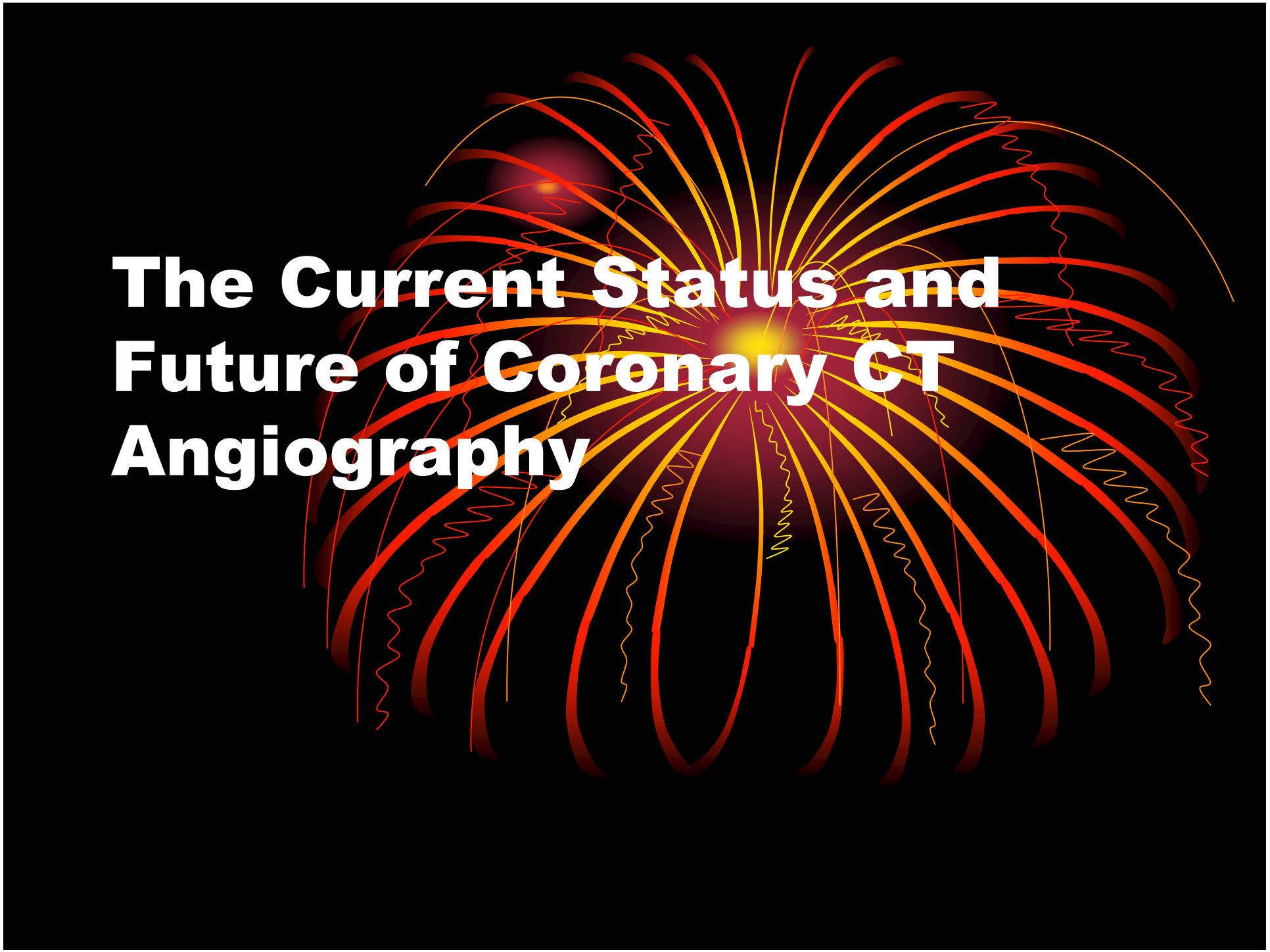
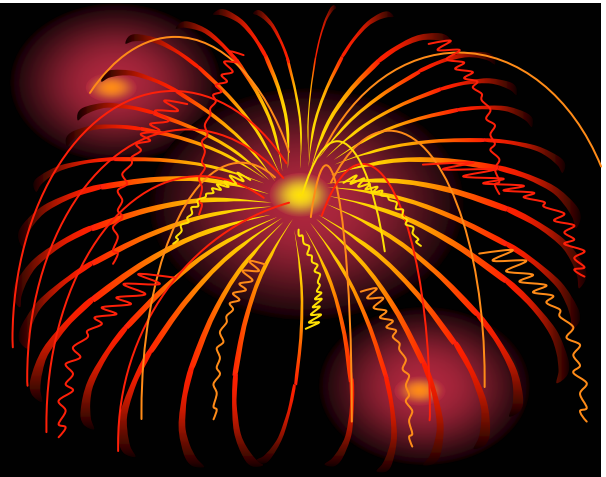

The Current Status and Future of Coronary CT Angiography

Introduction

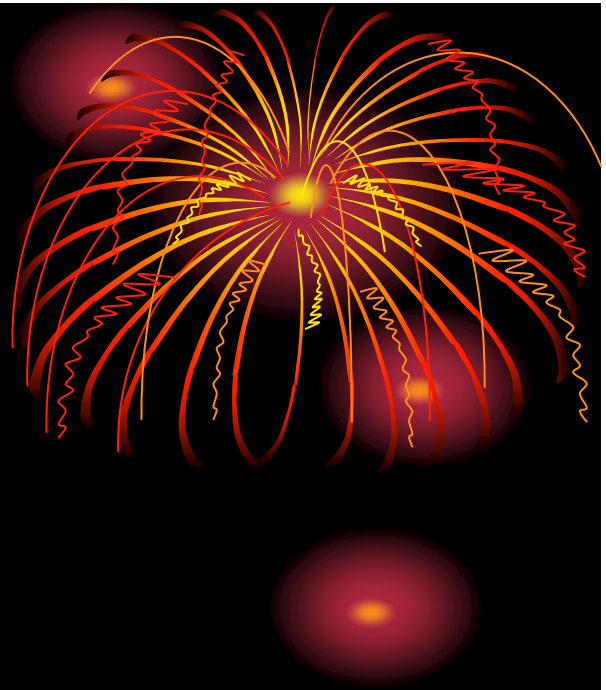


- In 2001, US

1. 3.51 million cardiac catheterization
2. 3.02 million for coronary artery
3. 9% emergency
4. 1.73 million for diagnosis only
5. 150000 sudden death for acute coronary syndrome

- Coronary CT angiogram (CCTA) V.S cardiac catheterization

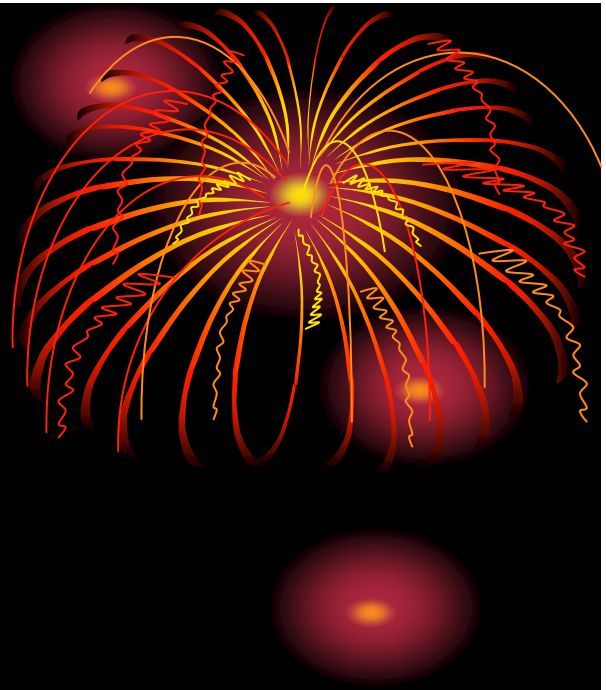
Technique



Indication

- **Symptoms**
- **Family history, smoking, hypertension, hypertension, DM, hypercholesterolemia**
- **↑ CRP, ↑ homocysteine, ↑ small LDL particle size**

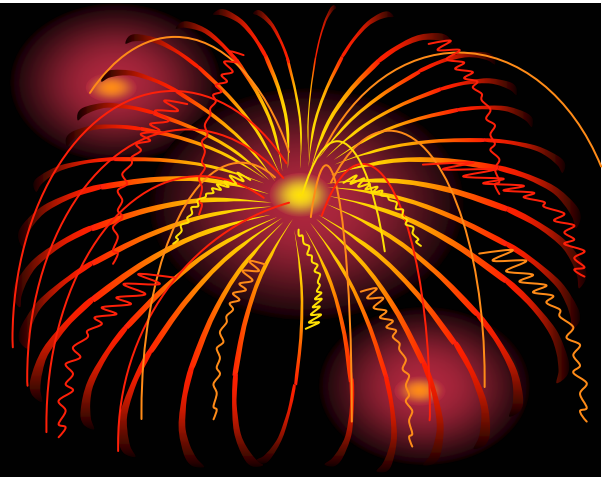
Technique



Contraindication

- **Allergy**
- **Pacemaker**
- **Irregular heart rate**
- **Heart block**
- **Renal insufficiency, Crea>1.8**

Technique



- **HR < 62 beats/min
- 100mg metaprolol, 1 hour

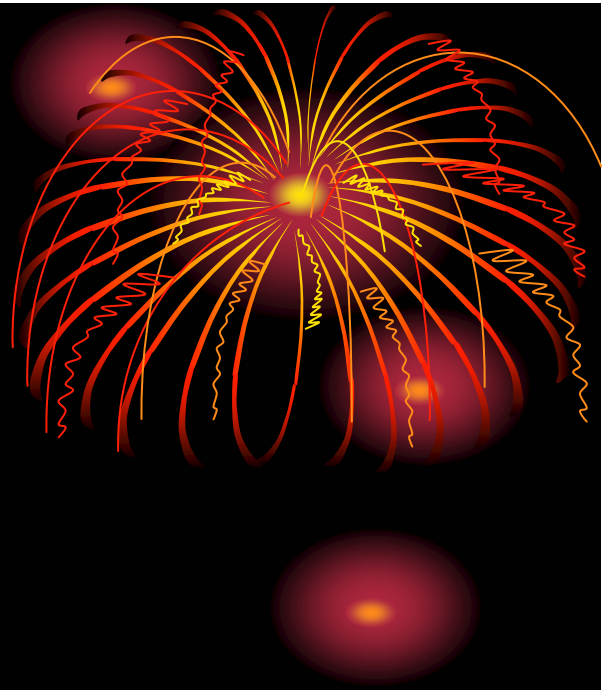
1. 62-70 bpm!!!! 50mg, 30 mins
2. >70 bpm!!!! 100mg, 30 mins

- COPD: 240mg verapamil

Technique

- 18-20 gauge angiocatheter in antecubital region
- Short 5-French polyurethane PICC line in axillary vein

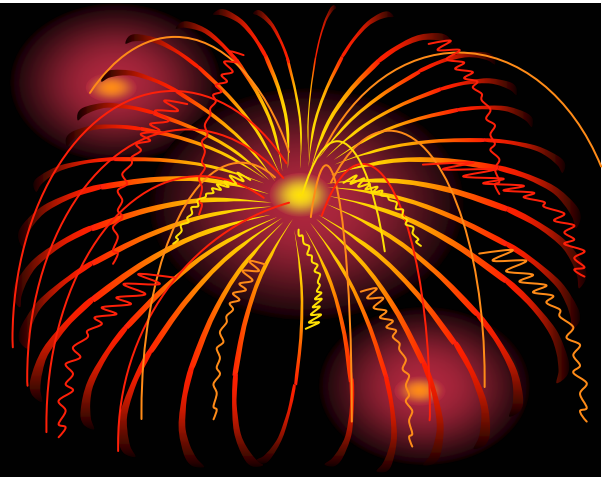
Technique



In CT suite

1. **An AP scout image**
2. **Lateral scout image**
3. **5mm cuts, 40mA, spiral noncontrast**
4. **NTG sublingually, timing bolus run**
5. **Visipaque 320, 20cc, 5 seconds : 3 seconds**

Technique



- Circulation time

1. if ≤ 30s, 80cc Visipaque 320
2. If > 30s, 100cc Visipaque 320

- Scanning

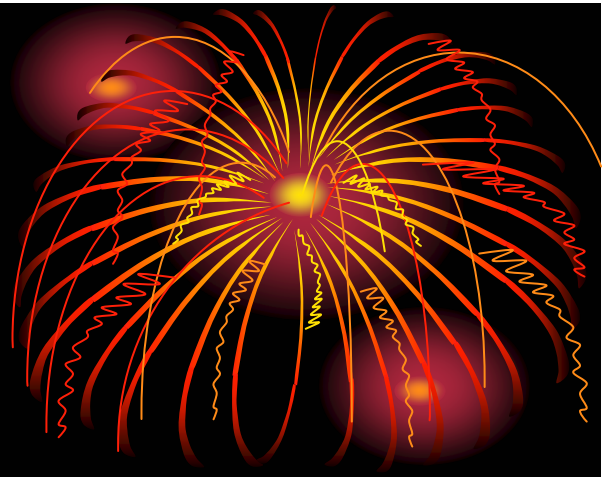
1. <60 bpm, single sector analysis
2. 60-75 bpm, two-sector
3. >75 bpm, reschedule or four-sector

Technique

- 0.625-mm slice thickness
- Tube current

1. Large body habitus: >750mA
2. Average-sized: 650mA
3. Small: 500mA
4. 40%-80% RR interval, the remain use 20% current

Technique



- >800 cases done
- No complication
- Reflex tachycardia due to NTG (2)
- Postnitro headache(2)

Technique

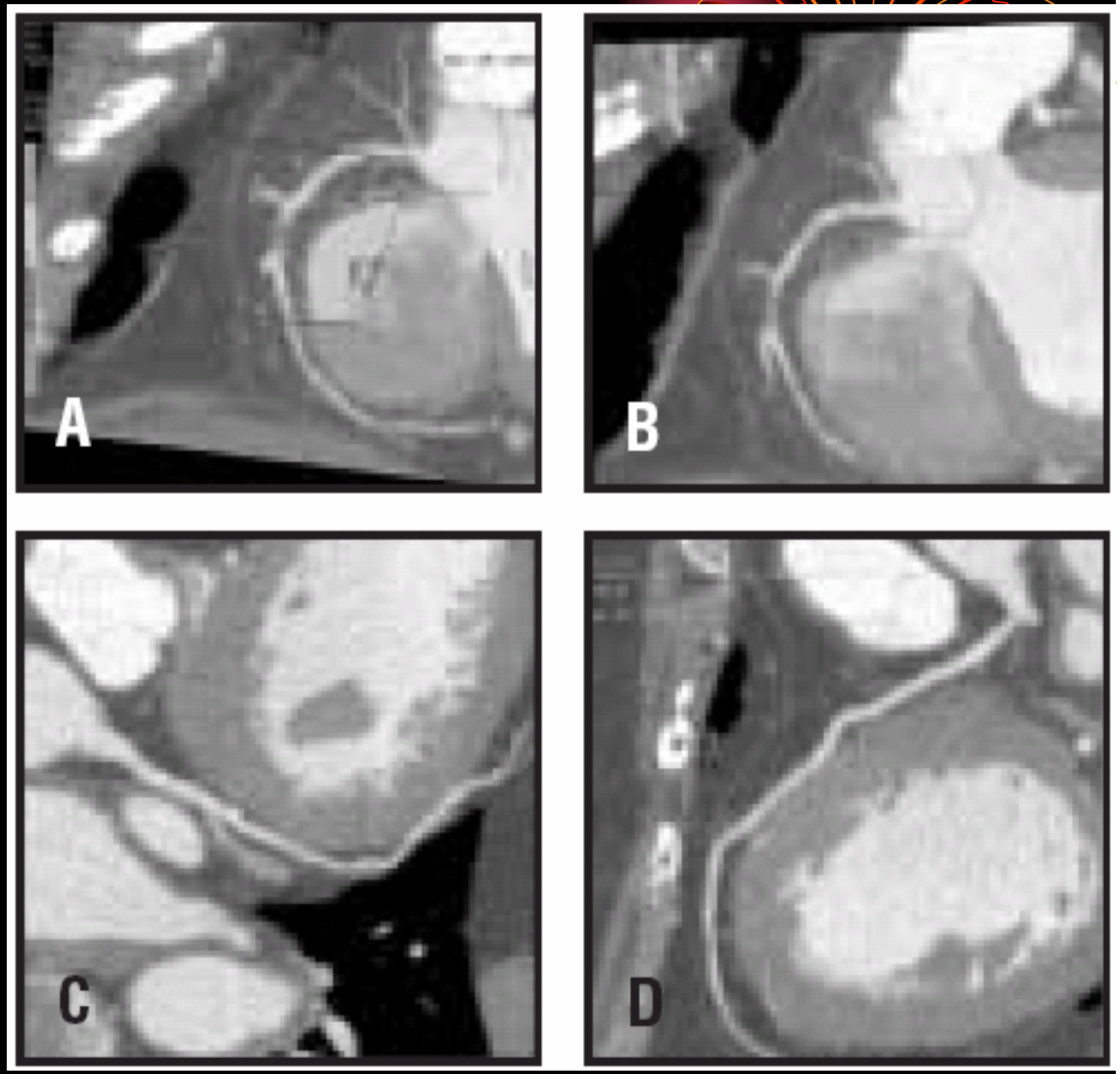
- Multiplanar reformats (MPRs), Maximum-intensity projections (MIPs), 3D volume-rendered images
- Window/level

1. Routine CCTA:800/100
2. Heavy calcified plaque burden: 1200/200
3. Stents anddetecting instent restenosis: 1400/300
4. Obese: 600/50

Clinical Value and Comparison with Alternative Procedures

- Coronary artery calcium scoring
- Soft plaque: intravascular ultrasound, the best
- CCTA

1. 78% sensitive for plaque
2. 95% sensitive for calcified plaque
3. In proximal vessels, all > 91%



A: High-grade stenosis of right coronary artery by fibrous plaque. Color coding confirms that plaque is mostly fibrous. B: Fibrous plaque without color coding. C: Left circumflex artery. D: Left anterior descending artery.

Clinical Value and Comparison with Alternative Procedures

Detect >50% stenosis

- **95% sensitive**
- **86% specific**
- **80% positive predictive value**
- **97% negetive predictive value**

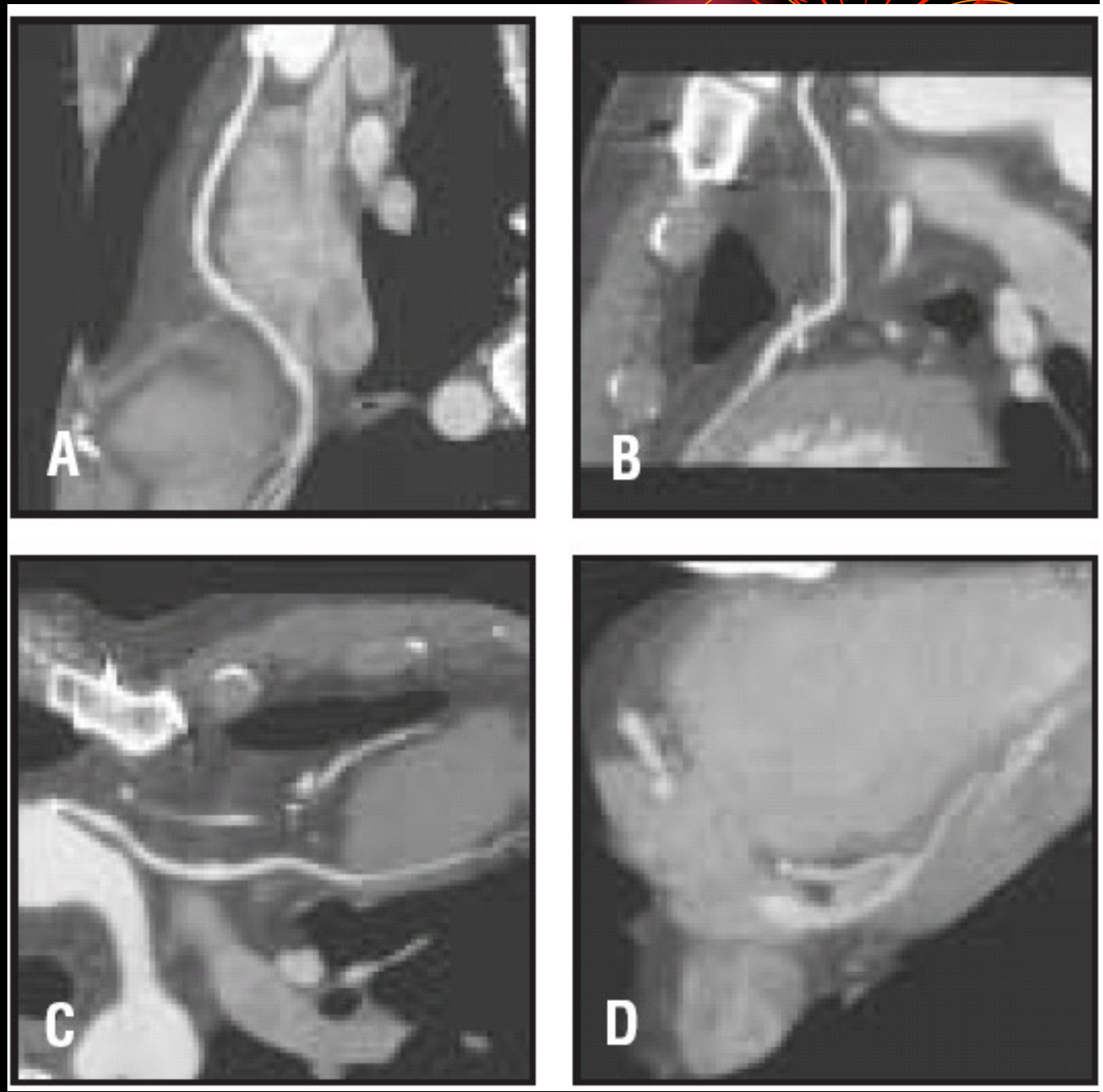
Clinical Value and Comparison with Alternative Procedures

- **Bypass graft**

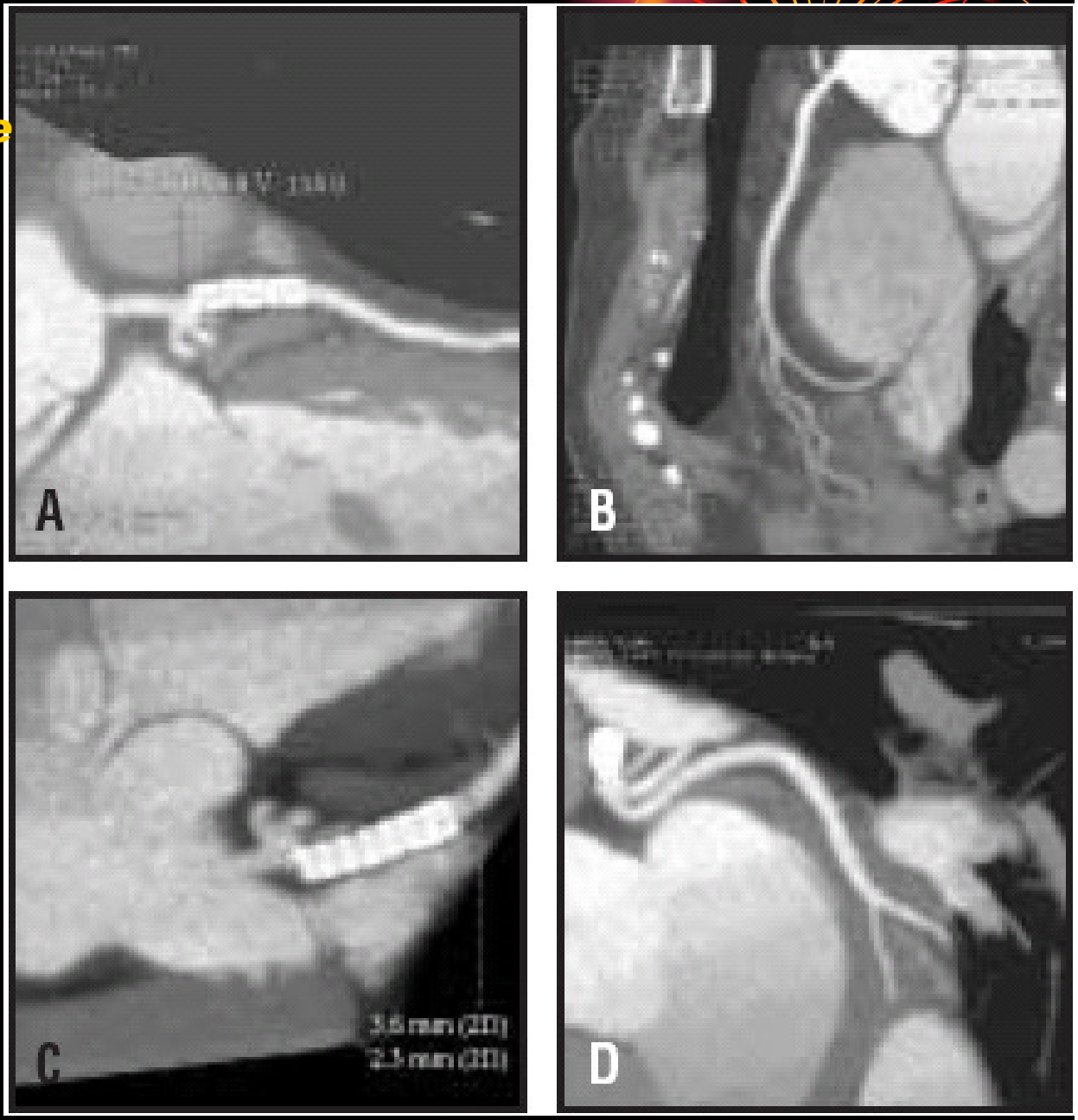
1. **Larger**
2. **No branches**
3. **Extracardiac location**

- **Stent**

A: Saphenous vein to the posterior descending artery. B: Left internal mammary artery to the left anterior descending artery. C: Saphenous vein to the first diagonal. D: After reconstruction, the data set may be rotated to image the anastomoses in profile.



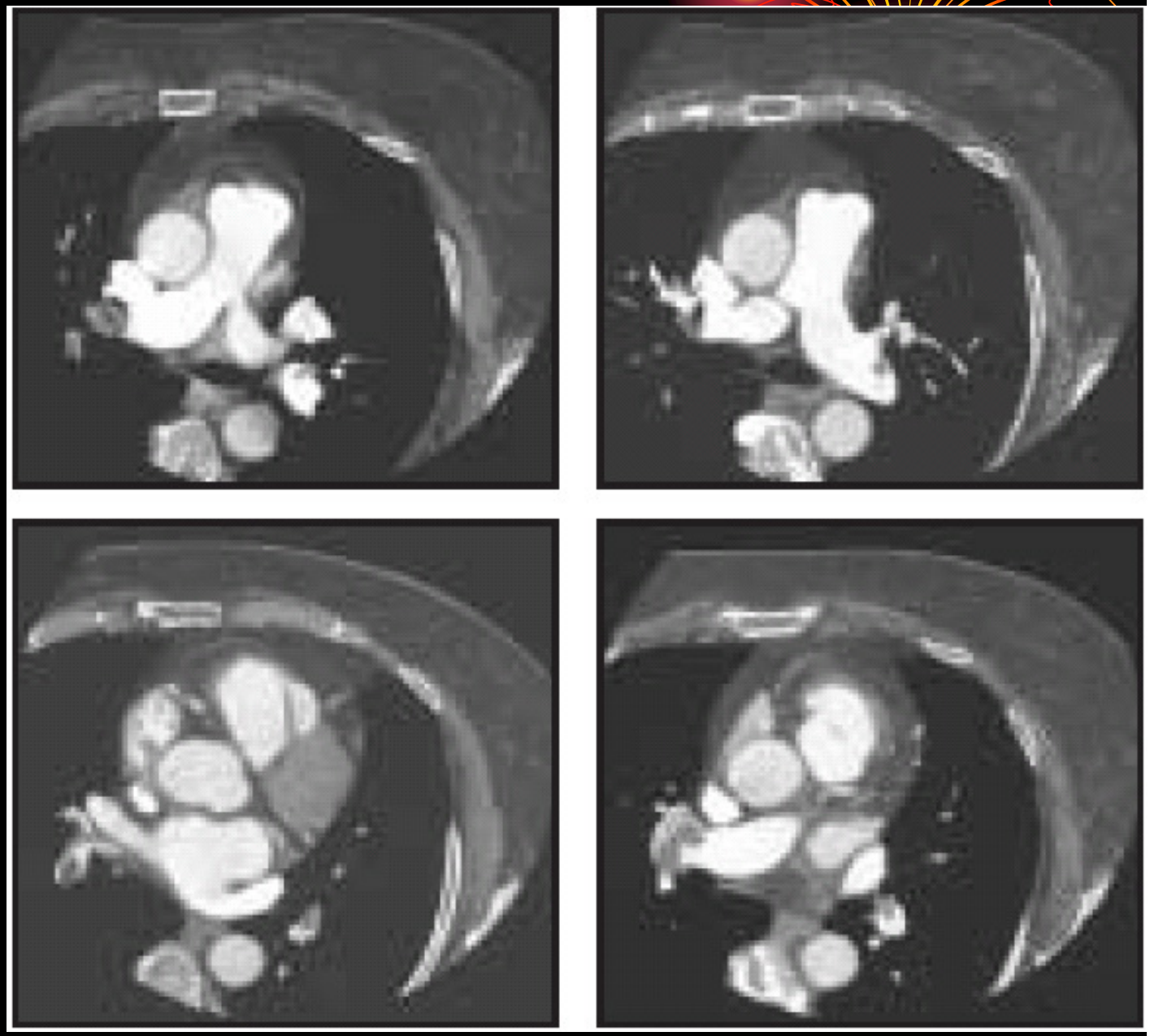
A: Example of incomplete deployment of the proximal stent with secondary intimal hyperplasia. This was likely deployed deliberately in such a fashion to avoid compromising the ostium of the first diagonal branch. B: Minimal plaque in the right coronary artery. C: No significant stenosis results from the intimal hyperplasia. D: Normal left circumflex artery.



Clinical Value and Comparison with Alternative Procedures

- 10% ancillary findings
- Followed a complete chest CT
- Pulmonary emboli, lung cancer, esophageal cancer, pancreatic carcinoma, Hodgkin's lymphoma, mesenteric panniculitis, arrythmogenic right ventricular dysplasia, and a pseudoaneurysm of the inferior left ventricular wall.

Pulmonary emboli are identified on the axial images in a patient complaining of chest pain and shortness of breath.



Clinical Value and Comparison with Alternative Procedures

- **Results of the exams**

1. **Negative**
2. **Mild plaque without stenosis**
3. **Moderate plaque with a 50% left main stenosis or a 50% to 70% stenosis elsewhere→→ Stress test, all**
4. **Severe plaque withany stenosis >70%→→ Catheter angiography, most**

Clinical Value and Comparison with Alternative Procedures

High mA(>650)

- First attempt: 95% success
- Second attempt: 80% success
- Follow-up stress test: 26%→13%
- Follow-up cath: 7%→3%

Conclusion

- **CCTA may surpass stress tests as the first exam a patient with potential CAD**
- **A case that nonemergency diagnostic catheterizations should be preceded by CCTA.**