

心脏磁共振扫描技术

苏州大学附属第一医院影像中心

陈剑华

The First Affiliated Hospital of Soochow University



- 随着MR技术的快速发展，心脏磁共振检查正朝着更清晰、更精细、更精确的方向发展。

- 回顾

1992年我院在GE Vactra 0.5T上就开展了心脏MR检查

参考文献：谢道海，丁乙，陈学仁，等.电影磁共振对正常人左心功能的测定.中华放射学杂志，1994,28（7）：444-447.

- 心脏磁共振所要解决的.....

- 1.心脏的解剖形态
- 2.心肌的MR信号有无异常
- 3.心肌的活动情况
- 4.心肌灌注有无异常
- 5.有无异常延时强化
- 6.心功能有无异常

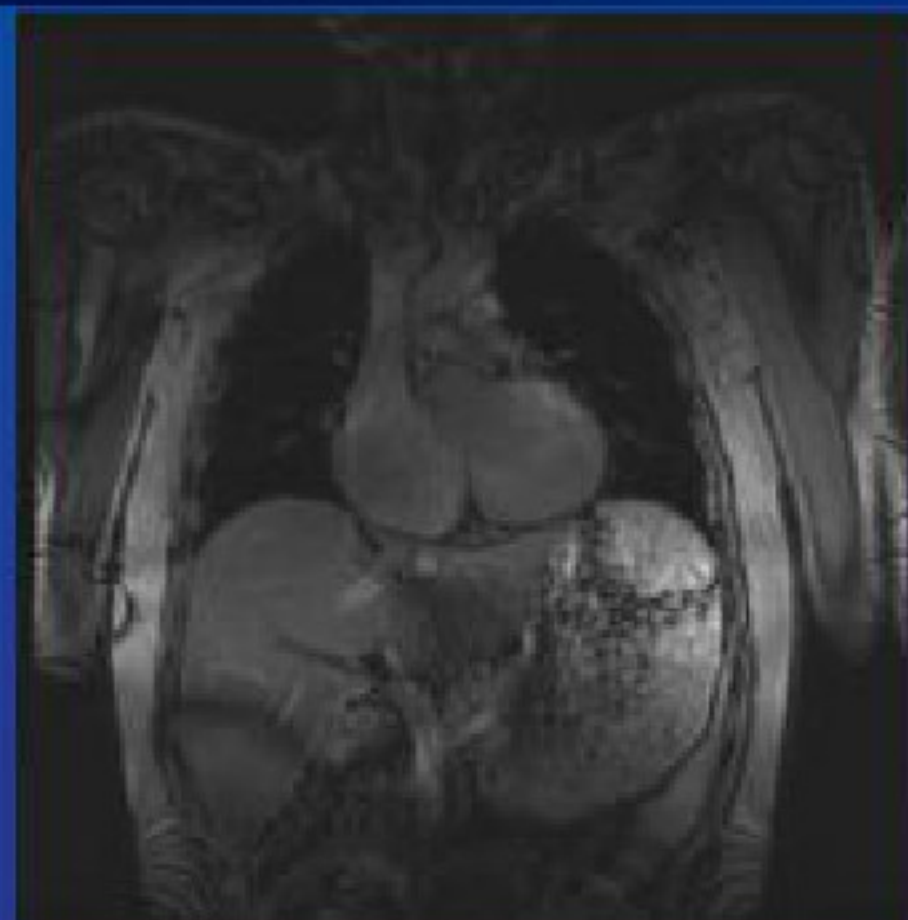
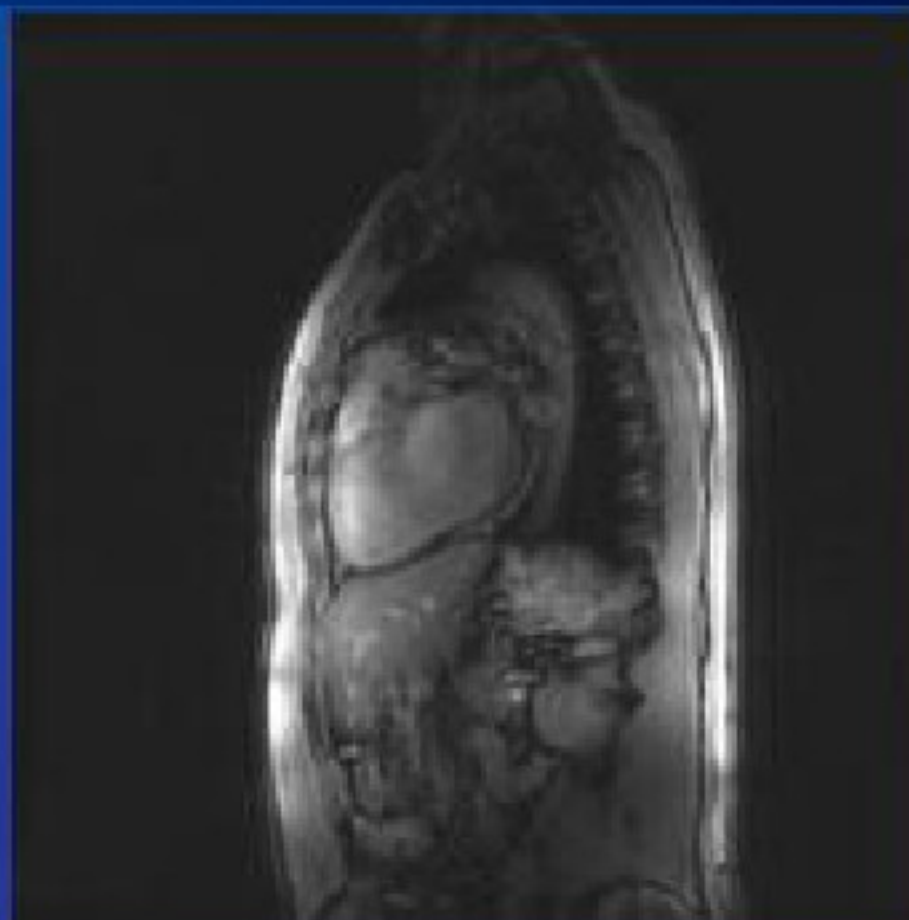
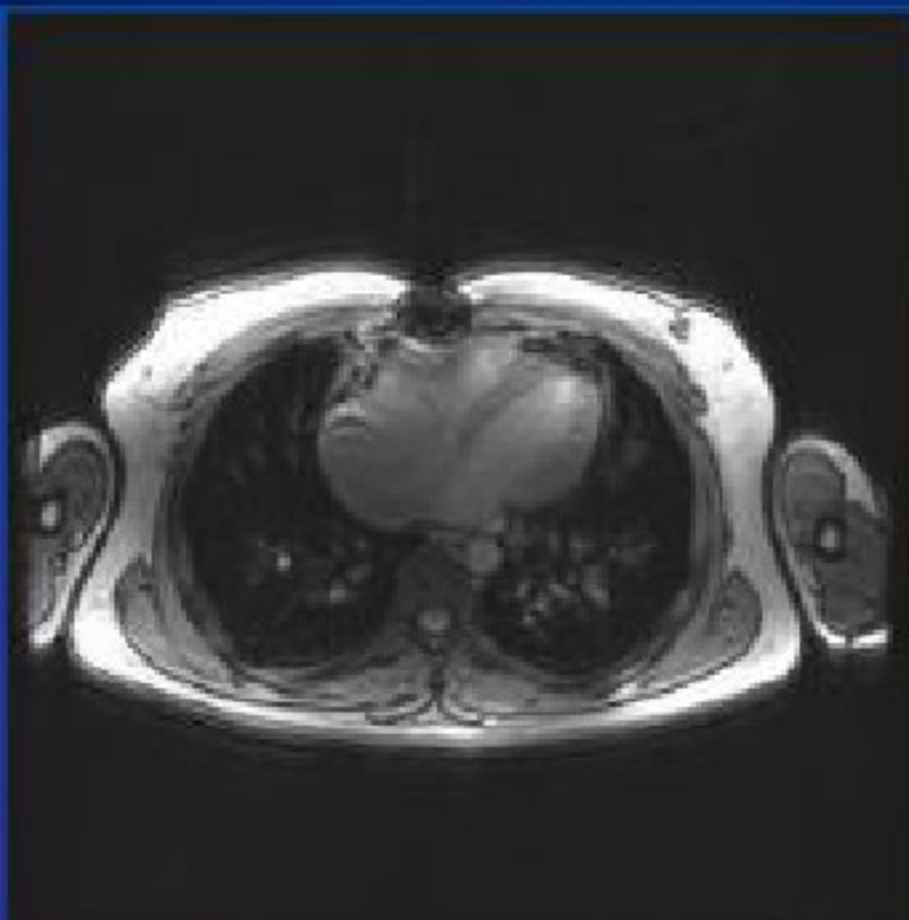
- 心脏磁共振检查前准备

- 1.呼吸屏气训练

- 2.心电门控的连接

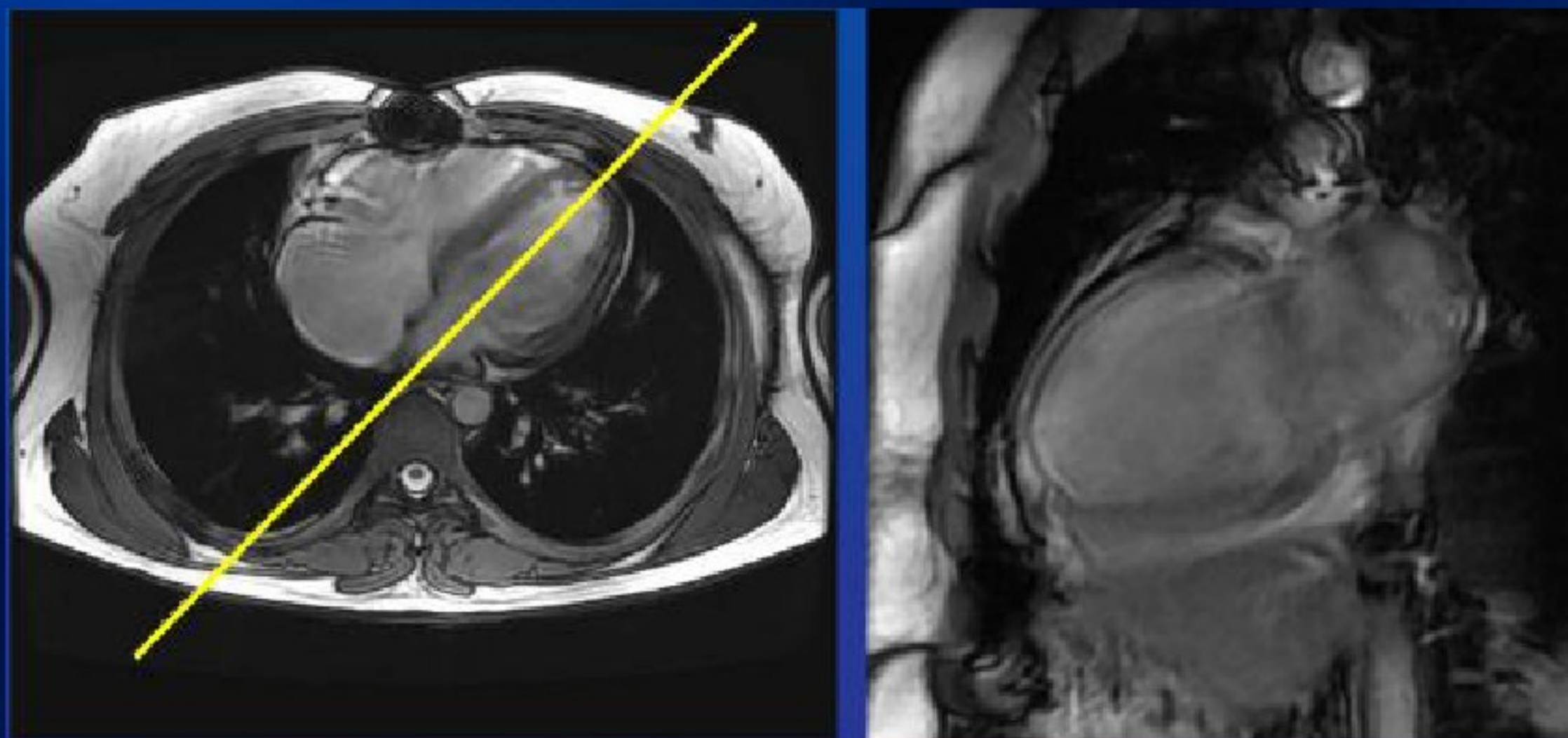
- 3.操作流程的回顾

- 磁共振心脏扫描定位



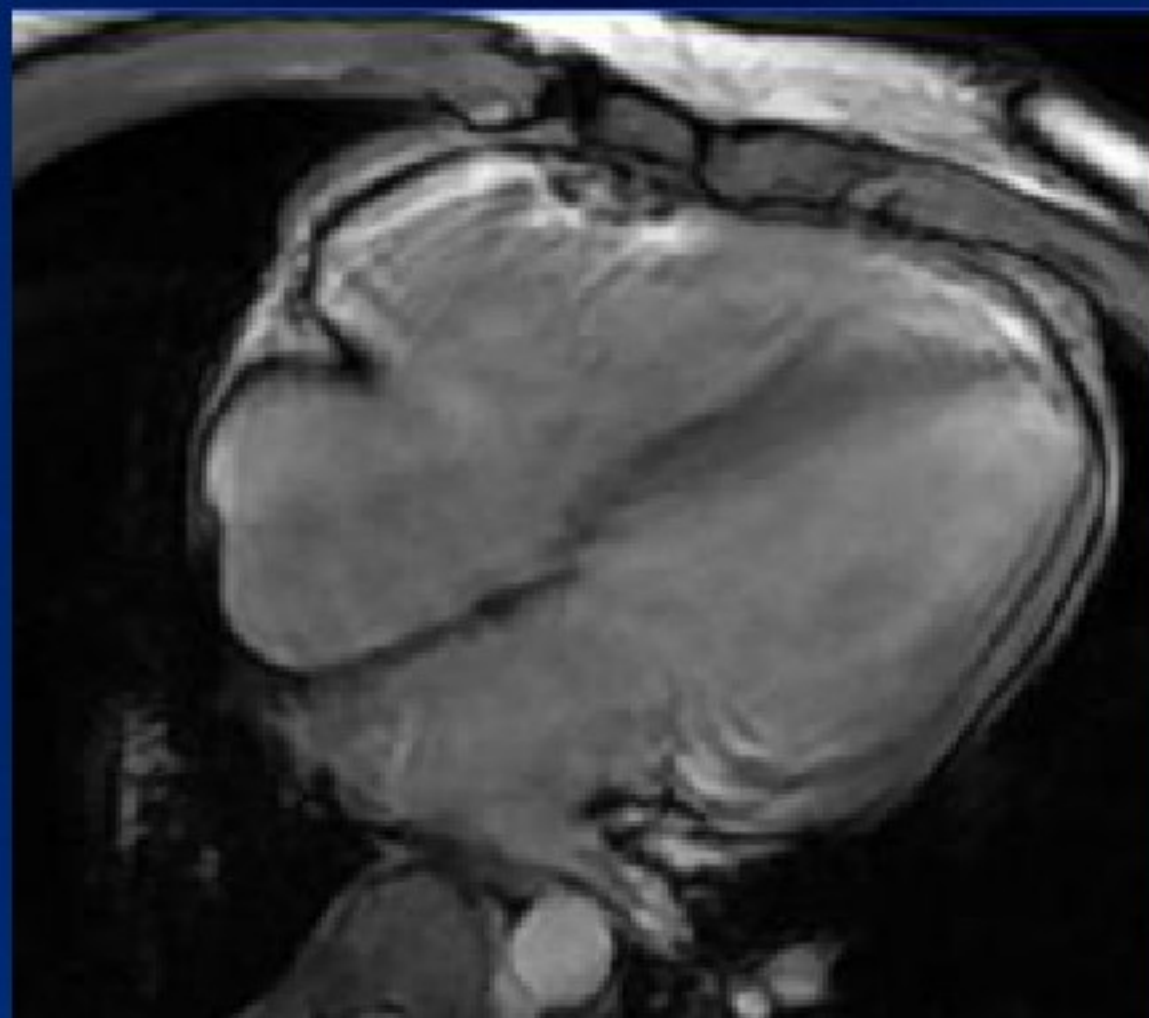
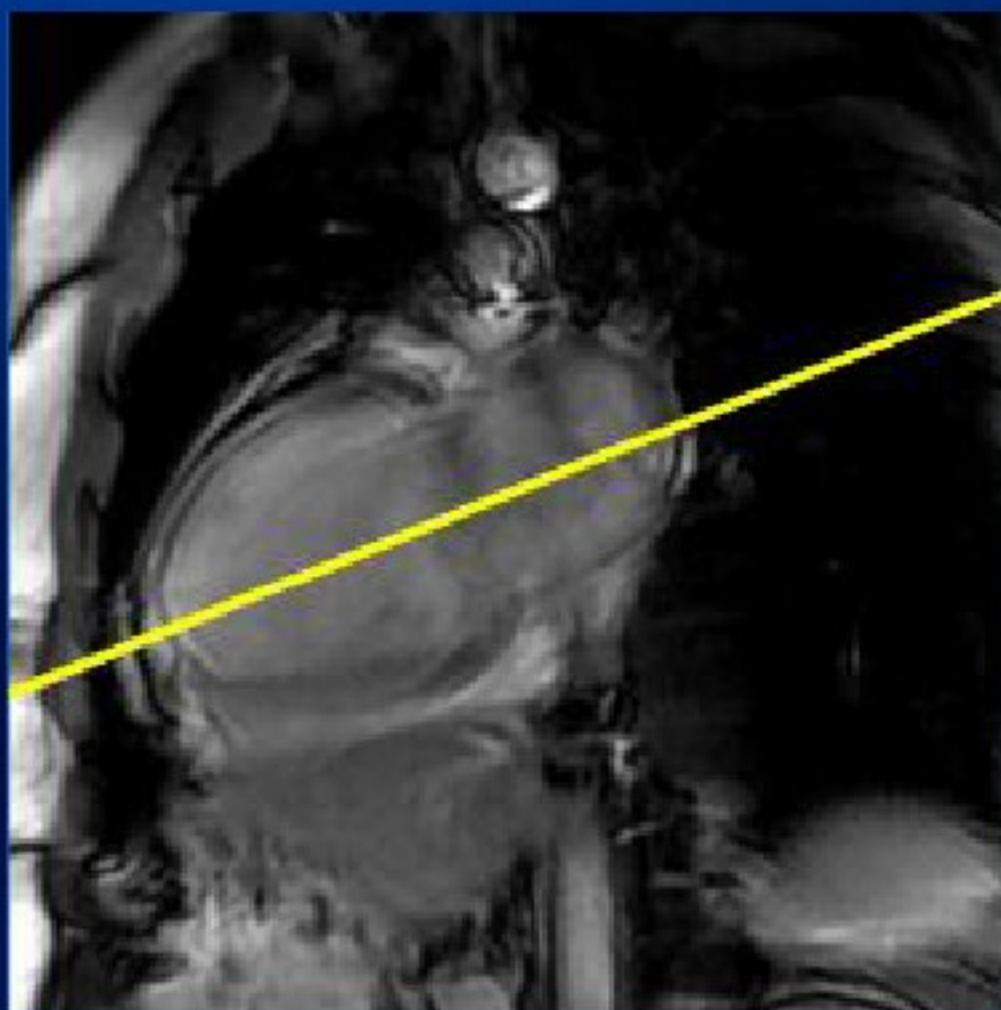
首先进行心脏冠、矢、横三方位定位图

- 磁共振心脏扫描定位



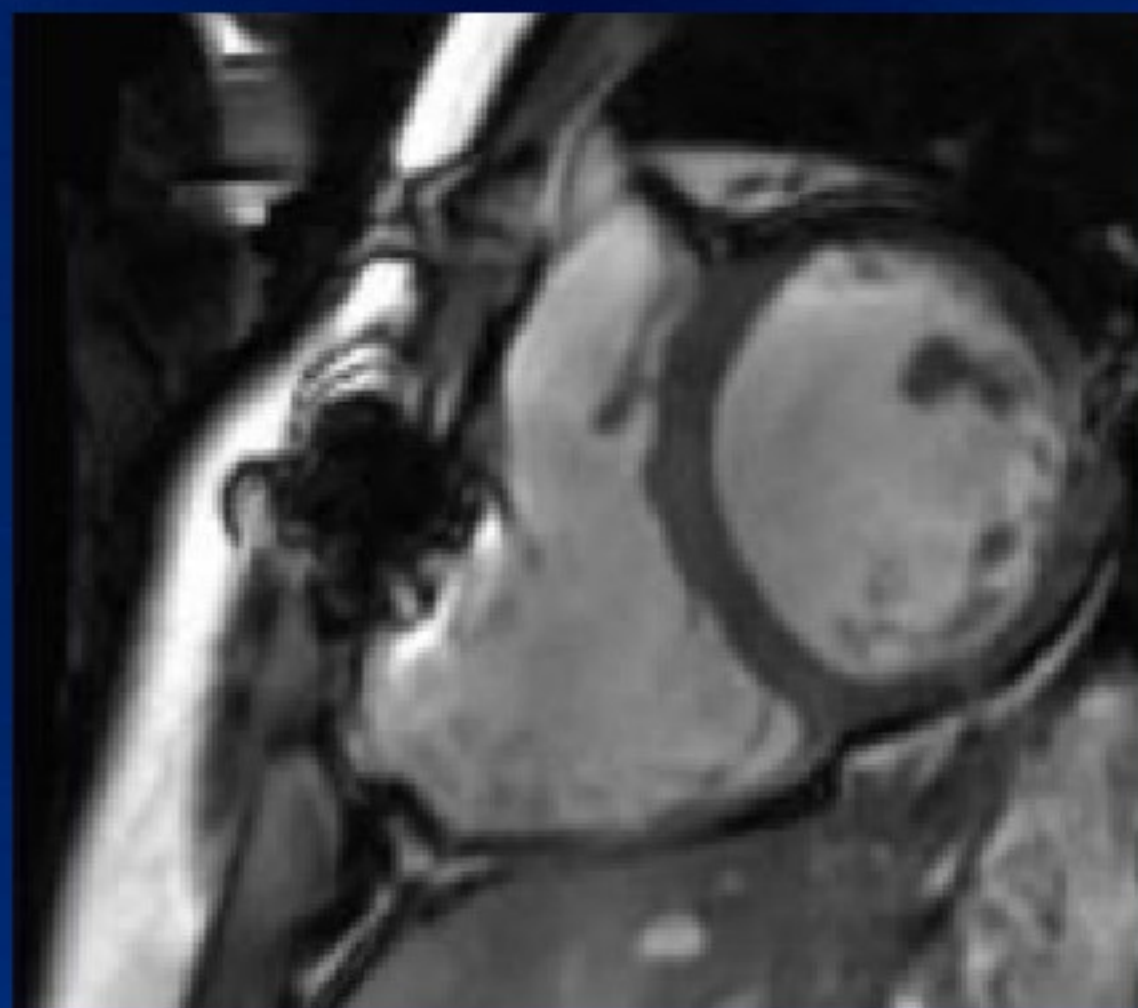
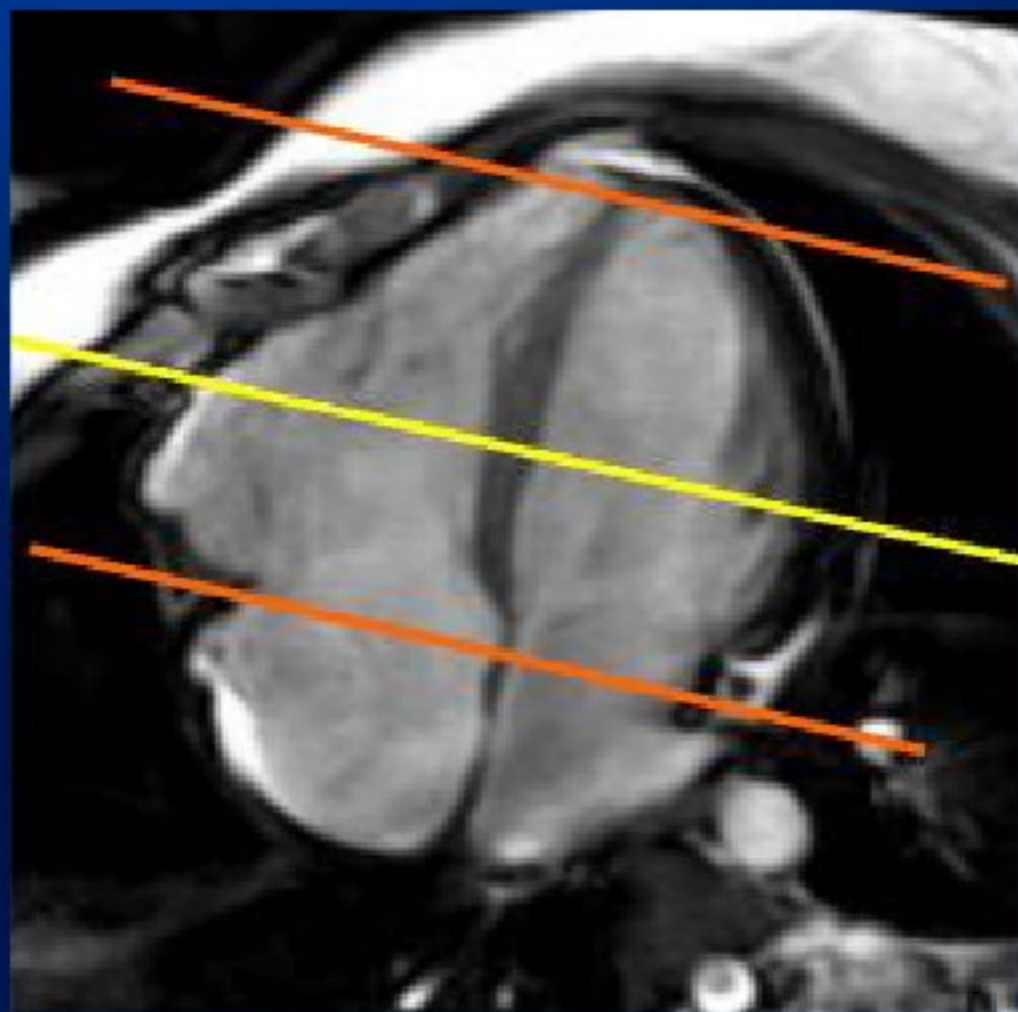
在横位上通过左室心尖与二尖瓣中点的连线定出两腔心

- 磁共振心脏扫描定位



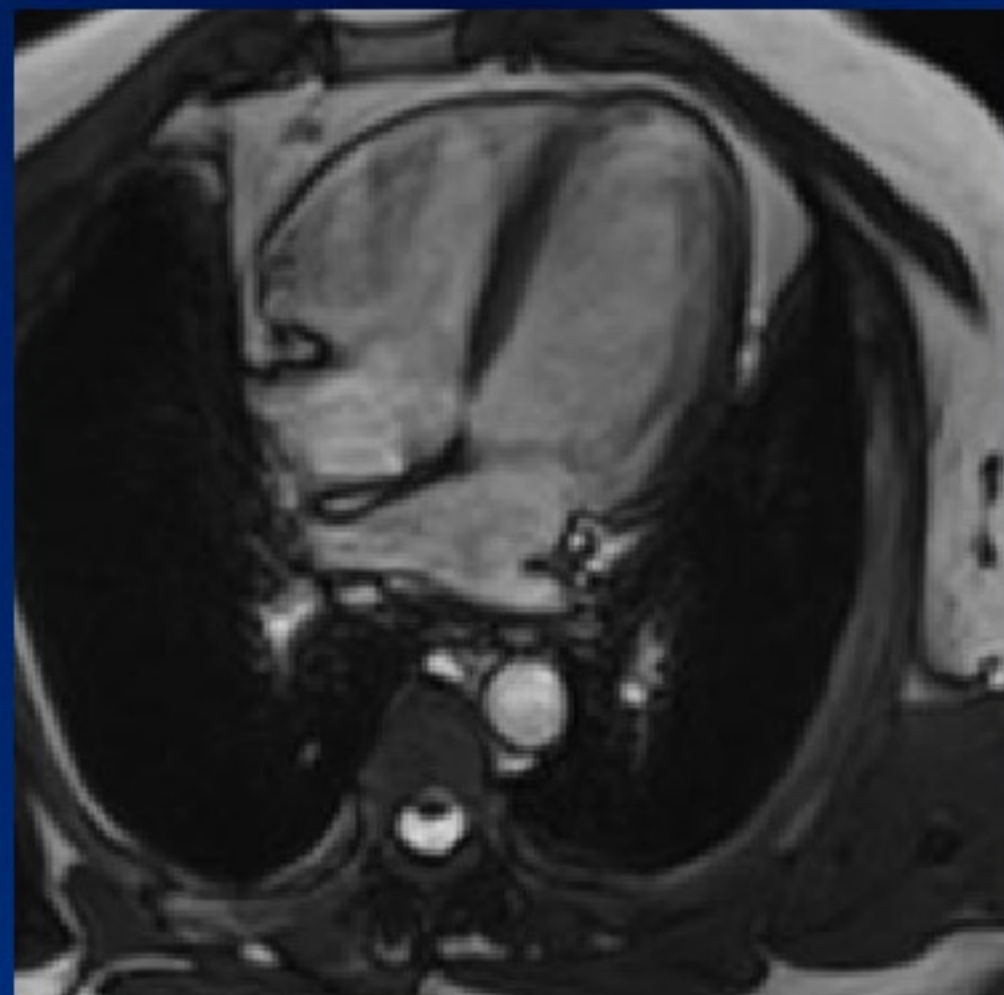
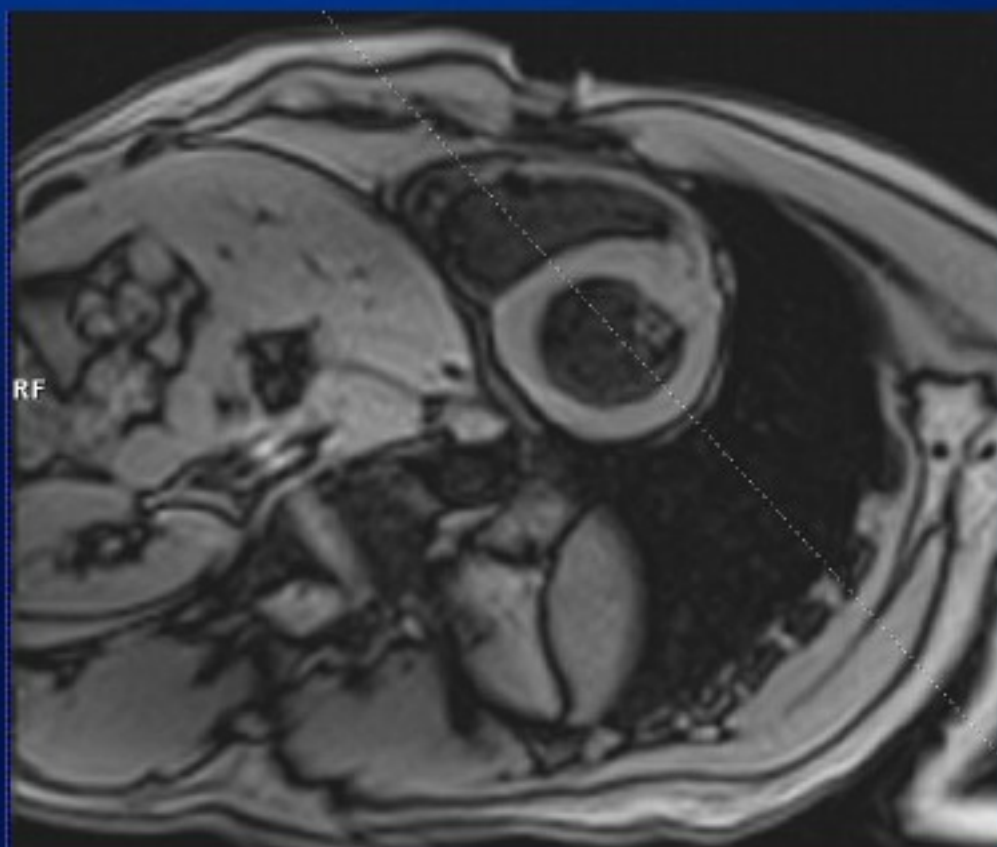
在两腔心上通过左室心尖与二尖瓣中点的连线定出四腔心

- 磁共振心脏扫描定位



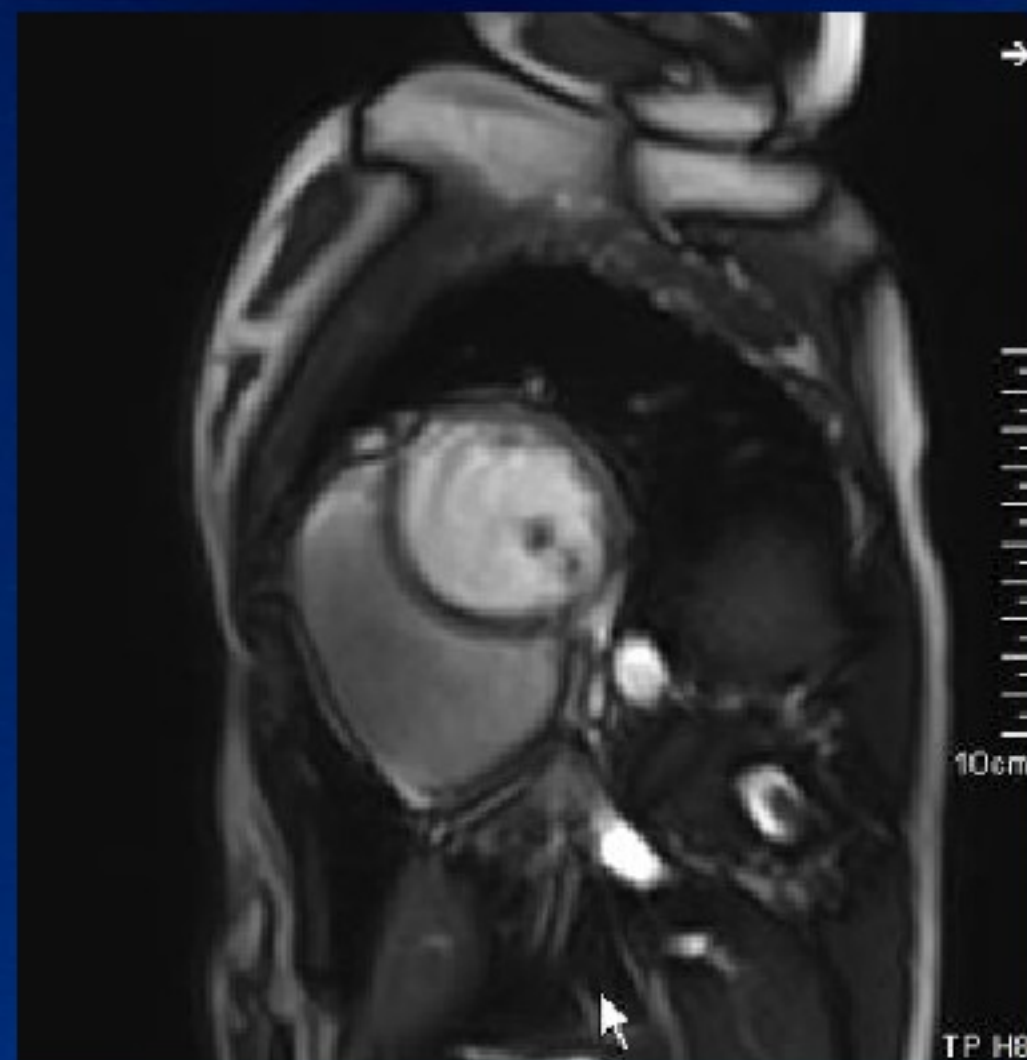
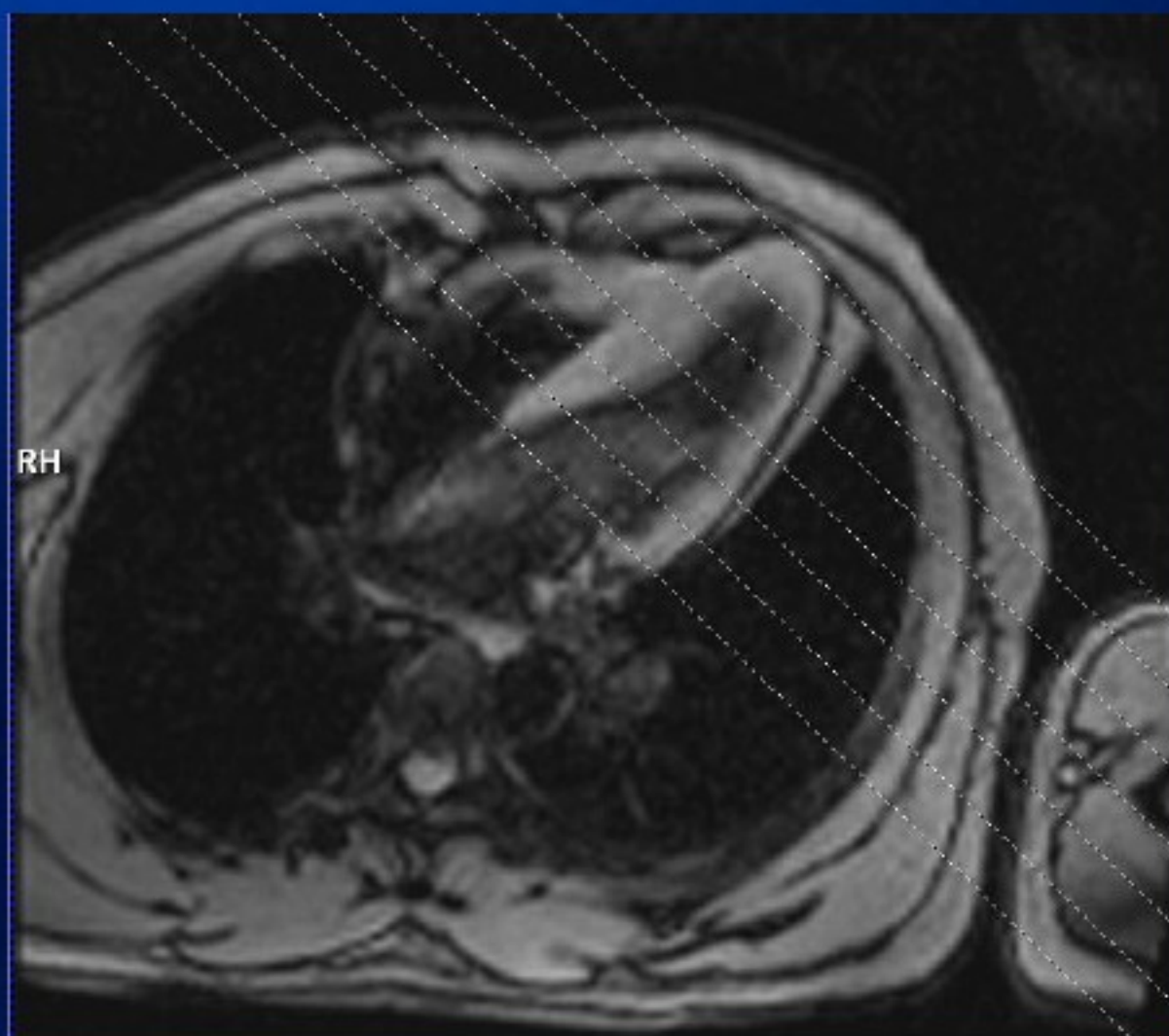
在四腔心上通过左室心尖与二尖瓣中点的连线的垂直线定出左室的短轴位

- 磁共振心脏扫描定位



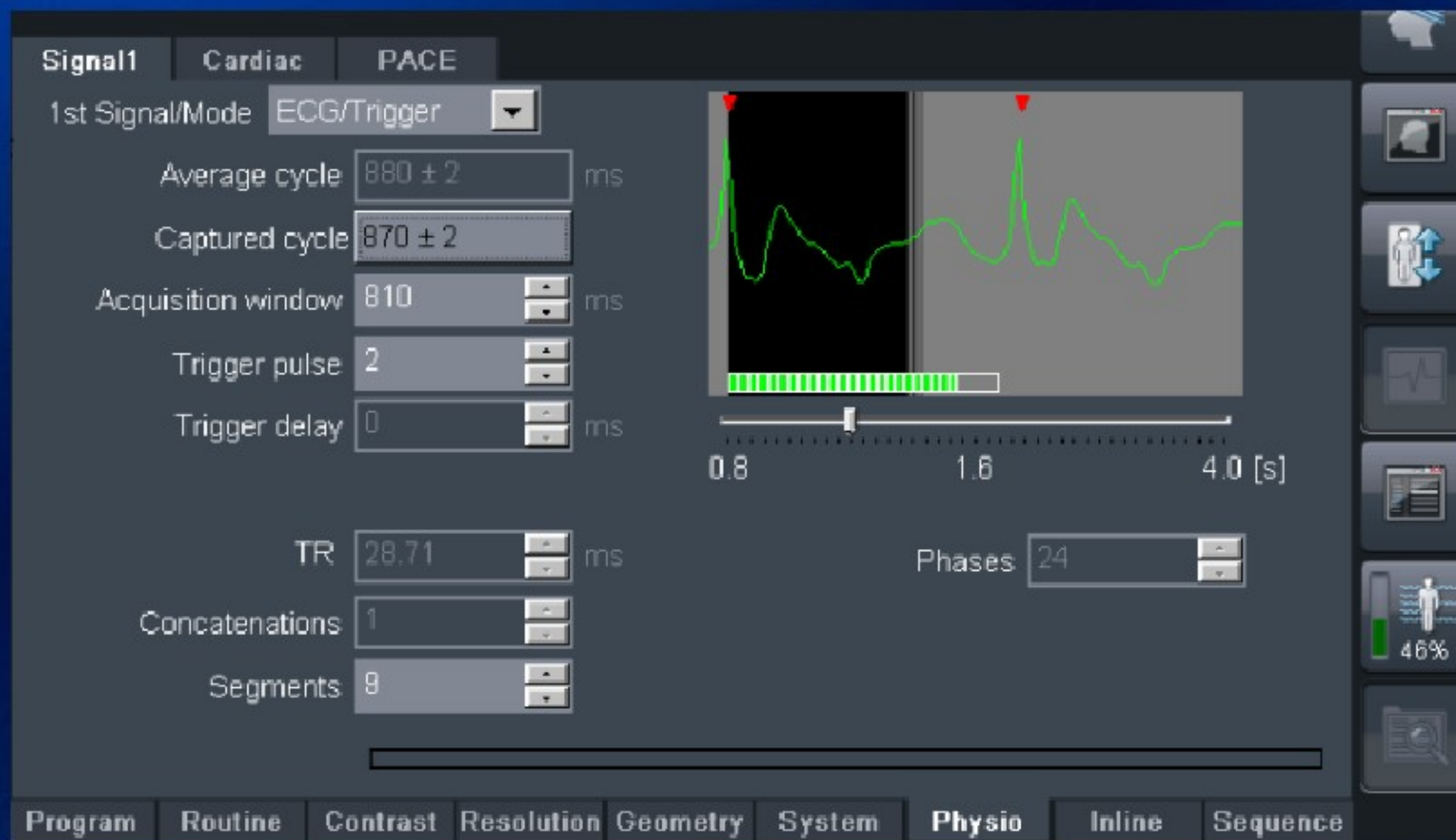
在短轴位上通过室间隔中点并垂直平分左右室定出准四腔心

- 磁共振心脏扫描定位



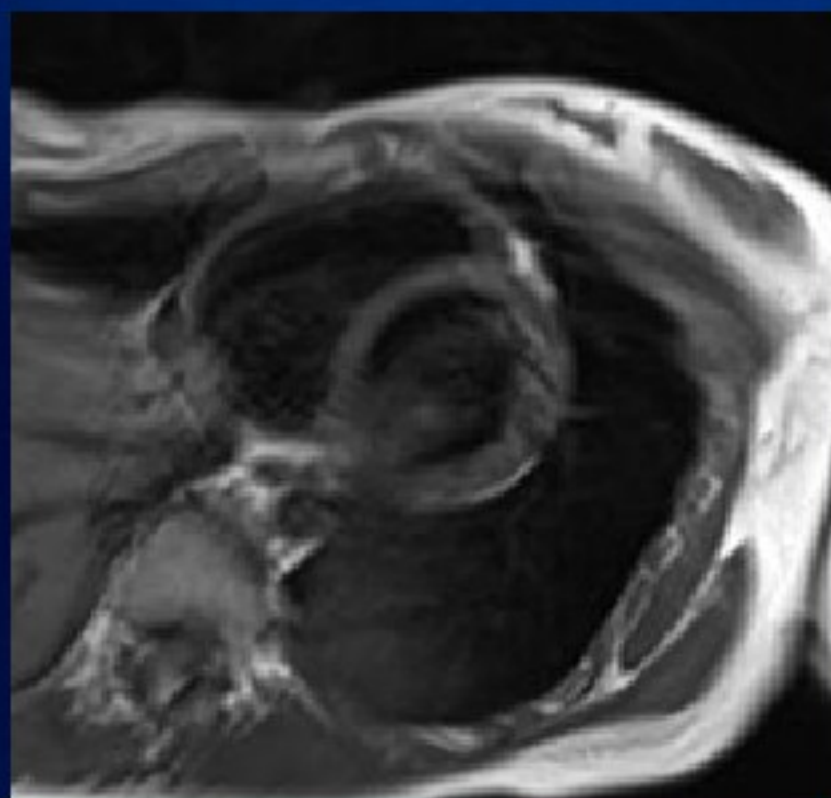
在短轴位上通过室间隔中点并垂直平分左右室定出准四腔心

- 扫描前心电门控补偿

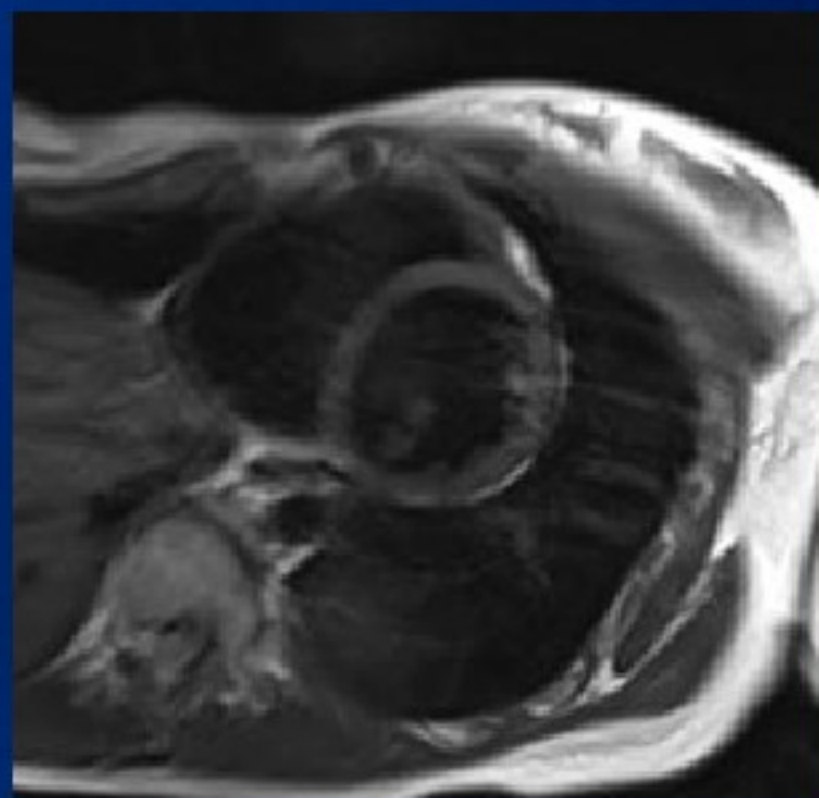


- 磁共振心脏扫描

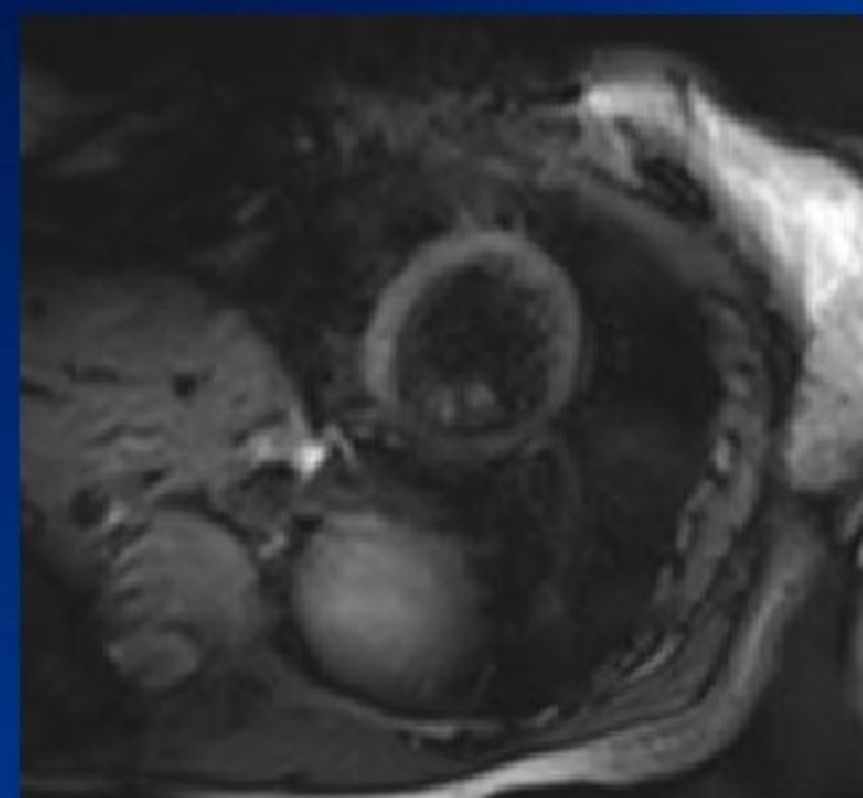
- 1. 首先进行短轴位T1、T2、T2压脂序列扫描



T1



T2



T2 tirm

- 磁共振心脏扫描

参考序列:

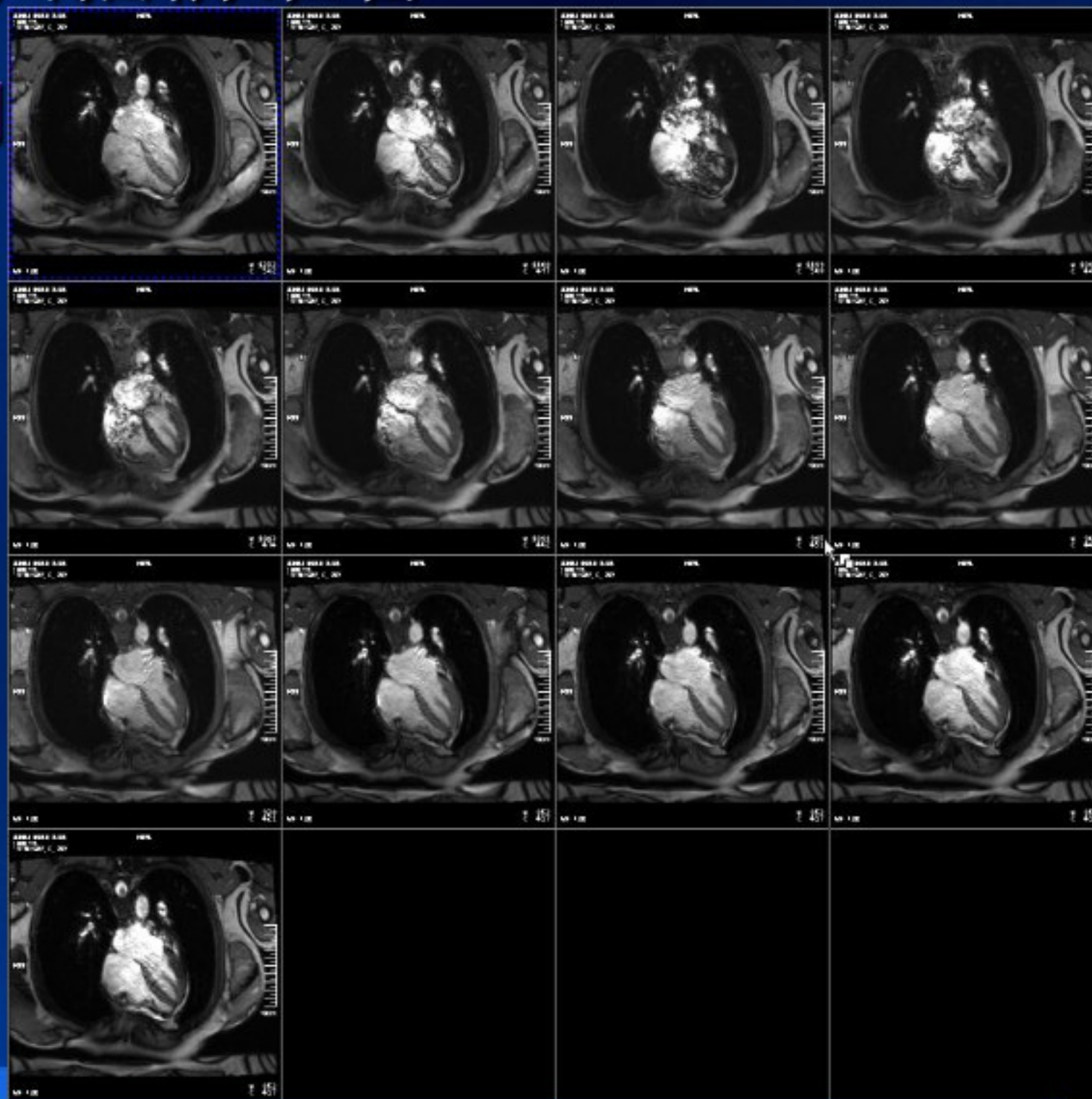
1.T1: tse_9_db_t1_iPAT

2.T2: tse_17_db_t2_iPAT

3.T2 tirm: tirm_15_db_t2_iPAT

- 磁共振心脏电影扫描前准备

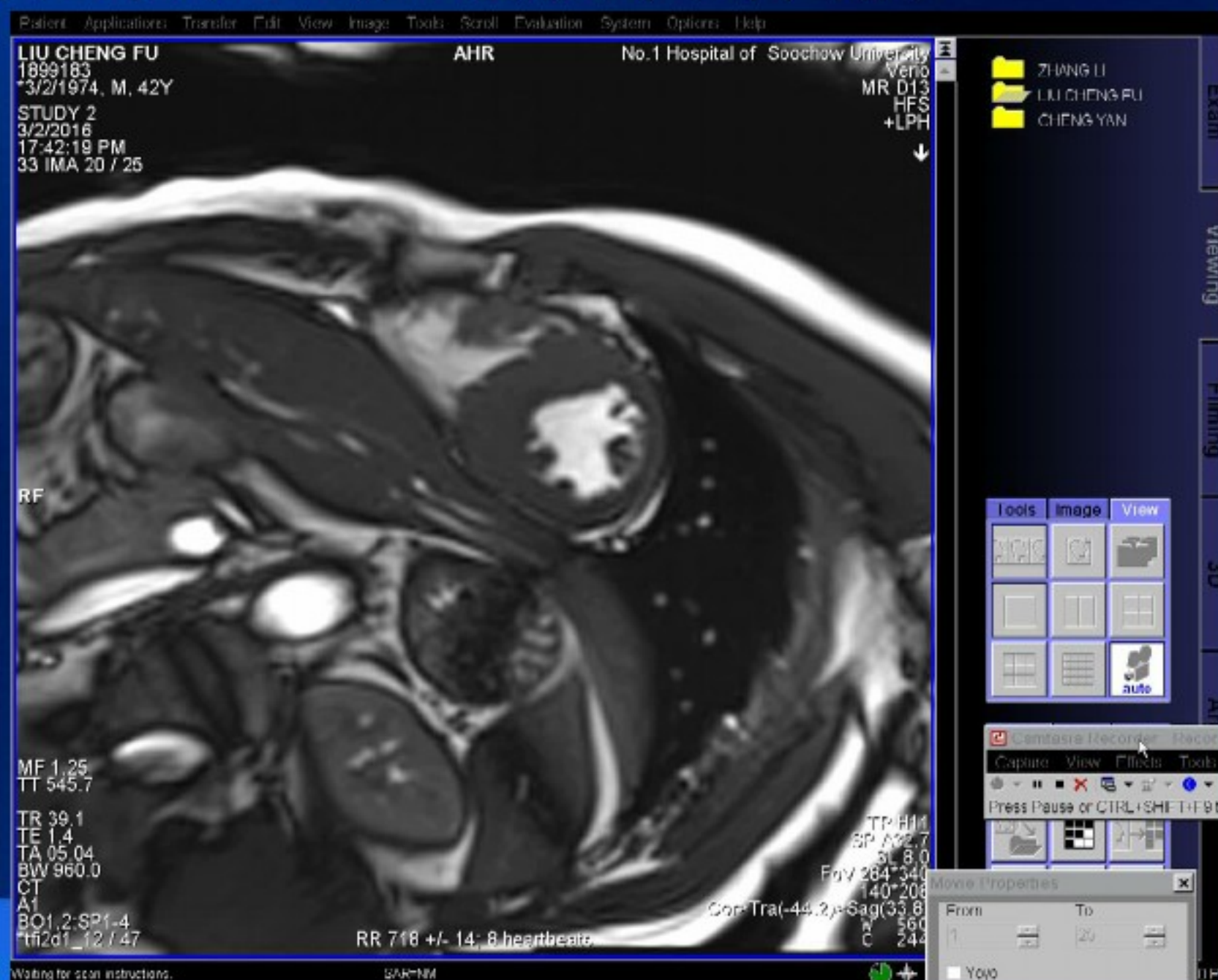
做trufi_freqScout序列



- 磁共振心脏电影扫描前准备
 - 1.呼吸屏气训练
 - 2.心电门控的链接
 - 3.操作流程的回顾

- 磁共振心脏电影扫描

2.进行短轴位心脏电影序列扫描



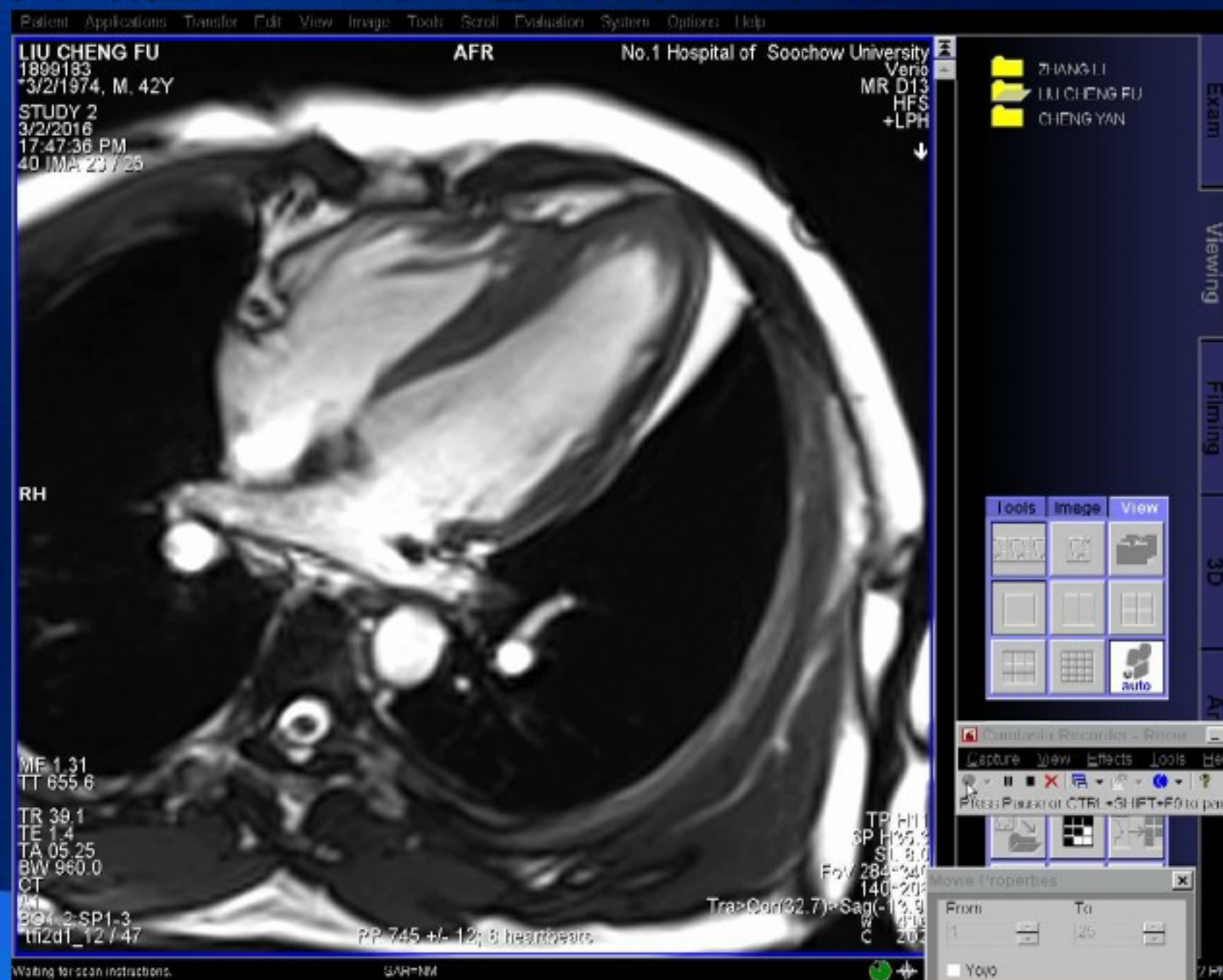
- 磁共振心脏电影扫描

参考序列:

cine_tf2d12_retro_iPAT

- 磁共振心脏电影扫描

3.进行四腔心心脏电影序列扫描



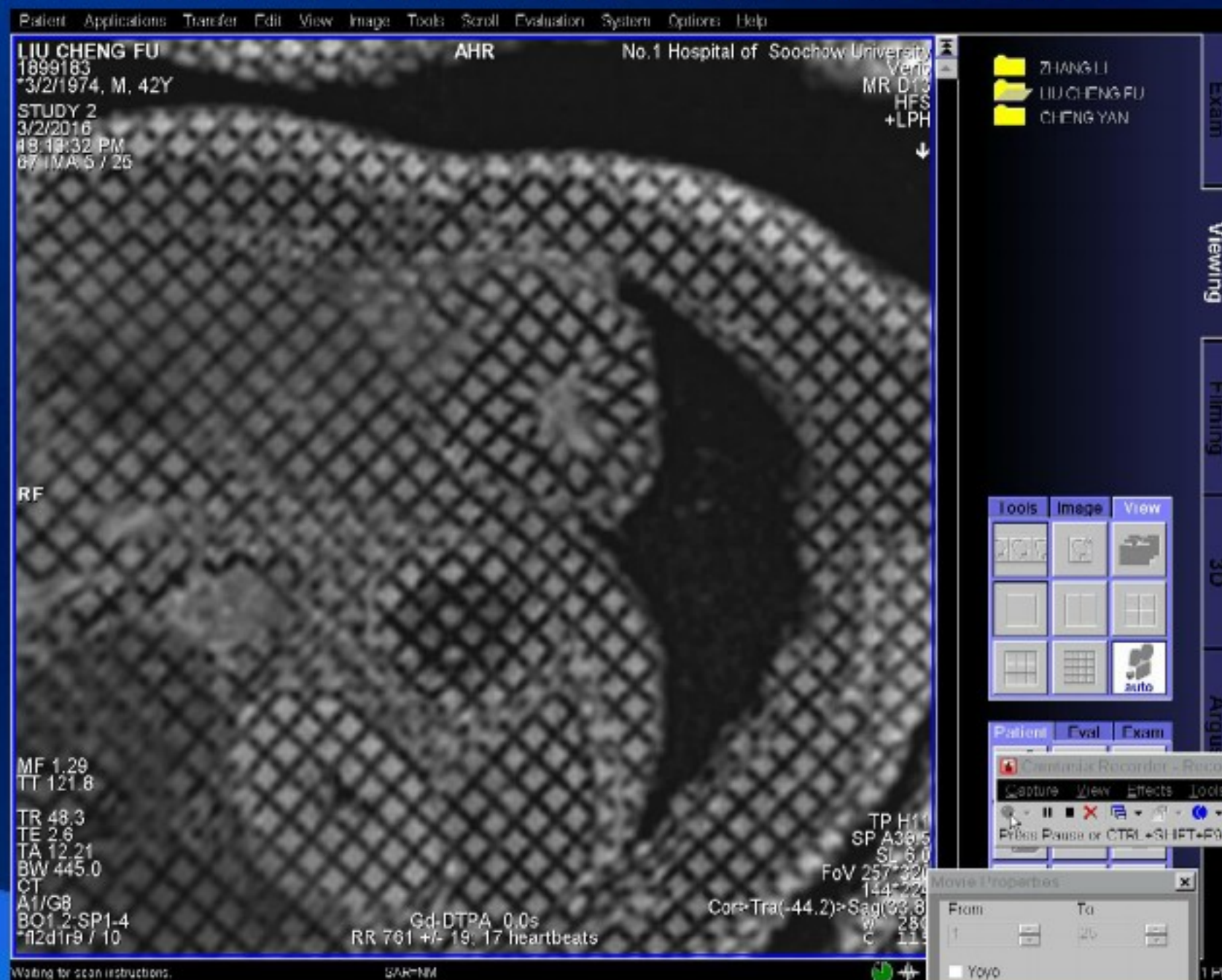
- 磁共振心脏电影扫描

参考序列:

cine_tf2d12_retro_iPAT

- 磁共振心脏电影网格扫描

4.进行短轴位网格心脏电影序列扫描



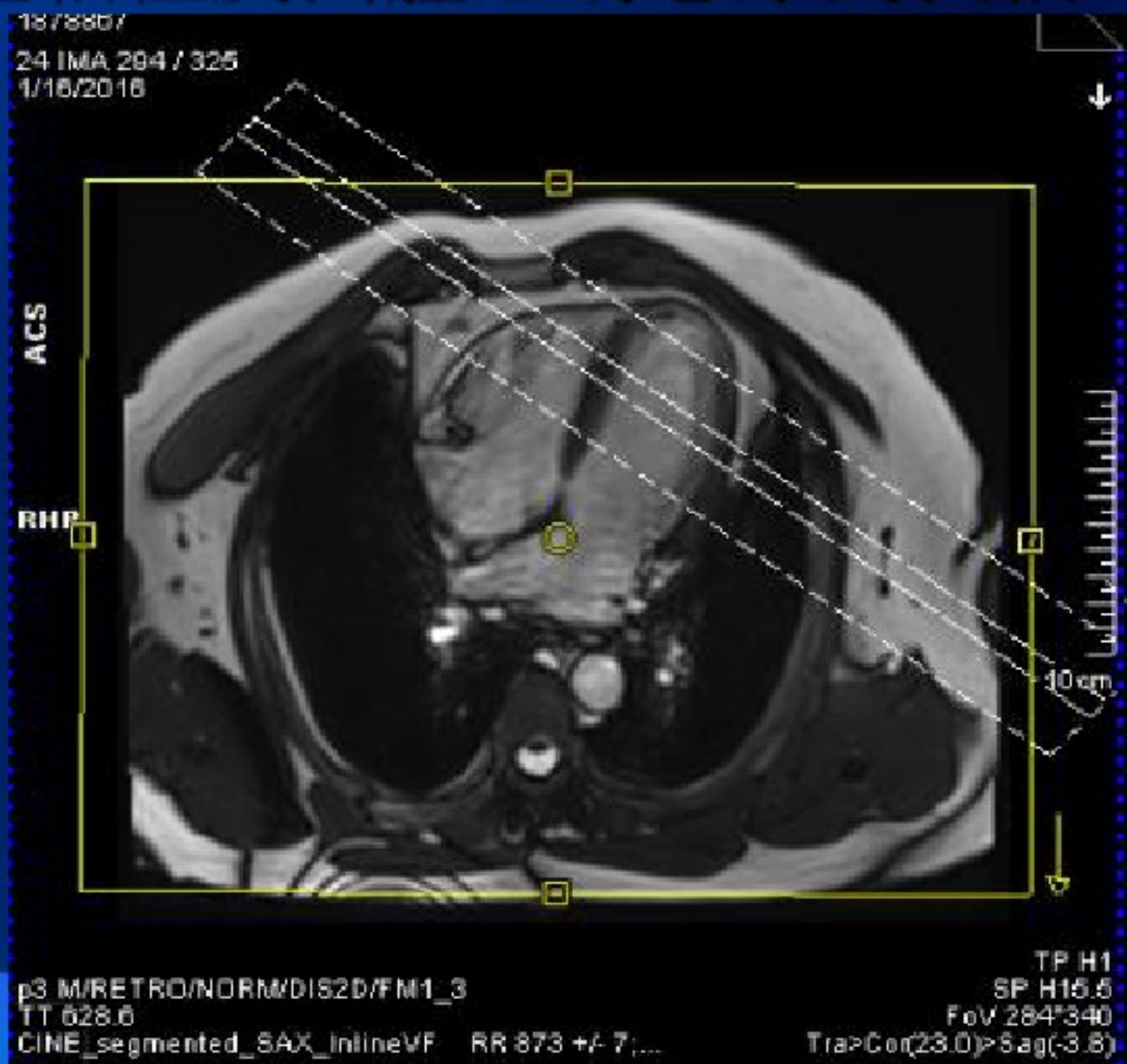
- 磁共振心脏电影网格扫描

参考序列:

cine_fl2d9_grid

- 磁共振心脏动态扫描

5.进行短轴位及四腔心动态序列扫描

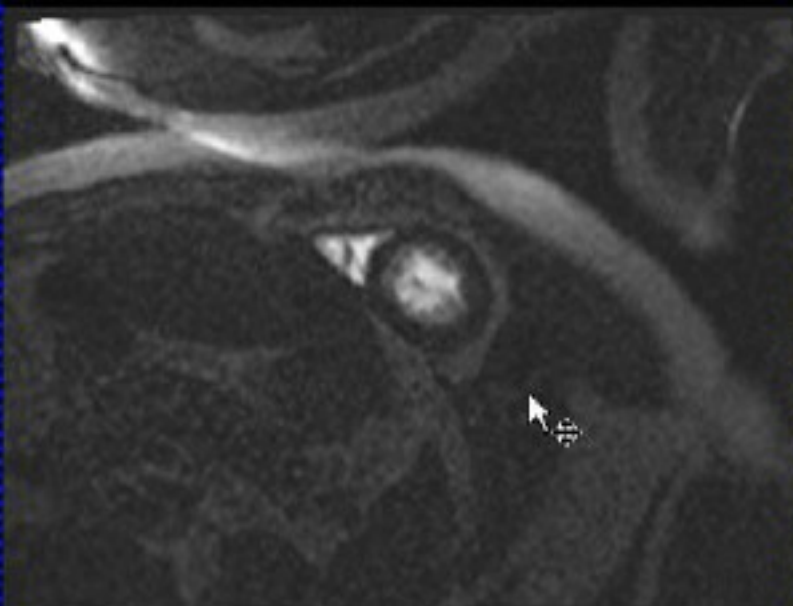


- 磁共振心脏动态扫描

7ml磁共振造影剂（Gd-DTPA）在动态扫描开始后2秒内快速注射

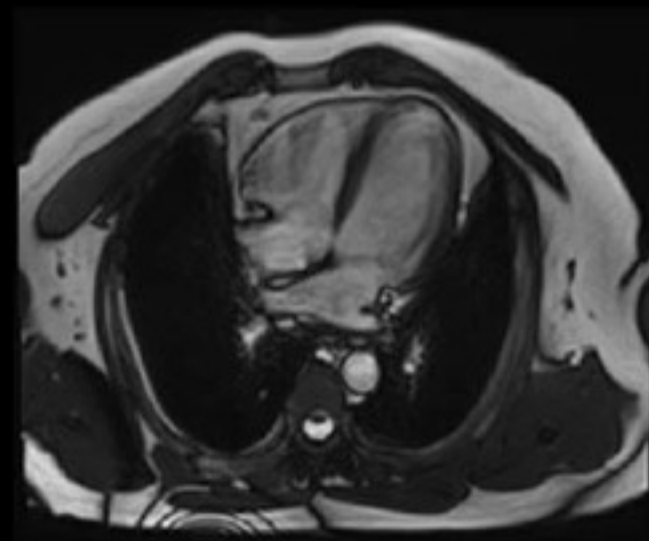
参考序列：dynamic_tfl_sr_ePAT

JIN WEI ZHONG
1070067
25 IMA 500 / 1026
1/16/2012



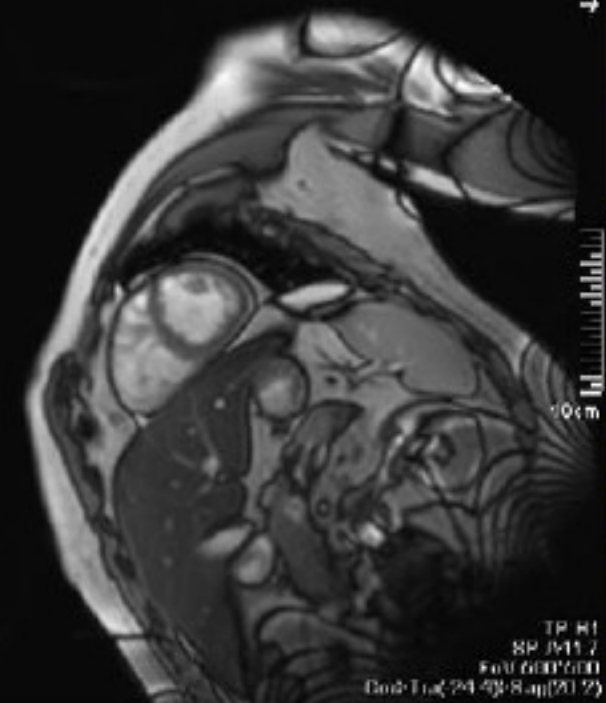
p2 M/R/TIRMNORM01820/PM1_8
T1 200.0
CINE-segmented_SAX_inflow
RR 873 +/- 7

JIN WEI ZHONG
1070067
12 IMA 6 / 14
1/16/2012



TP H1
SP H16.0
FoV 280.0x80.0
End-Coil 28.0x8.0x3.8

JIN WEI ZHONG
1070067
12 IMA 6 / 14
1/16/2012



TP H1
SP H11.7
FoV 600.0x500.0
End-Coil 24.0x8.0x3.8

JIN WEI ZHONG
1/16/1972
Dot

26	tirm_15_db_j2_IPAT	
27	tirm_15_db_t2_IPAT	
28	tirm_15_db_j2_IPAT	
29	tirm_15_db_t2_IPAT	
30	tirm_15_db_j2_IPAT	
31	tirm_15_db_t2_IPAT	
32	cine_02d9_grid	
33	dynamic_t1_sr_ePAT	

Σ 00:00



- 磁共振心脏延时扫描

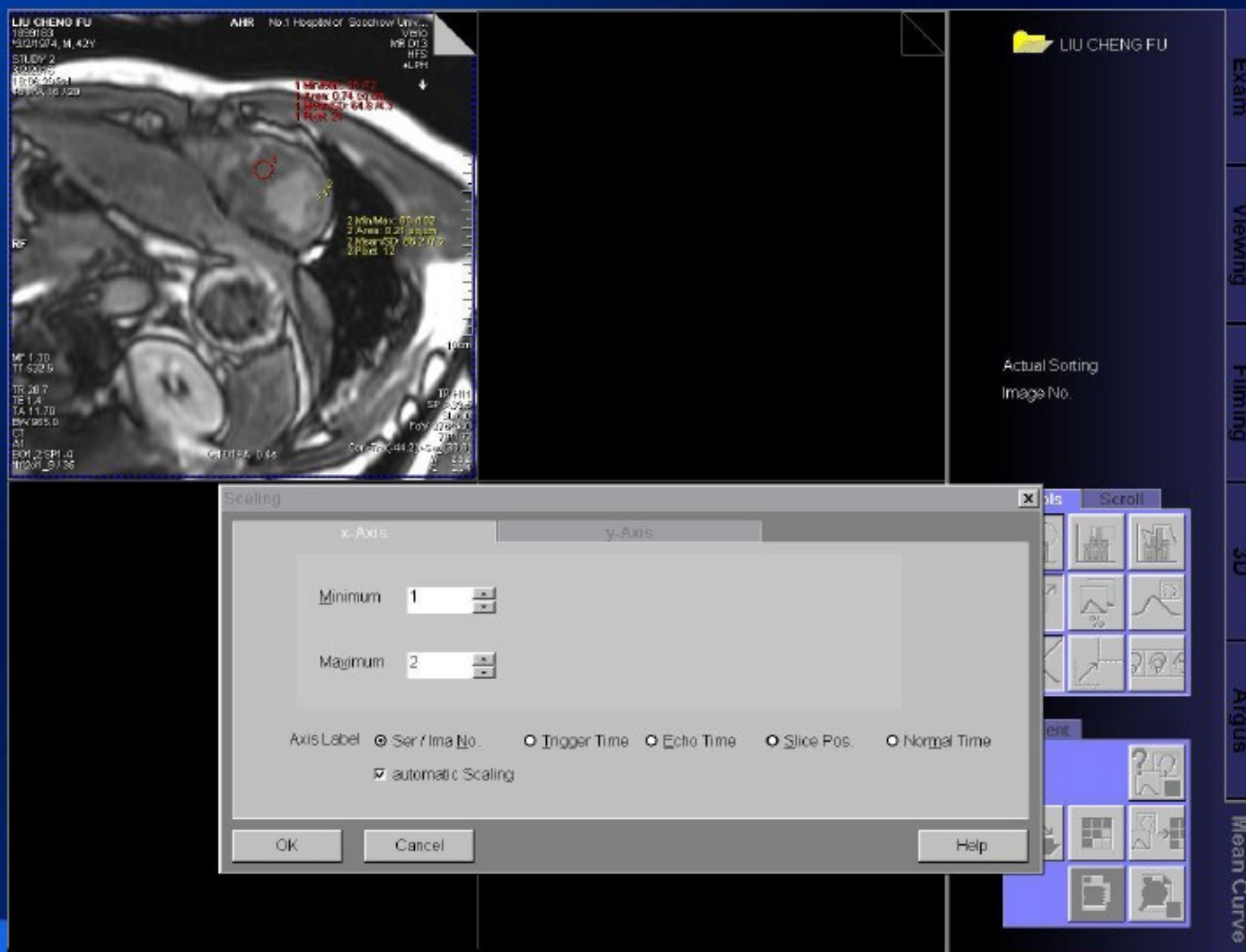
- 1.动态扫描结束后，将剩余的8ml磁共振造影剂（Gd-DTPA）全部注射完毕。

- 2.延时20min扫描。

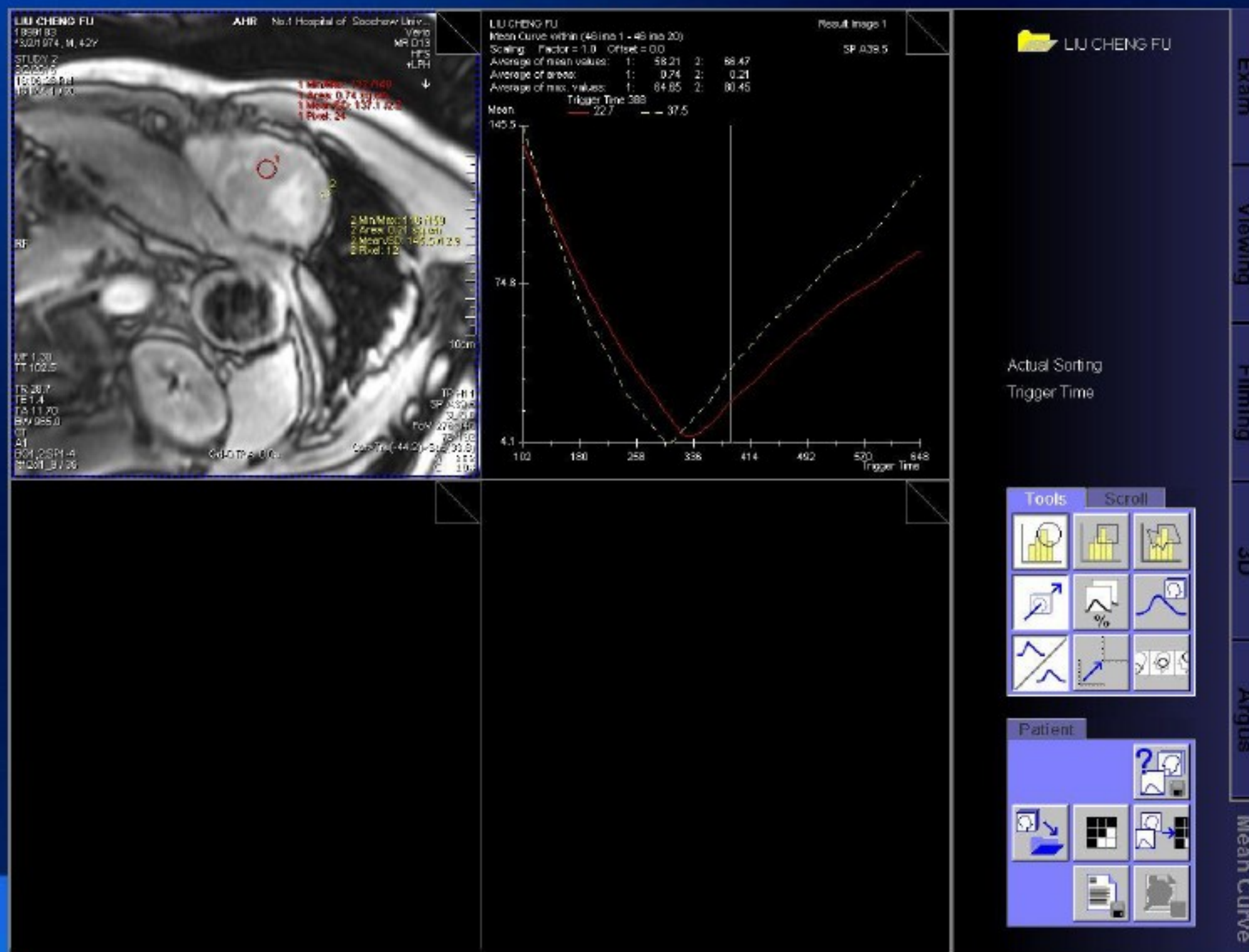
- 3.扫描前做TI Scout。

参考序列：TI_Scout

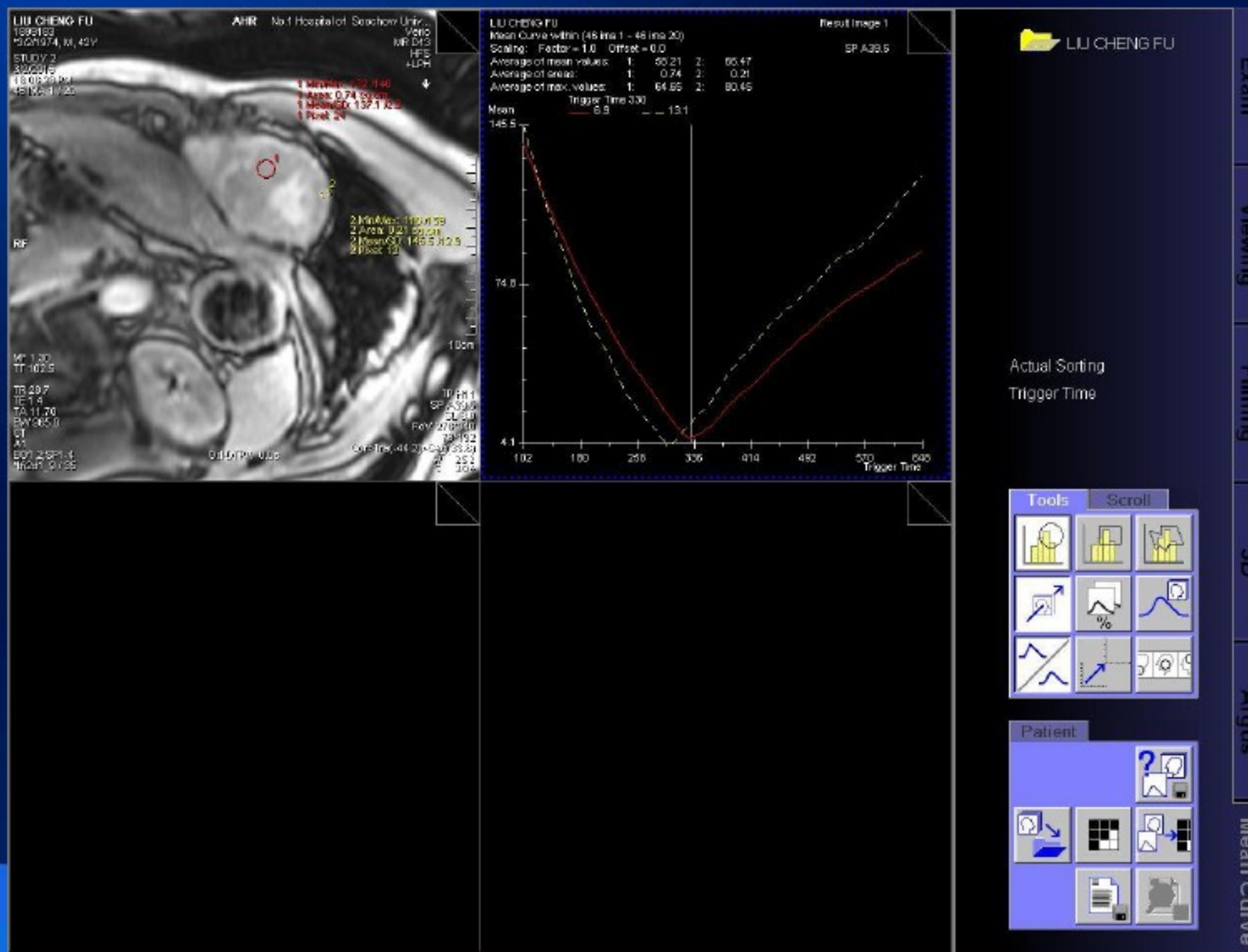
- 磁共振心脏延时扫描



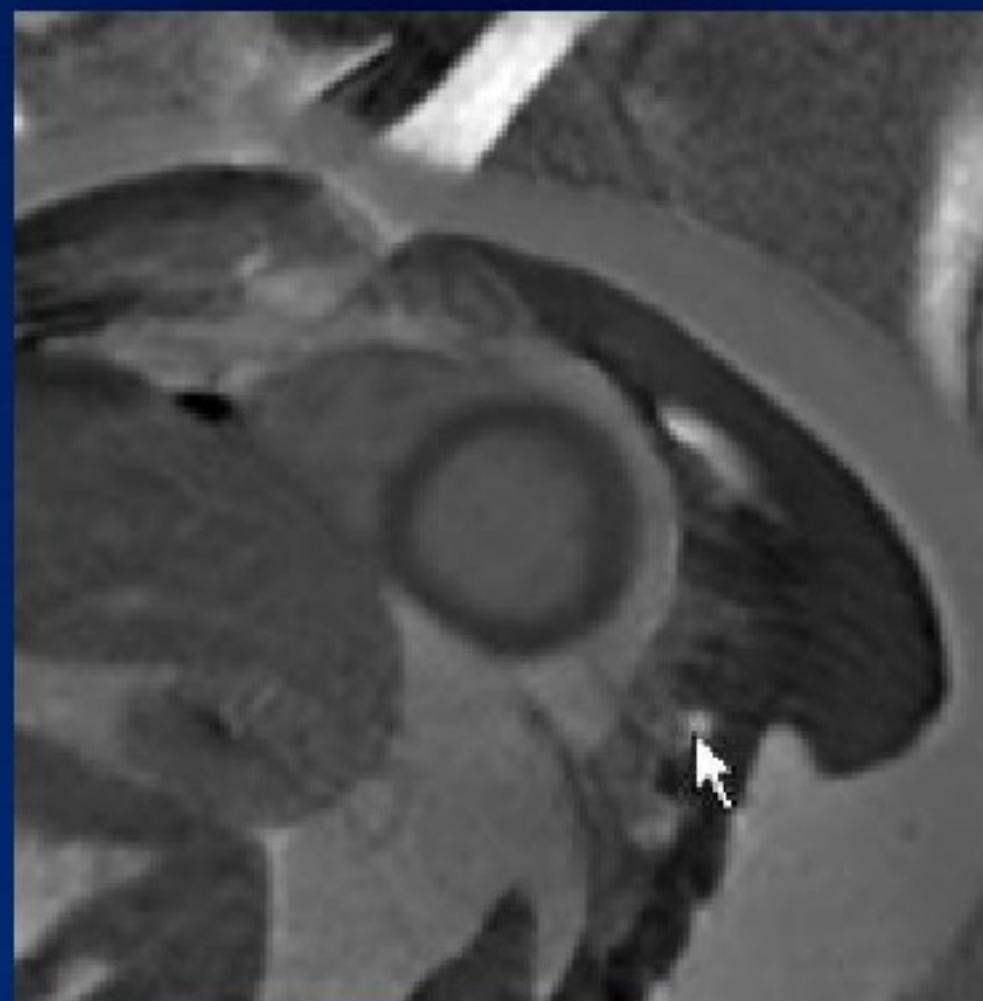
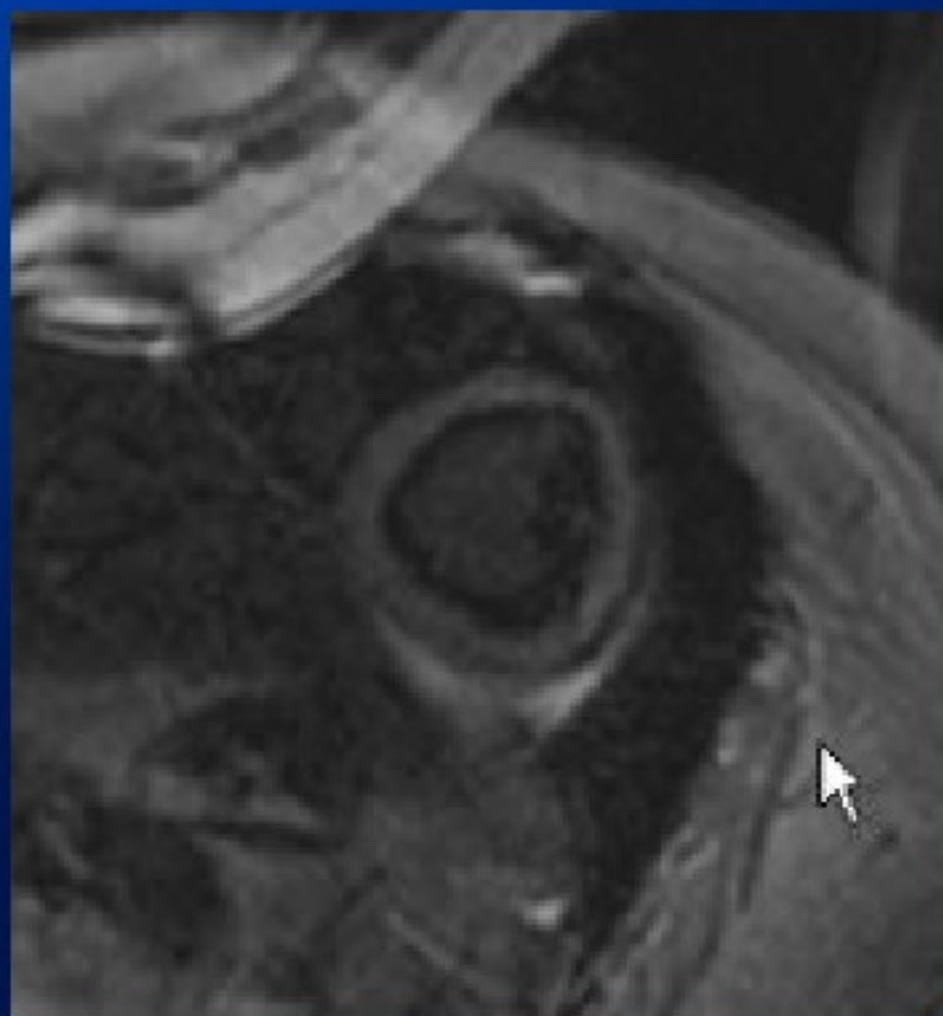
- 磁共振心脏延时扫描



• 磁共振心脏延时扫描



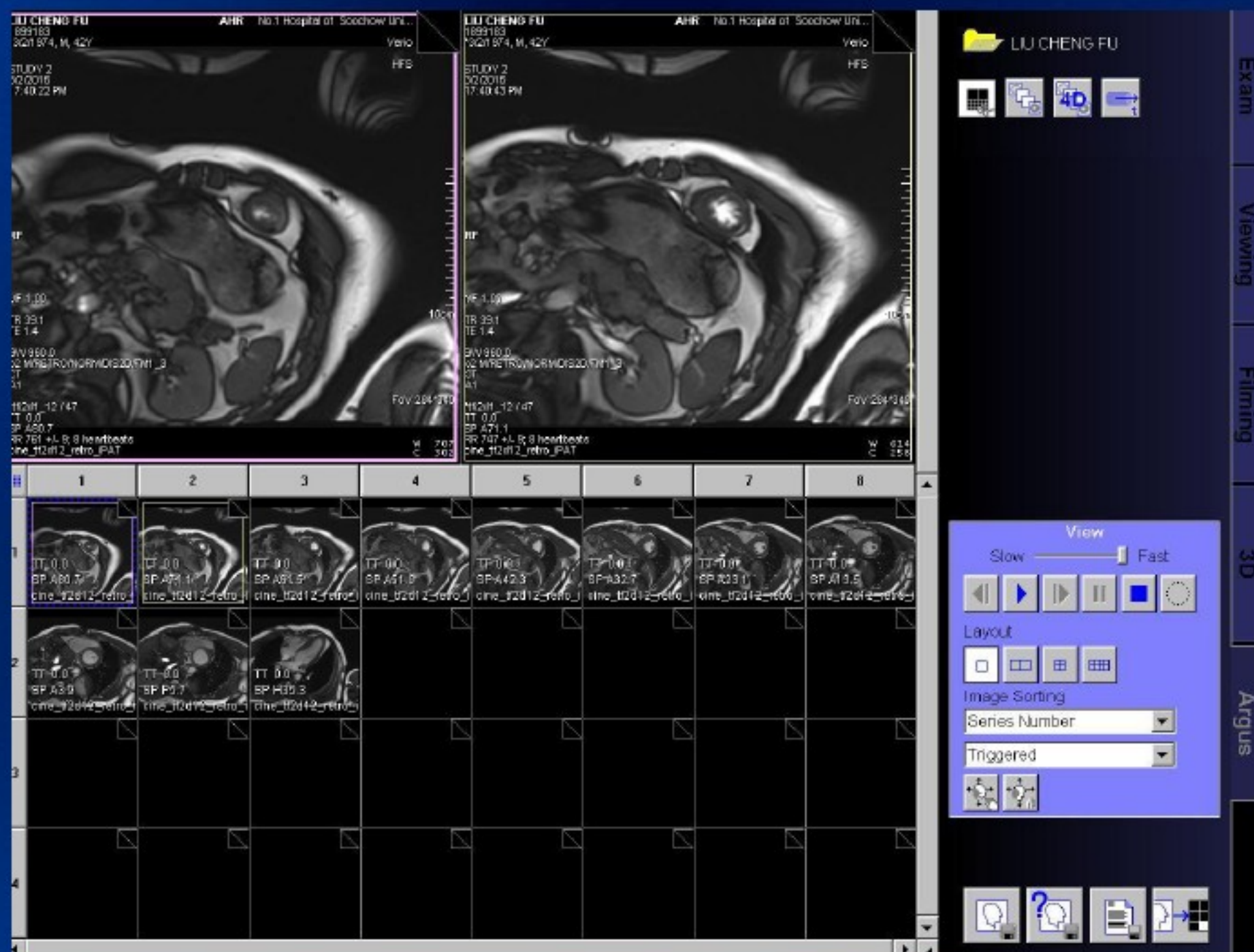
- 磁共振心脏延时扫描



参考序列: DE_high-res_tfl31_psir_seg

• 磁共振心功能分析

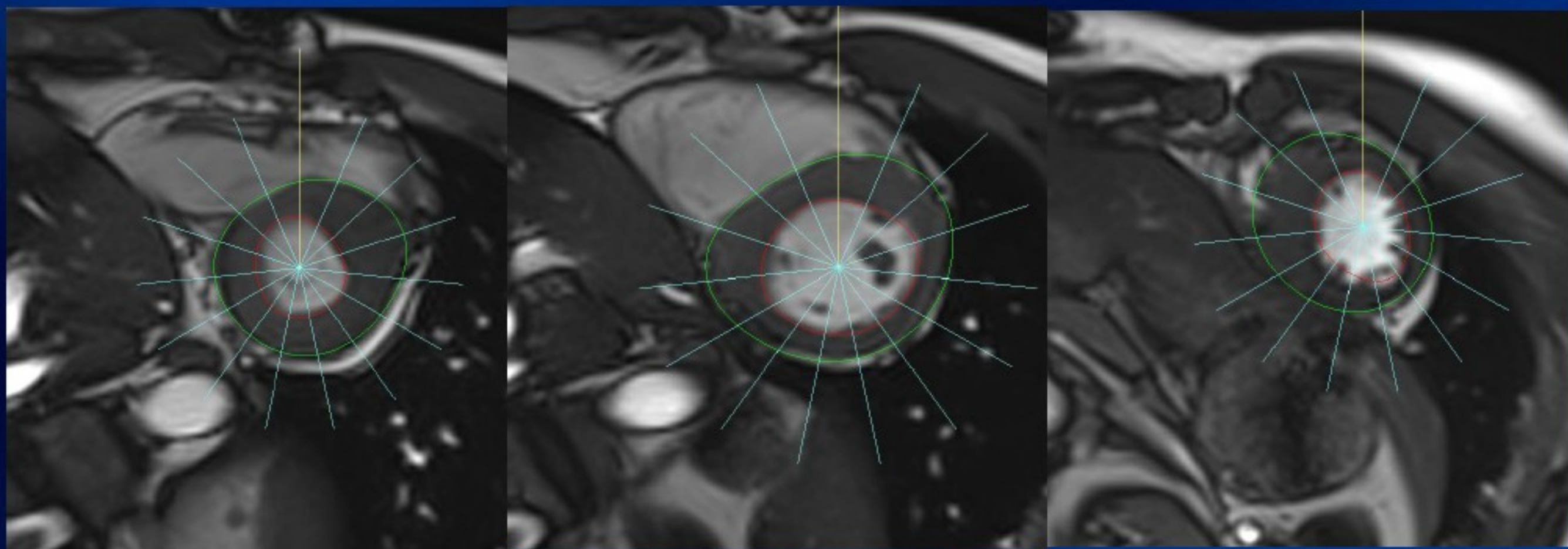
将所有短轴位
电影序列及四腔
心电影序列装载
到Argus软件中
进行处理



- 磁共振心功能分析



- 磁共振心功能分析



- 磁共振心功能分析

ED: 舒张末期

ES: 收缩末期

EF: 射血分数

EDV: 舒张末期容积

ESV: 收缩末期容积

SV: 每搏输出量

CO: 心博出量



• 磁共振心功能分析

Patient Name: LIU CHENG FU
 Patient ID: 18... Examination Date: 3/2/2016
 Patient Height: 170.00 cm. Patient Weight: 80.00 kg. Heart Rate: 81 Beats/min

ED to ES thickening for: Slice 1 Table
 SlicePosition SP P5.7 to SP P5.7 mm 1 of 9

Thickness (mm)				
Sector	ED	ES	Thickening (mm)	Thickening (%)
1	9.64	7.63	-2.01	-20.81
2	13.56	9.61	-3.95	-29.11
3	16.12	13.94	-2.18	-13.53
4	14.44	17.97	3.53	24.44
5	7.97	18.05	10.09	126.58
6	3.87	15.00	11.13	287.38
7	4.82	12.22	7.40	153.60
8	6.48	10.40	3.92	60.53
9	6.25	8.97	2.72	43.48
10	7.74	8.82	1.08	14.02
11	11.67	10.34	-1.33	-11.39
12	8.50	12.07	3.56	41.90
13	6.73	12.40	5.67	84.15
14	6.83	10.90	4.07	59.64
15	6.75	8.28	1.53	22.66

Check ED&ES. Computer estimated ED&ES settings may not be accurate.
 Check contours. Computer generated contours may not correspond to anatomy.

Drawing Result

Volume...

Thickening...

Smooth Contours

Sectors

Angle

View

Slow Fast

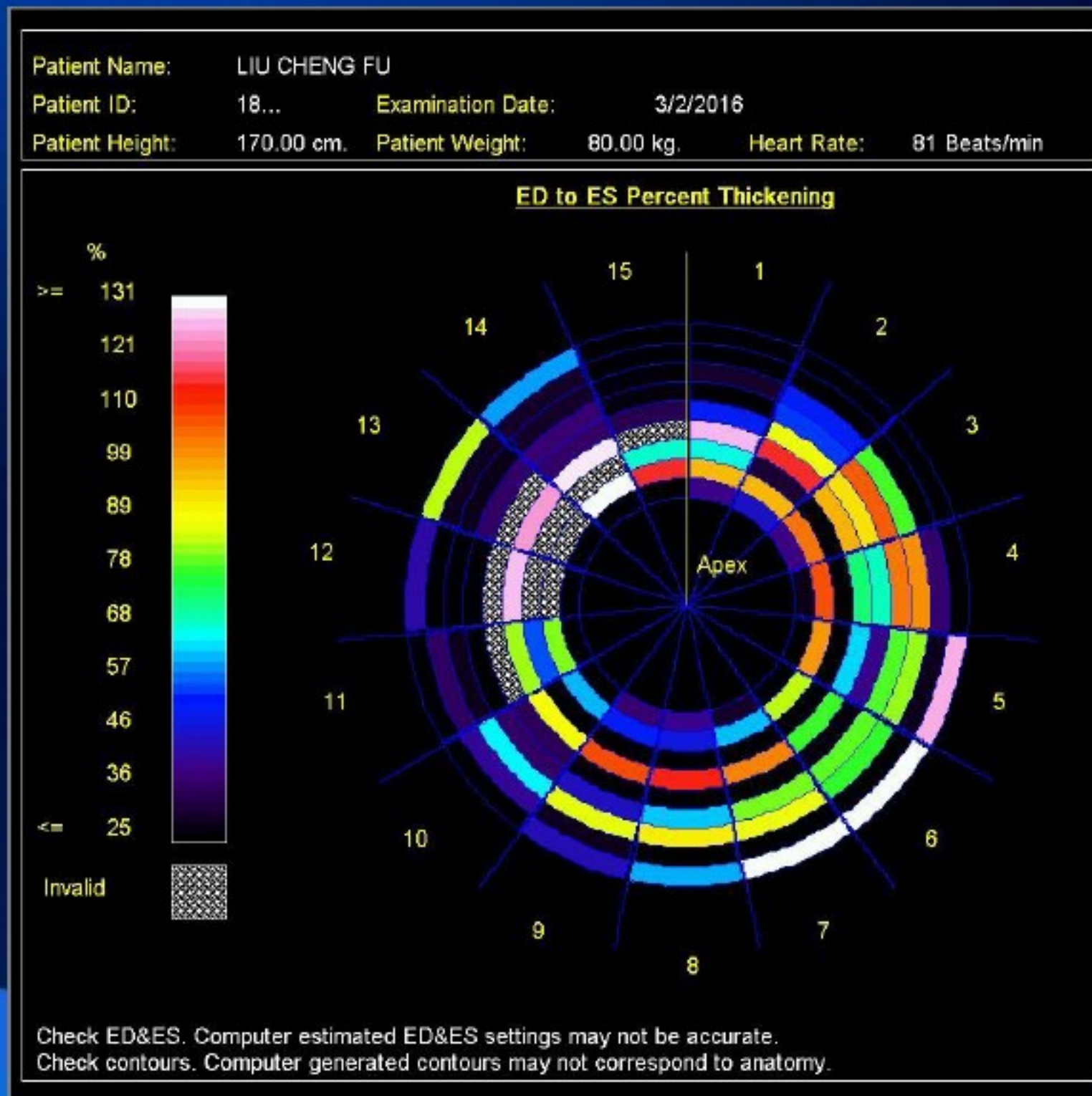


Layout





• 磁共振心功能分析



Drawing | **Result**

Volume...

Thickening...

Smooth Contours

Sectors

Angle

View

Slow Fast

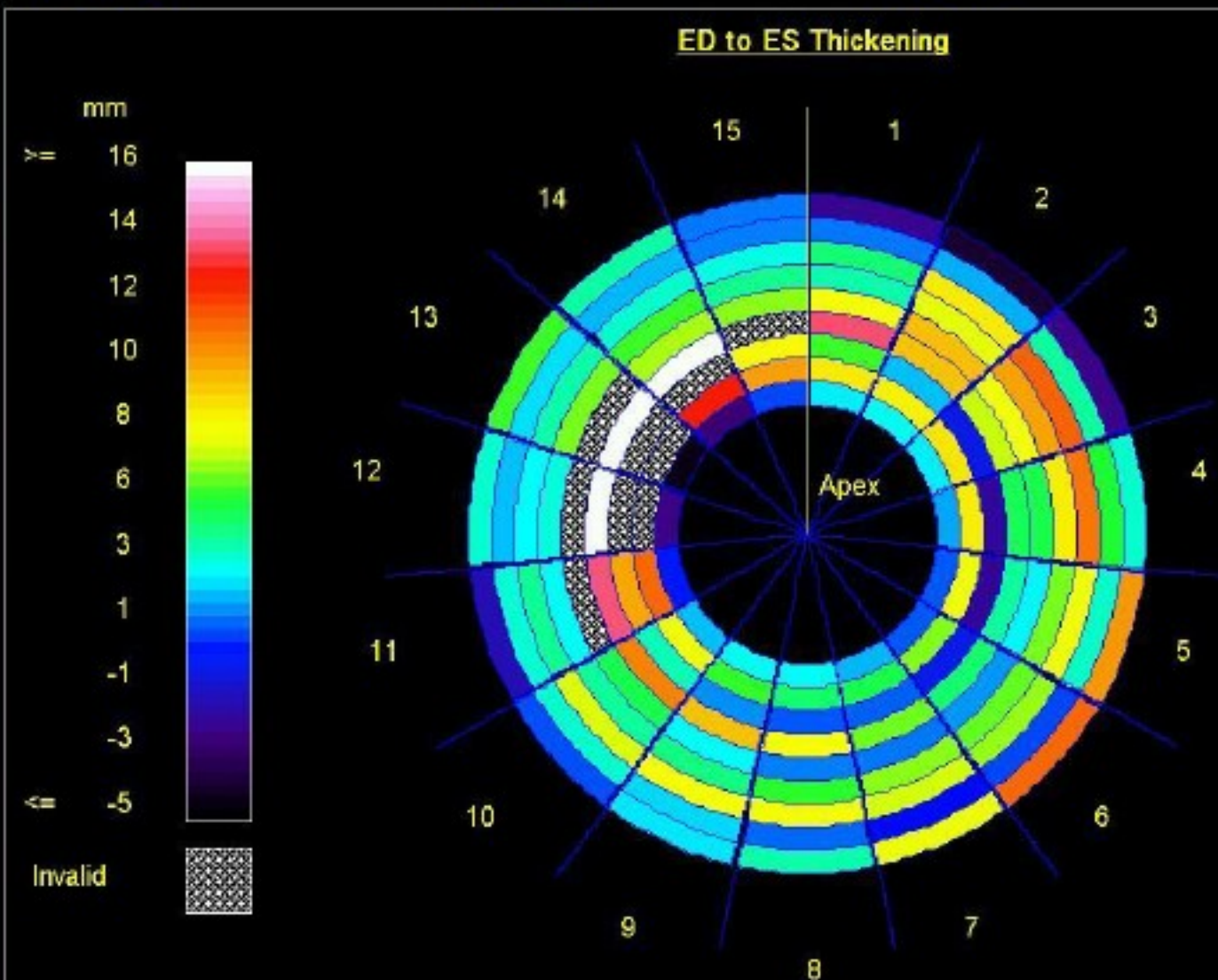
Layout





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Patient Name: LIU CHENG FU
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Smooth Contours



Sectors



Angle



View

Slow Fast

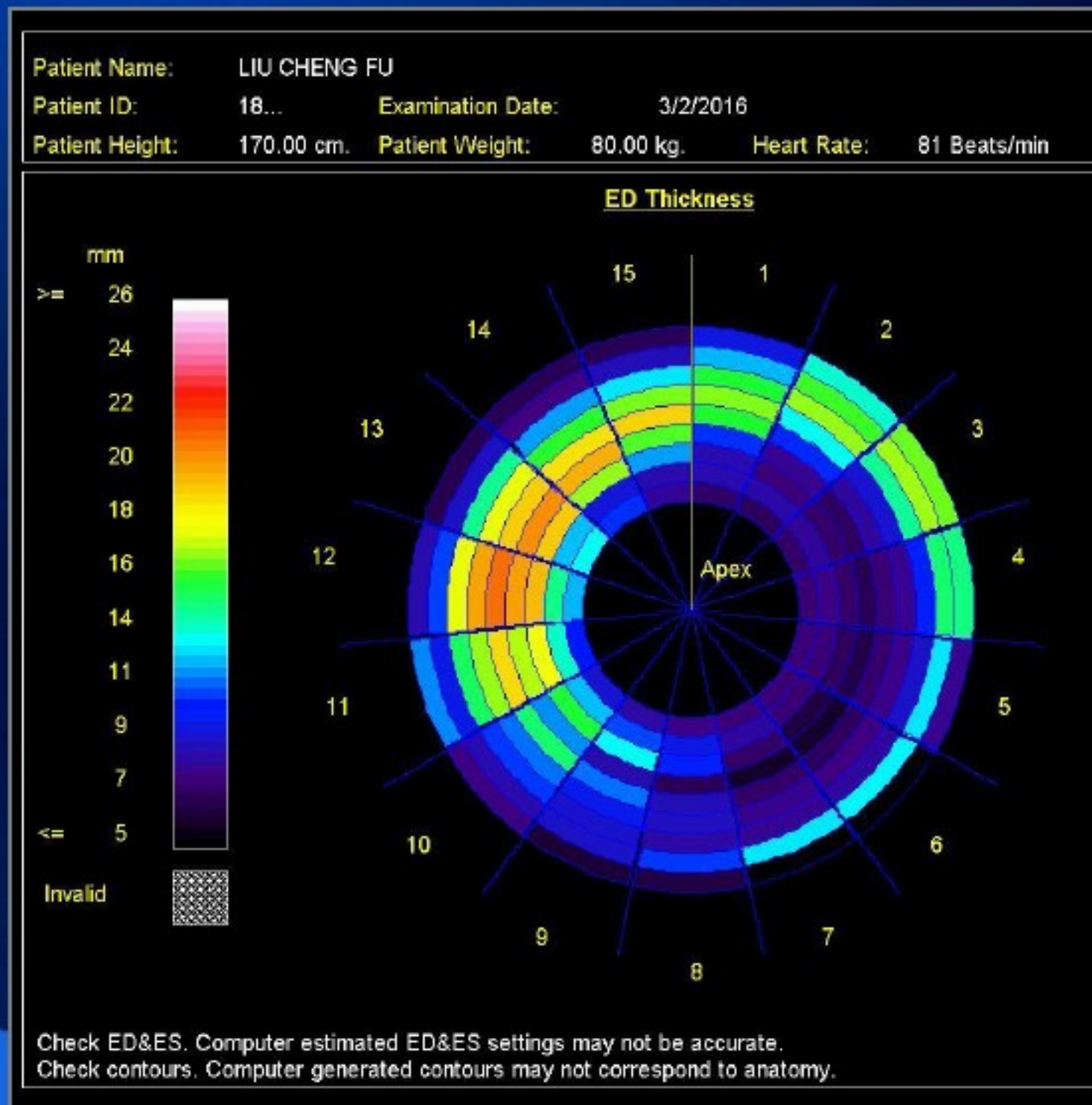


Layout





• 磁共振心功能分析



Drawing | **Result**

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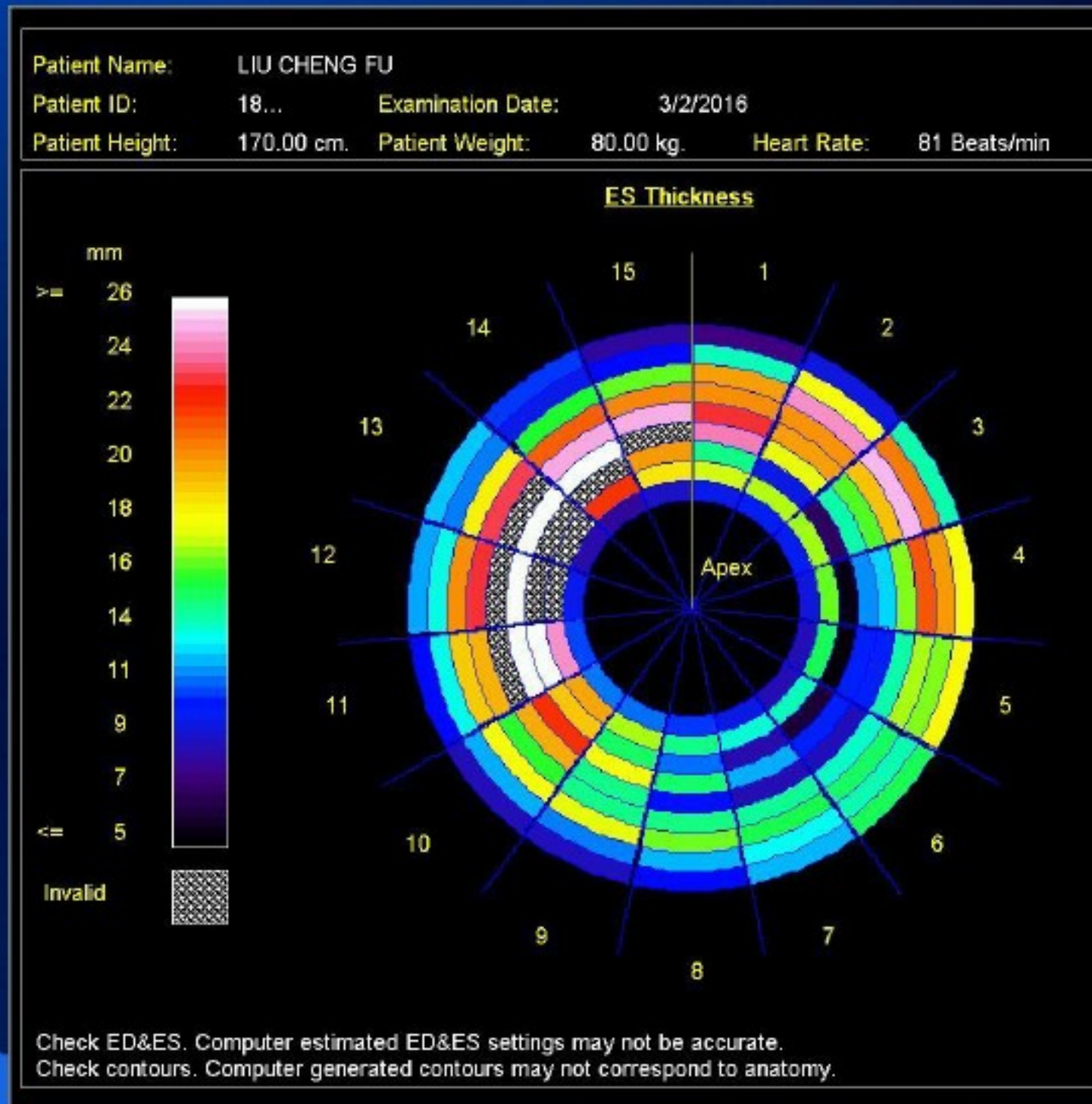
Slow Fast

Layout





• 磁共振心功能分析



Drawing | **Result**

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Patient Name: LIU CHENG FU
 Patient ID: 18... Examination Date: 3/2/2016
 Patient Height: 170.00 cm. Patient Weight: 80.00 kg. Heart Rate: 81 Beats/min

Left Ventricle - Absolute

Cardiac Function			Normal Range (M) (MRI)	Units
Ejection Fraction	EF	63.3	56.00 ... 78.00	%
End Diastolic Volume	EDV	105.6	77.00 ... 195.00	ml
End Systolic Volume	ESV	38.7	19.00 ... 72.00	ml
Stroke Volume	SV	66.9	51.00 ... 133.00	ml
Cardiac Output	CO	5.42	2.82 ... 8.82	l/min
Myocardial Mass (at ED)		160.5	118.00 ... 238.00	g
Myocardial Mass (Avg)		168.9 ± 13.3	118.00 ... 238.00	g

Filling and Ejection Data

Peak Ejection Rate	446.5	n.a.	ml/sec
Peak Ejection Time	98.2	n.a.	msec
Peak Filling Rate	363.2	n.a.	ml/sec
Peak Filling Time from ES	186.5	n.a.	msec

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LIU CHENG FU



Drawing

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Sectors



Angle



View

Slow ————— Fast



Layout



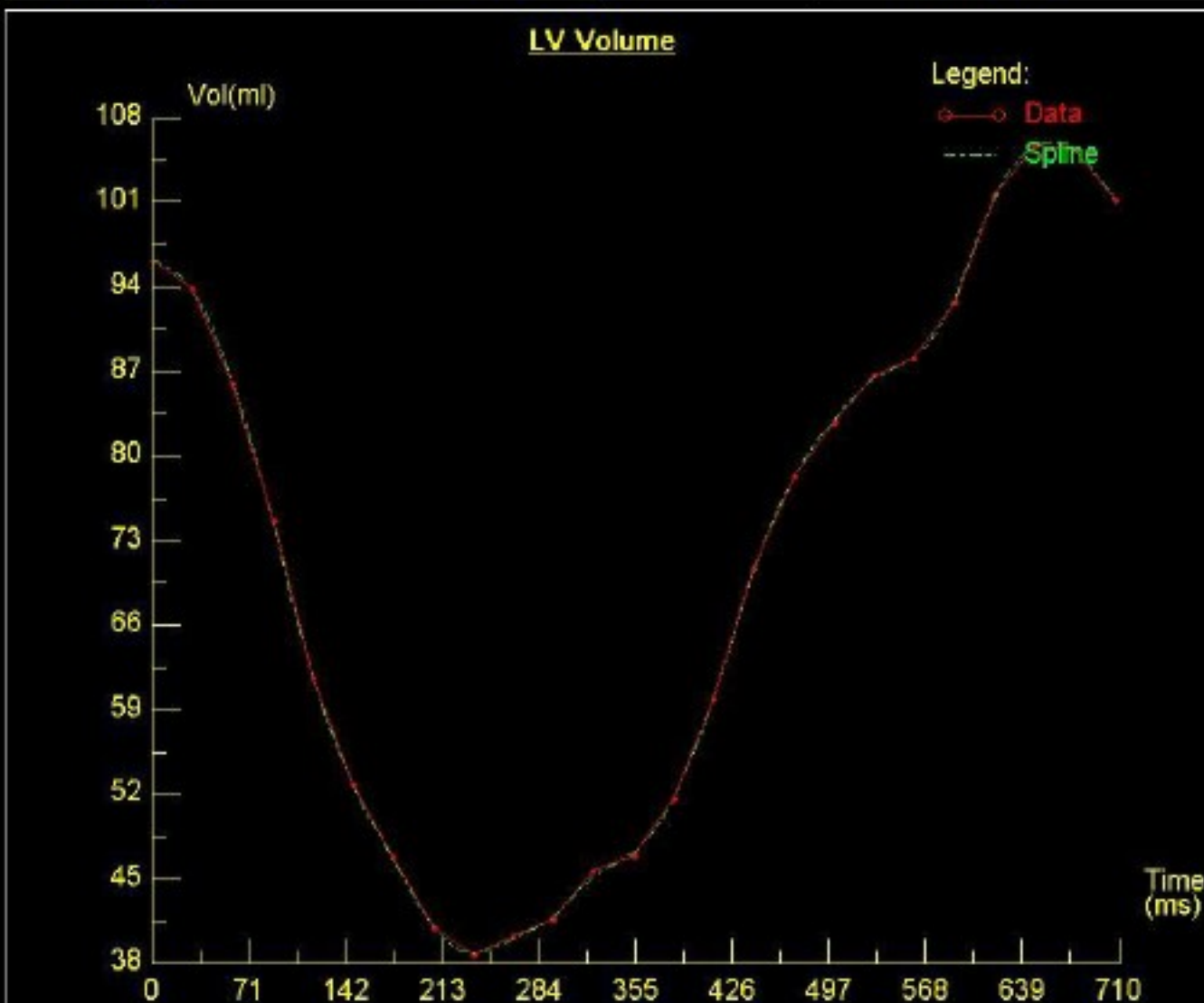
The First Affiliated Hospital of Soochow University





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Angle

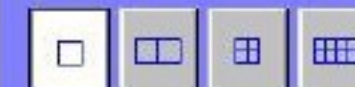


View

Slow Fast



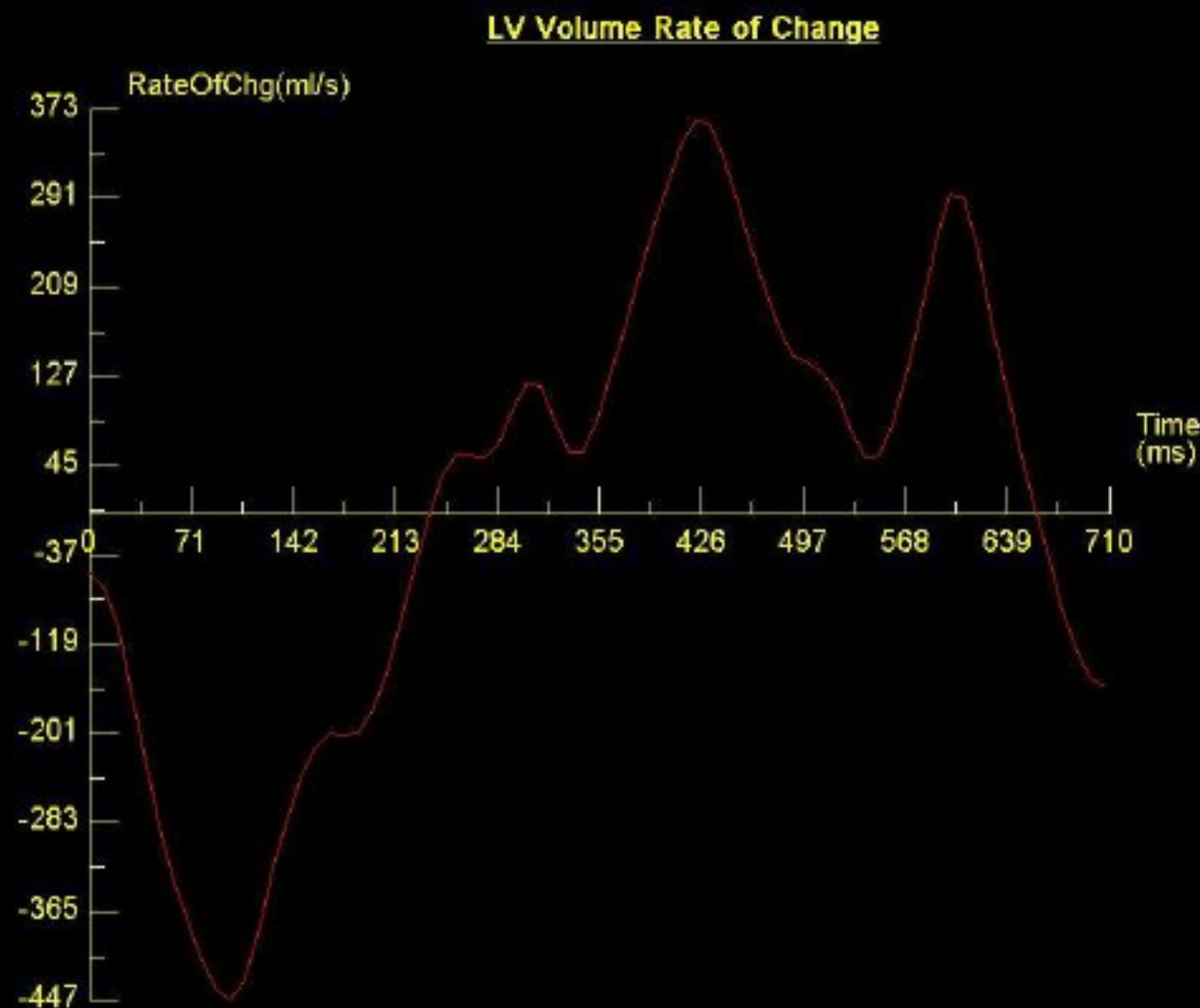
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Layout



- 心脏磁共振检查成功的关键

- 1.呼吸屏气训练

- 2.心电门控的链接

- 3.操作流程的回顾

苏大附属第一医院

謝

謝

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