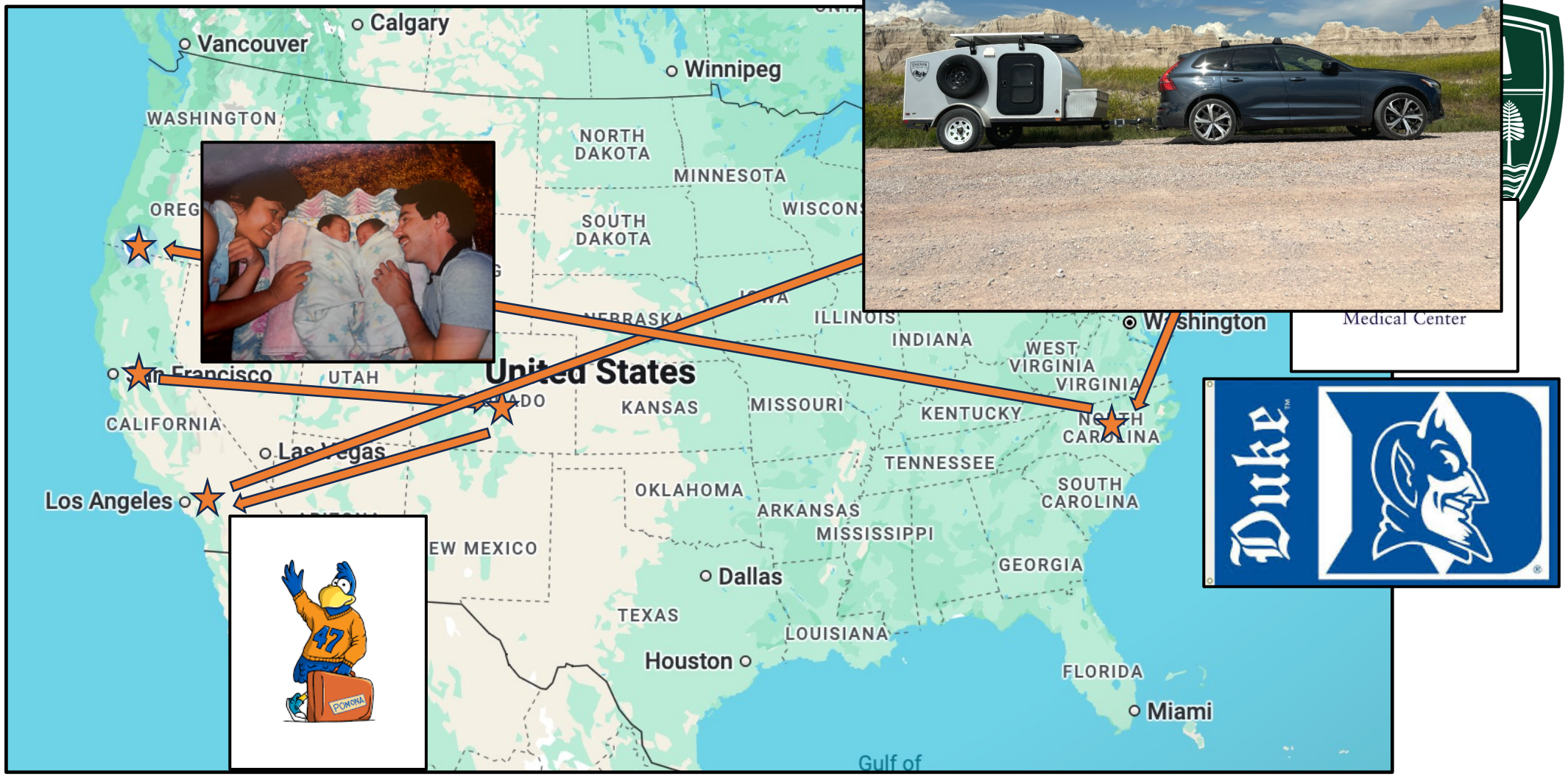
A History of the Heart Attack

By Ali Corley, MD

Feb 18, 2025

Nice to meet you!



Keeping busy as an interventional cardiologist

Coronary artery disease (CAD) is the leading cause of death worldwide and in the United States

Improved therapies have decreased mortality associated with CAD while increasing survival following a myocardial infarction

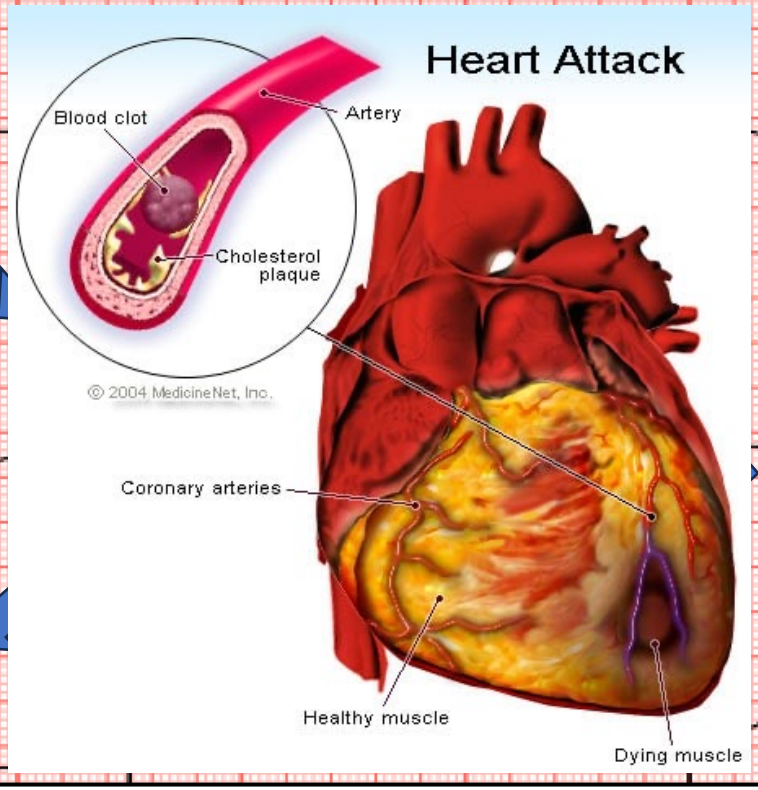
However, the prevalence of CAD is still expected to rise due to aging population and trends in lifestyles among developed countries

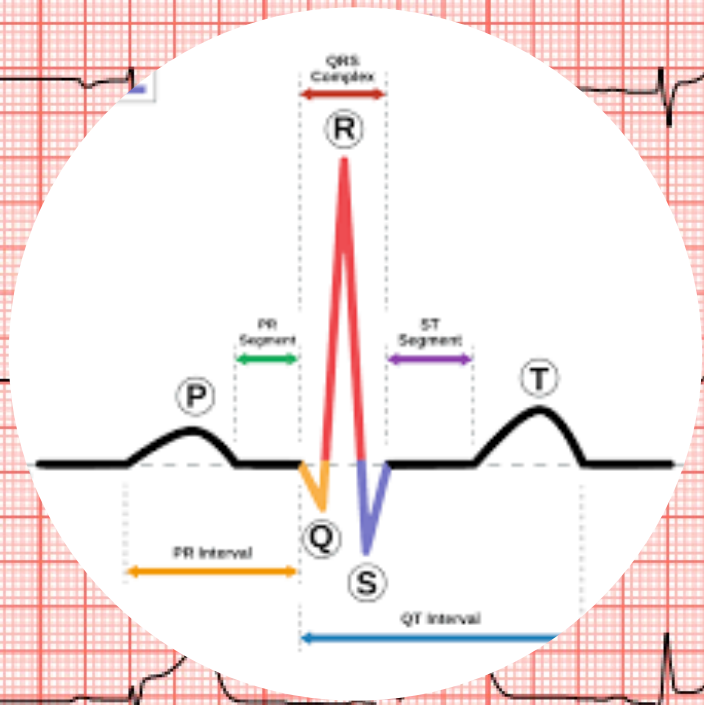
- 68 year old retired mailman with a past medical history of hypertension, hyperlipidemia, and prior smoking develops sudden onset chest pain

- He calls 911; EMS arrives to the scene and performs an initial evaluation

- His vital signs are: HR 105bpm, BP 155/92, O2 saturation 99%

- They perform an EKG…



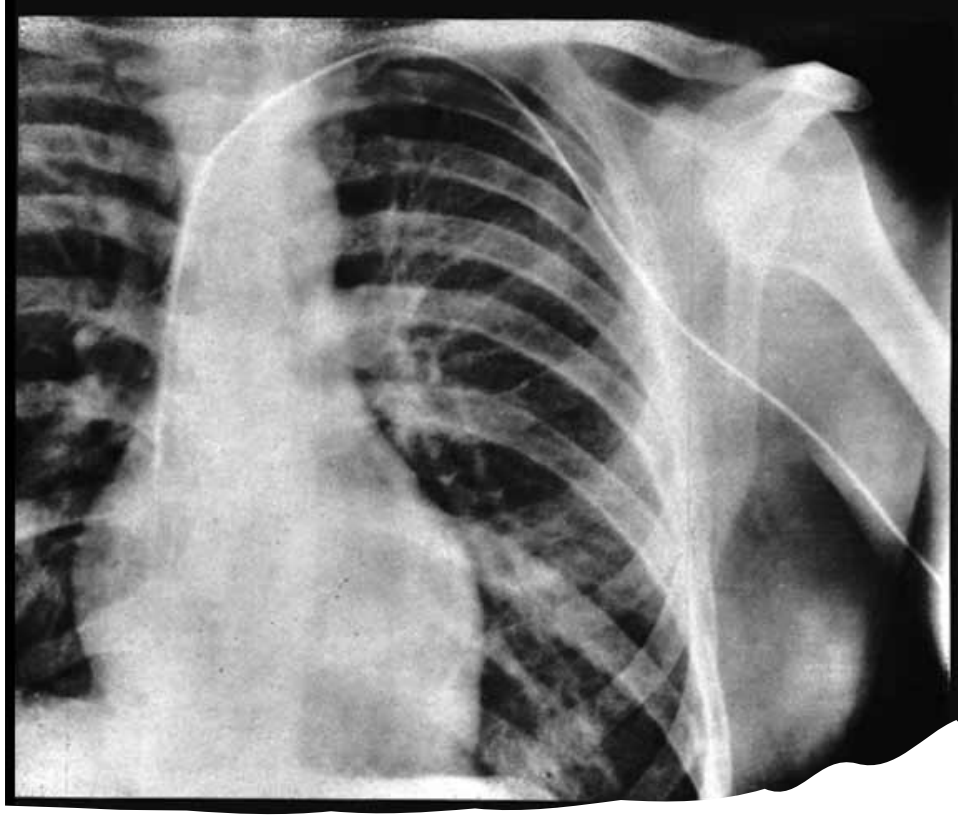


STEMI AKA ST Elevation Myocardial Infarction AKA “Heart Attack”

Philips PageWriter TC-201962 25 mm/sec 10 mm/mV F 60~ 0.15 - 100 Hz

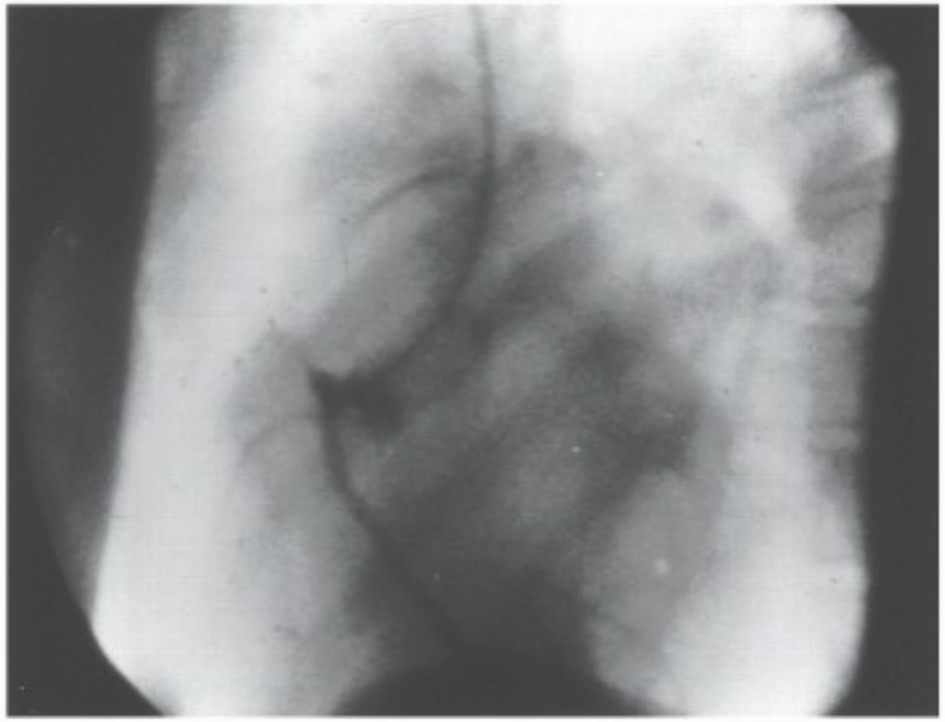
Harold Pardee first described these EKG changes in 1920

An electrocardiographic sign of coronary artery obstruction. Arch Int Med 1920;26:244-257



A little drama…

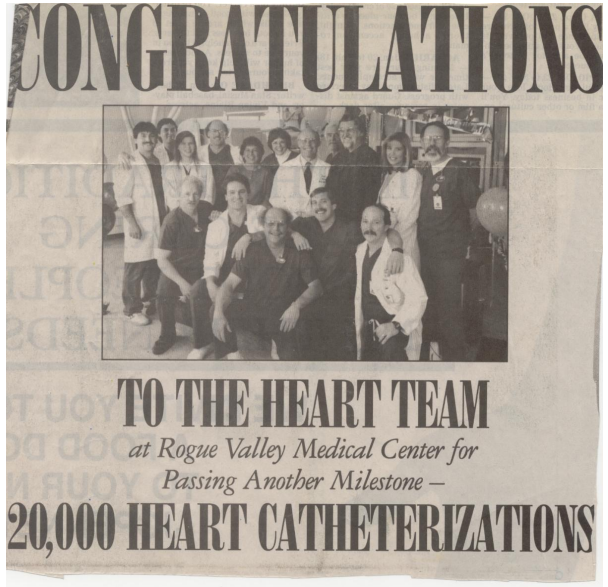
German physician Dr. Werner Forssmann performed the first human catheterization in 1929, on himself



ame from the first selective coronary arteriogram taken by F. Mason Sones, MD, on October 30, 1958. (Reprinted with per
e coronary angiogram and its seminal contribution to cardiovascular medicine over five decades. *Circulation* 2002;106:752

A little luck…

The first coronary angiogram was performed on October 30, 1958 by Dr. F. Mason Sones Jr. at the Cleveland Clinic

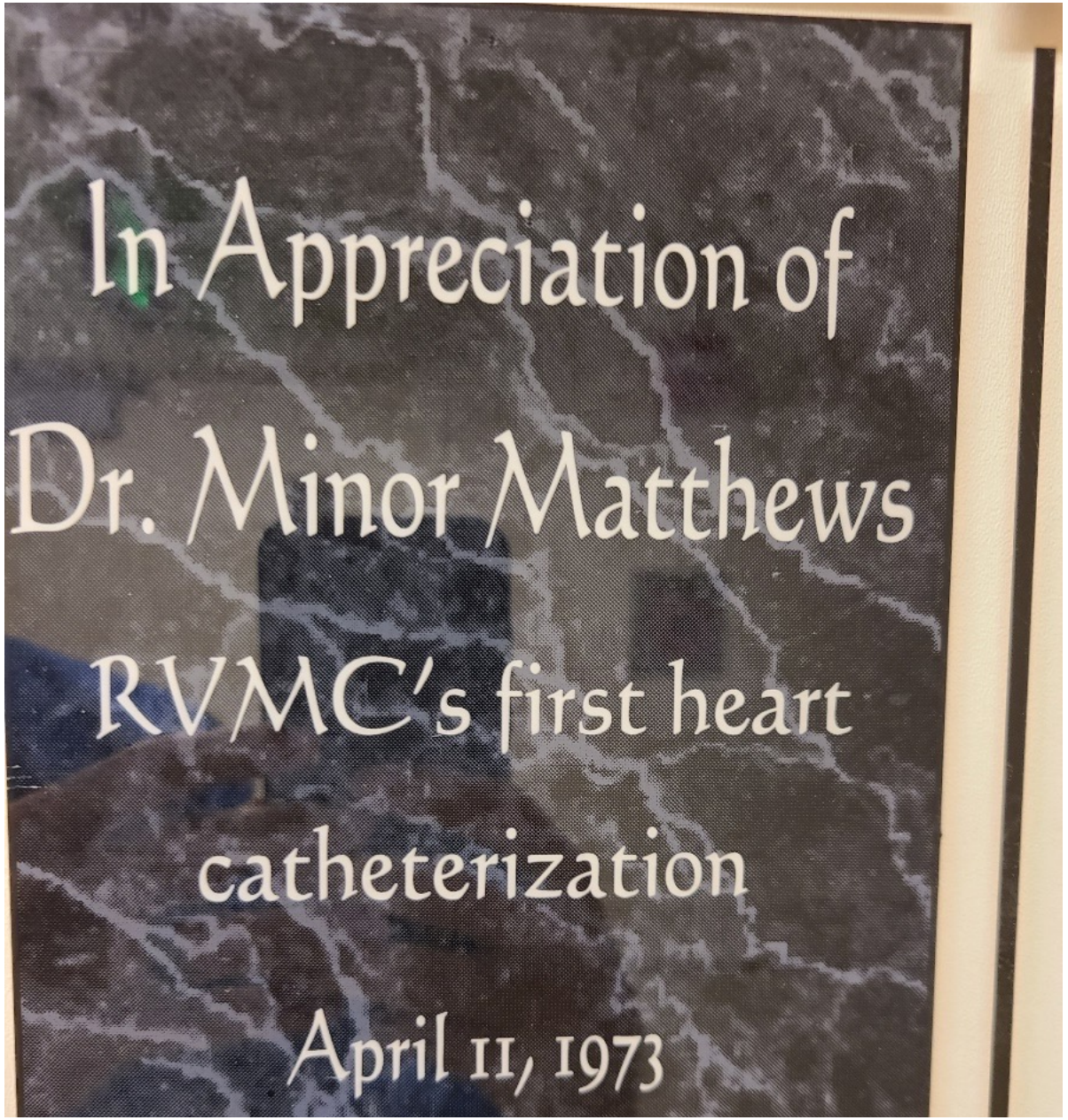


CONGRATULATIONS

TO THE HEART TEAM

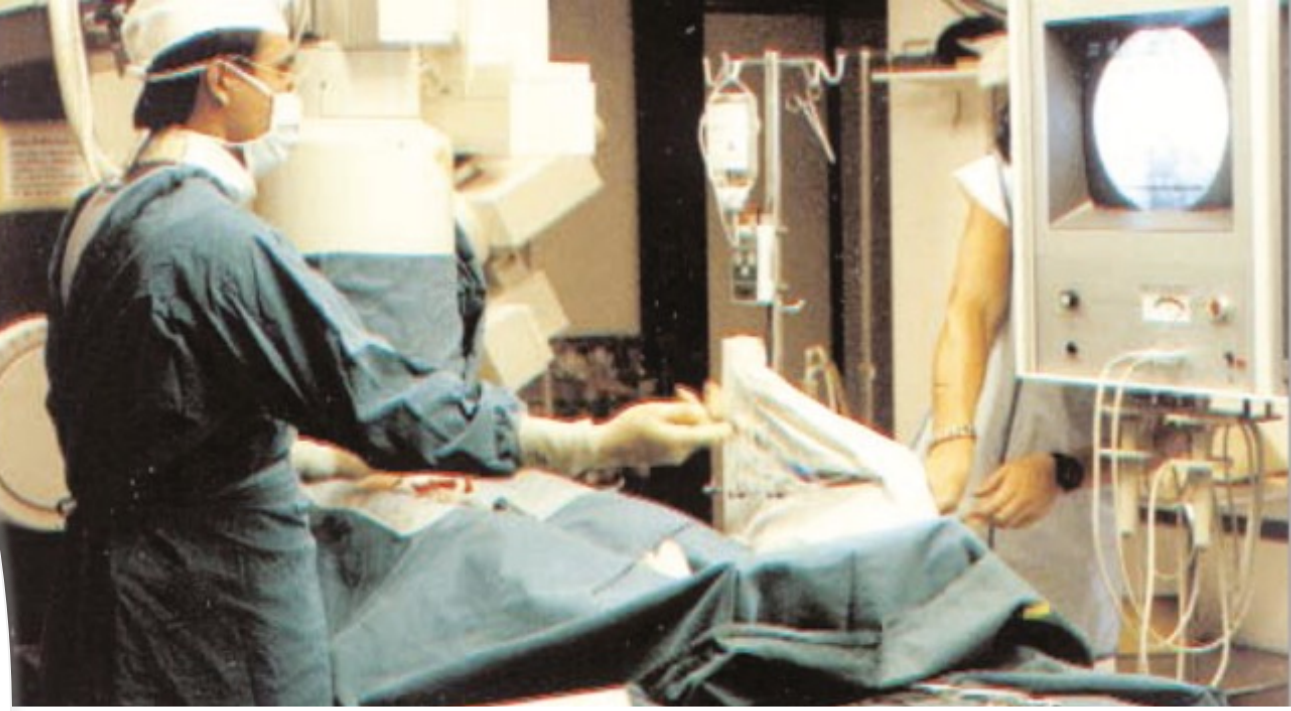
at Rogue Valley Medical Center for Passing Another Milestone –

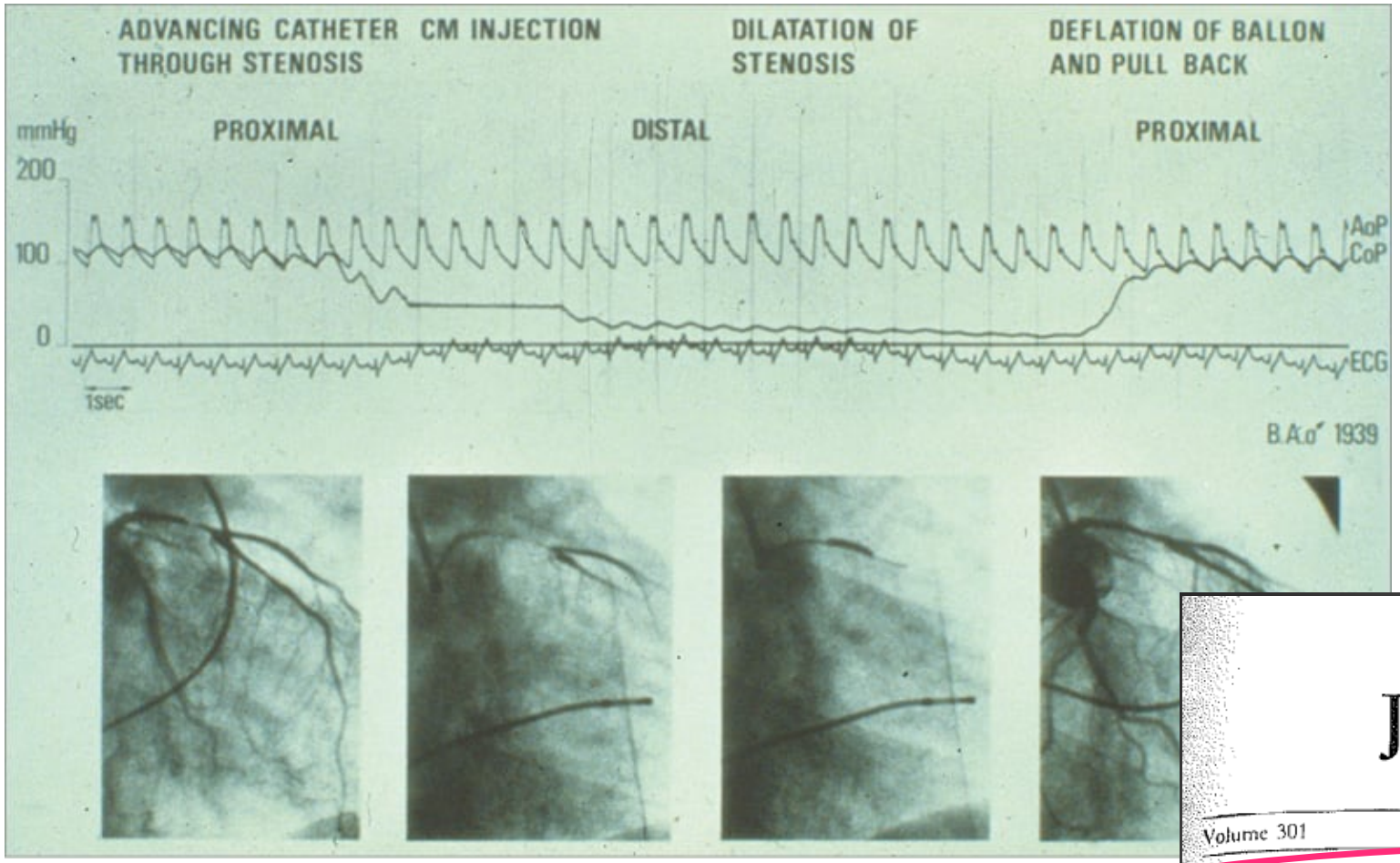
20,000 HEART CATHETERIZATIONS

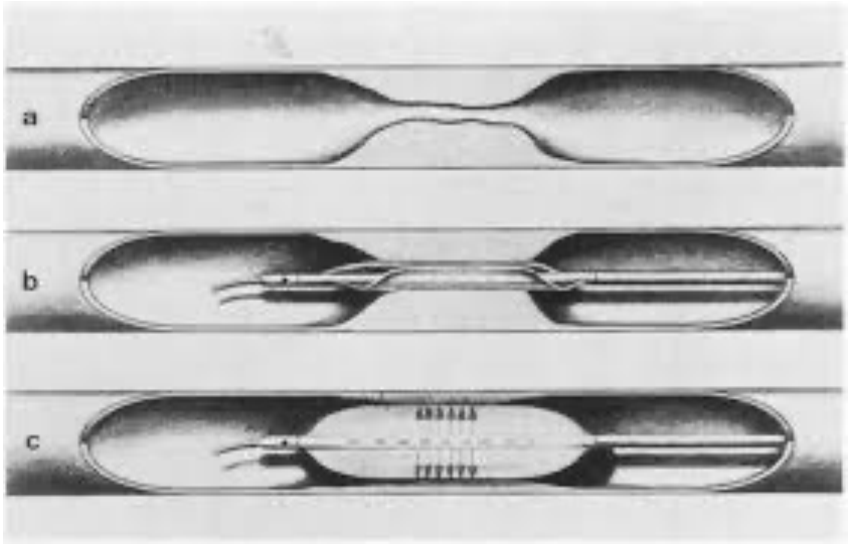


A little fear…

Dr. Andreas Gruentzig performed the first balloon angioplasty on September 16, 1977







roma likely to respond to dilatation. We estimate that only about 10 to 15 per cent of candidates for bypass surgery have lesions suitable for this procedure. A

The New England
Journal of Medicine

1979

Volume 301 JULY 12, 1979 Number 2

NONOPERATIVE DILATATION OF CORONARY-ARTERY STENOSIS

Percutaneous Transluminal Coronary Angioplasty

ANDREAS R. GRÜNTZIG, M.D., ÅKE SENNING, M.D., AND WALTER E. SIEGENTHALER, M.D.

ract In percutaneous transluminal coronary an-
lasty, a catheter system is introduced through a
emic artery under local anesthesia to dilate a ste-
c artery by controlled inflation of a distensible bal-

er the past 18 months, we have used this technic in 50 patients. The technic was successful in 32 patients, reducing the stenosis from a mean of 84 to 34 per cent ($P<0.001$) and the coronary-pressure gradient from a mean of 58 to 19 mm Hg ($P<0.001$). Twenty-nine patients showed improvement in cardiac function during follow-up examination. Because of acute deterioration in clinical status, emergency bypass was later necessary in five patients; three showed electrocardiograpic evidence of infarcts.

Patients with single-vessel disease appear to be most suitable for the procedure, and a short history of pain indicates the presence of a soft (distensible) atheroma likely to respond to dilatation. We estimate that only about 10 to 15 per cent of candidates for bypass surgery have lesions suitable for this procedure. A prospective randomized trial will be necessary to evaluate its usefulness in comparison with surgical and medical management. (N Engl J Med 301:61-68, 1979)

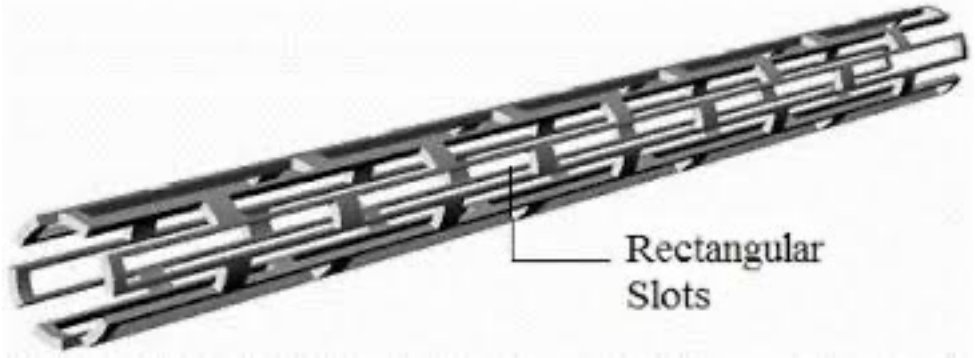
Rapid growth and innovation in interventional cardiology

1986

First coronary stent implanted in Switzerland (self expanding)

1987

Palmaz-Schatz stent developed in US (balloon expandable); first FDA approved stent



2002

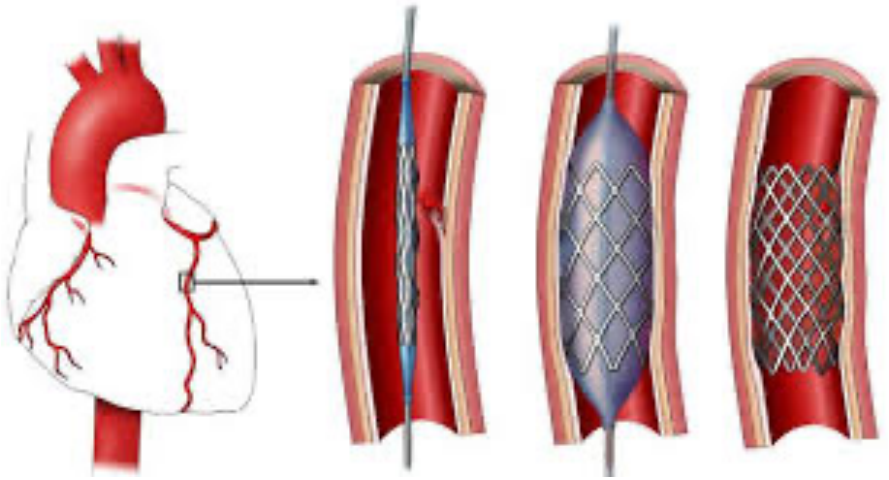
1st generation drug eluting stents invented

2008

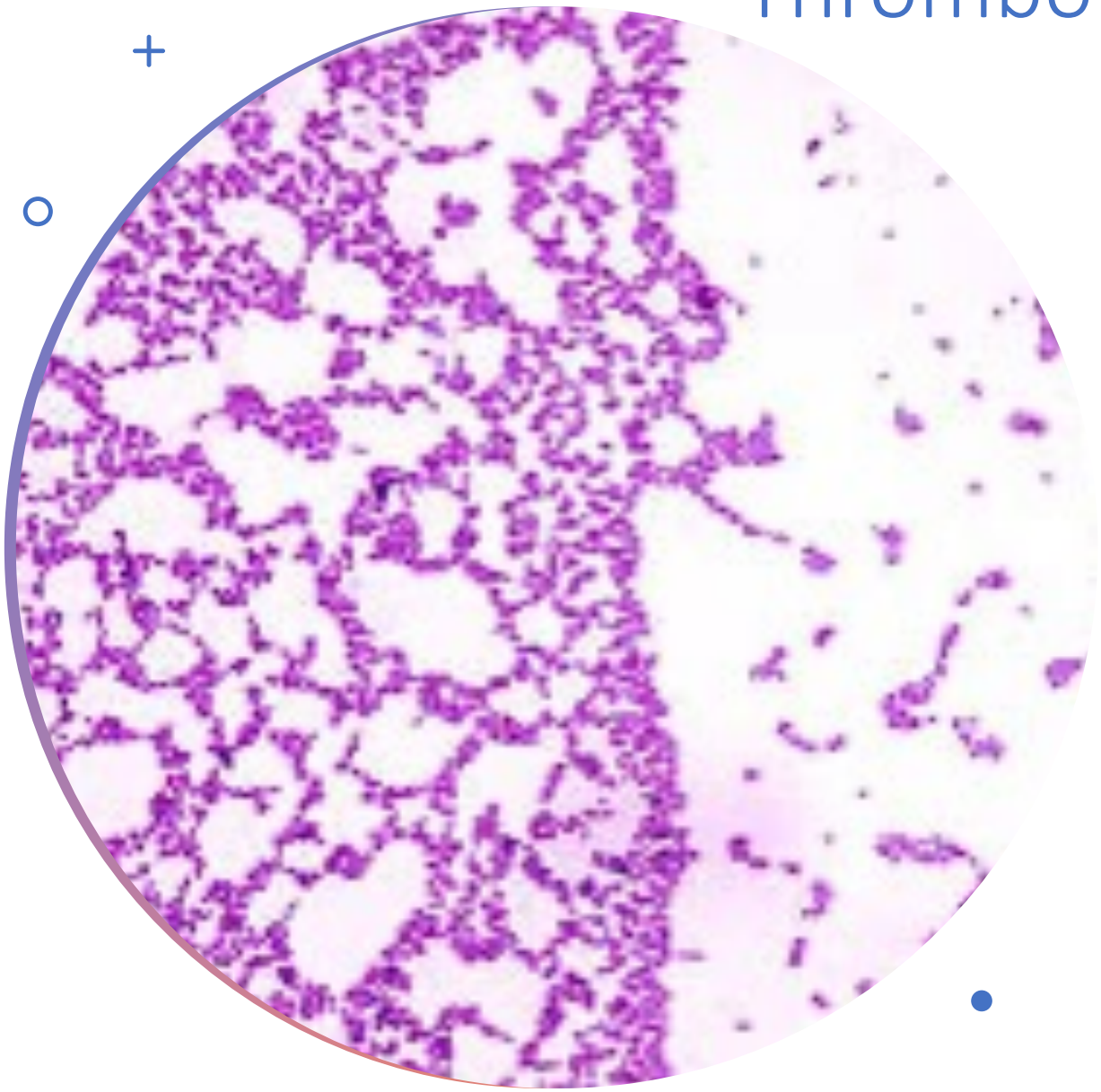
Development of 2nd generation drug eluting stents

2011

Development of 3rd generation drug eluting stents



Thrombolytic therapy, the Clot Buster



- First used in acute MI patients in 1958
- Many studies followed with variable results
- The earlier the administration, the better the outcome
- In the early 1990s, it was established that when given within 90 minutes of the onset of symptoms, thrombolytics could reduce the mortality rate by half
- However, bleeding rates and stroke rates were considerable

In the early 2000s PCI emerged as the best treatment for STEMI

Thrombolytics

PCI

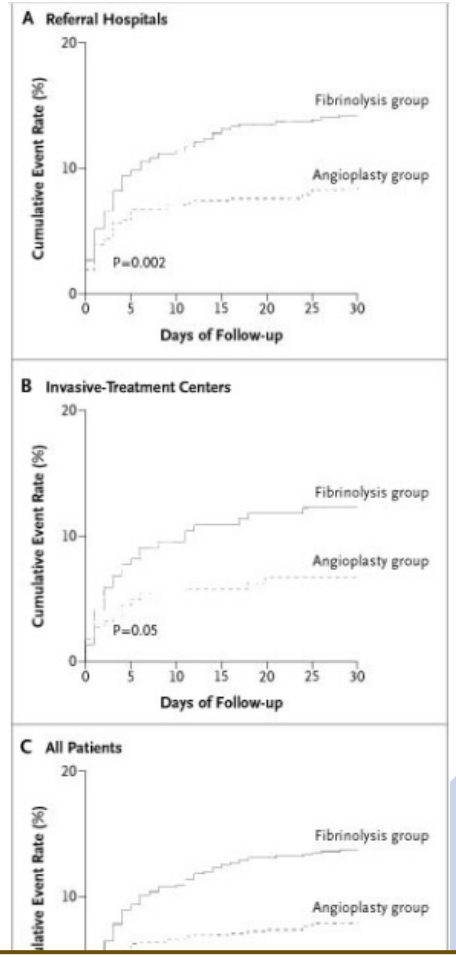
No technical skills required

Available everywhere

Better mortality

Less stroke/bleeding

Better combined endpoints

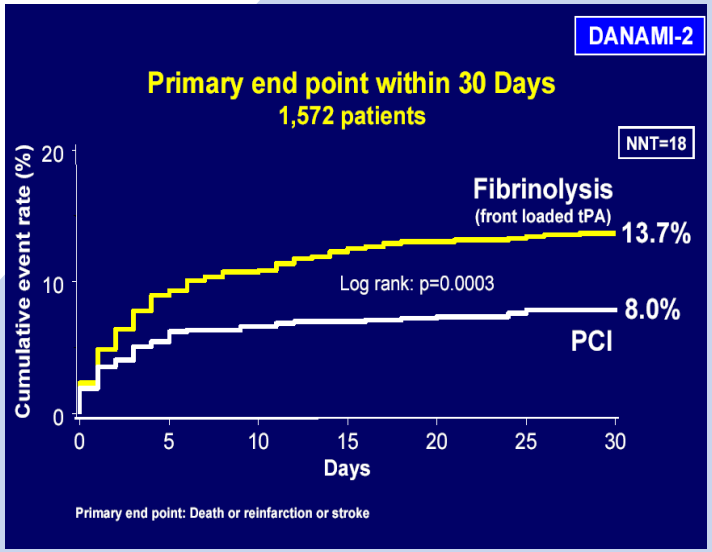


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Comparison of Coronary Angioplasty with Fibrinolytic Therapy in Acute Myocardial Infarction

Henning R. Andersen, M.D., Torsten T. Nielsen, M.D., Klaus Rasmussen, M.D., Leif Thuesen, M.D., Henning Kelbaek, M.D., Per Thayssen, M.D., Ulrik Abildgaard, M.D., Flemming Pedersen, M.D., Jan K. Madsen, M.D., Peer Grande, M.D., Anton B. Villadsen, M.D., Lars R. Krusell, M.D., et al., for the DANAMI-2 Investigators*



The DANAMI-2 Trial even showed that patients admitted to non PCI capable hospitals benefited from transfer to a PCI capable center over lytics as long as the transfer took < 2hrs

The American Journal of Cardiology

Acknowledgment: We thank Karen A. Bales, RN, BSN, Dr. Douglas Burwell, Dr. Nicholas Dienel, Dr. John Forsyth, Dr. Gary Foster, Dr. Michael Fugit, Dr. Mark Huth, Dr. Ken Lightheart, Dr. David Martin, Dr. Minor Mathews, Dr. Brian Morrison, Dr. Bruce Patterson, Dr. Eric Pena, Dr. Brad Personious, Dr. Richard Schaefer, Mercy Flights, American Medical Response, Ashland Fire & Rescue, Rogue River Fire District, Northern Siskiyou Ambulance, Medford Fire Department, Jackson County Fire District #3, Rogue Valley Medical Center and PCI team, Providence Medford Medical Center, Ashland Community Hospital, Three Rivers Community Hospital, Fairchild Medical Center, Jane Sawall, RN, CNS, Heather Freiheit, RN, BSN, and Jo Jacavone, RN, MS.

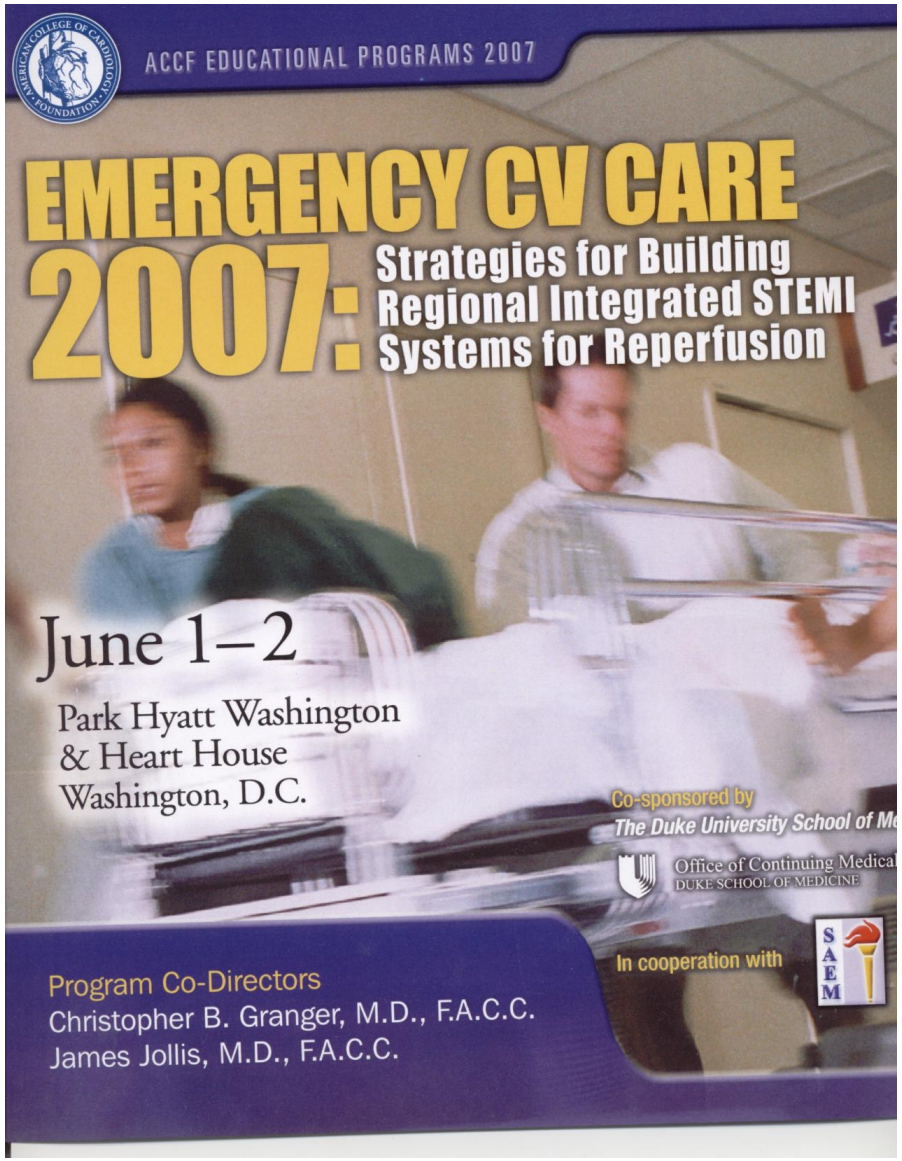
An Approach to Shorten Time to Infarct Artery Patency in Patients With ST-Segment Elevation Myocardial Infarction

Brian W. Gross, MD[a,*], Kent W. Dauterman, MD[a], Mark G. Moran, MD[b], Todd S. Kotler, MD[b], Stephen J. Schnugg, MD[a], Paul S. Rostykus, MD, MPH[c], Amy M. Ross, PhD, RN, CNS[d], and W. Douglas Weaver, MD[e]

We developed a regional strategy to decrease the time to percutaneous coronary intervention (PCI) for patients with acute ST-segment elevation myocardial infarction (STEMI). Protocols were created for paramedics and referring hospitals to identify and directly triage all patients with STEMI to a single PCI center. Time to PCI reperfusion and in-hospital mortality were assessed in 233 consecutive patients with STEMI. Ninety-minute initial hospital door-to-patent infarct artery was achieved in 58.3% of paramedic-diagnosed and directly triaged patients compared with 37.5% of "walk-ins" to the PCI hospital and with only 5.2% of those transferred from another hospital emergency department (ED; $p < 0.001$). Overall in-hospital mortality was 2.1%, 0% in paramedic identified patients, and 0% in those walk-ins to the PCI hospital ED compared with 4.3% for those transferred from a referring hospital ED ($p = 0.007$). Paramedic diagnosis of STEMI and direct triage to a prealerted interventional hospital for primary PCI was associated with a high percentage of patients achieving <90-minute infarct artery patency. Substantial delays remained for those who presented initially to a non-PCI hospital ED despite the expedited protocol. In conclusion, this observational study suggests that wider use of paramedic electrocardiographic STEMI diagnosis and direct triage to a prealerted PCI hospital catheterization team may help improve outcomes of patients with STEMI. (Am J Cardiol 2007;99:1360–1363)

May 2007

In 2003 we proposed a heretical approach to STEMI… Paramedics would diagnose STEMI in the "field" and bypass the closest ER and go directly to the pre-alerted cath lab at a PCI capable center

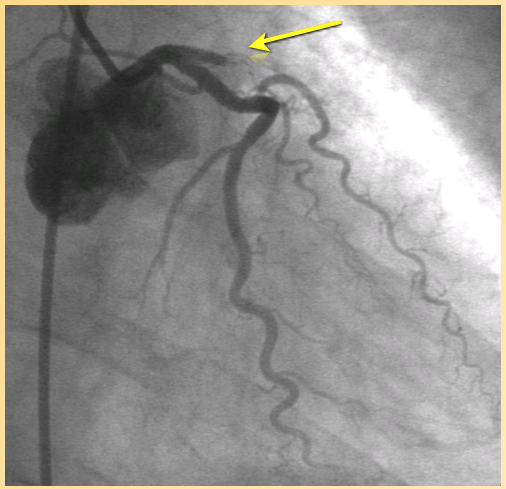


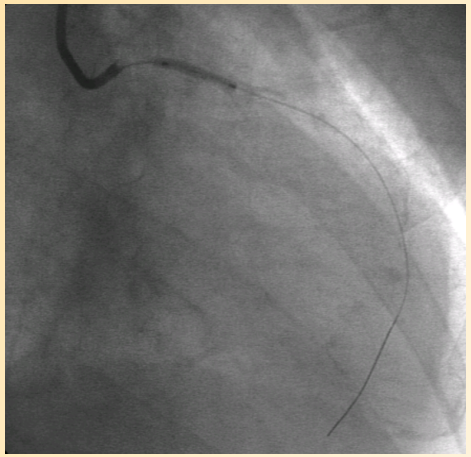
CLINICAL STUDIES

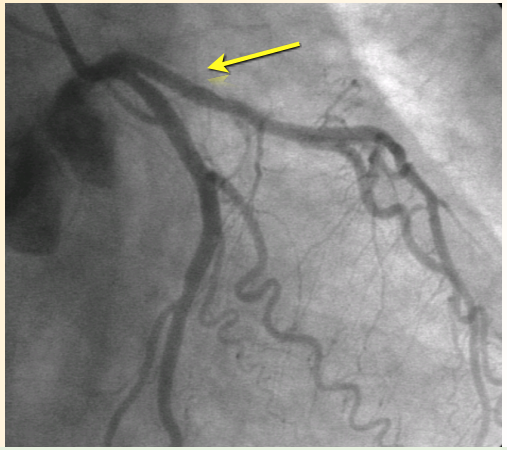
Integration of Pre-Hospital Electrocardiograms and ST-Segment Elevation Myocardial Infarction Receiving Center Networks

Impact on Door-to-Balloon Times Across 10 Independent Regions

Ivan C. Rokos, MD,* William J. French, MD,† William J. Koenig, MD,‡ Samuel J. Stratton, MD, MPH,§ Beverly Nighswonger, RN,§ Brian Strunk, MD,‖ Jackie Jewell, RN,‖ Ehtisham Mahmud, MD,¶ James V. Dunford, MD,¶ Jon Hokanson, MD,# Stephen W. Smith, MD,** Kenneth W. Baran, MD,†† Robert Swor, DO,‡‡ Aaron Berman, MD,‡‡ B. Hadley Wilson, MD,§§ Akinyele O. Aluko, MD,‖‖ Brian W. Gross, MD,¶¶ Paul S. Rostykus, MD, MPH,## Angelo Salvucci, MD,*** Vishva Dev, MD,††† Bryan McNally, MD, MPH,‡‡‡ Steven V. Manoukian, MD,§§§ Spencer B. King III, MD,‖‖‖

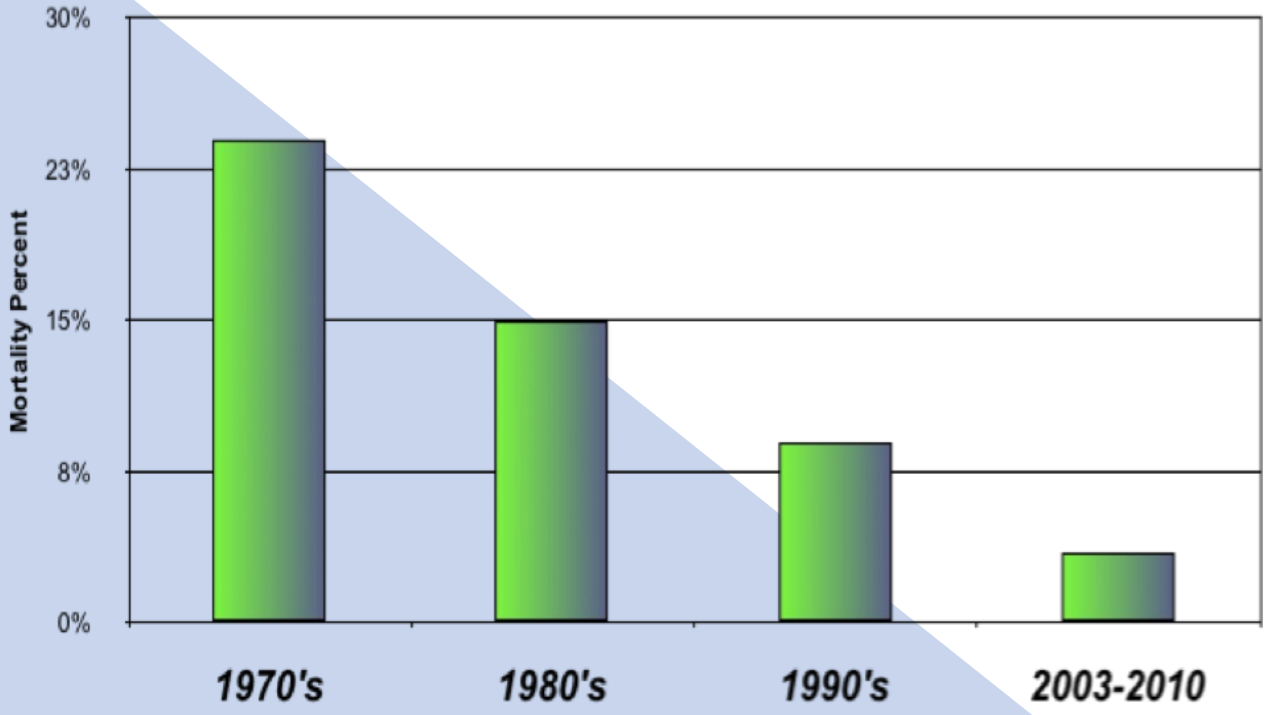


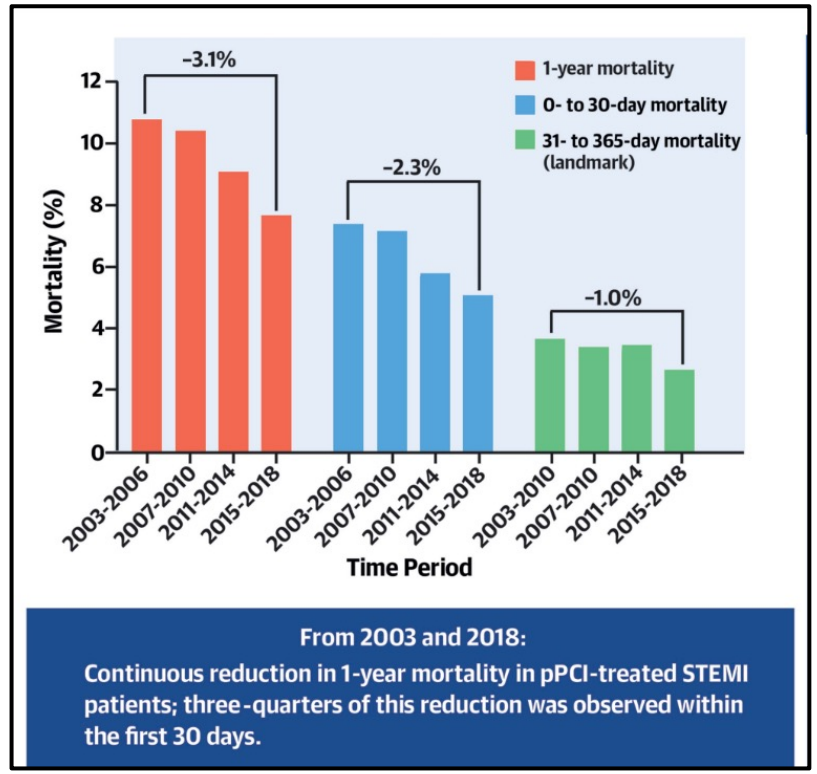




J. Am. Coll. Cardiol. Intv., April 2009; 2: 339 - 346

Historical trends in STEMI mortality





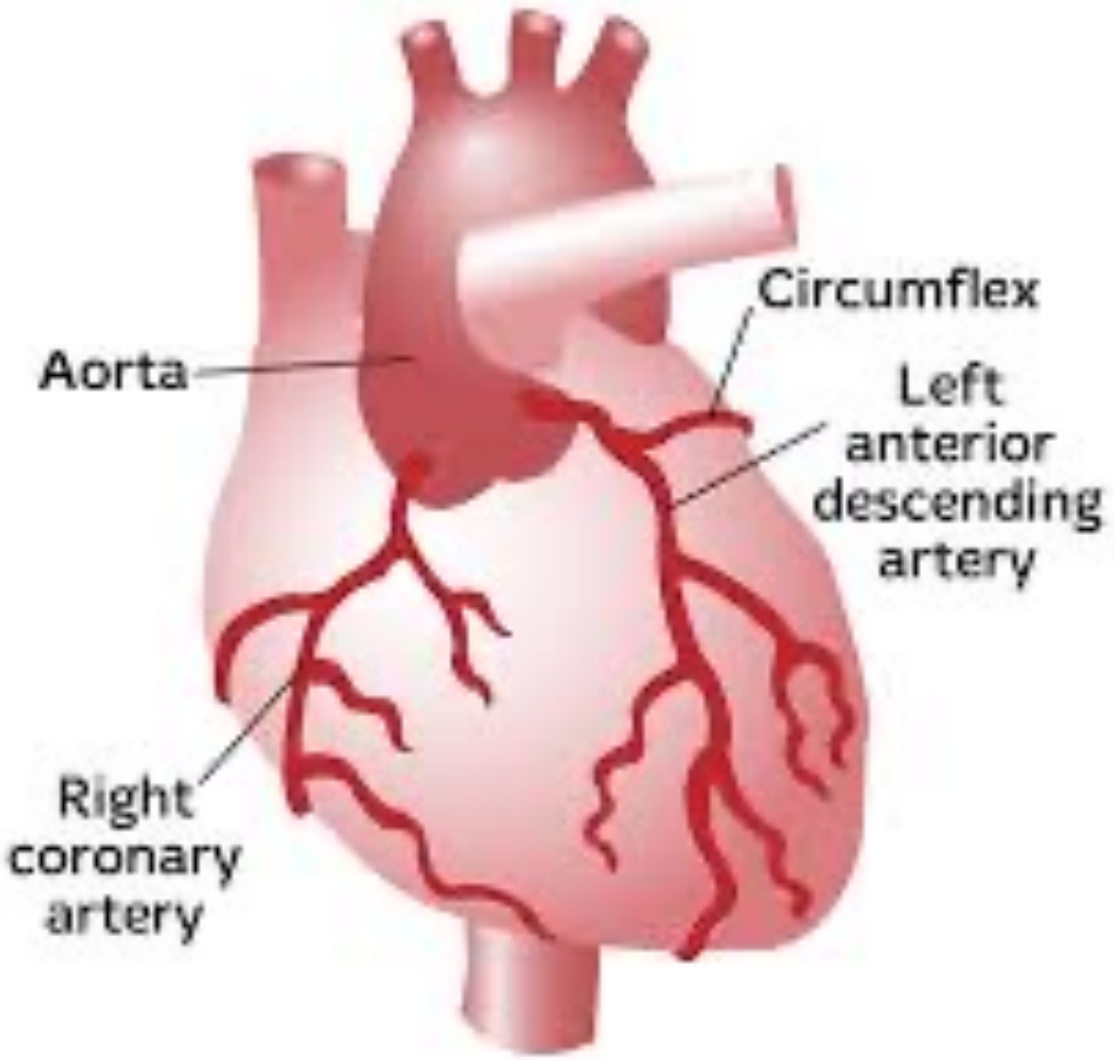
- Recent data suggest that 30d mortality after STEMI is 5-9%

- Patients that survived 90 days after MI and got appropriate guideline directed therapy, had 10-year mortality that was only 2% higher than that of a matched general population

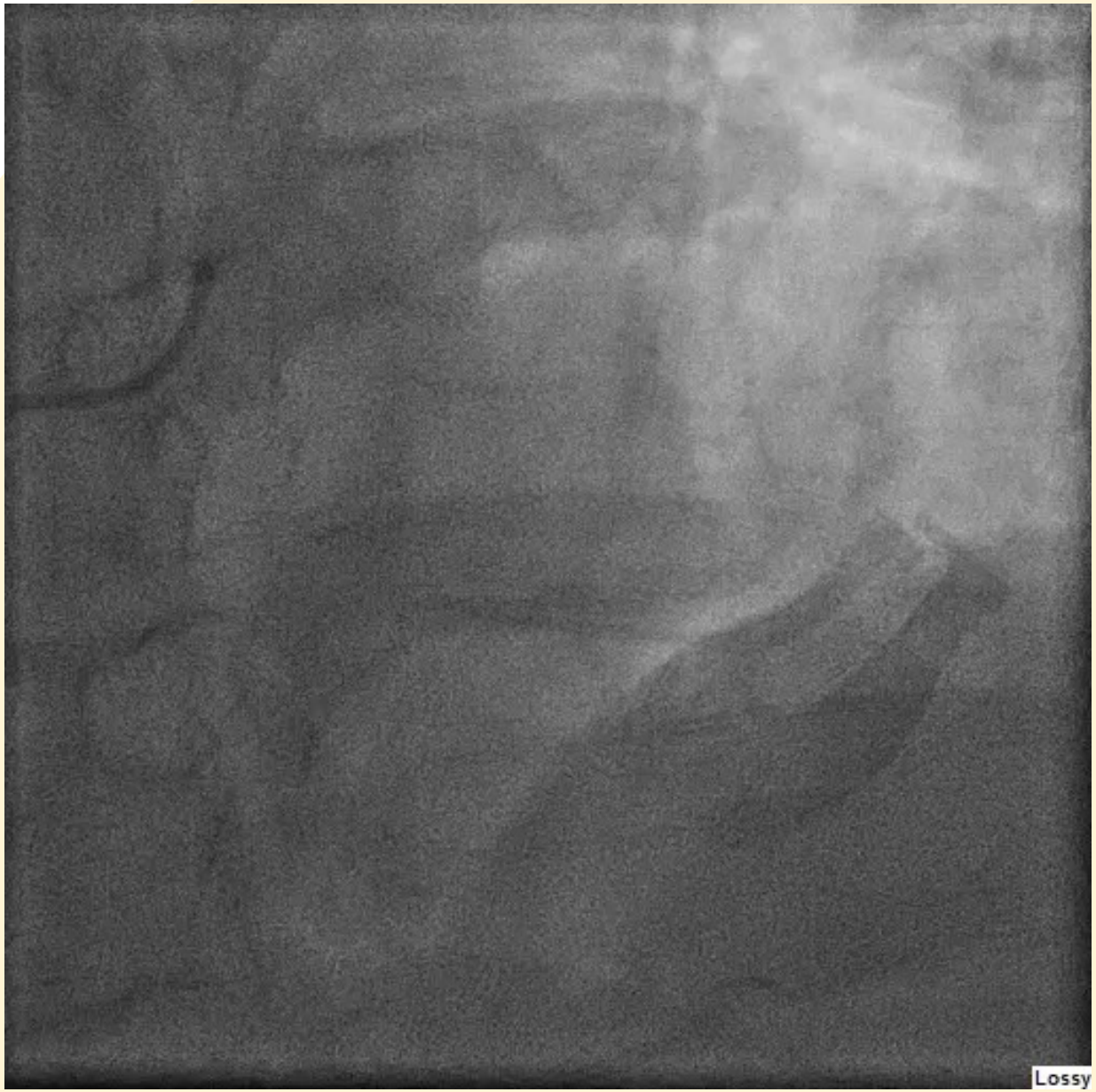
Back to our 68 year old retired mailman…

- EMS immediately recognize the ST elevations on EKG and activate a Code STEMI
- The RR ED, cath lab team, general cardiologist, and interventional cardiologist receive STEMI Blast Page

Coronary anatomy




Lossy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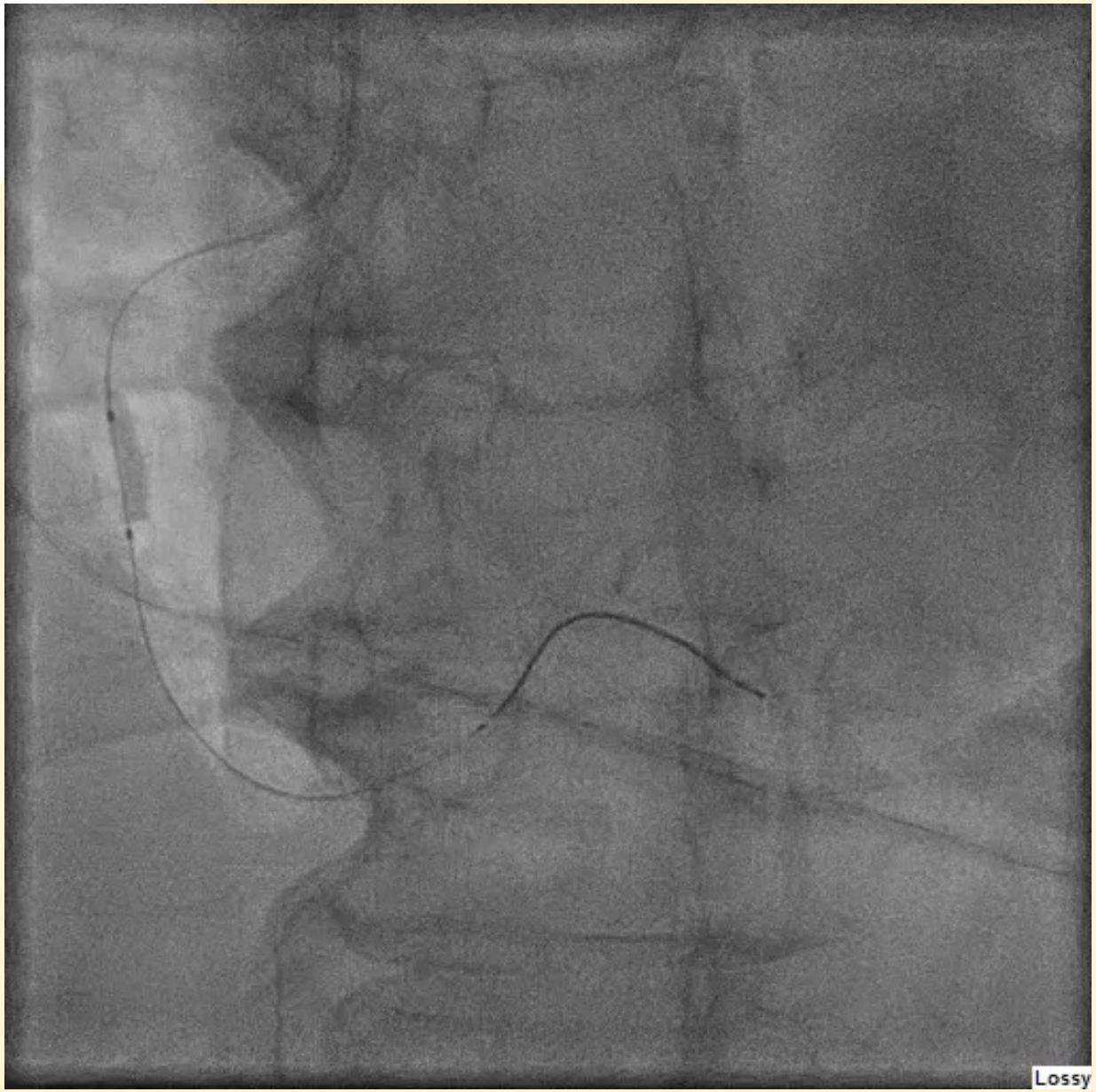
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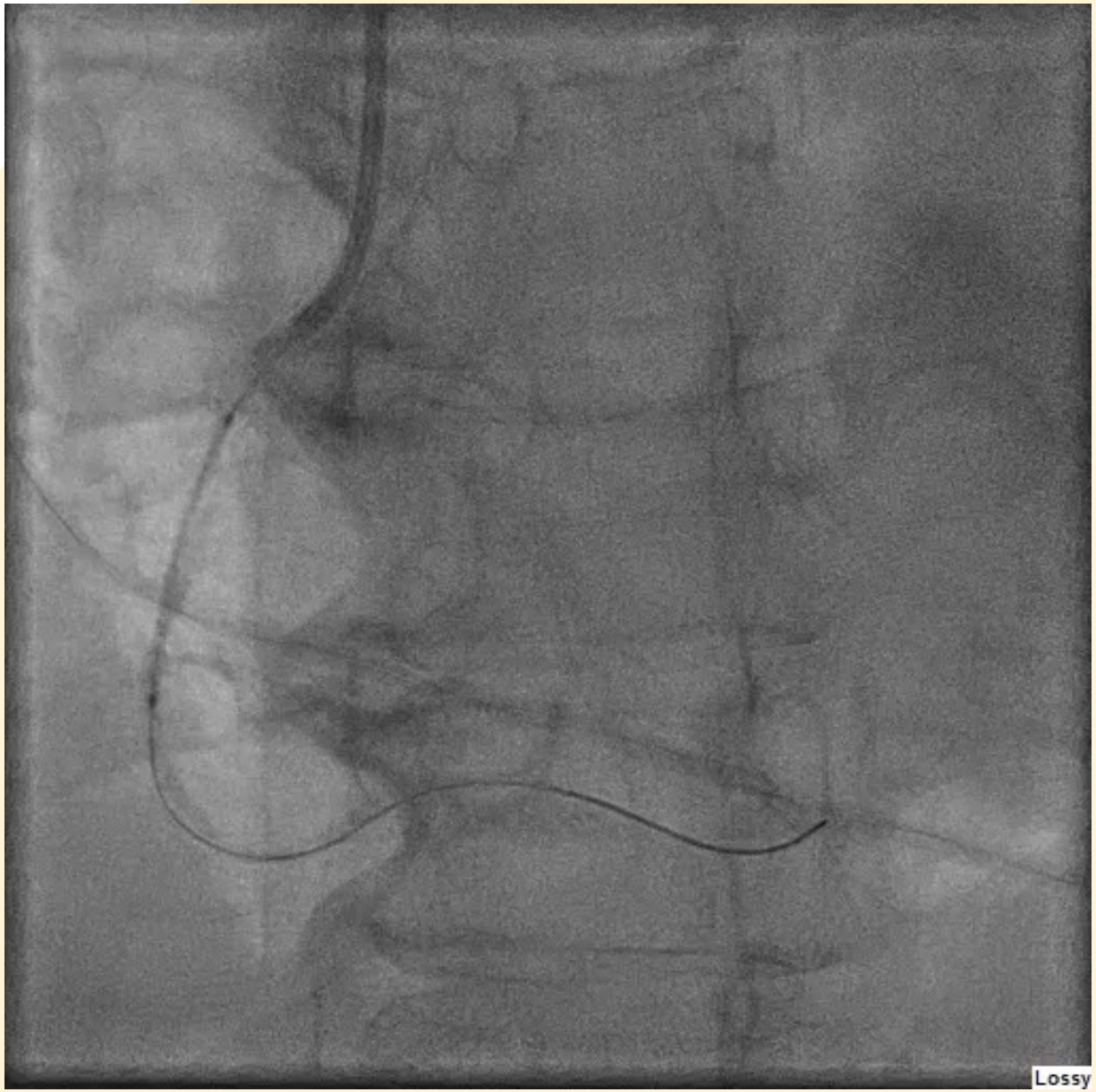
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Feedback and continuous efforts to improve

ASANTE®

The Joint Commission CERTIFICATION — American Heart Association — Primary Heart Attack Center

MISSION: LIFELINE®

STATE OF JEFFERSON STEMI System

STEMI Feedback Report

[redacted]

Indicator FMC = First Medical Contact PCI = Device/balloon	Actual time	Goal	Goal met
FMC to ECG time	5	≤10 minutes	👍
FMC to cleared scene time	10	≤15 minutes	Track Only
ECG to One-Call (ER Blast Pages) time	58	≤7 minutes	
FMC to Cath Lab time	90		
Cath Lab to PCI time (D2B)	13	≤30minutes	👍
FMC to PCI time	103	≤120minutes	👍

Pt C/C: This [redacted] told Dan & Shawn she "didn't feel good yesterday but today is when the pain really started. She was doing normal house chores when her arms felt numb and central chest pain began with radiation to her back and neck." She was visibly in severe distress, very restless with 10/10 chest pain and cool, diaphoretic skin signs. She has a history of oxygen-dependent COPD with chronic hypoxic respiratory failure & ongoing smoking, obesity, and HTN.

ECG: She is having a large inferolateral wall infarction with massive ST elevation leads II, III, & aVF extending to leads V4-V6 (red circles), with reciprocal ST depression nearly all other leads.

Cath Lab findings: Dr. Corley & team found an occluded mid RCA (red arrow).

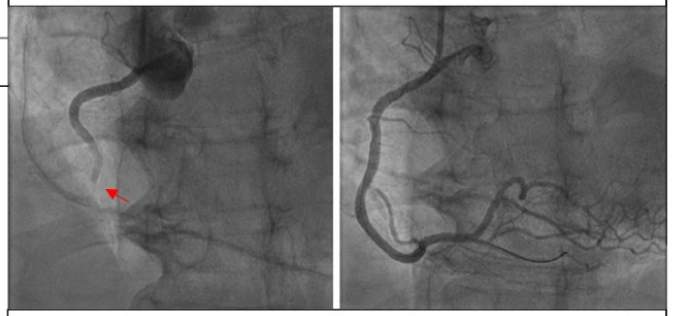
Treatment: Dr. Corley & team deployed a 3.5 x 28 mm stent reperfusing her large RCA (right picture). The cath team were challenged with her being in cardiogenic shock requiring dopamine then norepinephrine, then a right heart cath which showed signs of right ventricular (RV) failure. Fortunately her RV failure recovered 12 hours later with her echo showing basal inferior/inferolateral wall motion abnormalities but preserved EF 70%. She had several

[redacted]

Excellence: Great work STEMI team!

Recommendations: For transports > 45 minutes, we are given 120 total minutes. This transport was 66 minutes.

Angiogram showing blockage | Post-stent blood flow



STEMI team: EMS: AMR: Dan Hunt, Shawn King

ED: Matt Moxley, Faith Akers, Taylor Cook

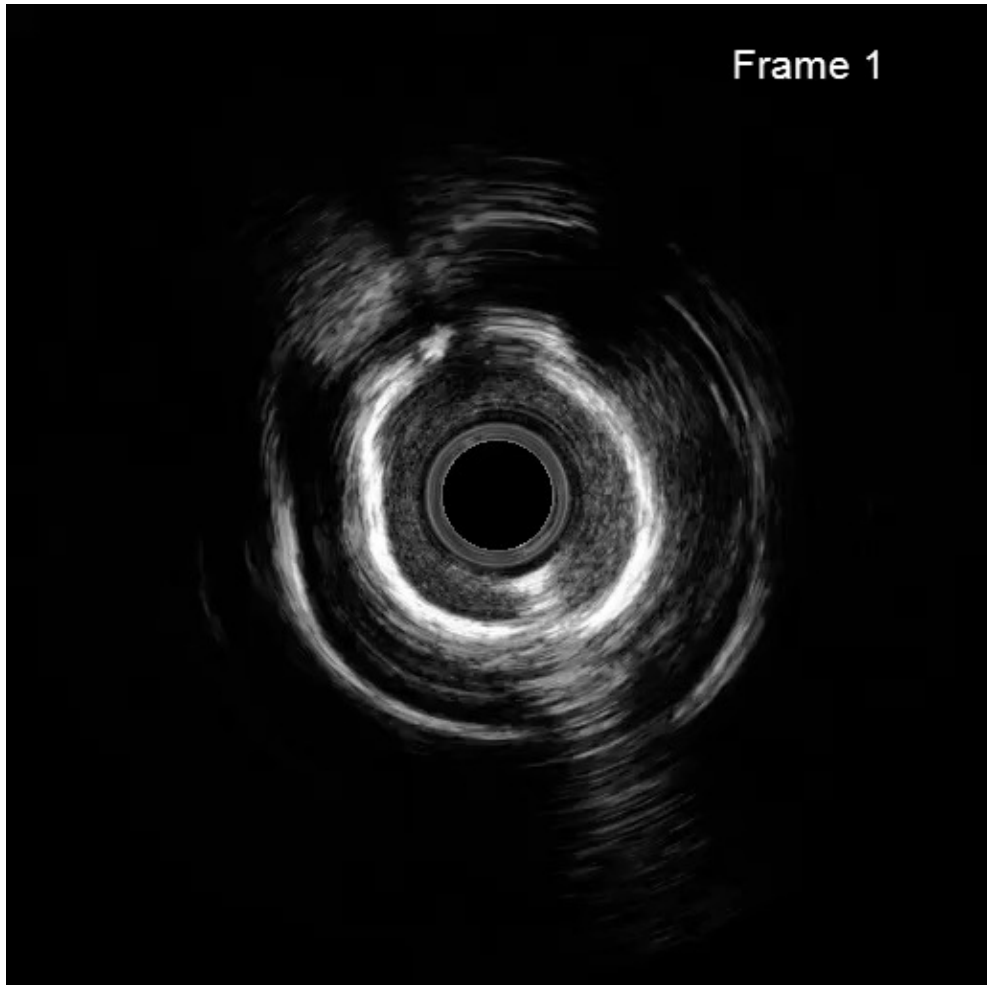
Cardiology: Dr. Geisen, Dr. Corley

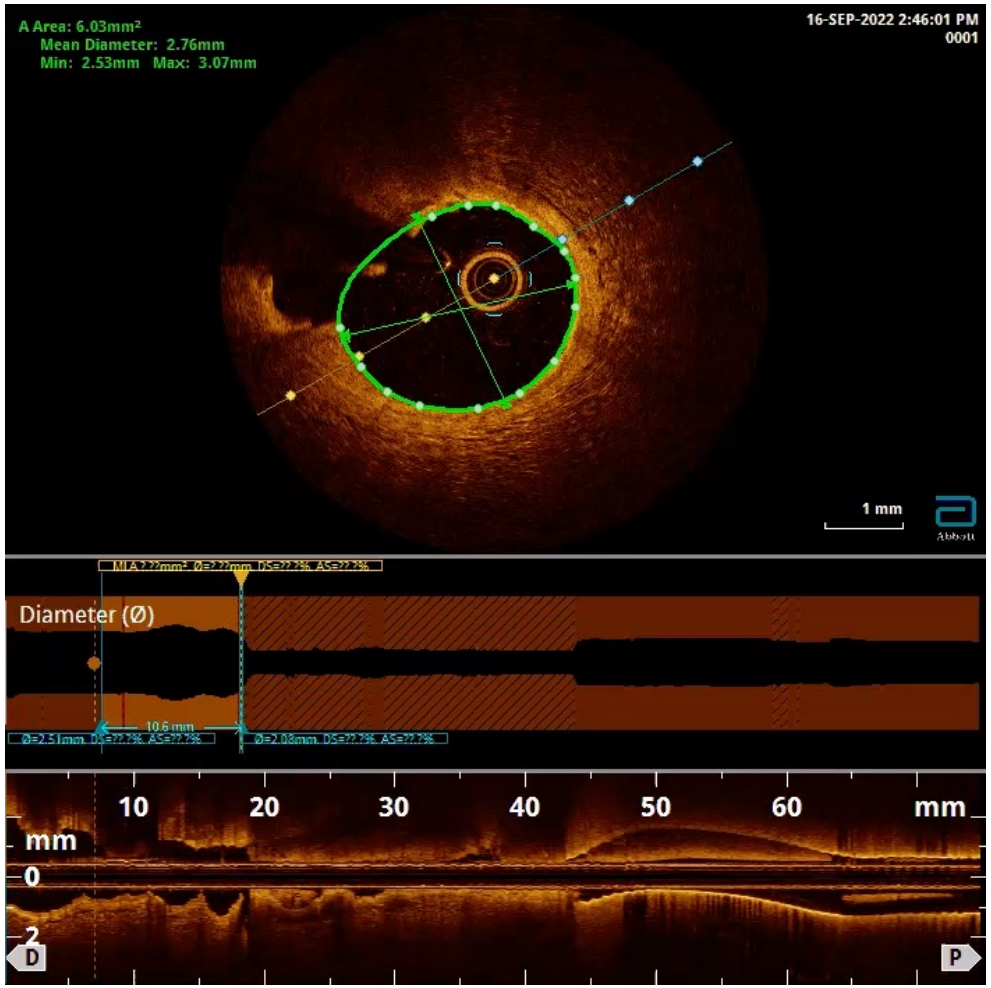
Cath Lab: Jer Middleton, DQ Bardwell, Olivia Rhein, Cody Wright

We're supplying this feedback to optimize our coordinated team response for every STEMI patient. Thank you for your ongoing effort to provide quick and excellent care to our STEMI patients. *Sincerely, Dr. Brian Gross, Dr. Kent Dauterman and Daniel Moore, RN, – our STEMI Program medical directors & nurse coordinator. DWM 11/23*

Percutaneous coronary intervention today

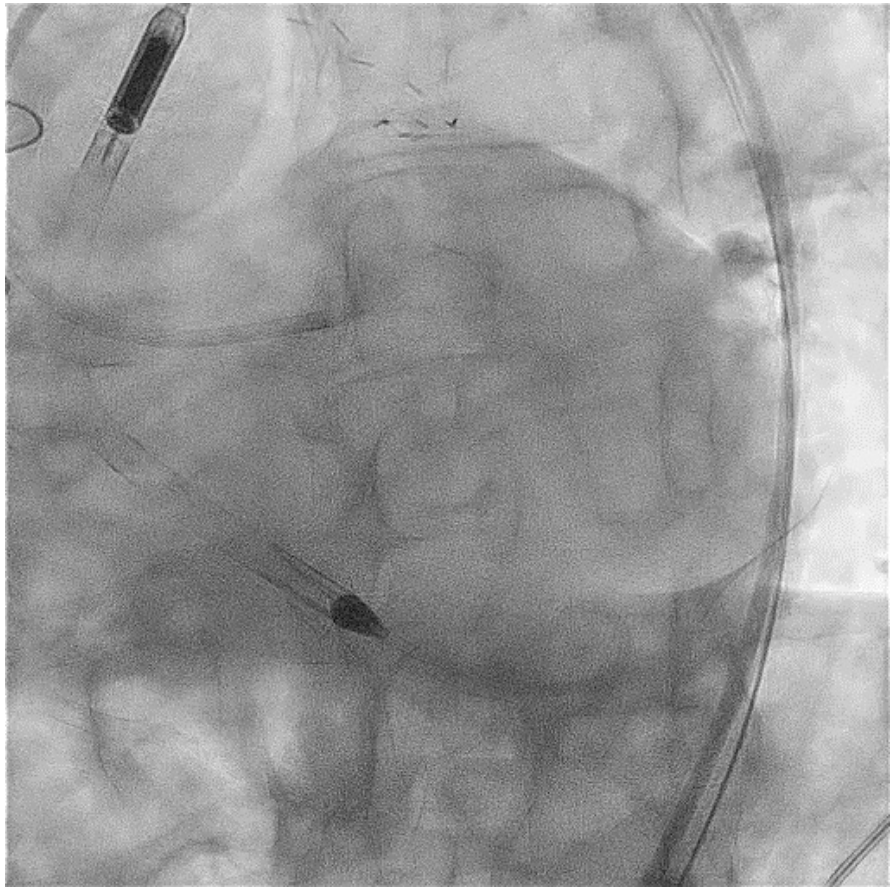
Intravascular imaging

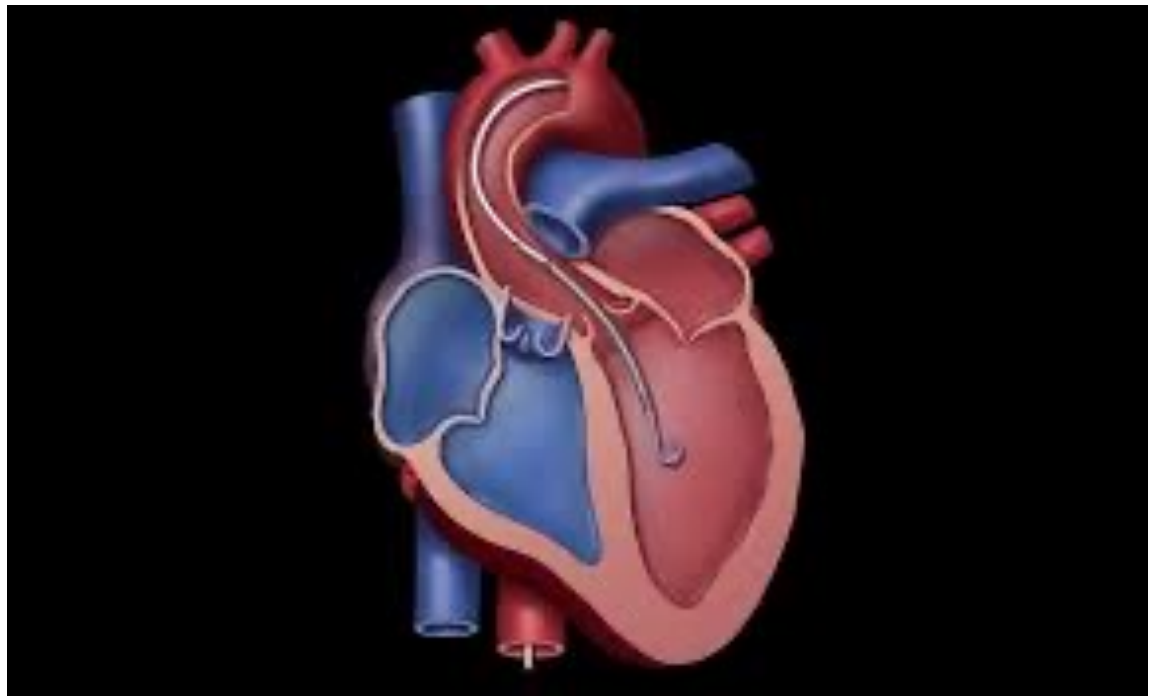




Percutaneous coronary intervention today

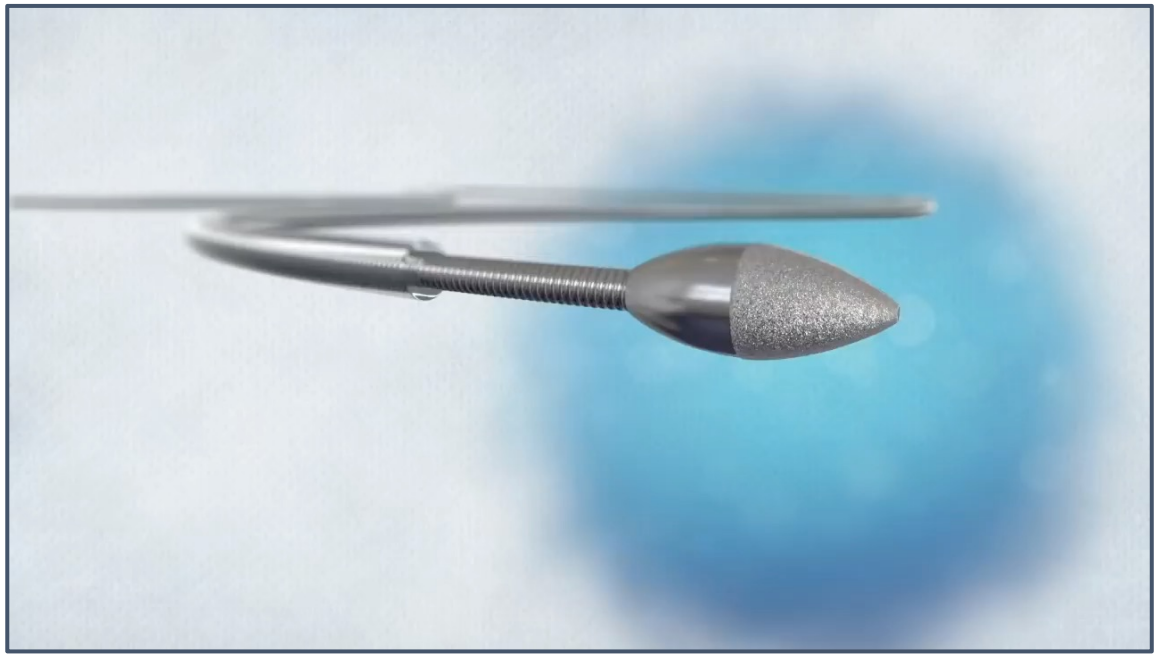
Mechanical circulatory support devices



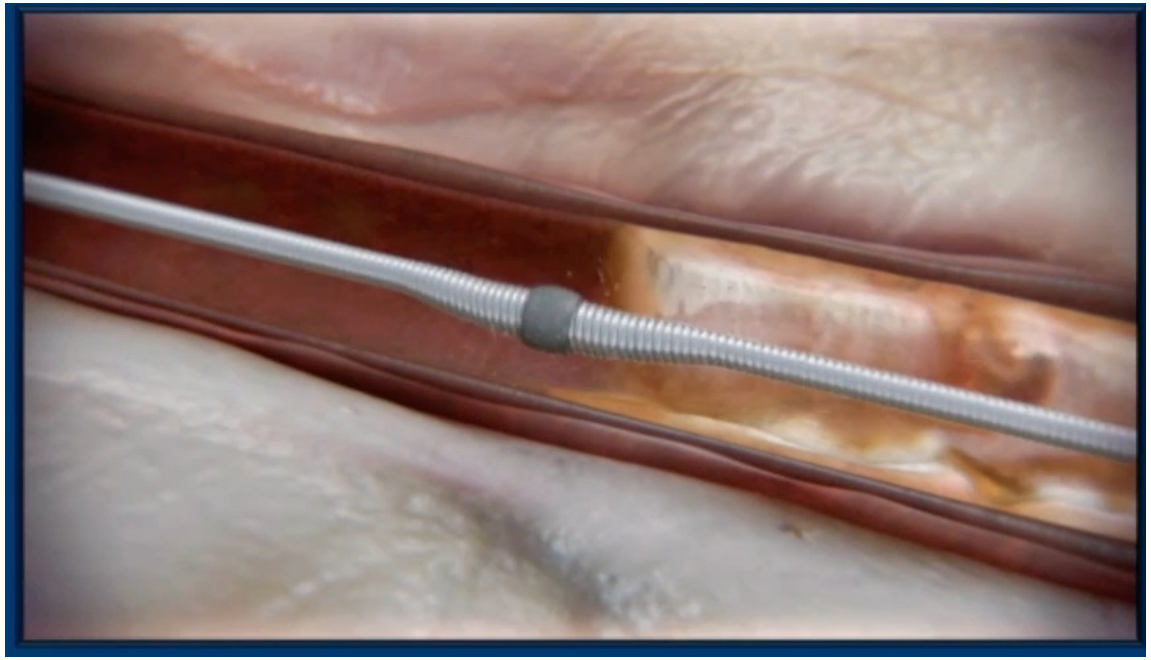


Percutaneous coronary intervention today

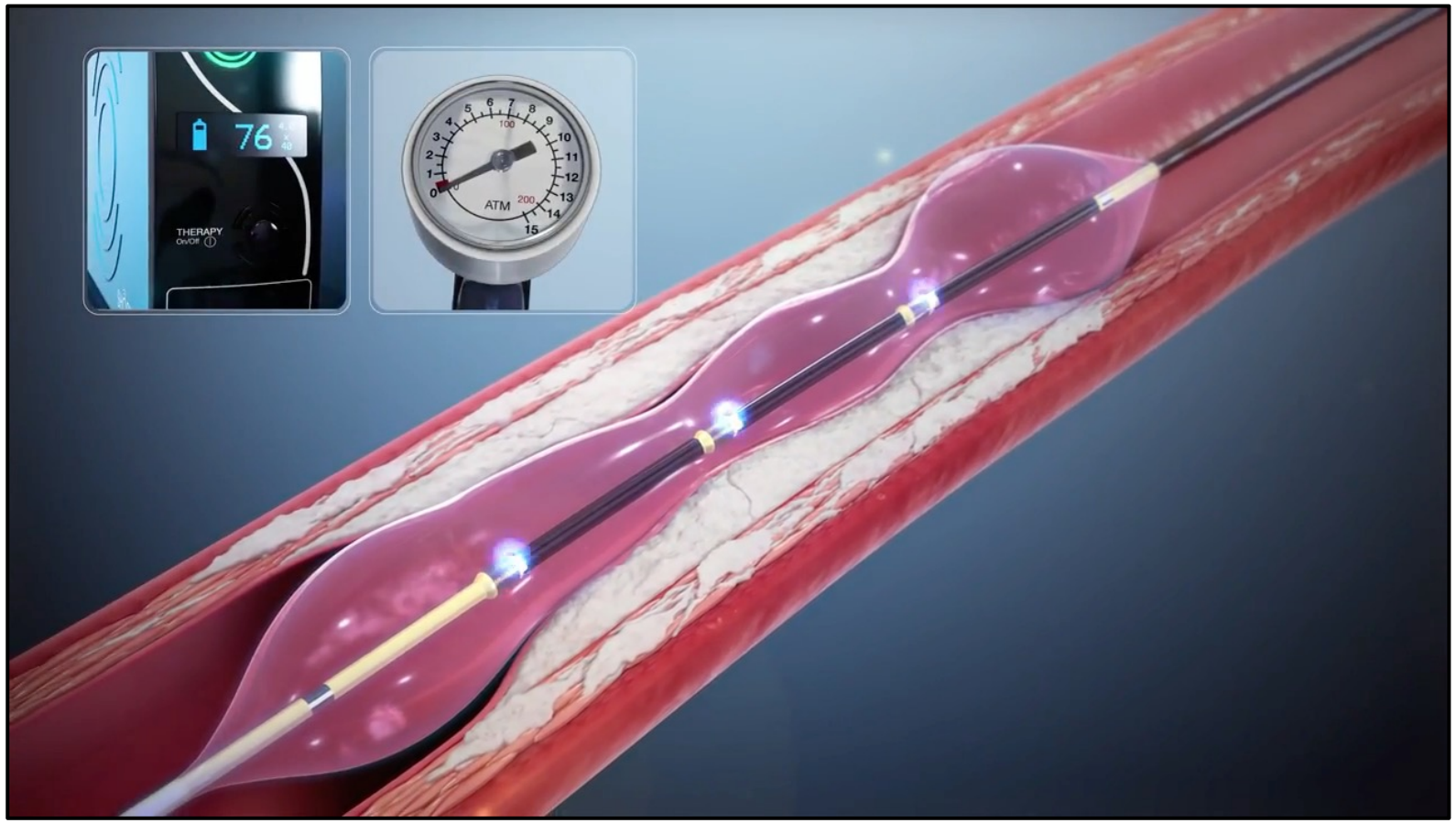
Calcium modification



Courtesy of Boston Scientific



Courtesy of Cardiovascular Systems, Inc.



Courtesy of Shockwave Inc.

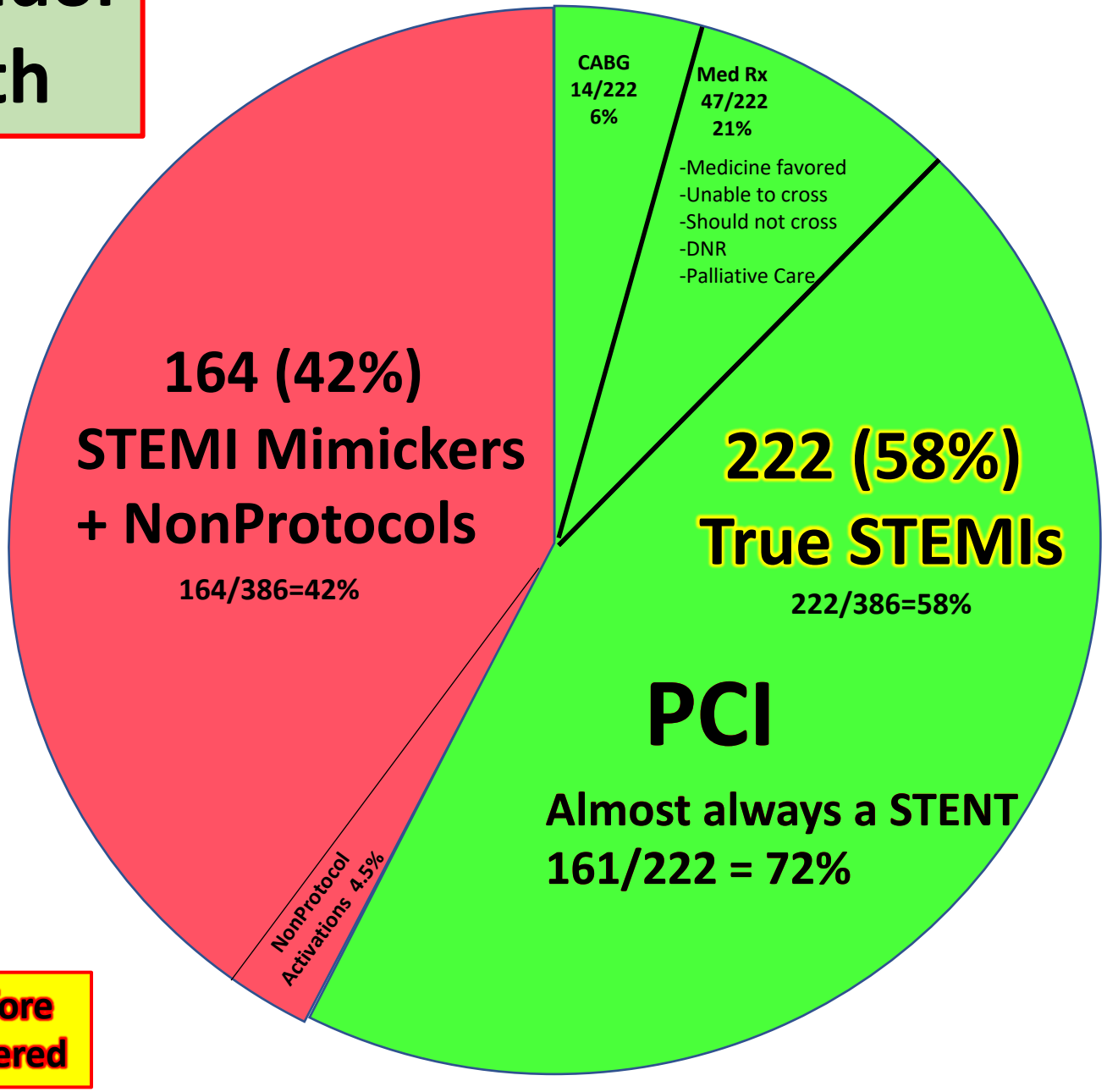
#355 I-5 Corridor Emergent Cath

386 Total STEMI Activations for 2024

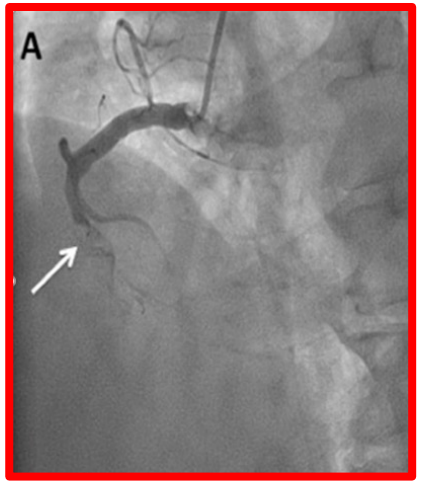
588 Total PCI

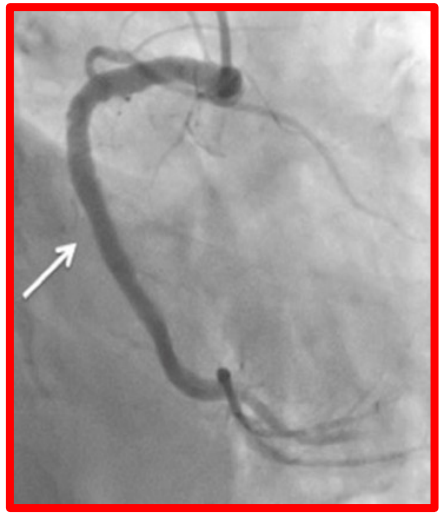
#31 non-I-5 Corridor TNKase followed by cath

In addition, 16 STEMI mimicker activations were NSTEMI patients who went emergently to the cath lab:
- 9 PCI
- 4 CABG
- 3 Med Rx



5 died before care delivered





ARRMC 2024


Thank you!