Online Appendix for the following *JACC* article

TITLE: The Electrophysiological Cardiac Ventricular Substrate in Patients After Myocardial Infarction: Noninvasive Characterization with Electrocardiographic Imaging

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APPENDIX

Table 1. Patient Characteristics (from main text)

Patient	Age	Gender	Race	Infarct	LVEF	AAD	ACE/ARB	BB	Digoxin	VT
Ischemic Cardiomyopathy
1	80	Male	White	Inferior	33		Yes	Yes		
2	66	Male	White	Inferolateral	17	Amiodarone	Yes	Yes		Yes
3	48	Male	White	Apical	17	Amiodarone	Yes	Yes	Yes	Yes
4	62	Male	White	Inferobasal	30	Amiodarone Mexiletine	Yes	Yes		Yes
5	71	Male	White	Anteroapical	27	Amiodarone Mexiletine	Yes	Yes	Yes	Yes
6	27	Female	Black	Apical	10	Amiodarone	Yes	Yes		Yes
7	50	Male	White	Inferobasal	23	Sotalol	Yes	Yes	Yes	Yes
8	68	Male	White	Anteroapical	20	Amiodarone	Yes	Yes		Yes
9	52	Male	Other	Inferoapical	32		Yes	Yes		
10	85	Male	White	Inferior	40		Yes	Yes	Yes	
11	76	Male	White	Inferolateral	35		Yes	Yes		
12	77	Male	White	Inferolateral	40		Yes	Yes		
13	66	Male	White	Inferoseptal	32	Amiodarone	Yes	Yes		Yes
14	74	Male	White	Inferoseptal	24	Amiodarone	Yes	Yes		Yes
15	58	Male	White	Apical	15	Amiodarone	Yes	Yes		
16	52	Male	White	Anterior	30	Sotalol	Yes	Yes		Yes
17	59	Male	White	Inferior	33	Amiodarone	Yes	Yes		Yes
18	60	Male	White	Apical	55		Yes	Yes		Yes
19	50	Male	White	Anteroapical	35		Yes	Yes		
20	55	Male	White	Anteroapical	34		Yes	Yes		
21	50	Female	White	Anteroapical	35		Yes	Yes		
22	64	Male	Black	Septal	45		Yes	Yes		
23	62	Male	White	Apical	15		Yes	Yes	Yes	
24	76	Male	White	Septal	35		Yes	Yes		

Table 1. Patient Characteristics AAD: antiarrhythmic drug; ACE: angiotensin converting enzyme-inhibitor; ARB: angiotensin receptor-blocker; BB: beta-blocker; LVEF: left ventricular ejection fraction; VT: ventricular tachycardia
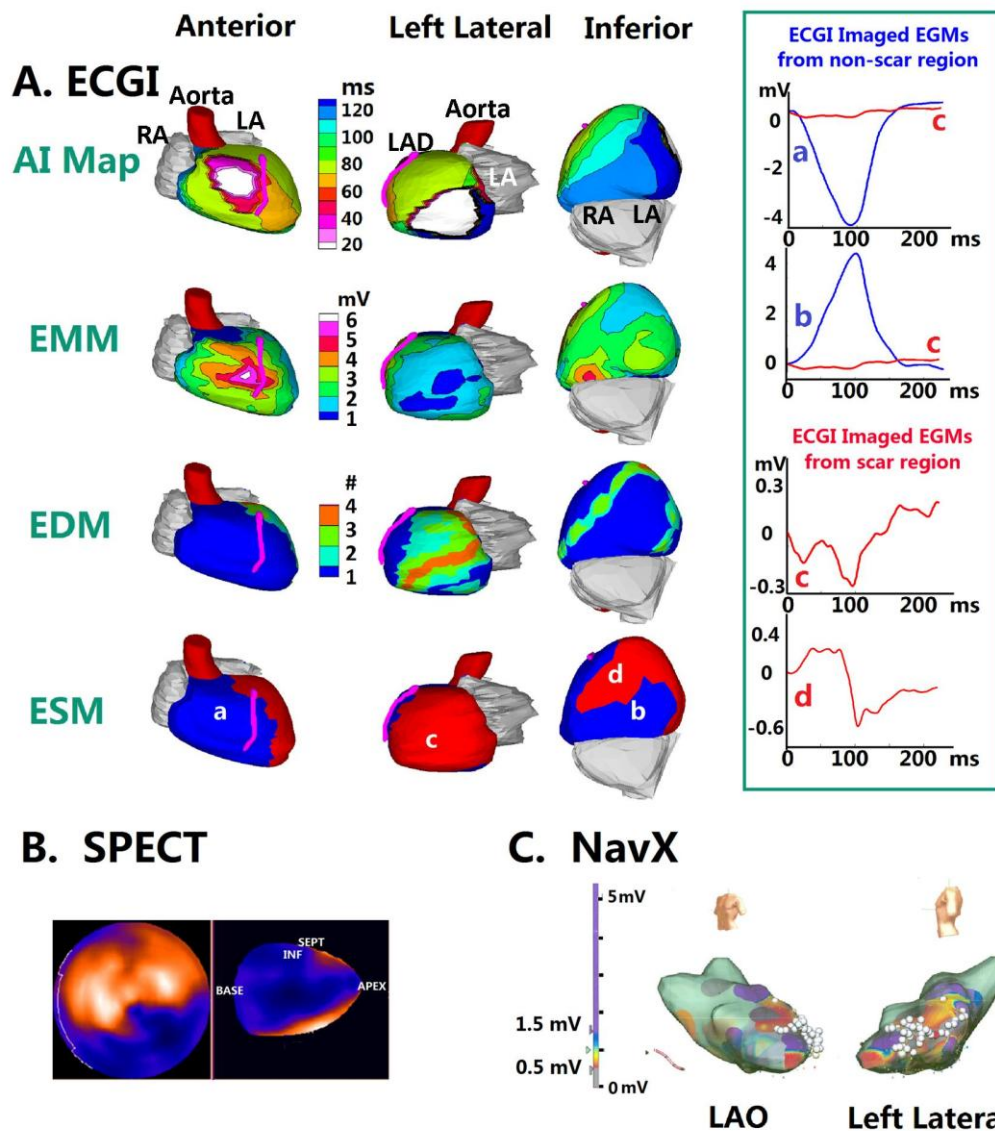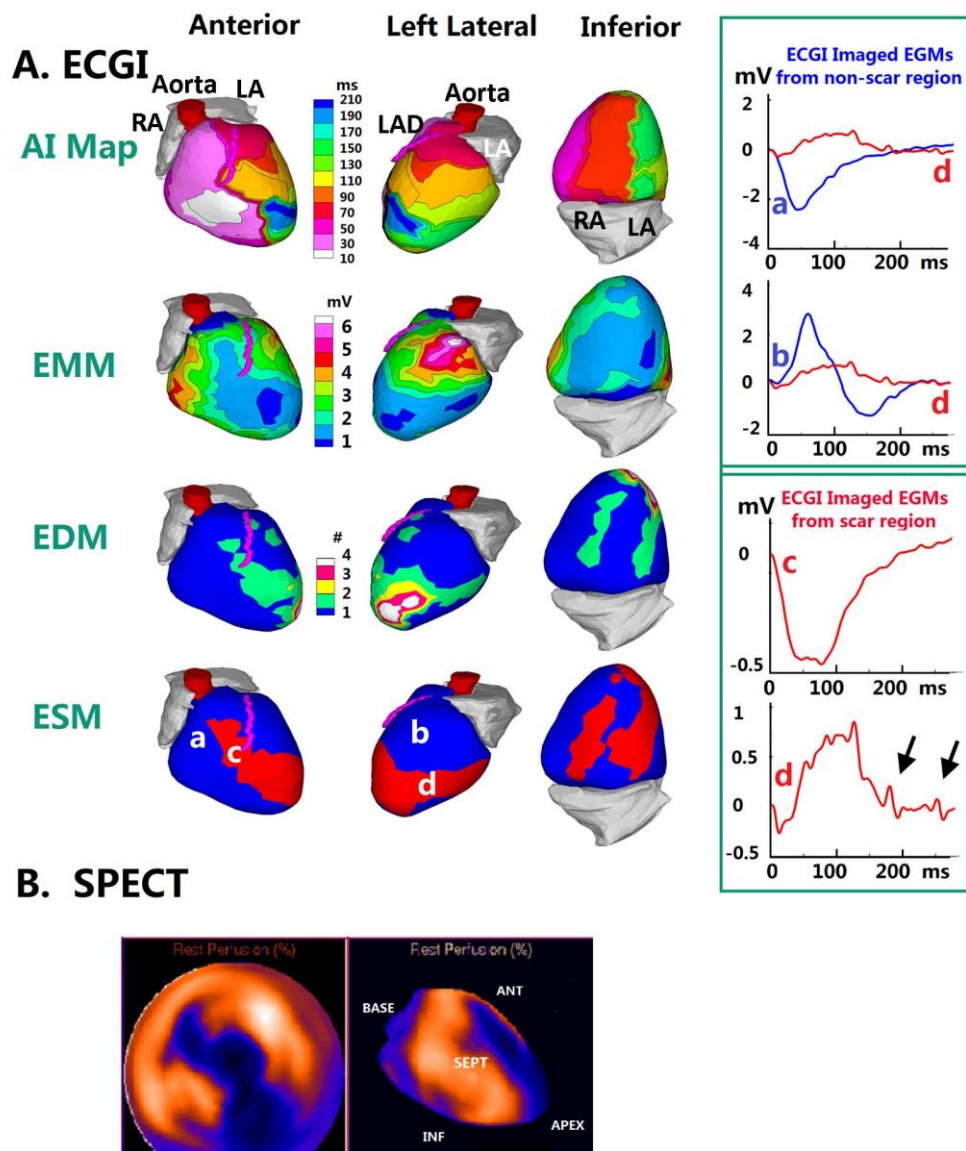
Patient 1.
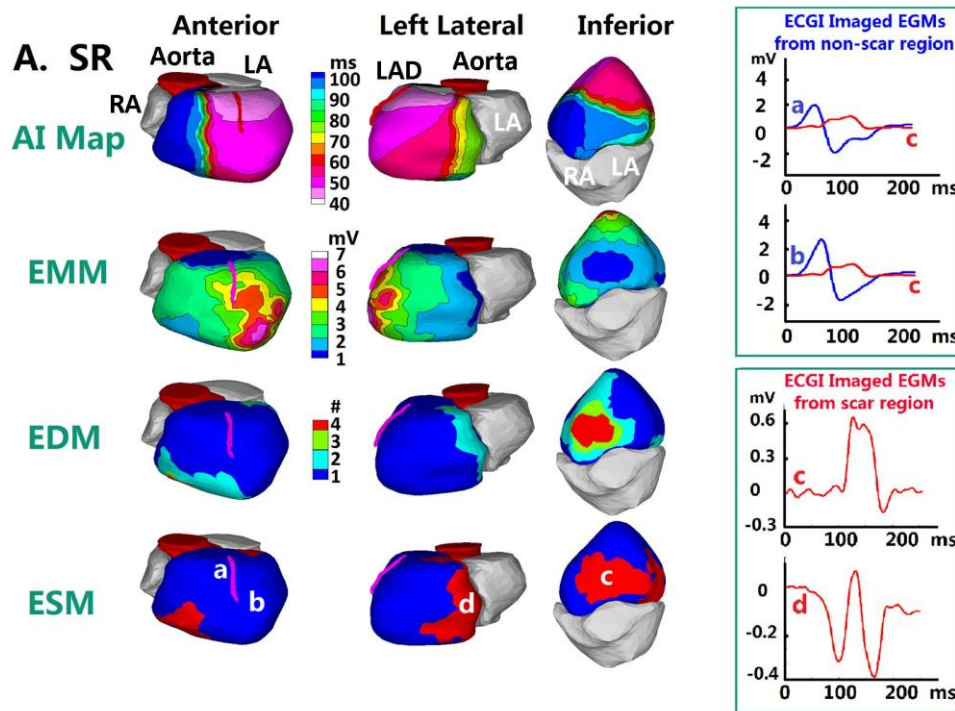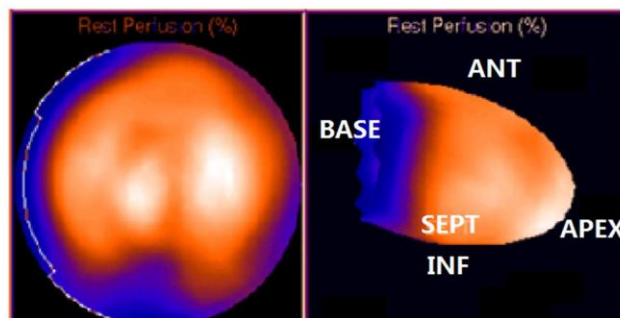
Patient 1. Inferior Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the right ventricle (dark blue in AI map) in a typical right-bundle-branch block pattern. ESM demonstrates an electrical scar in inferior regions (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an inferior area of myocardial infarction.
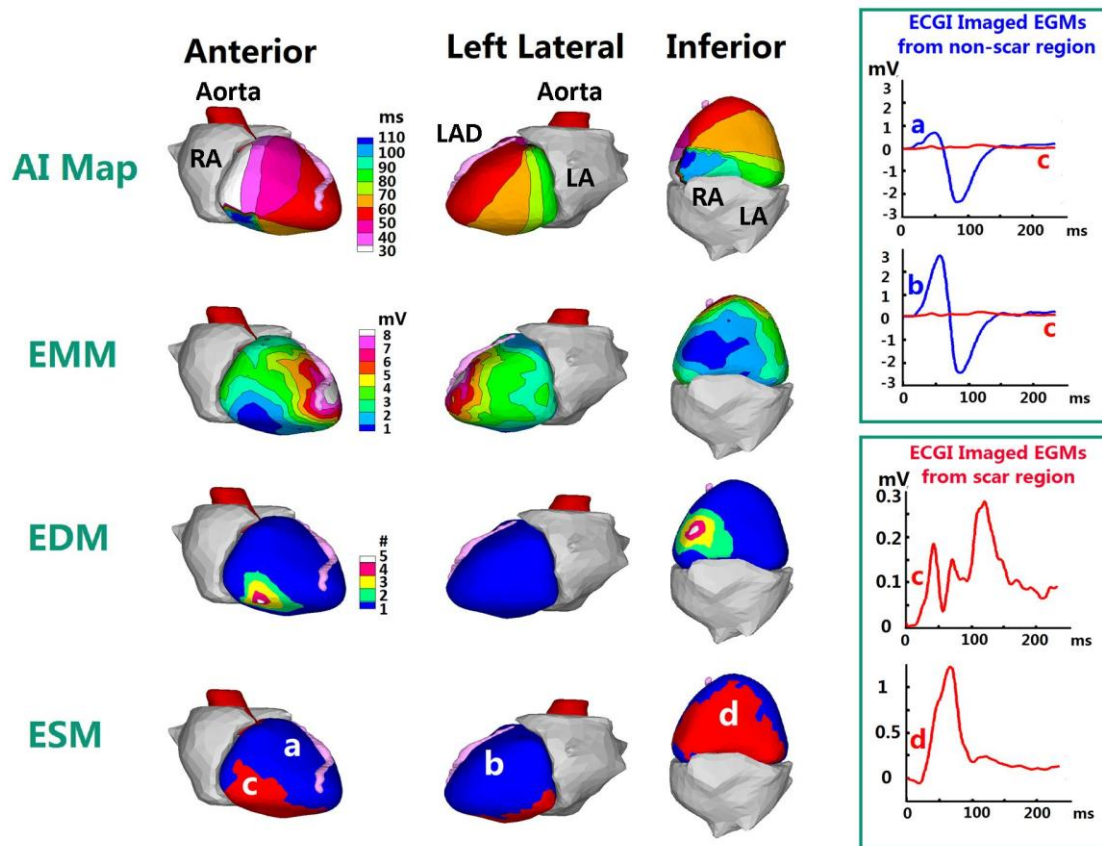
Patient 2.

Patient 2. Large Inferolateral Myocardial Infarction. Panel A: ECGI activation map with biventricular pacing (AI map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. Two areas of early activation are in the RV and LV lateral wall, consistent with biventricular pacing (white in AI map). ESM demonstrates an electrical scar throughout the lateral wall, extending both anteriorly and inferiorly. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and inferior long-axis view (right), demonstrating a large area of infarction in the inferolateral LV. **Panel C:** Endocardial mapping of the LV using the EnSite-NavX system (St. Jude Medical). Large area of complex endocardial scar is found along the inferior and lateral LV.
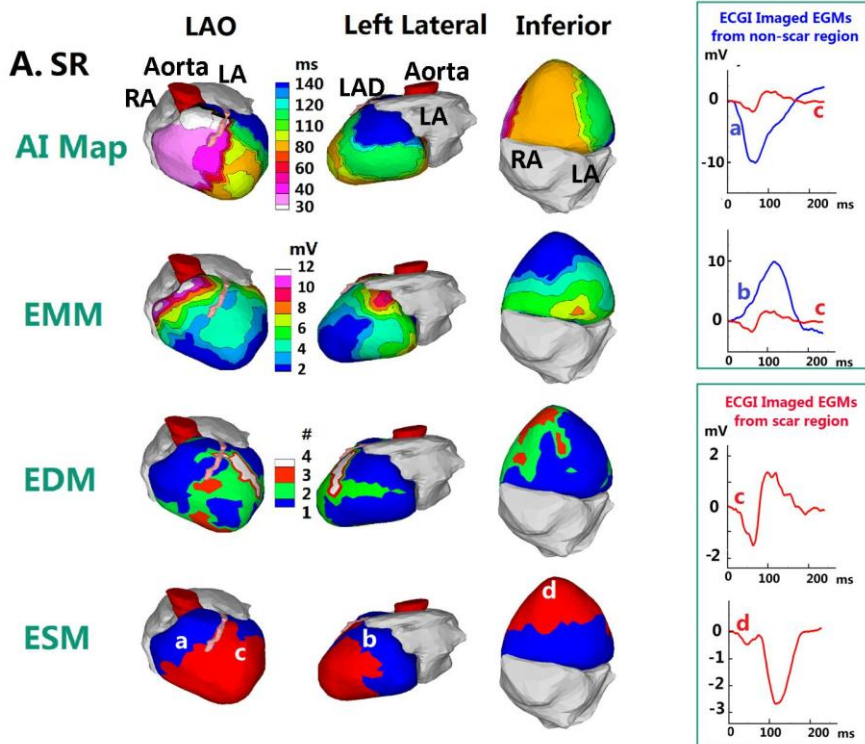
Patient 3.

Patient 3. Apical Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the anterior apex (dark blue in AI map), which is abnormal. ESM demonstrates an electrical scar in the apex, extending anteriorly and inferiorly (in red). Note that this location correlates with the region of latest activation. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. Black arrows demonstrate late potentials. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating a large area of infarction in the anterior, apical and inferior LV.
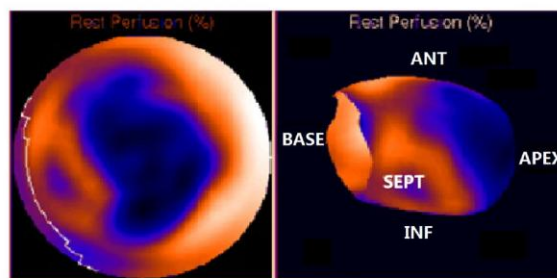
Patient 4.

Patient 4. Inferior Myocardial Infarction Extending to the Right Ventricle. ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the inferior basal right ventricle (dark blue in AI map), which is abnormal. ESM demonstrates an inferior electrical scar extending to RV (in red). Note that this location correlates with the region of latest activation. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. Endocardial bipolar catheter mapping (not shown) demonstrated myocardial scar near the inferior tricuspid and mitral annuli.
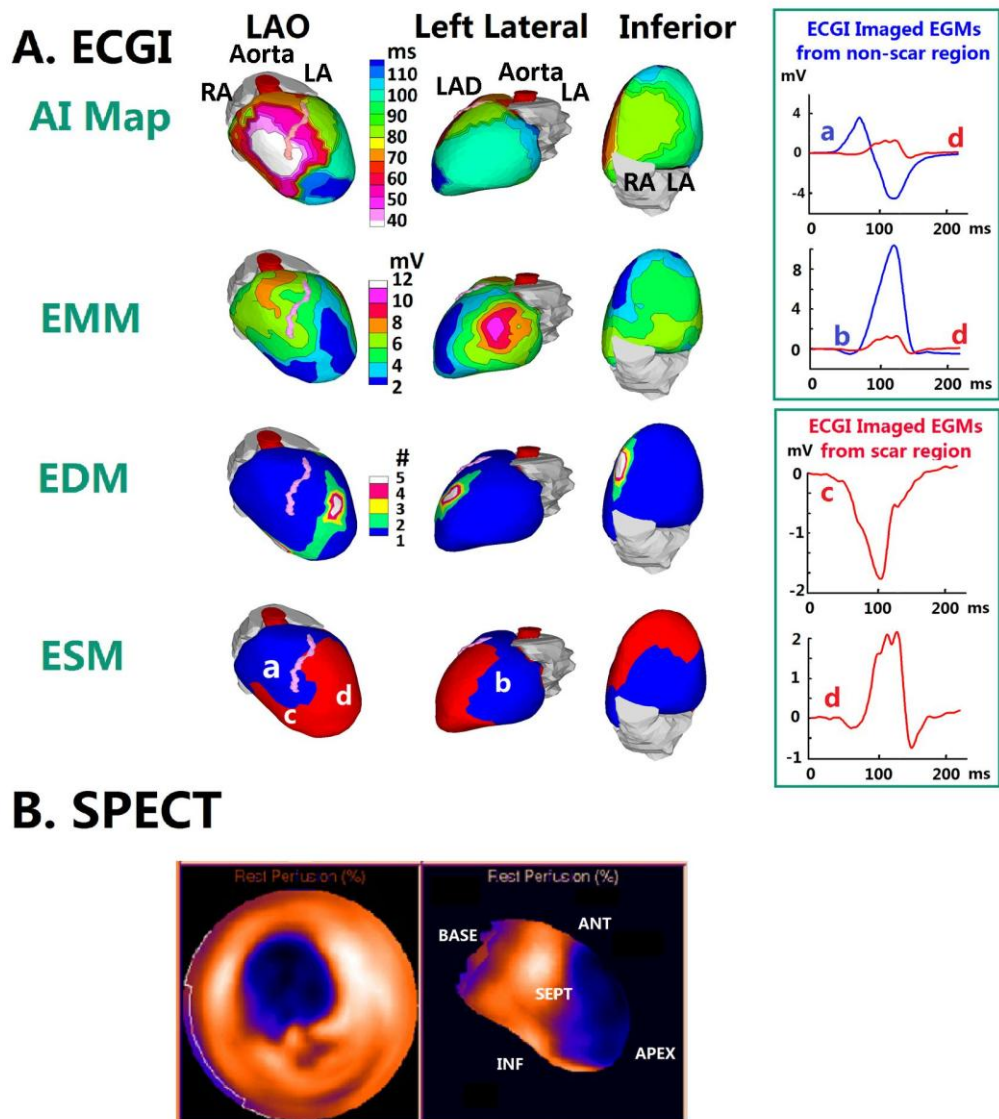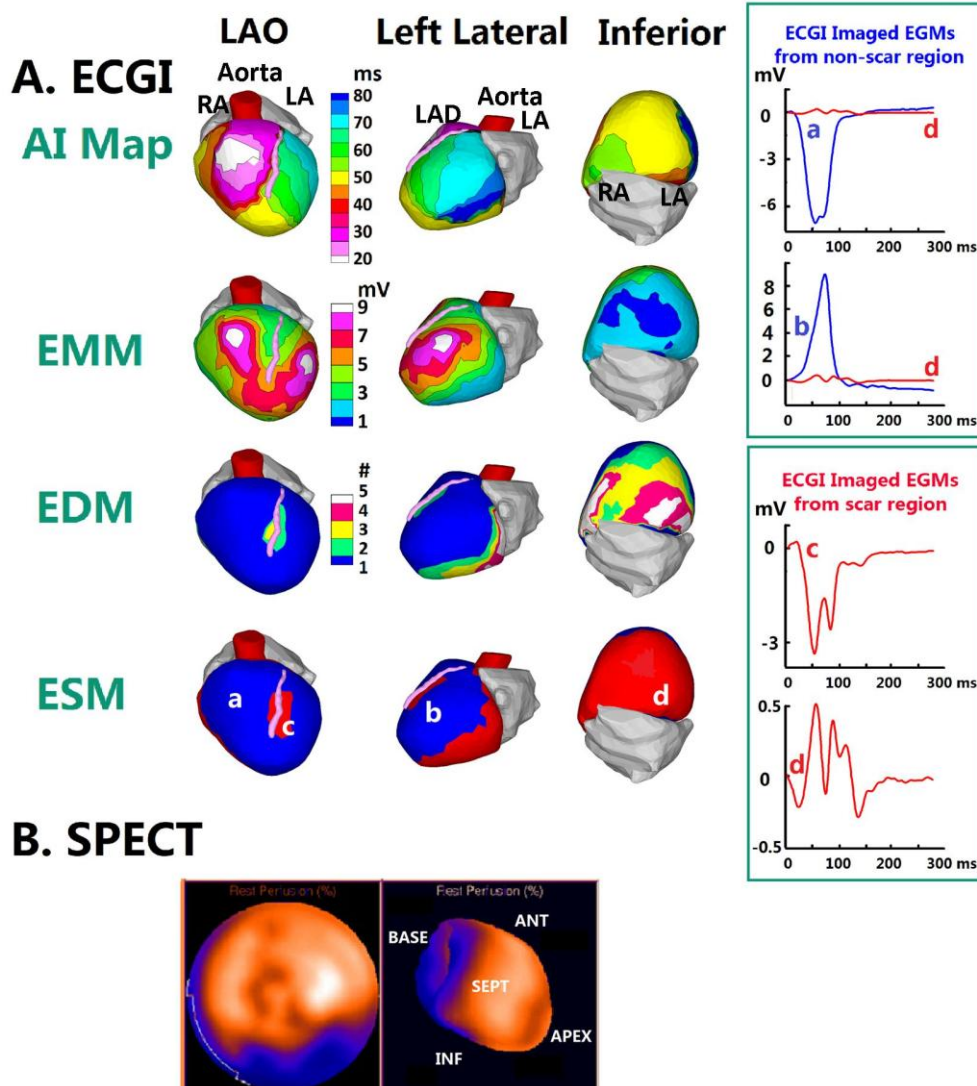
Patient 5.

Patient 5. Apical Myocardial Infarction/Aneurysm. Panel A. ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. Apical activation is delayed greatly. The latest activation is in the basal-lateral LV (dark blue in AI map). ESM demonstrates an electrical scar in the apex, extending anteriorly and inferiorly (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B.** Resting SPECT imaging shows a similar large apical distribution of scar.
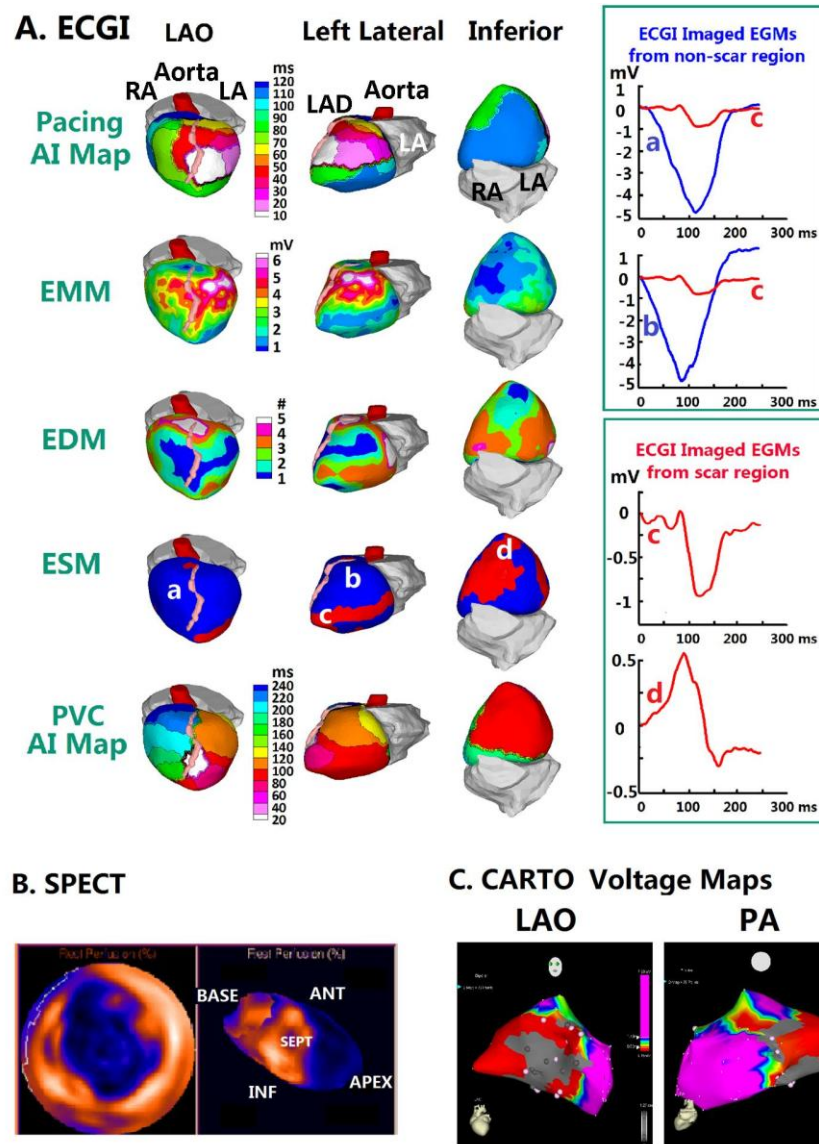
Patient 6.

Patient 6. Anterior Apical Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the anterior apex (dark blue in AI map), which is abnormal. ESM demonstrates an electrical scar in the anterior apex (in red). Note that this location correlates with the region of latest activation. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating a large area of infarction in the anterior apex.
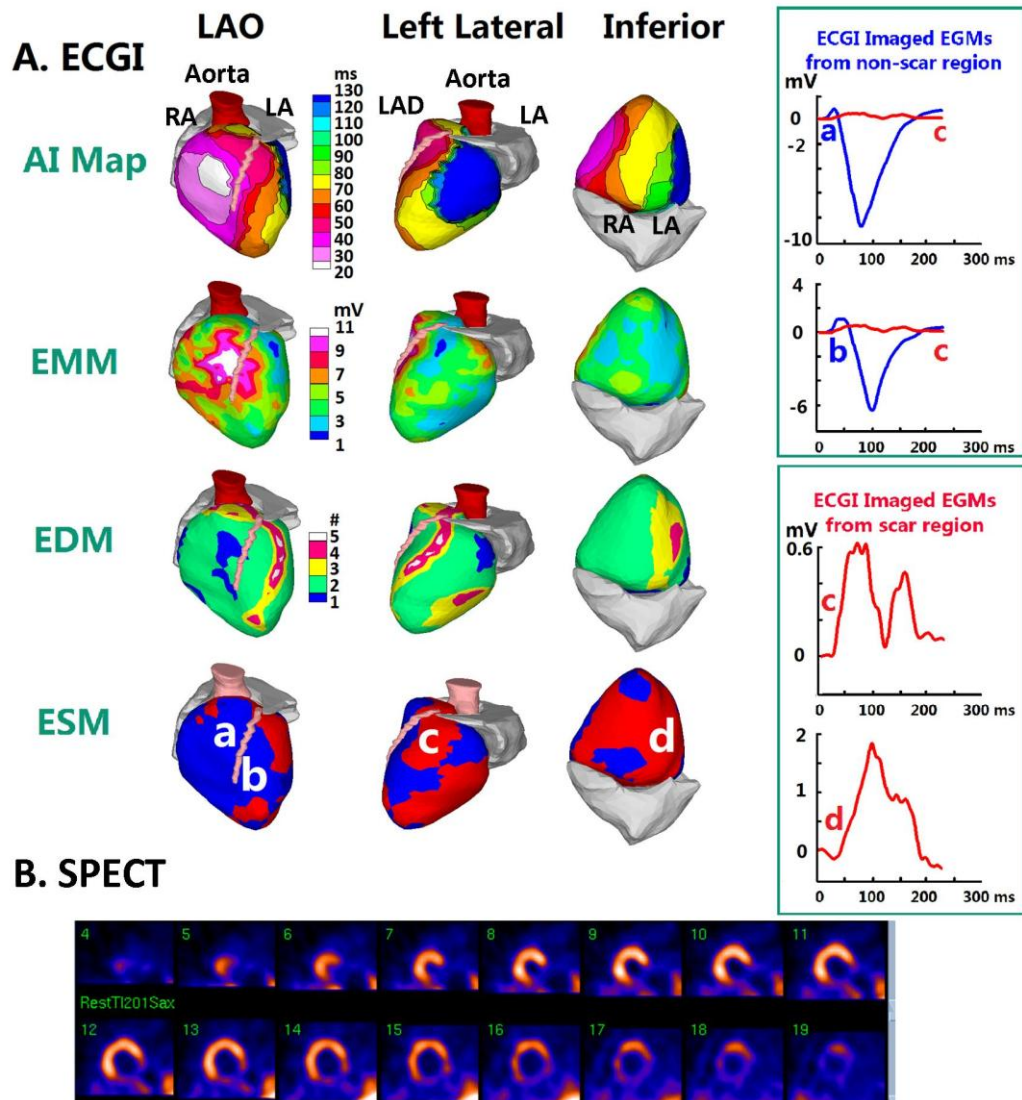
Patient 7.

Patient 7. Inferior Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the posterolateral LV (dark blue in AI map). ESM demonstrates an electrical scar throughout the inferior wall and posterolateral LV (in red). Note that this location correlates with the region of latest activation. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an area of infarction in the inferior and posterolateral wall.
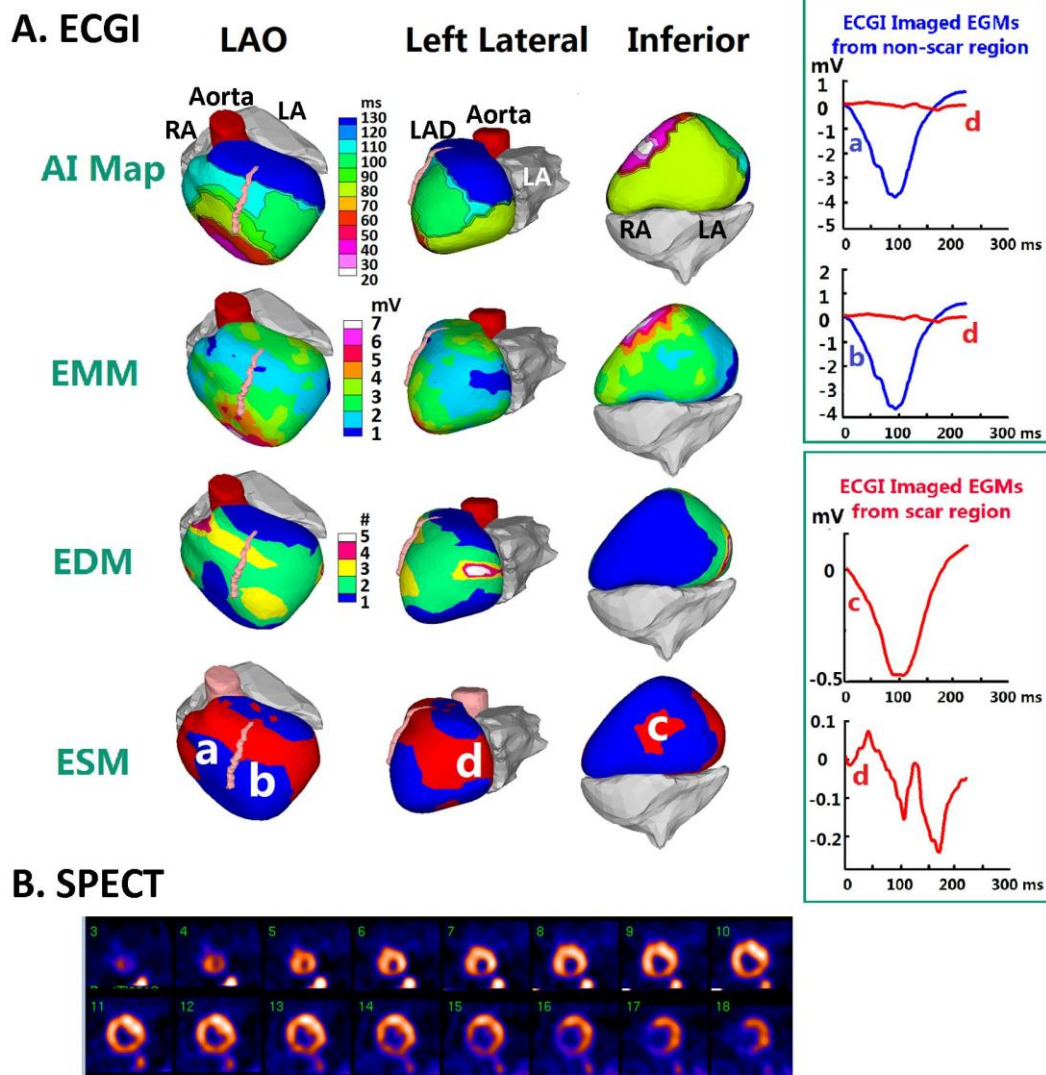
Patient 8.

Patient 8. Anterior Apical Myocardial Infarction. Panel A: ECGI activation map during pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the inferior LV (blue in AI map), inferior to a line of block from the LV pacing stimulus. ESM demonstrates an apical electrical scar (in red).

A premature ventricular beat was recorded (PVC AI Map), originating from the electrical scar border. Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating a large area of infarction in the anterior apex. **Panel C:** Endocardial bipolar voltage maps in two views (left anterior oblique and posterior-anterior) of the left ventricle, showing a large apical and anterior scar (red and gray color).
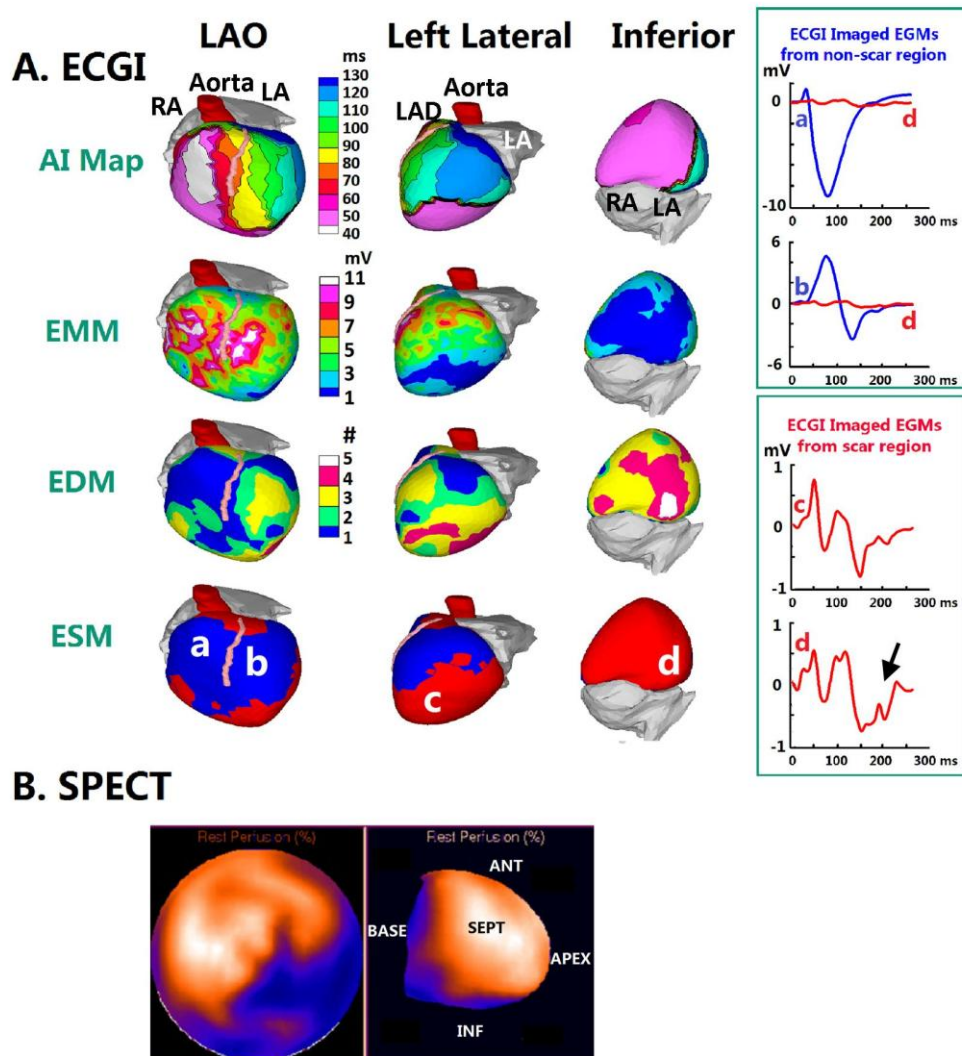
Patient 9.

Patient 9. Inferolateral Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation is in the lateral LV (dark blue in AI map). ESM demonstrates an electrical scar throughout the inferior wall extending laterally (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown with serial short axis views, which demonstrate an area of infarction in the inferior and lateral walls.
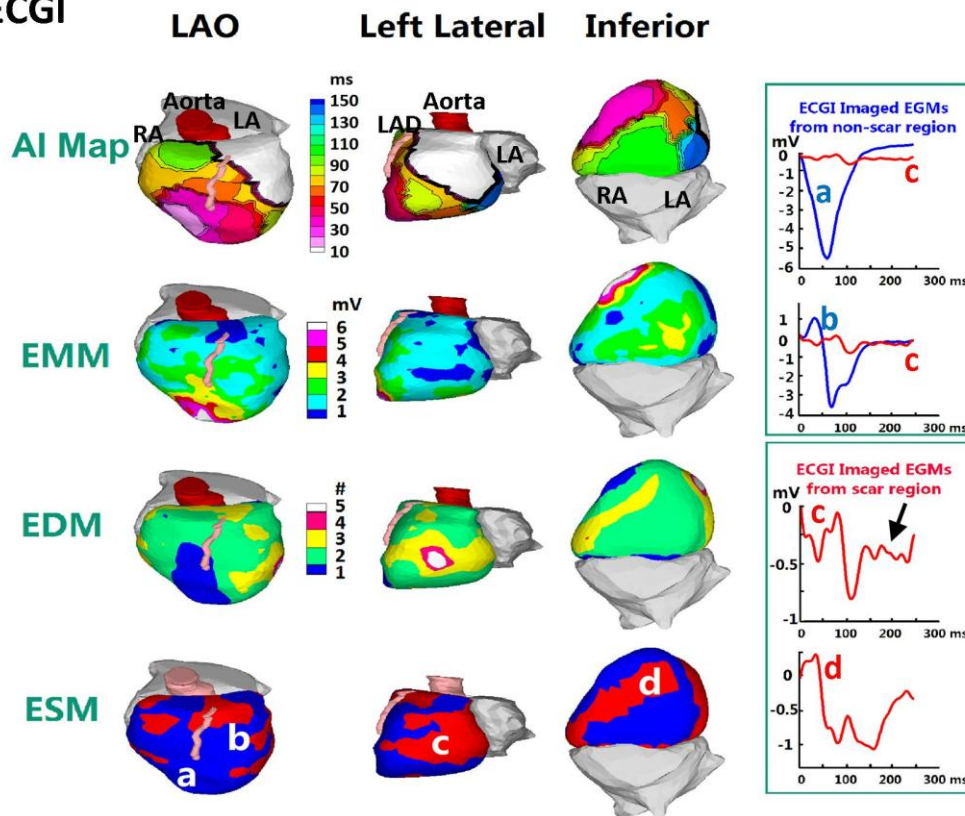
Patient 10.

A. ECGI

B. SPECT

Patient 10. Inferior Myocardial Infarction. Panel A: ECGI activation map during RV pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. Earliest activation is seen in the RV apex (white in AI Map), consistent with RV apical pacing. ESM demonstrates a small electrical scar inferiorly and a larger scar laterally (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown with serial short axis views, which demonstrate an area of infarction in the inferior wall.
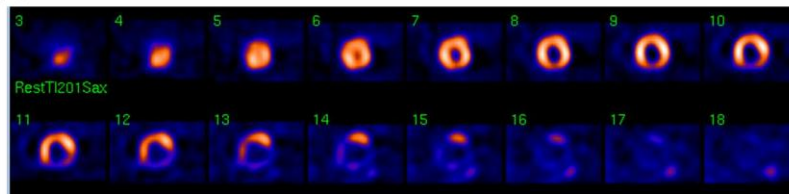
Patient 11.

Patient 11. Inferolateral Myocardial Infarction. Panel A: ECGI activation map during biventricular pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. ESM demonstrates an electrical scar throughout the inferior wall extending laterally (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. A late potential is identified with a black arrow. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an area of infarction in the inferior and lateral walls.
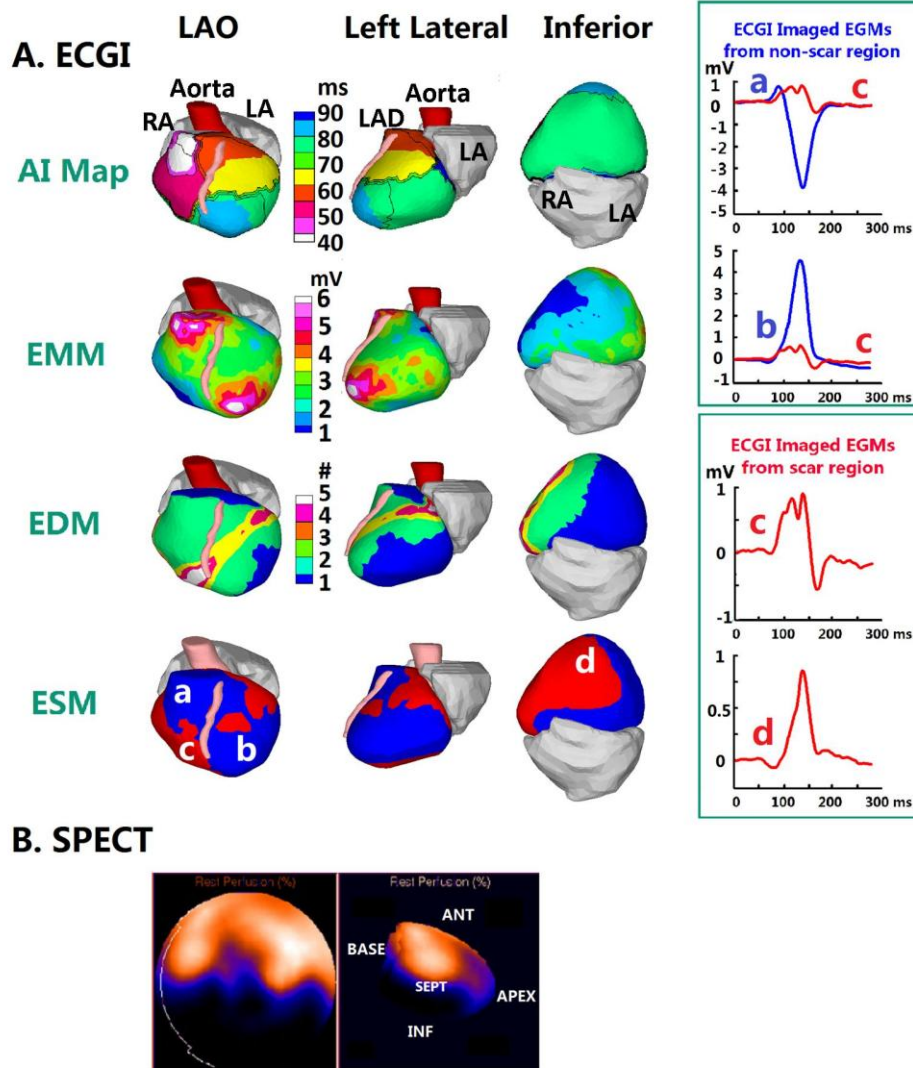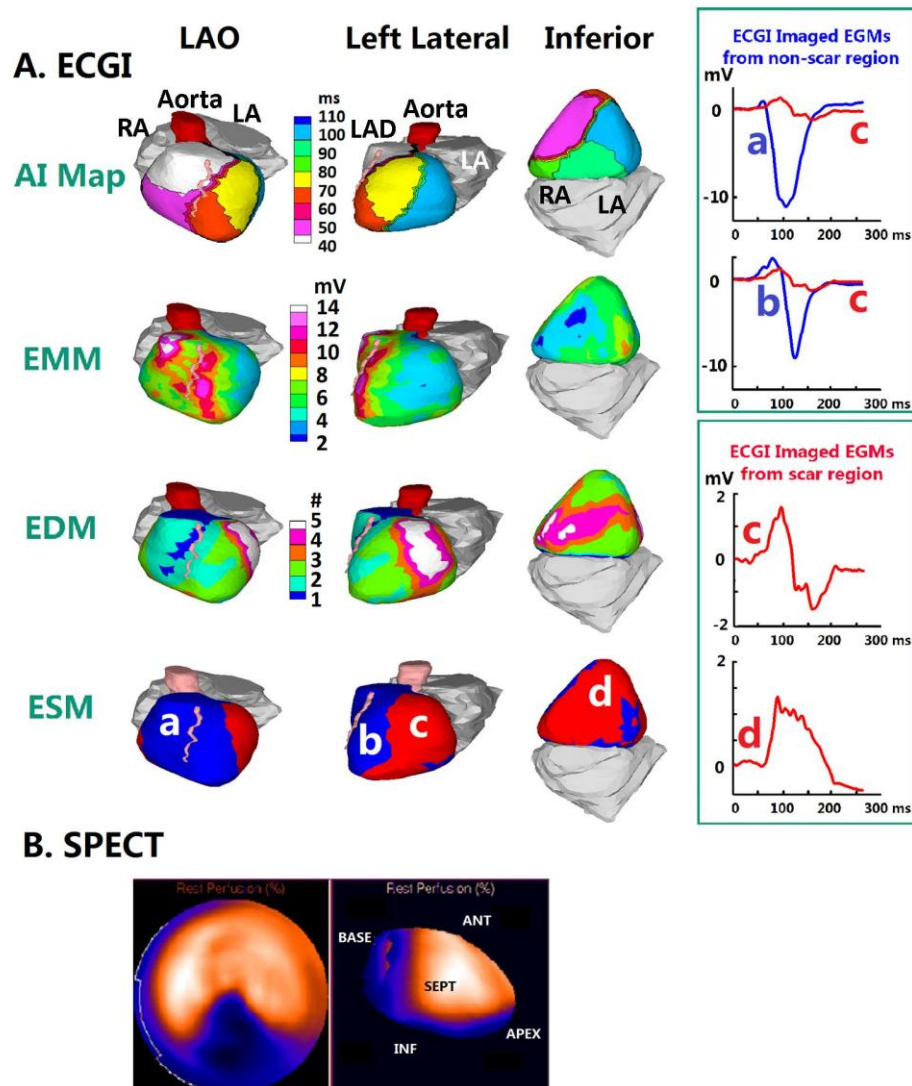
Patient 12.

Patient 12. Inferior and Lateral Myocardial Infarction. Panel A: ECGI activation map with biventricular pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. ESM demonstrates electrical scar inferiorly and a larger scar laterally (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown. A late potential is identified with a black arrow. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown with serial short axis views, which demonstrate an area of infarction in the mid and basal inferior and lateral walls.
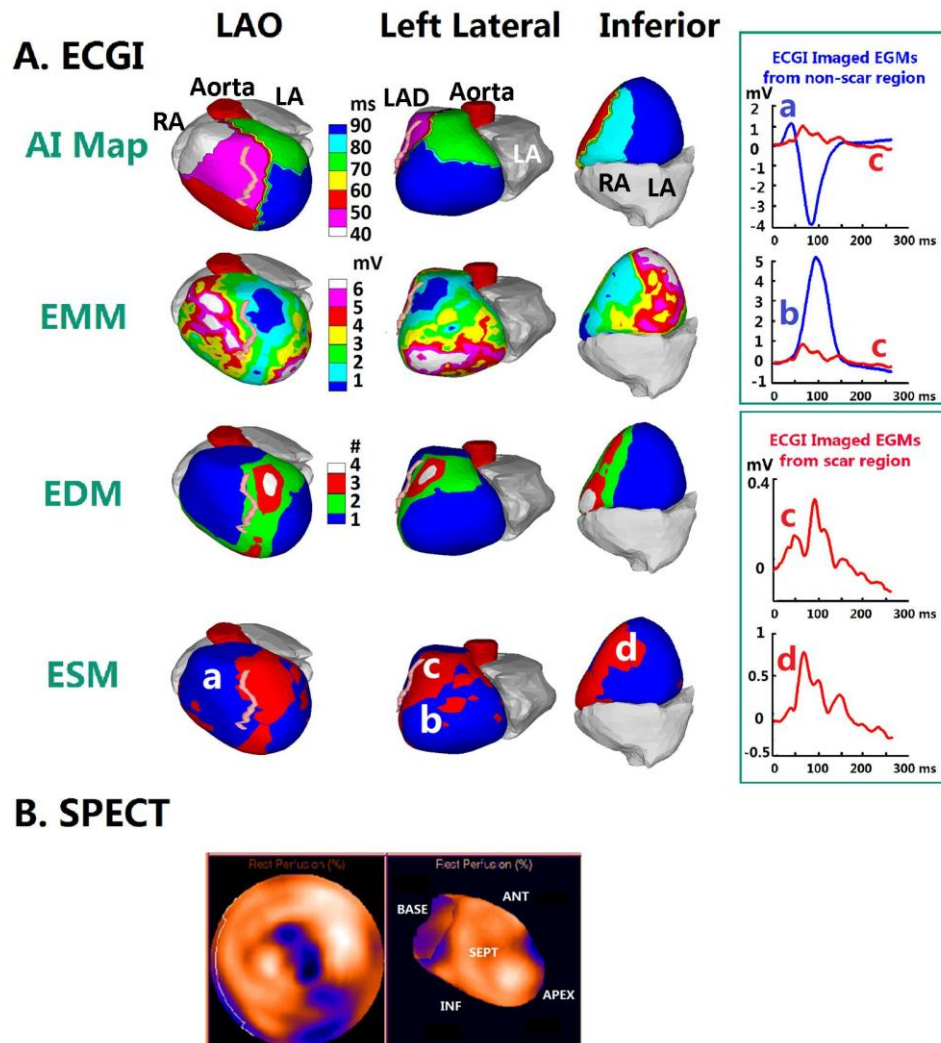
Patient 13.

Patient 13. Large Inferolateral Myocardial Infarction. Panel A: ECGI activation map with biventricular pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation (blue in AI Map) is the apex, which is abnormal. ESM demonstrates an electrical scar throughout the inferior wall extending toward the right ventricle (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an extensive area of infarction in the inferior wall.
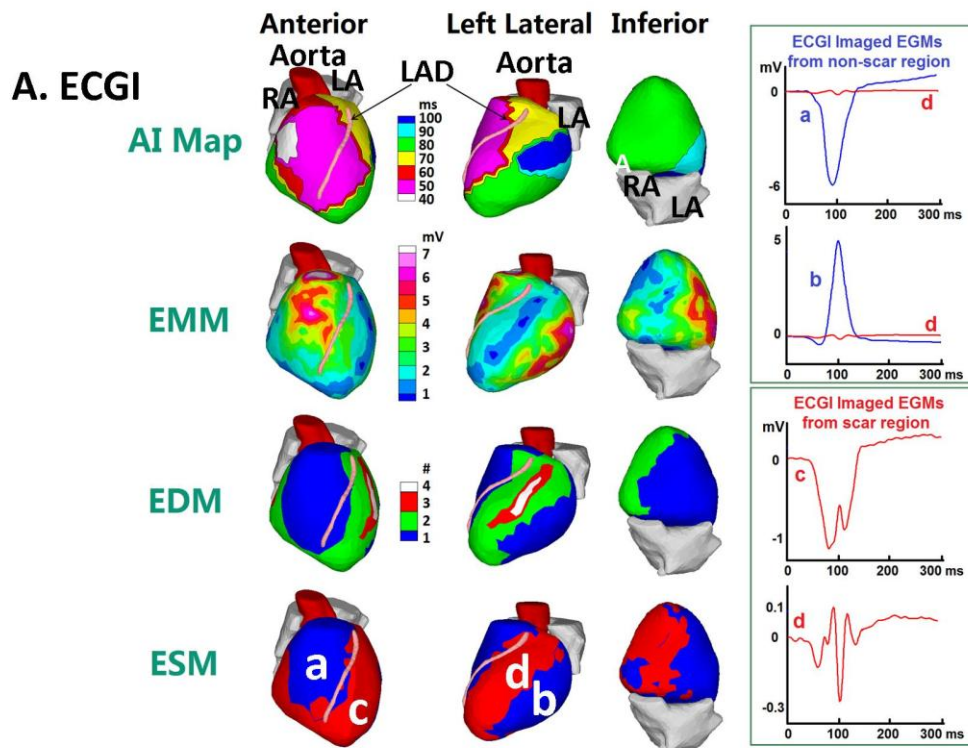
Patient 14.

Patient 14. Inferior Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation (blue in AI Map) is the basal lateral LV, which is normal. ESM demonstrates an electrical scar throughout the inferior wall extending toward the lateral LV (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an extensive area of infarction in the inferior wall.
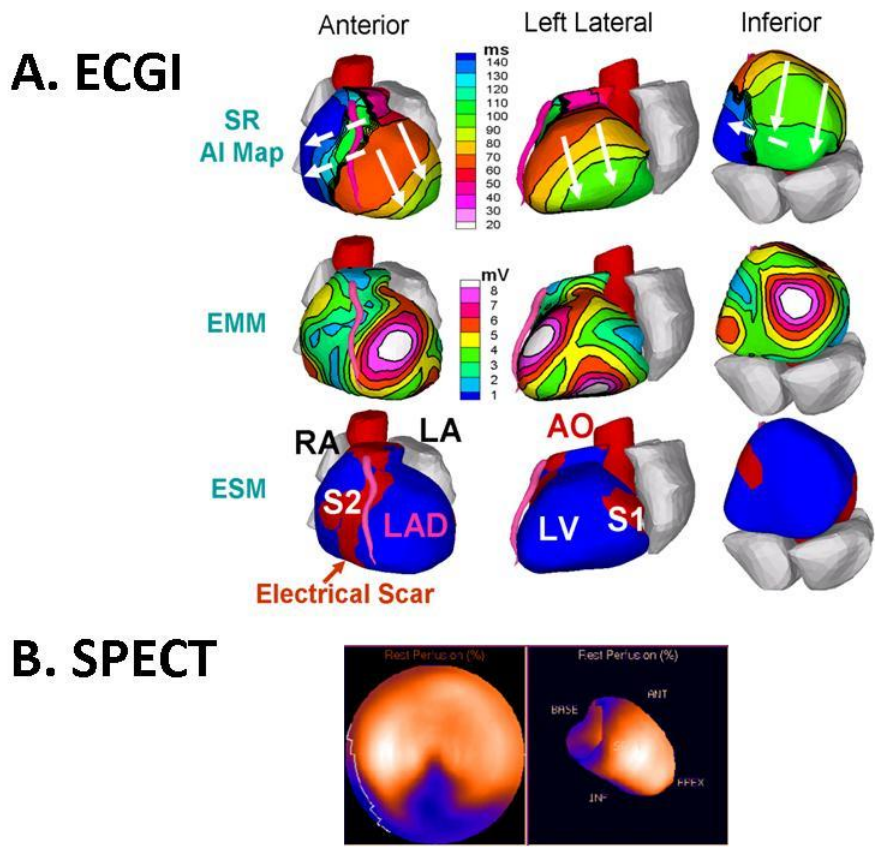
Patient 15.

Patient 15. Anteroapical Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. The latest activation (dark blue in AI Map) is the apex, which is abnormal. ESM demonstrates an electrical scar in the anterior apex (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an area of infarction in the apical anterior wall.
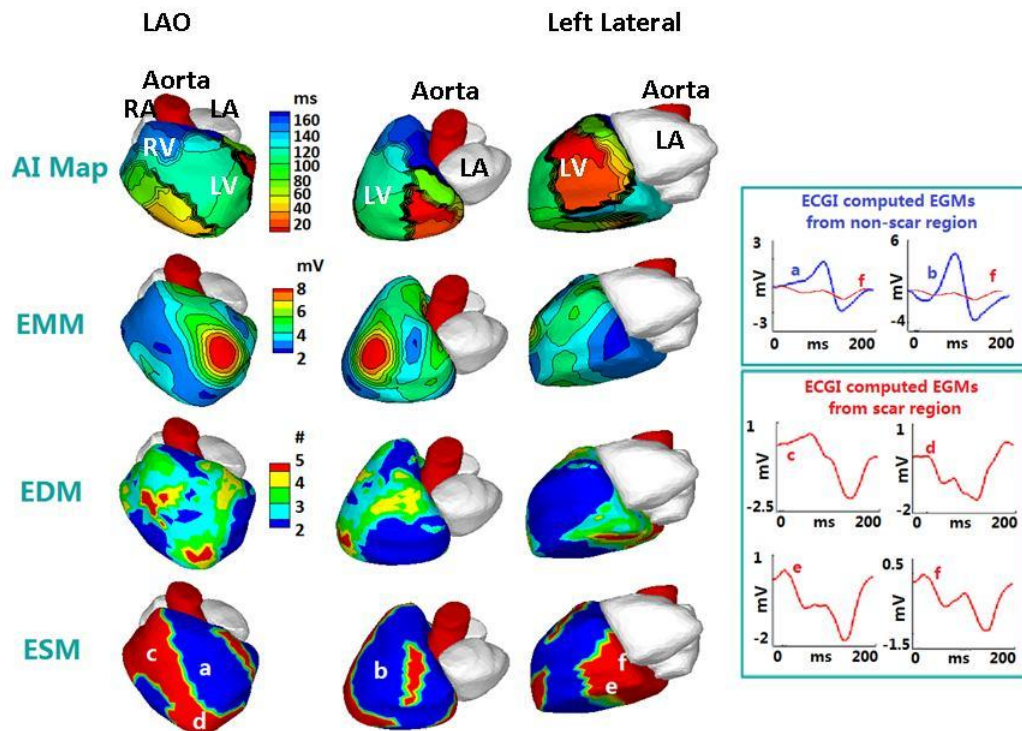
Patient 16.

Patient 16. Large Anteroapical Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. ESM demonstrates an electrical scar in the apex, extending anteriorly and inferiorly (in red). Selected EGMs from non-scar region (a and b, blue) and scar region (c and d, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an area of infarction in the LV apex extending anteriorly and inferiorly.
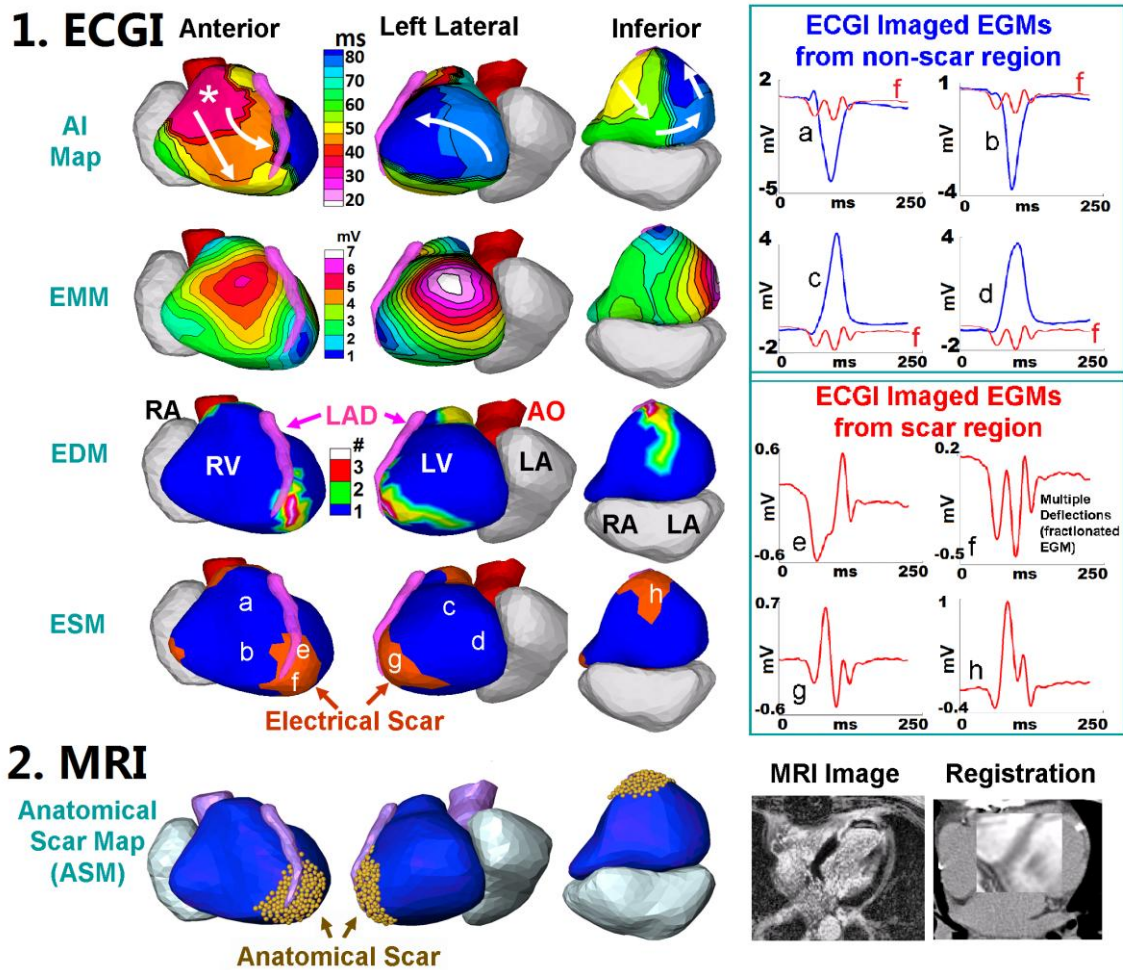
Patient 17.

Patient 17. Inferior Myocardial Infarction. Panel A: ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), and electrical scar map (ESM) are shown in three views. ESM demonstrates an electrical scar in the anterior RV and inferior lateral LV (in red). There is delayed RV activation due to conduction block that correlates with the electrical scar location. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating an area of infarction in the inferior apical wall.

Patient 18.

Patient 18. Septal Myocardial Infarction. Panel A: ECGI activation map during biventricular pacing (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. ESM demonstrates an electrical scar in the RV and a second electrical scar in the basal lateral and inferior septal region (in red). Note LV inferolateral line of conduction block (black thick line in AI Map, left lateral view) which correlates with the electrical scar location selected EGMs from non-scar region (a-b, blue) and scar region (c-f, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. Invasive bipolar catheter mapping in the left ventricle demonstrated a large scar in the septal region extending anteriorly and inferiorly (data not shown).
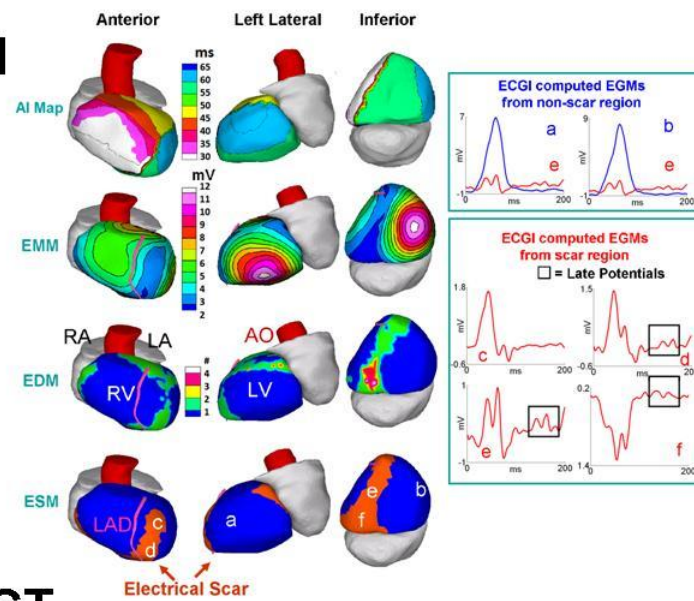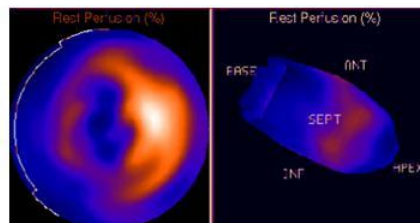
Patient 19.

Patient 19: Apical Myocardial Infarction. 1: ECGI activation map in sinus rhythm (AI map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. White asterisk in AI map shows the RV breakthrough site of earliest activation and white arrows show direction of wavefront propagation. Latest activation in the LV apex (dark blue in AI map), which is abnormal. ESM demonstrates an electrical scar at the apex. Note that this location correlates with the region of latest activation. **2:** Anatomical scar map from DE-MRI is shown, with a similar apical distribution of scar. **3:** Four selected EGMs from non-scar region (a-d, blue) and four selected EGMs from scar region (e-h, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar.

Patient 20.

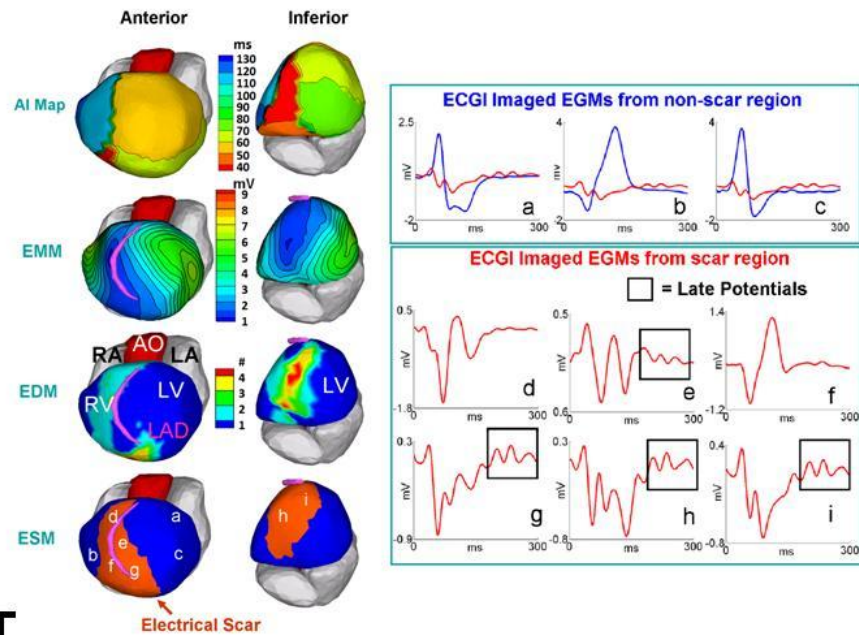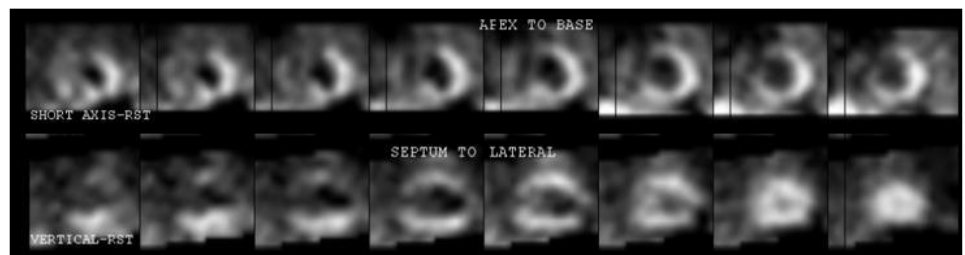**Patient 20. Septal Myocardial Infarction. Panel A:** ECGI activation map in sinus rhythm (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. ESM demonstrates a linear electrical scar along the anterior and inferior septum, sparing the lateral wall (in red). Selected EGMs from non-scar region (a-b, blue) and scar region (c-f, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. Late potentials are shown in black boxes. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in a standard "bullseye" configuration (left) and long-axis view (right), demonstrating a large area of infarction in the septal wall, extending anteriorly and inferiorly.

Patient 21.

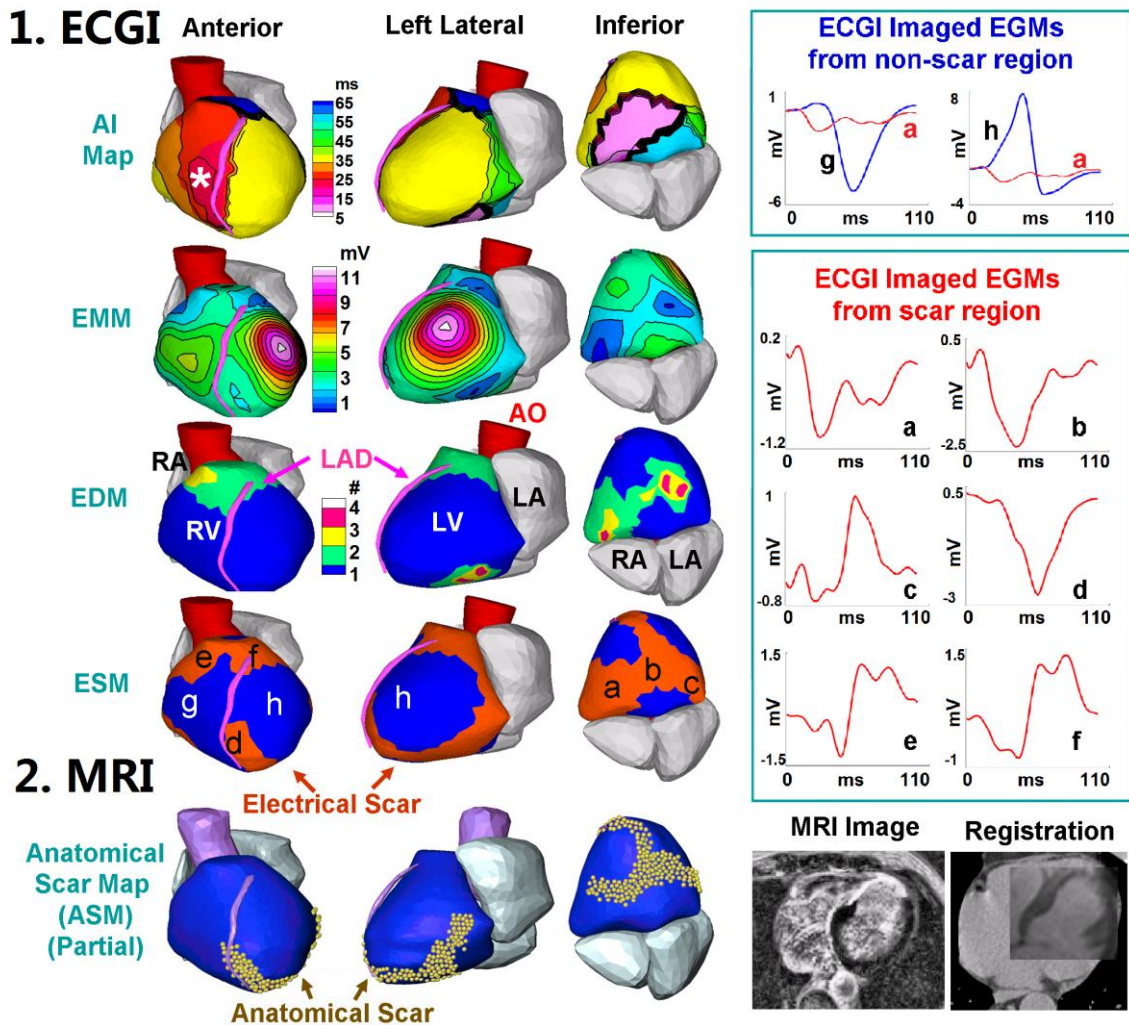**Patient 21. Septal Myocardial Infarction. Panel A:** ECGI sinus rhythm activation map (AI Map), electrogram magnitude map (EMM), electrogram deflection map (EDM) and electrical scar map (ESM) are shown in three views. Activation of the right ventricle occurs late (AI map, blue). ESM demonstrates a linear electrical scar along the anterior and inferior septum, sparing the lateral wall (in red). Selected EGMs from non-scar region (a-c, blue) and scar region (d-i, red) are shown and highlight the low amplitude and fractionated EGM qualities seen in electrical scar. Late potentials are shown in black boxes. **Panel B:** Resting myocardial perfusion imaging (SPECT) is shown in an axial configuration (top row) and vertical long-axis view (bottom), which demonstrate an area of infarction in the anterior septal wall, extending to the apex.
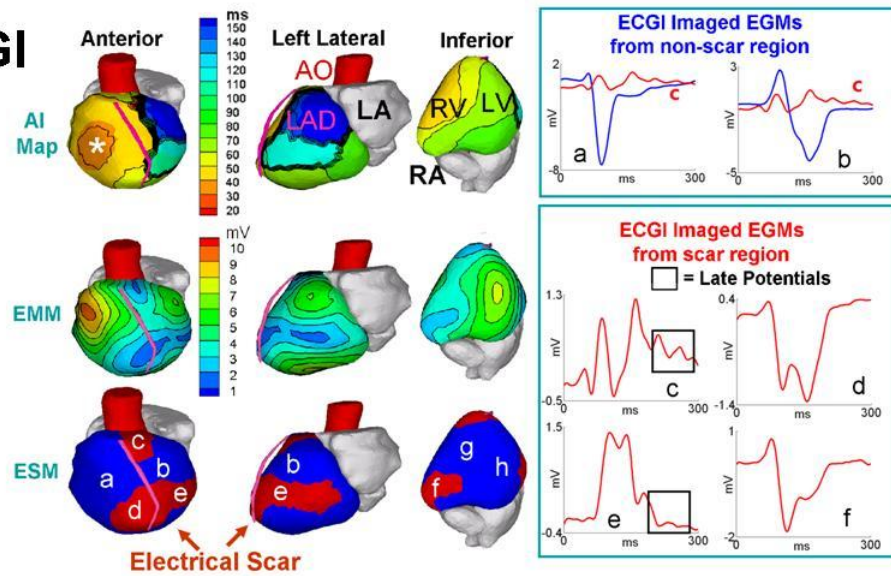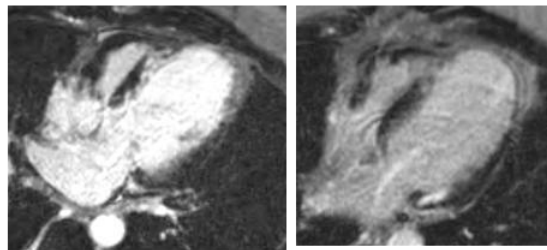
Patient 22.

Patient 22: Complex Inferior and Lateral Myocardial Infarction. 1. ECGI sinus rhythm activation map, EMM, EDM and ESM are shown in three views. Of note, the sinus rhythm activation of the inferior septum is abnormal (pink region in AI map). ESM demonstrates an inferior electrical scar that extends across the inferior wall and toward the apex. **2.** Anatomical scar map from DE-MRI shows a similar inferior distribution of scar. **3.** EGMs from non-scar (g-h, blue) and scar (a-f, red) regions highlight the low amplitude characteristics of electrical scar.

Patient 23.

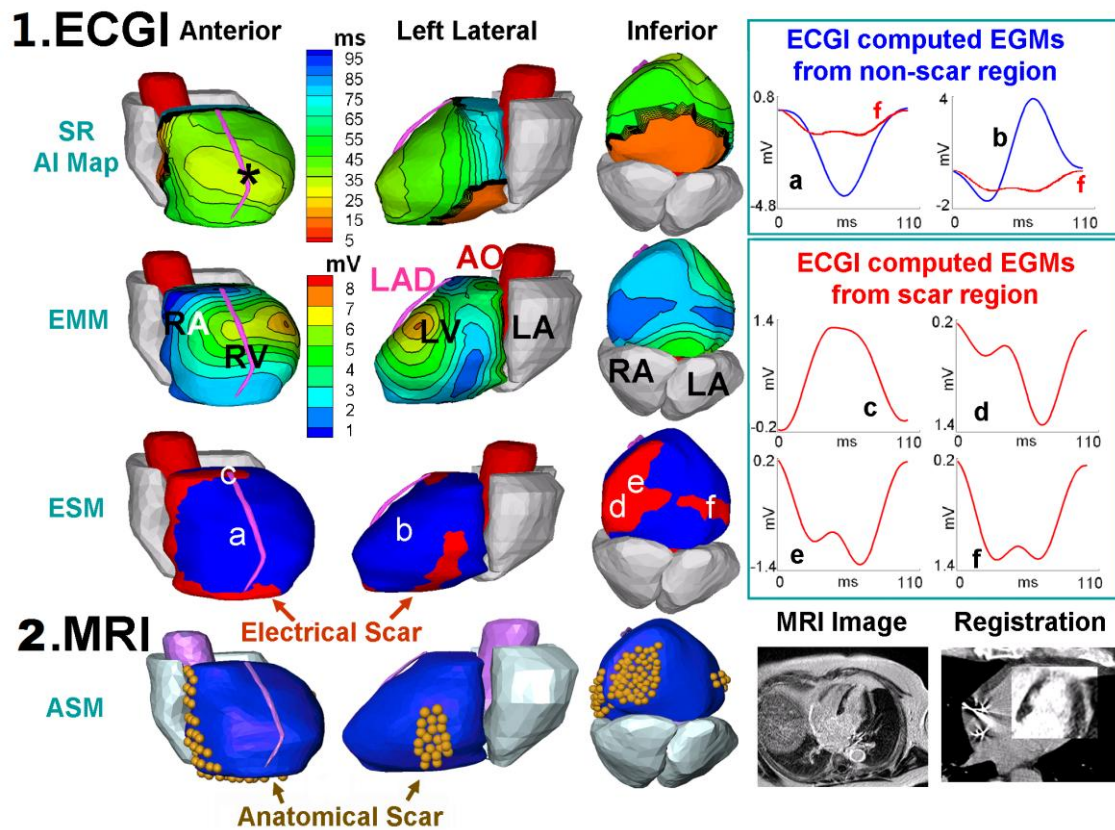**Patient 23: Anterior Apical Myocardial Infarction. Panel A:** ECGI sinus rhythm activation map, EMM, EDM and ESM are shown in three views. The latest area to activate is the anterior LV base, and thick lines of block are observed in the anterior LV. ESM demonstrates an apical electrical scar that extends anteriorly. EGMs from non-scar (a-b, blue) and scar (c-f, red) regions highlight the low amplitude characteristics of electrical scar. Late potentials are highlighted in black box. **Panel B:** DE-MRI demonstrates a transmural apical infarction which extends toward the lateral wall.

Patient 24.

Patient 24: Complex Inferior and Lateral Myocardial Infarction. 1. ECGI sinus rhythm activation map, EMM, EDM and ESM are shown in three views. Of note, the early activation of the inferior septum is abnormal (red region in AI map). ESM demonstrates an inferior electrical scar that extends across the inferior wall and toward the apex. **2.** Anatomical scar map from DE-MRI shows a similar inferior distribution of scar. **3.** EGMs from non-scar (g-h, blue) and scar (a-f, red) regions highlight the low amplitude characteristics of electrical scar.