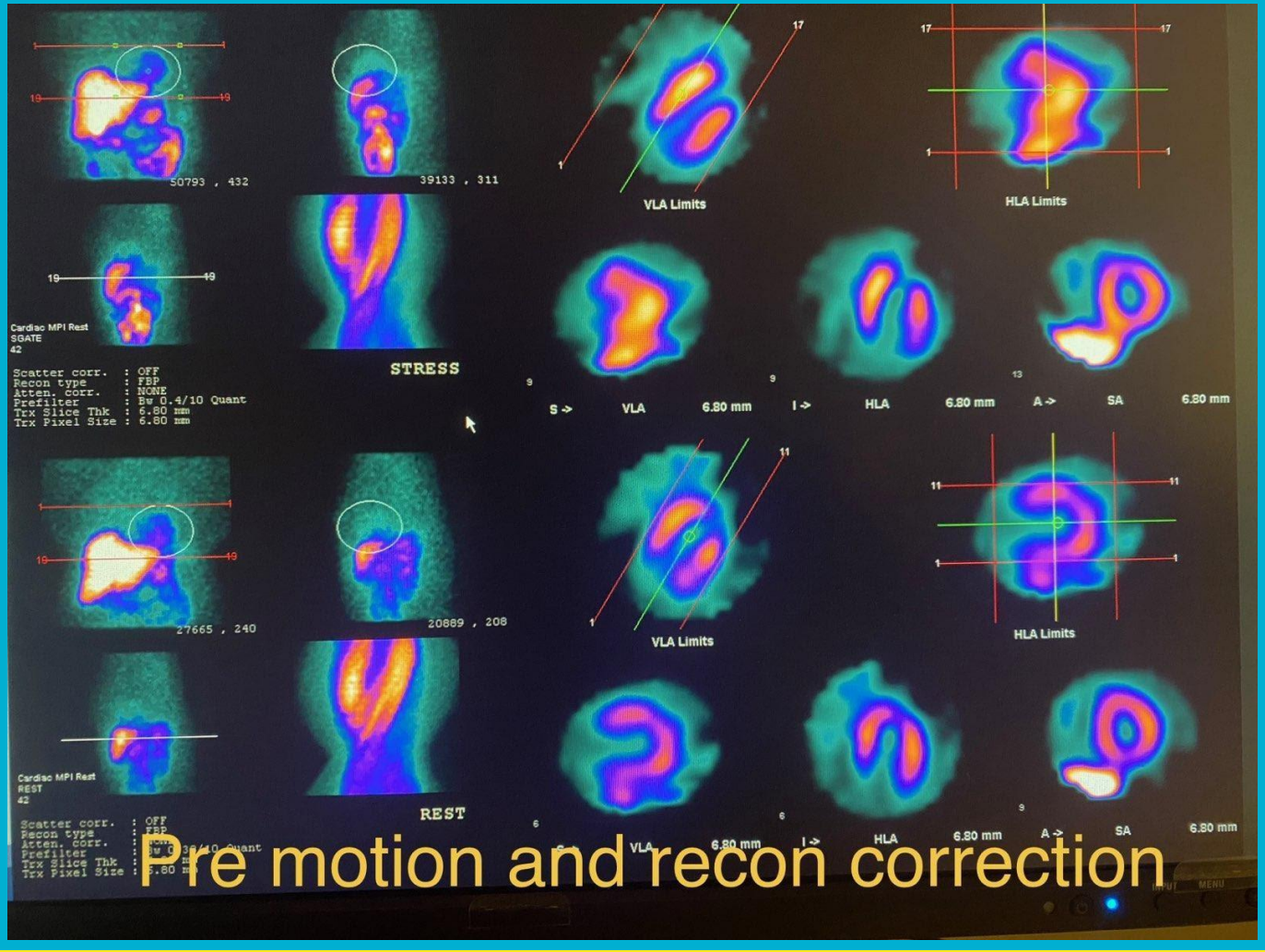
Stress Total Severity Score = 16



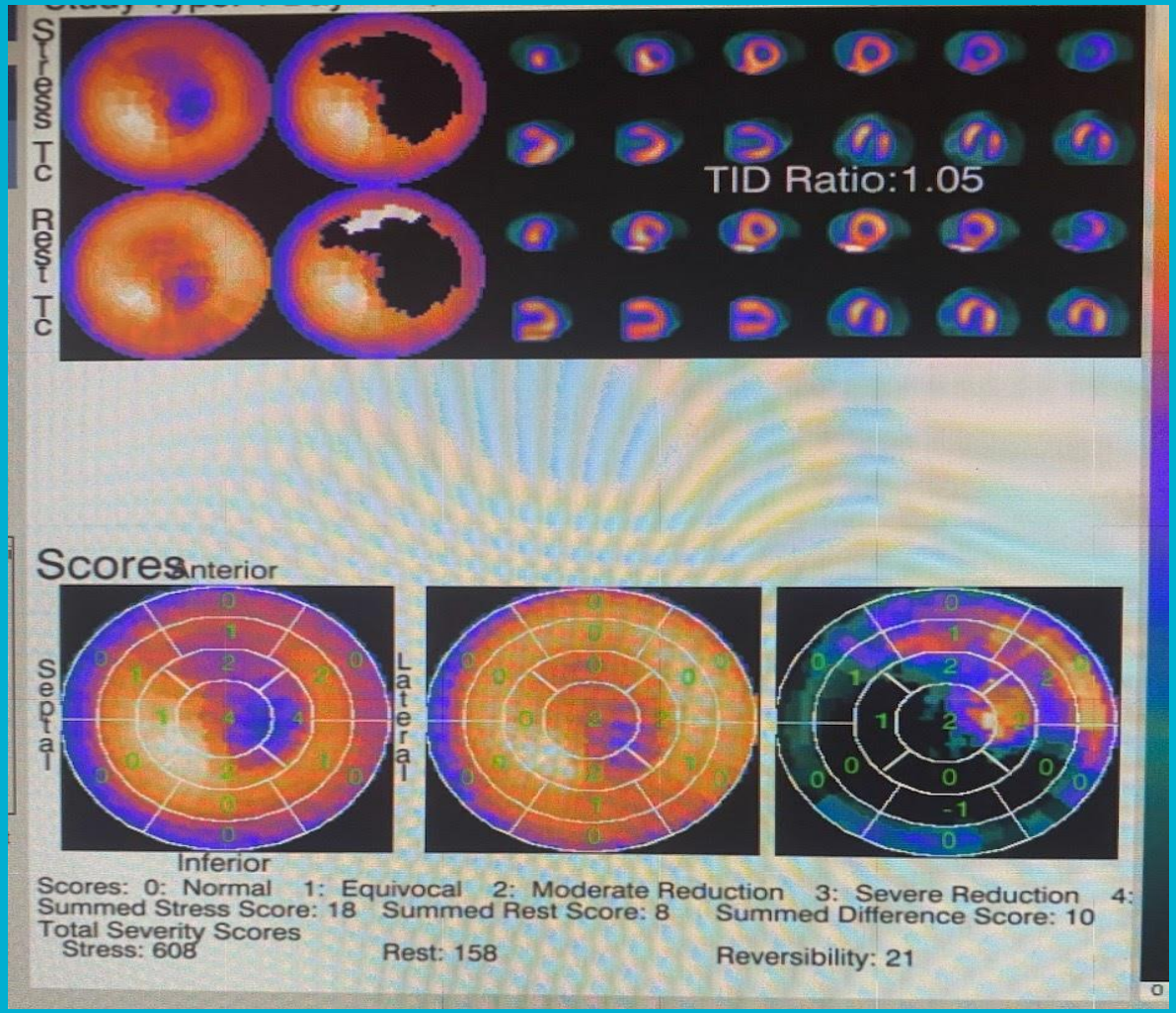
Motion causes breaks in the sonogram (<-) which can cause defects in images

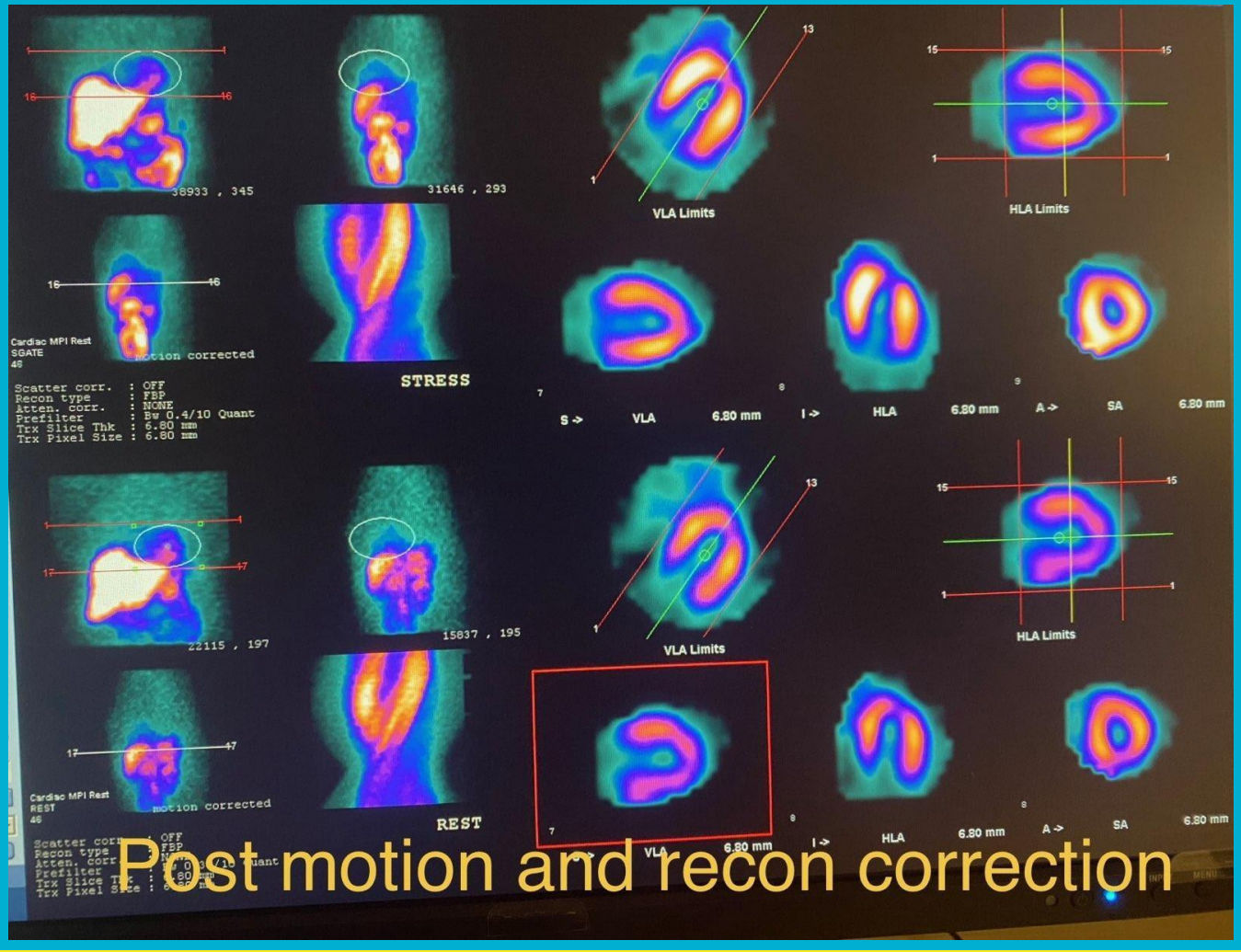


Motion correction shifts the frames to eliminate/ minimize motion

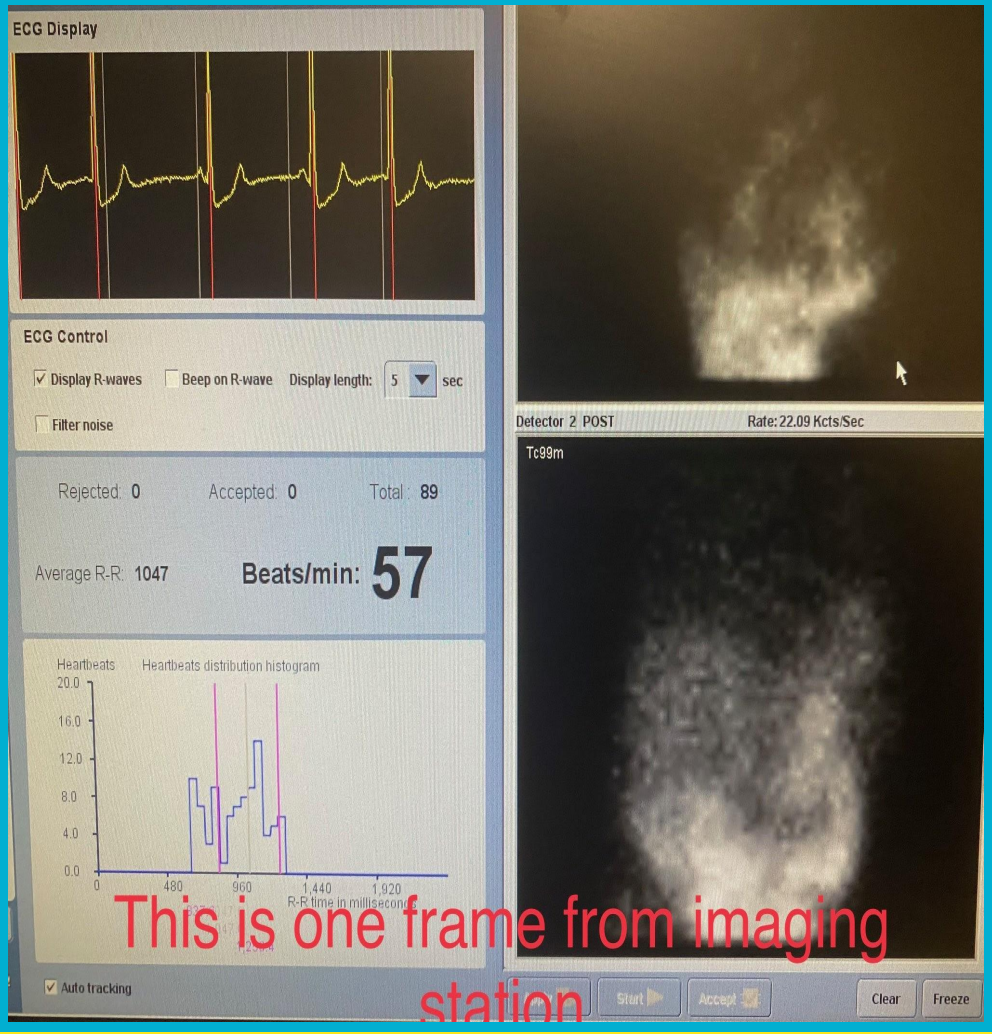


Pre motion and recon correction

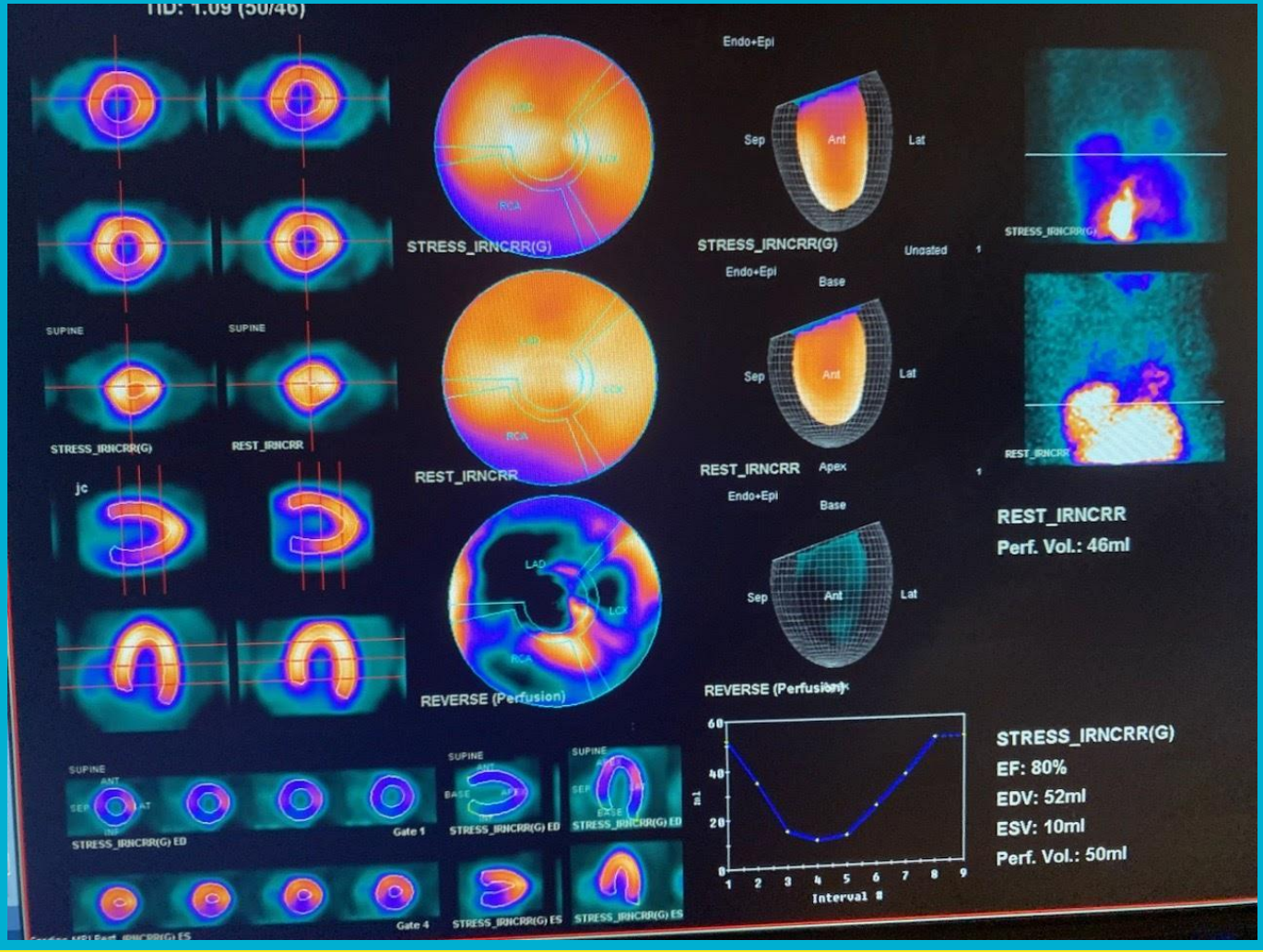

Stress Tc
Rest Tc
TID Ratio:1.05
Scores
Anterior
Septal
Lateral
Inferior
Scores: 0: Normal 1: Equivocal 2: Moderate Reduction 3: Severe Reduction 4:
Summed Stress Score: 18 Summed Rest Score: 8 Summed Difference Score: 10
Total Severity Scores
Stress: 608
Rest: 158
Reversibility: 21

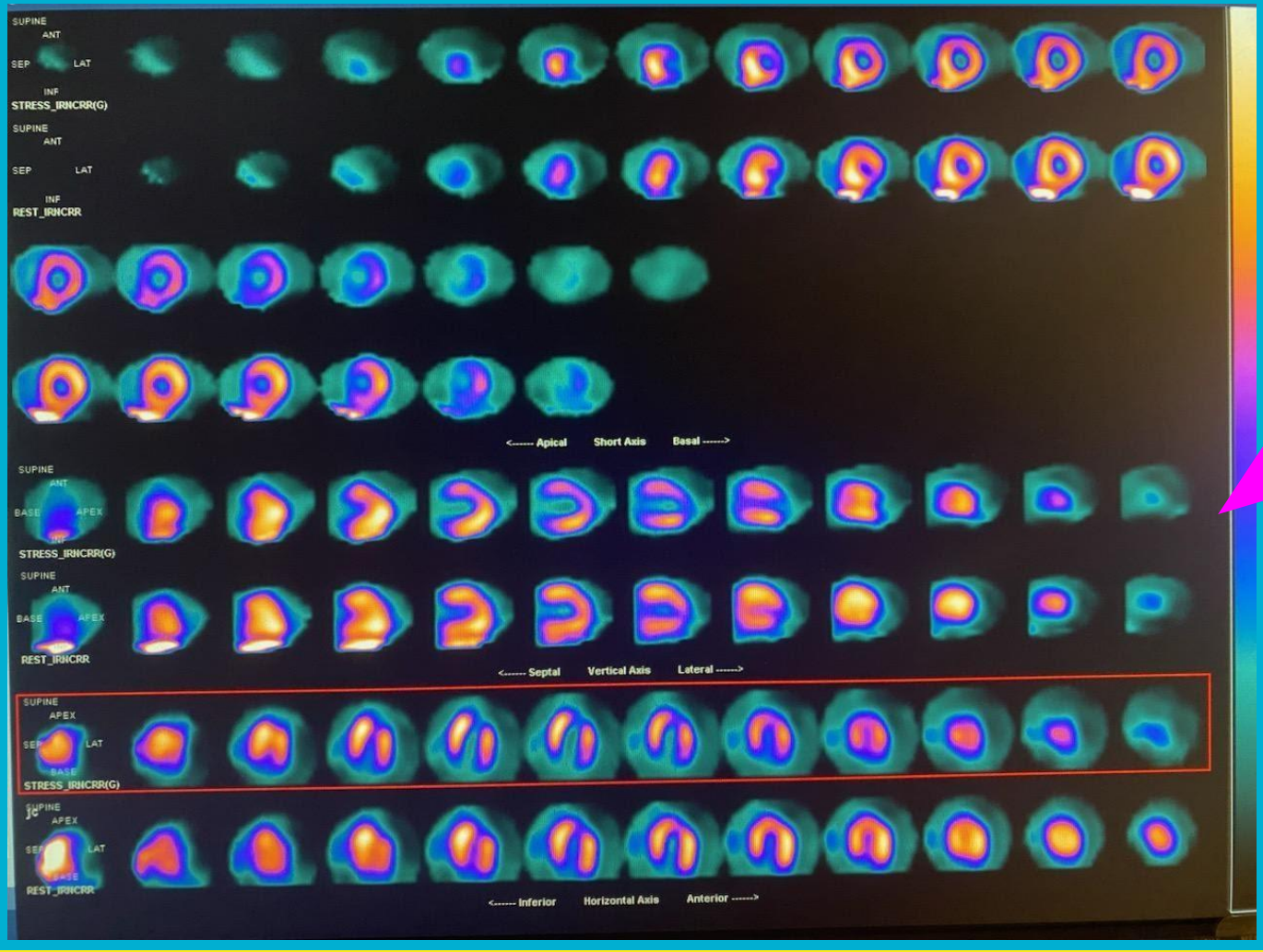


Post motion and recon correction

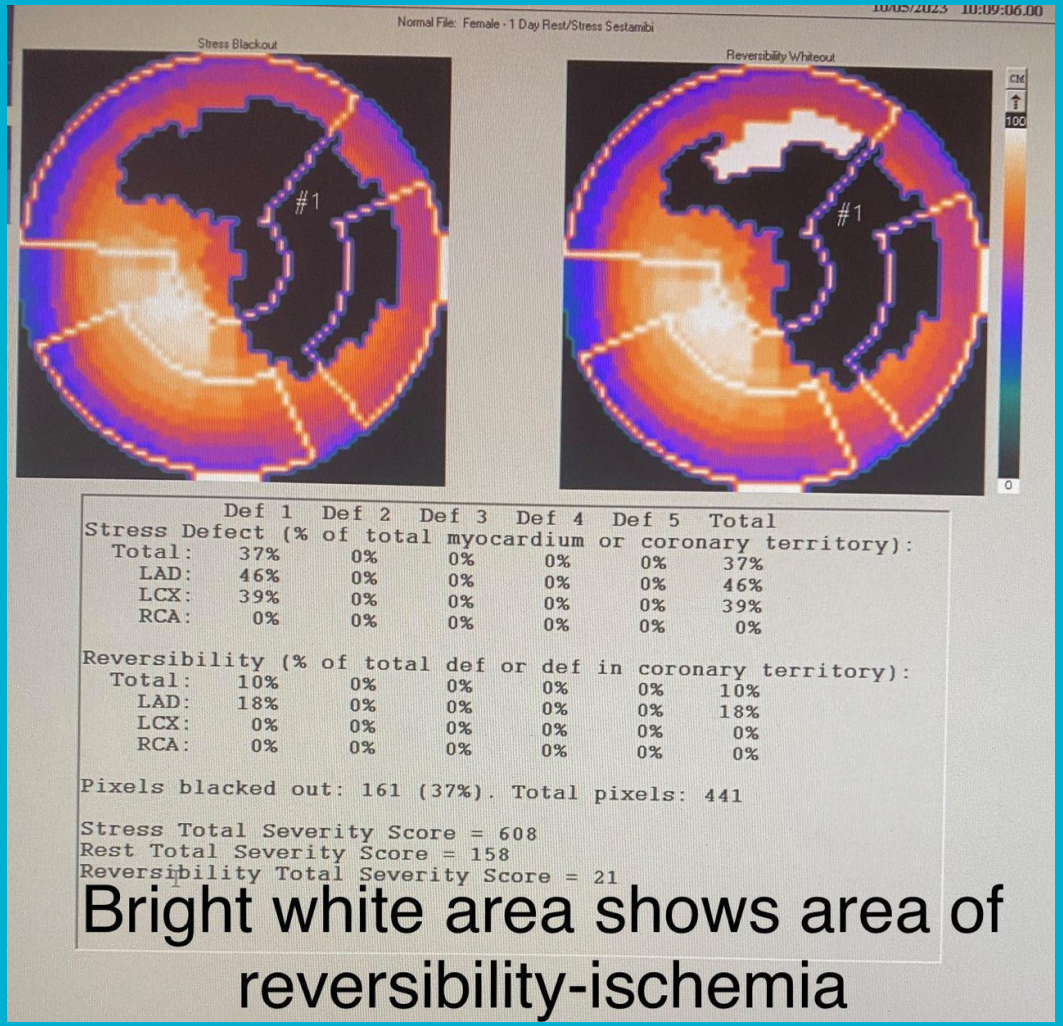


This is one frame from imaging station

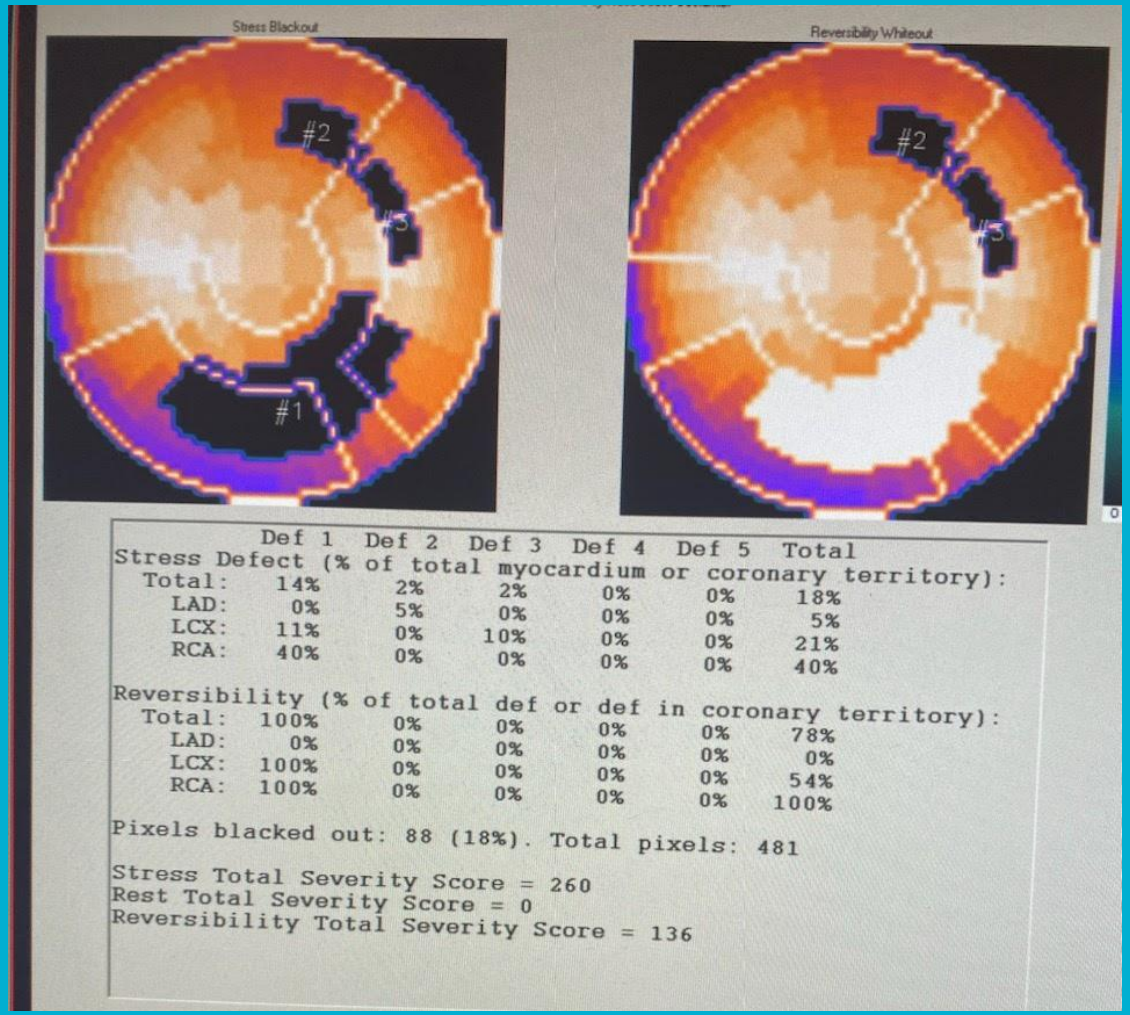

SUPINE
STRESS_IRNCRR(G)
SUPINE
REST_IRNCRR
jc
STRESS_IRNCRR(G)
REST_IRNCRR
REVERSE (Perfusion)
Endo+Epi
Sep
Ant
Lat
STRESS_IRNCRR(G)
Unrated
Endo+Epi
Base
Sep
Ant
Lat
REST_IRNCRR
Apex
Endo+Epi
Base
Sep
Ant
Lat
REVERSE (Perfusion)
REST_IRNCRR
Perf. Vol.: 46ml
STRESS_IRNCRR(G)
EF: 80%
EDV: 52ml
ESV: 10ml
Perf. Vol.: 50ml
Interval 8
STRESS_IRNCRR(G) ED
Gate 1
STRESS_IRNCRR(G) ED
STRESS_IRNCRR(G) ED
Gate 4
STRESS_IRNCRR(G) ES
STRESS_IRNCRR(G) ES



Abnormal scan



Bright white area shows area of reversibility-ischemia



	Def 1	Def 2	Def 3	Def 4	Def 5	Total
Stress Defect (% of total myocardium or coronary territory):						
Total:	14%	2%	2%	0%	0%	18%
LAD:	0%	5%	0%	0%	0%	5%
LCX:	11%	0%	10%	0%	0%	21%
RCA:	40%	0%	0%	0%	0%	40%
Reversibility (% of total def or def in coronary territory):						
Total:	100%	0%	0%	0%	0%	78%
LAD:	0%	0%	0%	0%	0%	0%
LCX:	100%	0%	0%	0%	0%	54%
RCA:	100%	0%	0%	0%	0%	100%

Pixels blacked out: 88 (18%). Total pixels: 481

Stress Total Severity Score = 260
Rest Total Severity Score = 0
Reversibility Total Severity Score = 136

Results:

REFERRING PHYSICIAN: Obermiller

INTERPRETOR: SATHISH MAGGE, MD

STUDY: STRESS TEST

DATE OF EXAMINATION: 10/13/2022

STUDY: Nuclear portion of the stress test.

DESCRIPTION OF STUDIES: Refer to the EKG portion dictated by PCP.

Patient received sestamibi per protocol. Sestamibi imaging obtained. Gated images were obtained. Gated imaging showed an EF of 67%. SPECT imaging revealed normal perfusion without reversibility. Right ventricle is normal. Left ventricle volume curve is normal. TID ratio within normal limits of 1.06.

FINAL IMPRESSION: Grossly normal nuclear portion of the stress test. Please refer to the EKG portion dictated by PCP. SPECT imaging revealed normal perfusion. Ejection fraction well preserved by gated SPECT. Right ventricle is normal. Left ventricle volume curve is normal. TID ratio within normal limits.

Dictation D/T: 11/03/2022 14:02:00

ELECTRONICALLY SIGNED BY: DCTNAME SIGNDATE

DICTATED BY: DCTNAME
CREDENTIALS: RADCRED
SIGNED: SIGNDATE

REFERRING PHYSICIAN:

INTERPRETOR: SATHISH MAGGE, MD

DATE OF EXAMINATION: 02/28/2023

Refer to the EKG portion dictated by PCP.

Sestamibi injected per protocol and also body weight. SPECT imaging obtained. Gated imaging obtained. Gated images showed an EF of 61%. TID ratio slightly elevated to be 1.3, very small defect of the inferior wall with preserved systolic function. Low risk features of significant CAD. Right ventricle is normal. Left ventricle volume curve is normal. TID ratio slightly elevated.

FINAL IMPRESSION: Small size mildly reversible defect of the inferior wall with preserved systolic function of 61%. Right ventricle is normal. Left ventricle volume curve is normal. TID ratio slightly elevated. Low risk features of significant coronary artery disease.

Dictation D/T: 03/02/2023 11:41:00

ELECTRONICALLY SIGNED BY:

DICTATED BY:
CREDENTIALS:
SIGNED:

REFERRING PHYSICIAN: ERIN FITZPATRICK, PA-C

INTERPRETER: Ramana Murty, MD

STUDY: STRESS TEST

DATE OF EXAMINATION: 06/01/2022

Stress test with sestamibi.

Patient underwent stress test. Isotope was injected.

Volume interval curve of the left ventricle is normal. No transient ischemic dilatation of the left ventricle is noted. There is moderate reversible ischemia involving the inferior wall.

Systolic ejection fraction of the left ventricle is normal, 59 percent. End-systolic and diastolic volumes of the left ventricle are normal.

SUMMARY:

1. Moderate increased risk for underlying coronary artery disease with reversible ischemia involving the inferior wall. Patient is symptomatic. Other segments of the left ventricle are contracting and perfusing well. Systolic ejection fraction of the left ventricle, 59 percent.
2. Optimize the medical therapy and the risk management. If symptoms persist, may consider further evaluation, possible revascularization.

Dictation D/T: 06/27/2022 12:22:00

Next steps:

- If normal then next steps is trying to see if patient has another source causing the chest pain
  - Anxiety
  - GERD
  - Musculoskeletal cause
  - Pulmonary cause
- If mild defect seen on imaging or EKG then next step is to determine medical management vs invasive methods with LHC
  - Antianginals such as BB, CCB, Imdur, Ranexa, etc.
- If moderate to large size defect then usual next steps is LHC
  - Refer to interventional cardiologist to have LHC
  - Definitive way to diagnose CAD and it's severity

Sources

- https://www.omnicalculator.com/sports/bruce-protocol-mets#what-is-a-metabolic-equivalent-of-task-met
- https://www.digirad.com/wp-content/uploads/2018/06/understanding-nuclear-medicine-stress-test.jpg
- https://www.uptodate.com/contents/selecting-the-optimal-cardiac-stress-test?source=history_widget#
- https://www.uptodate.com/contents/regadenoson-drug-information?source=history_widget
- https://www.uptodate.com/contents/dobutamine-drug-information?source=history_widget
- https://www.uptodate.com/contents/stress-testing-for-the-diagnosis-of-obstructive-coronary-heart-disease?source=history_widget
- https://www.uptodate.com/contents/overview-of-stress-echocardiography?source=history_widget
- https://www.uptodate.com/contents/screening-for-coronary-heart-disease?source=history_widget
- https://www.uptodate.com/contents/pathogenesis-of-atherosclerosis?source=history
- https://www.uptodate.com/contents/atherosclerosis-the-basics?source=history
- https://www.uptodate.com/contents/cardiac-imaging-with-computed-tomography-and-magnetic-resonance-in-the-adult?search=cta%20coronary&source=search_result&selectedTitle=1~115&usage_type=default&display_rank=1#H4194395465