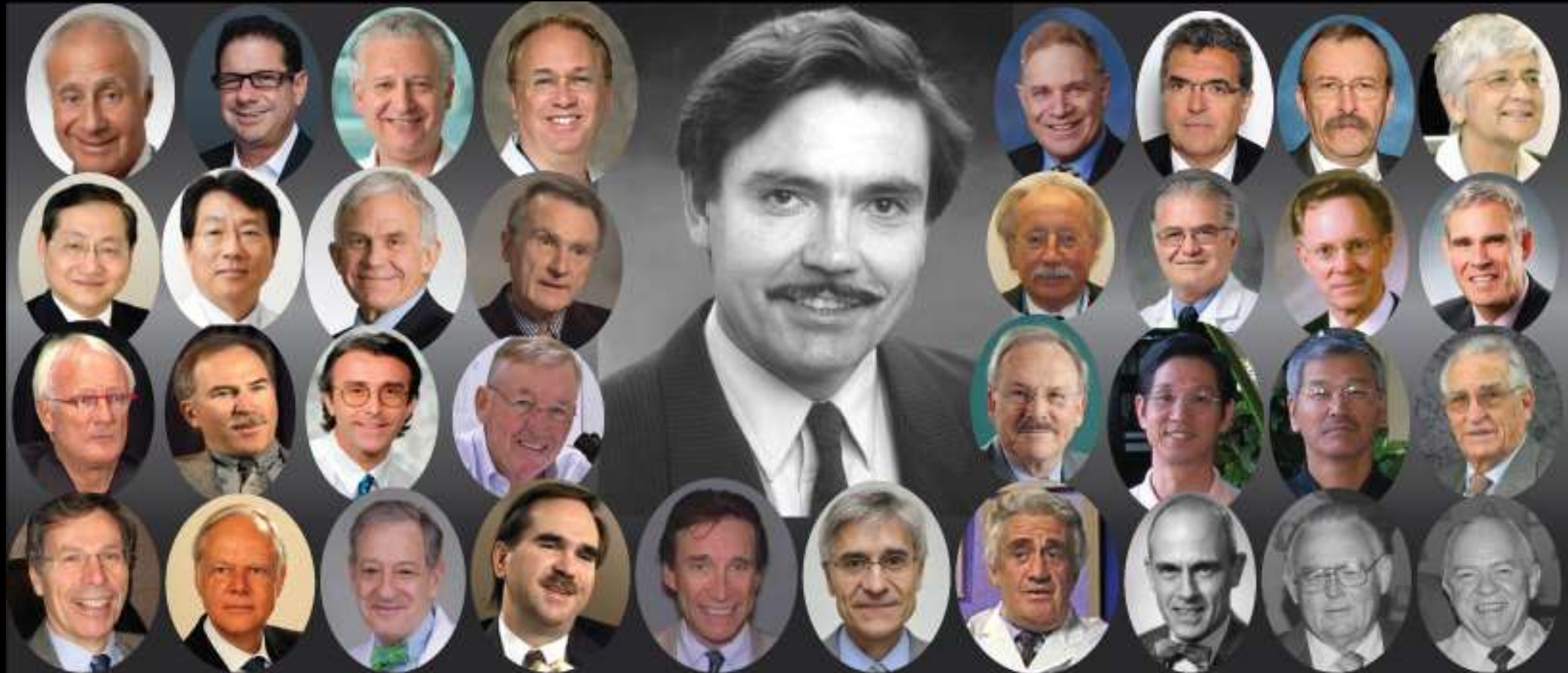


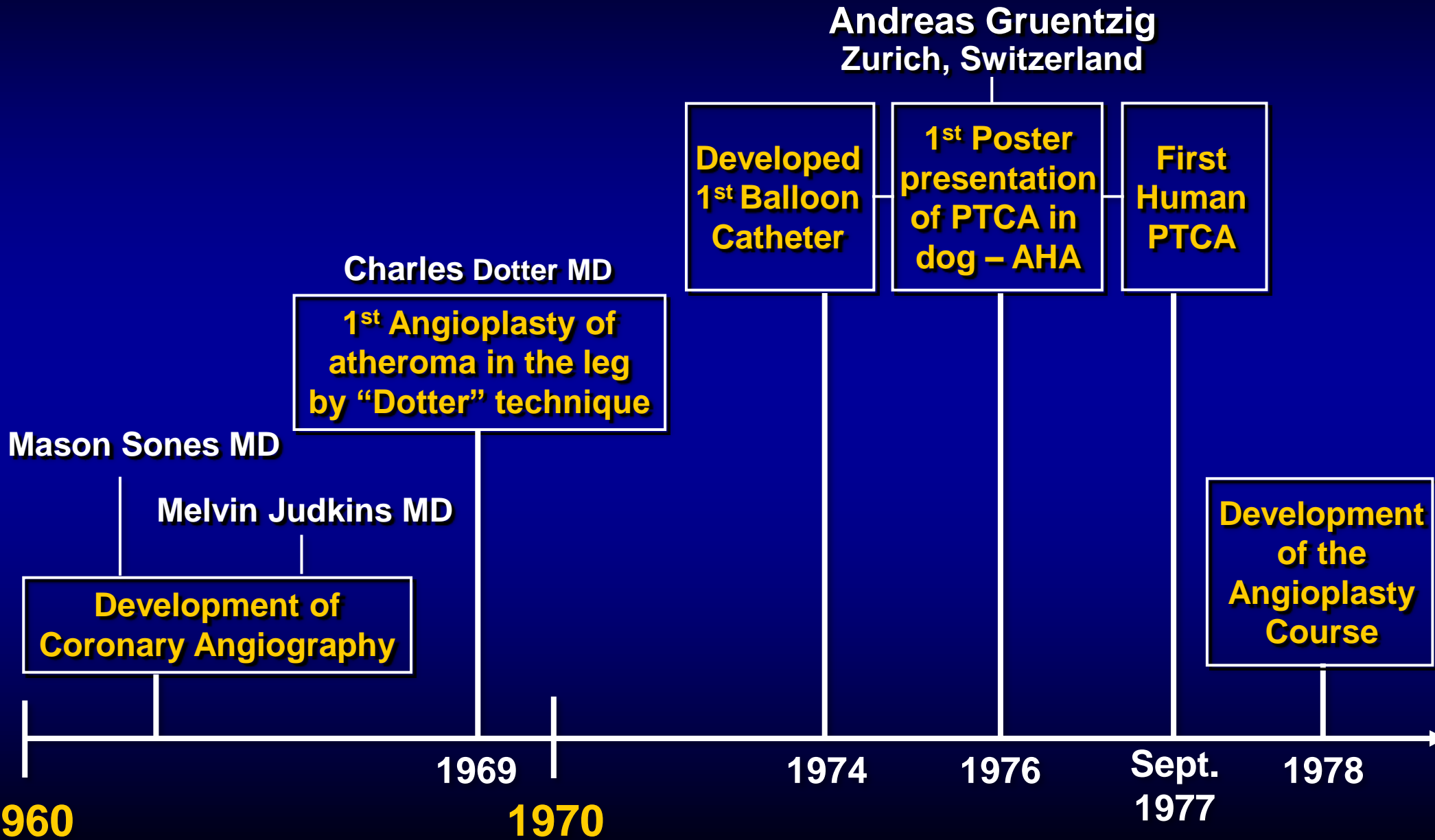
A Brief History of Angioplasty: Evolution of an Art

Barry D. Rutherford MD • TCT AP 2016

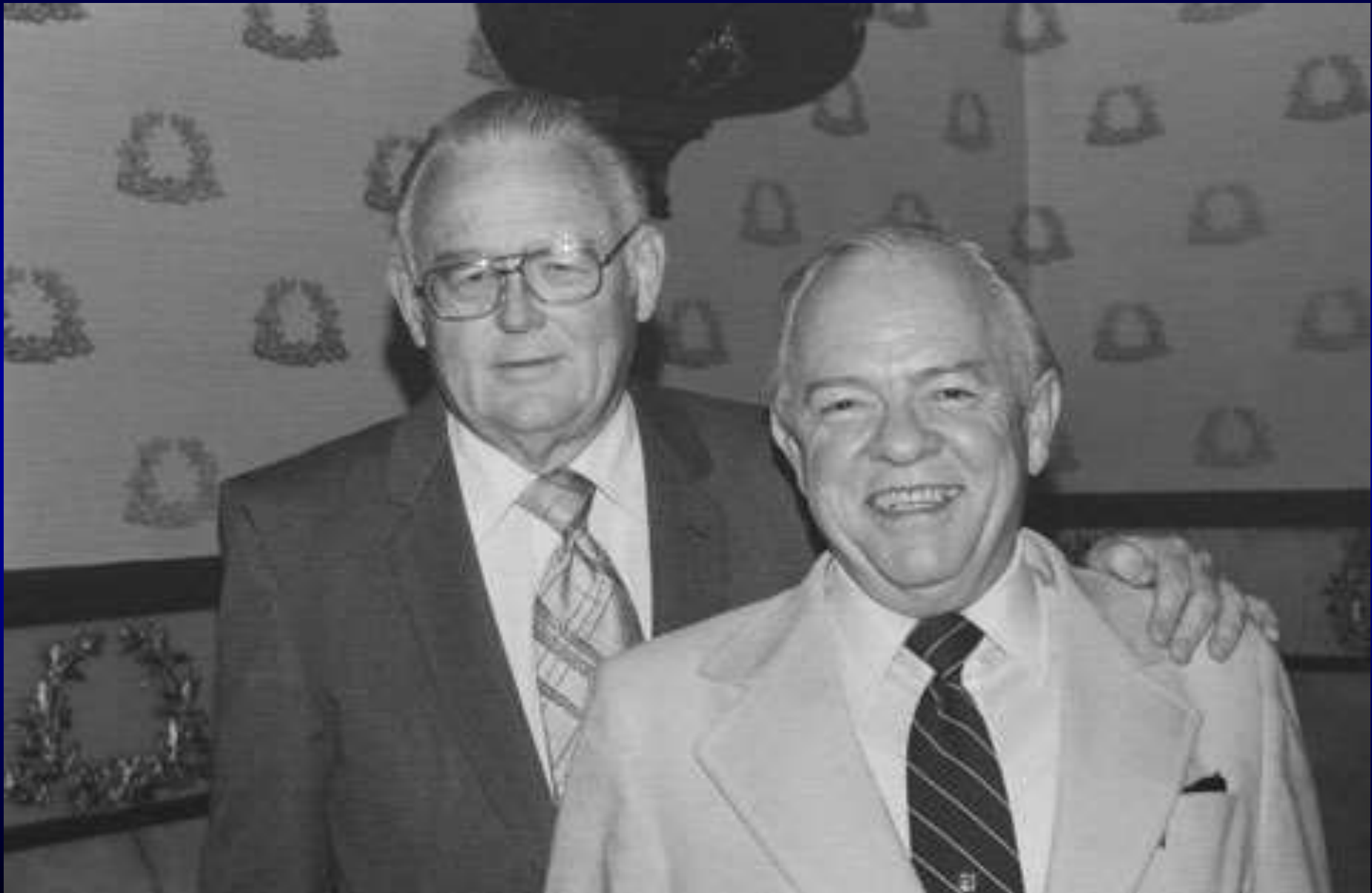


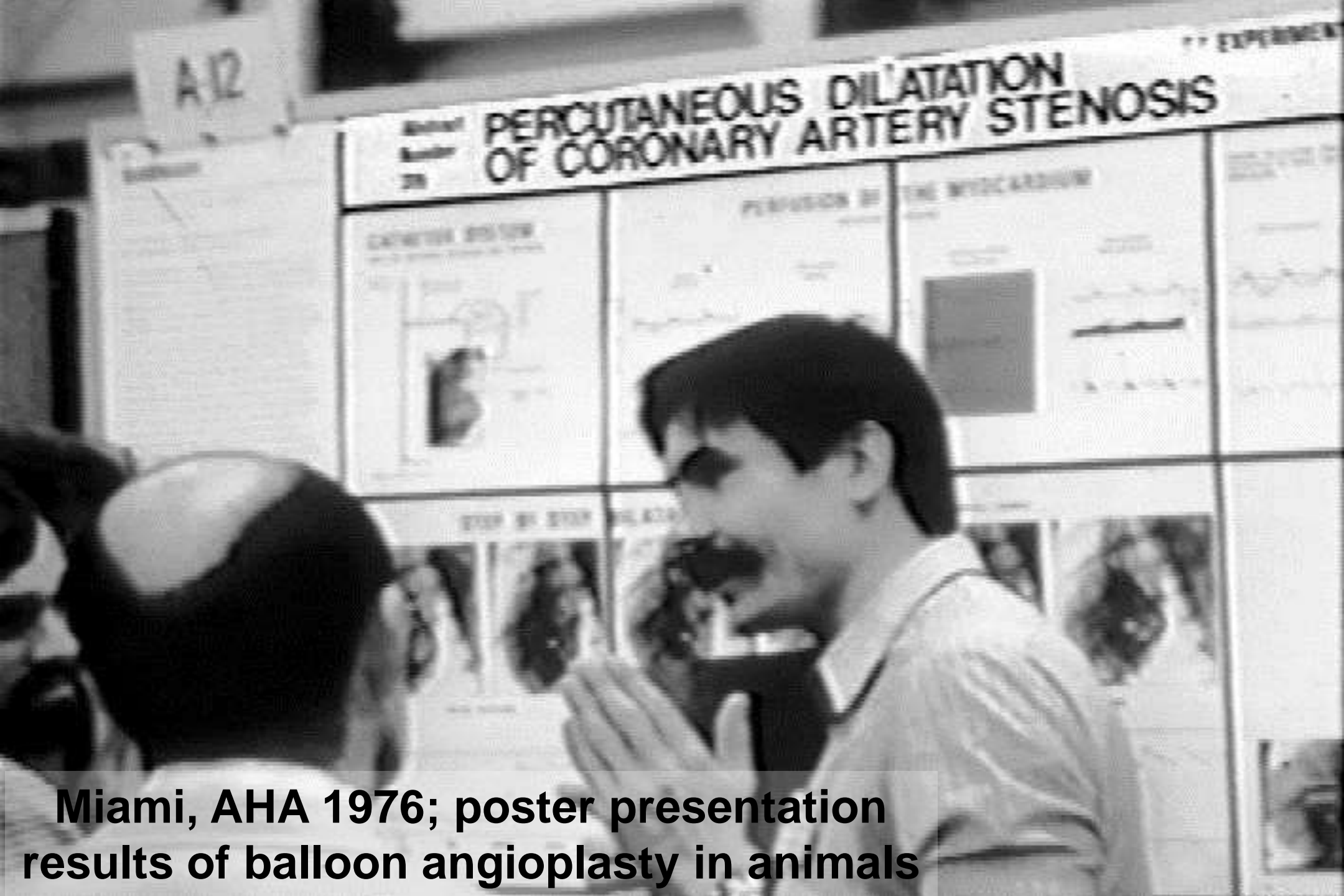
“We Stand on the Shoulders of Giants”

Time Lines in Angioplasty



Melvin Judkins and Mason Sones








A12

Abstract
Number
20

PERCUTANEOUS DILATATION OF CORONARY ARTERY STENOSIS

EXPERIMENTAL

<p>EXPERIMENTAL DESIGN</p> 	<p>PERCUTANEOUS DILATATION</p> 	<p>THE MYOCARDIUM</p> 
--	--	---

<p>STEP BY STEP</p> 	<p>RESULTS</p> 	<p>CONCLUSIONS</p> 
--	---	---

Miami, AHA 1976; poster presentation results of balloon angioplasty in animals

Adolph Bachman

First Angioplasty Patient; September 1977



G.R. 46-Year-Old Male, Rhodes Scholar Director – IMF, Washington, DC

January 1982: Onset of typical angina
progressive course, developing rest
and nocturnal pain

Risk Factors: Strong FH of CAD;
Heavy cig intake; Chol 240, HDL 30

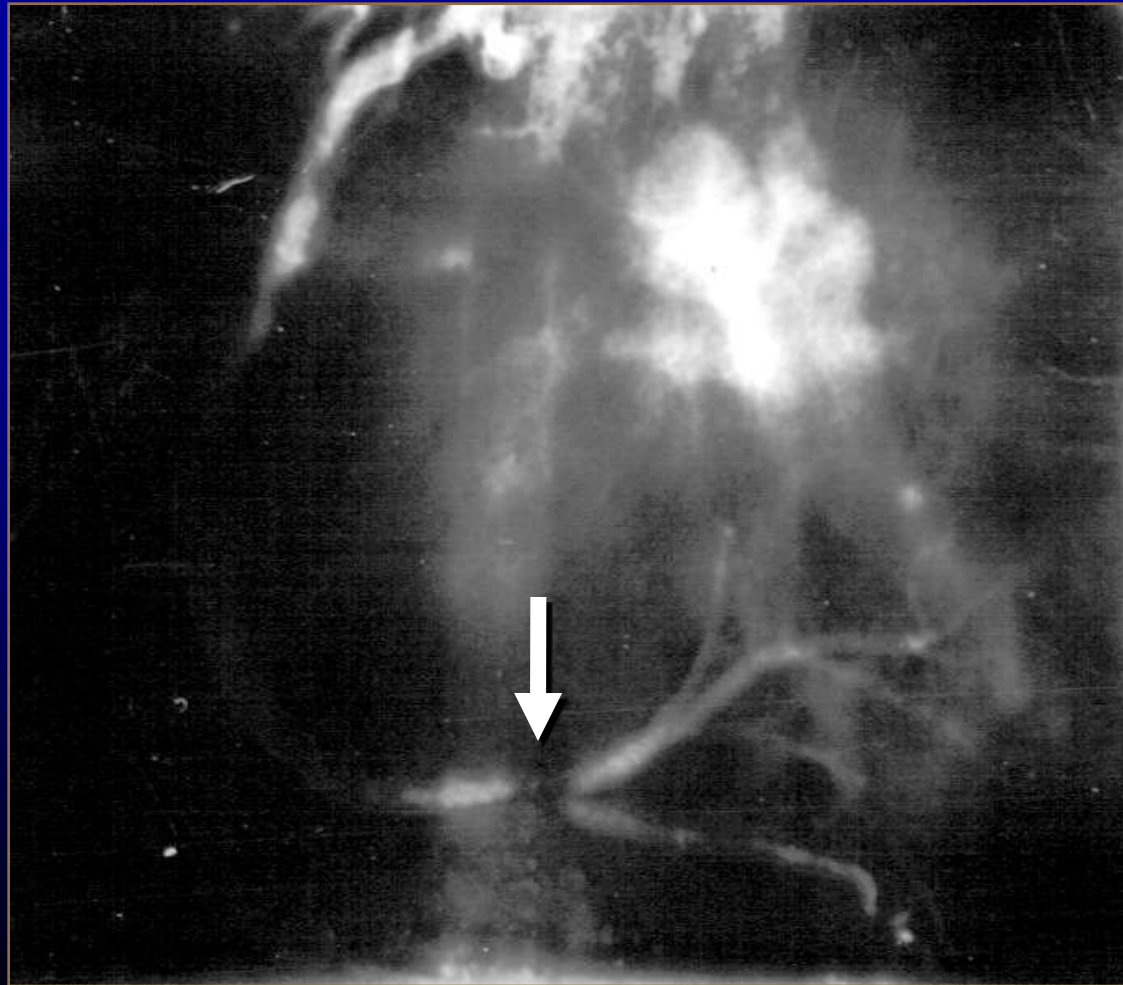
Medications: Inderal, NTG

ECG: WNL

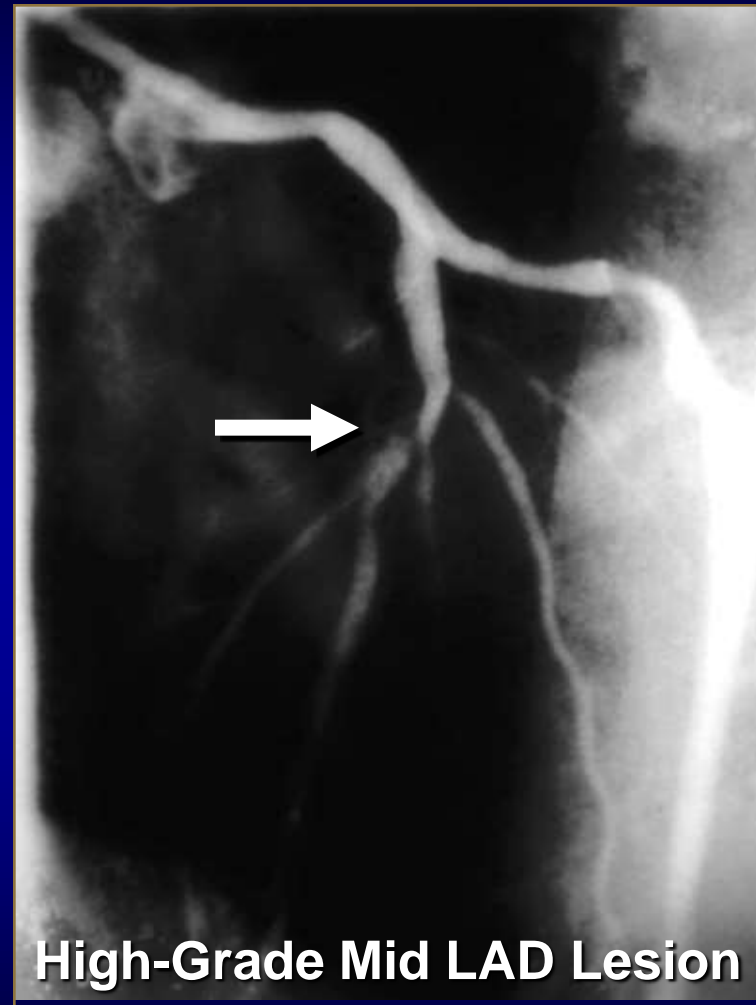
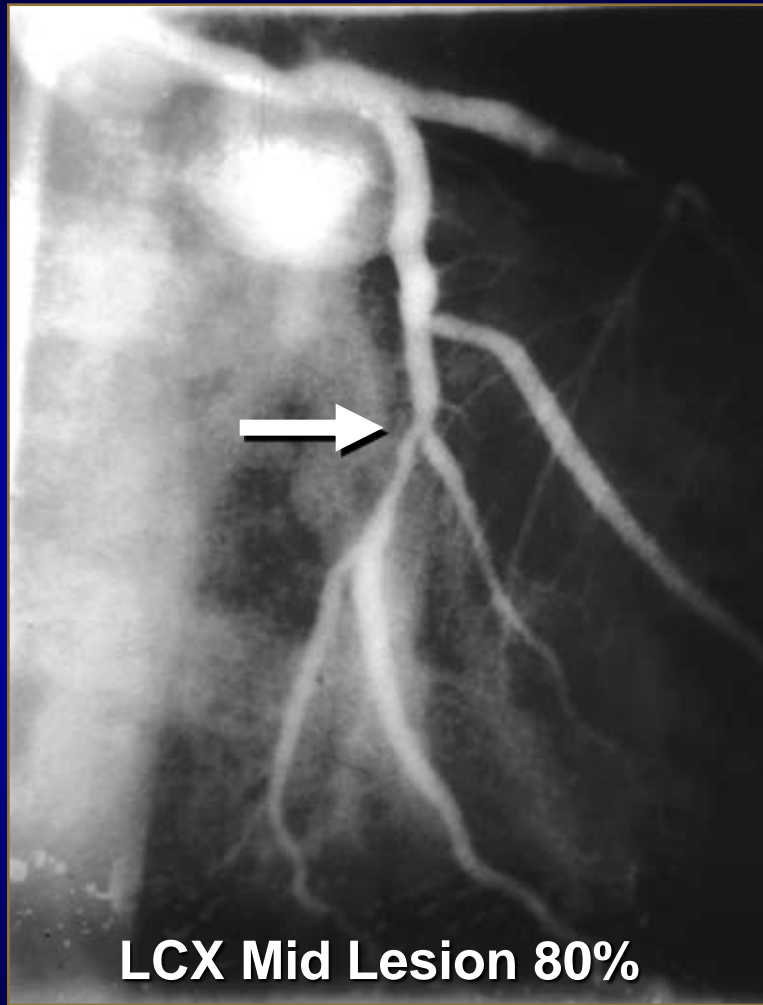
Cor Angio LVEDP – 10 mm Hg; EF 60%

March 1982:

G.R. March 1982
RCA High Grade Distal Disease



G.R. March 1982; Coronary Angiogram



What Interventional Techniques were available at that time?

Time Lines in Angioplasty

Geoffrey Hartzler MD
David MaConahay MD
Barry Rutherford MD

Mid America Heart Institute

First 300 PTCAs

Multiple Vessel PTCA.
PTCA in Acute
Myocardial Infarction

MAHI Angioplasty
Teaching Courses

Loss of
Gruentzig
Sones
Judkins
Dotter

Richard Myler MD
Simon Sertzer MD

First PTCA
in the USA

New Device Era

- Rotablator
- Laser
- Atherectomy Catheter
- Initial Stent Development
- IVUS
- Radiation Therapy
- New DES
- Biodegradable Stents

1980

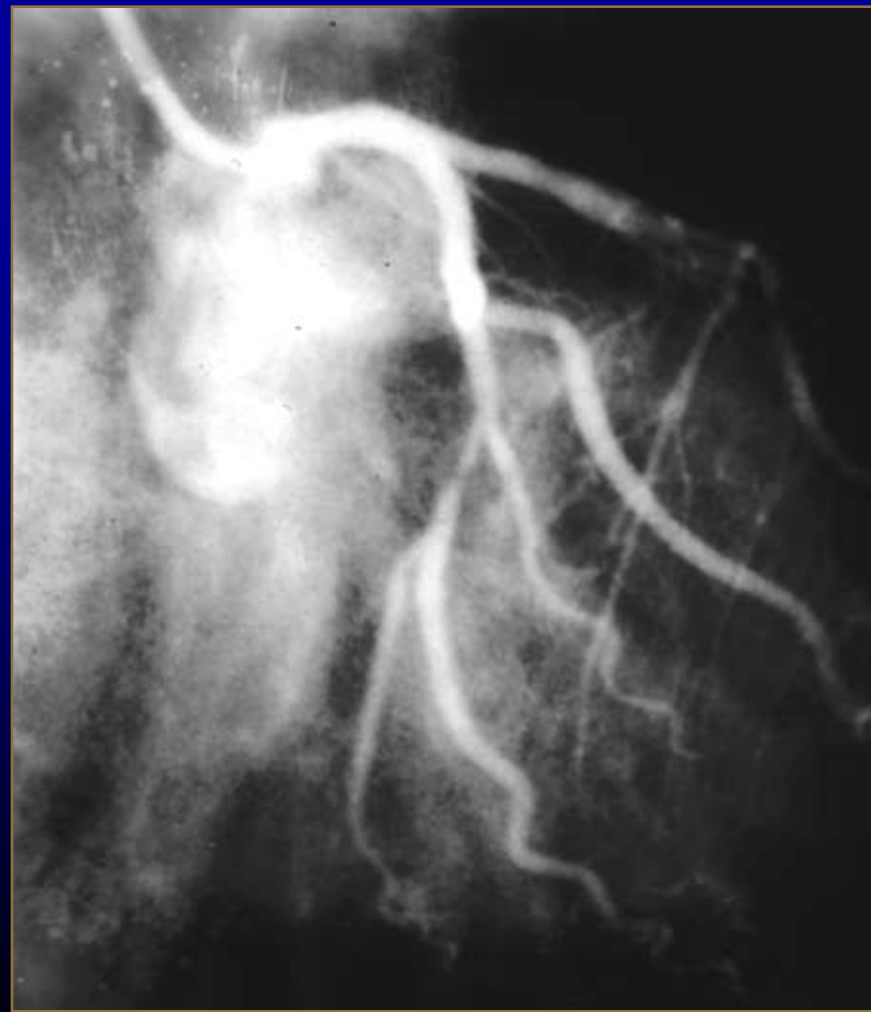
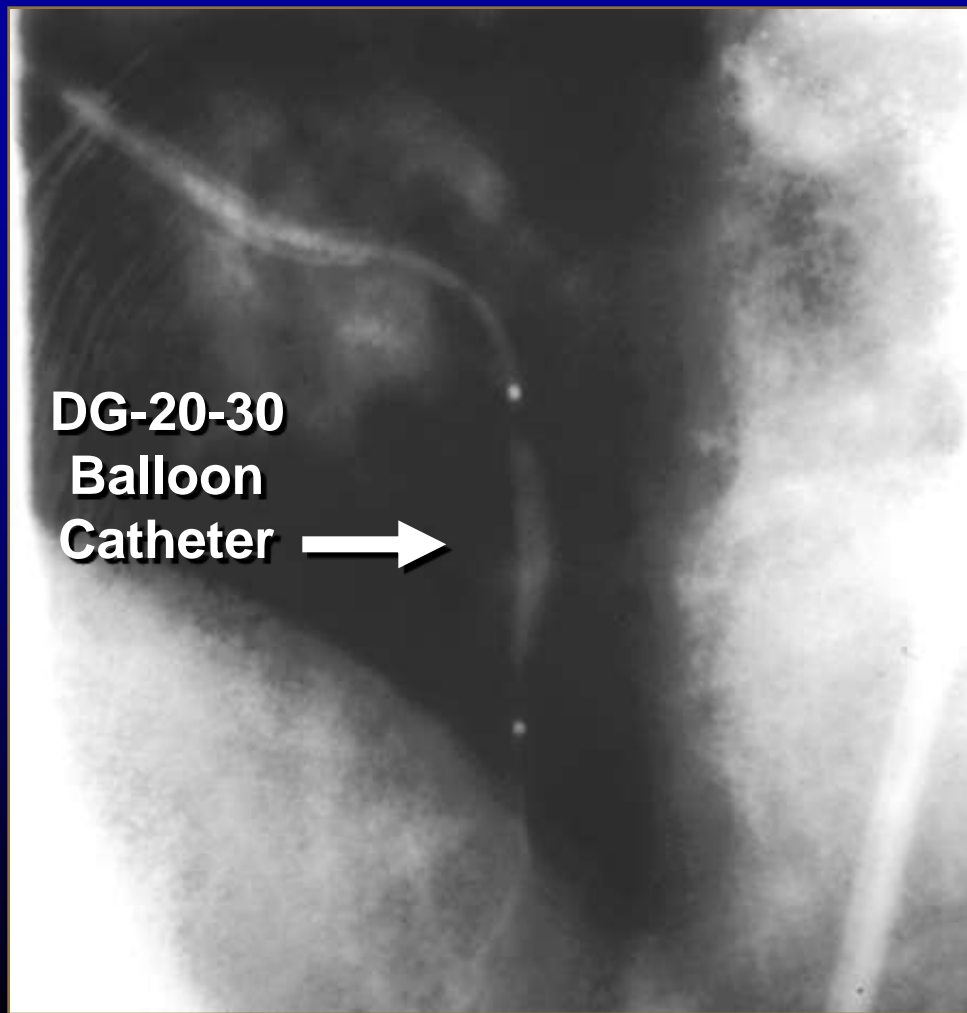
1982

1985

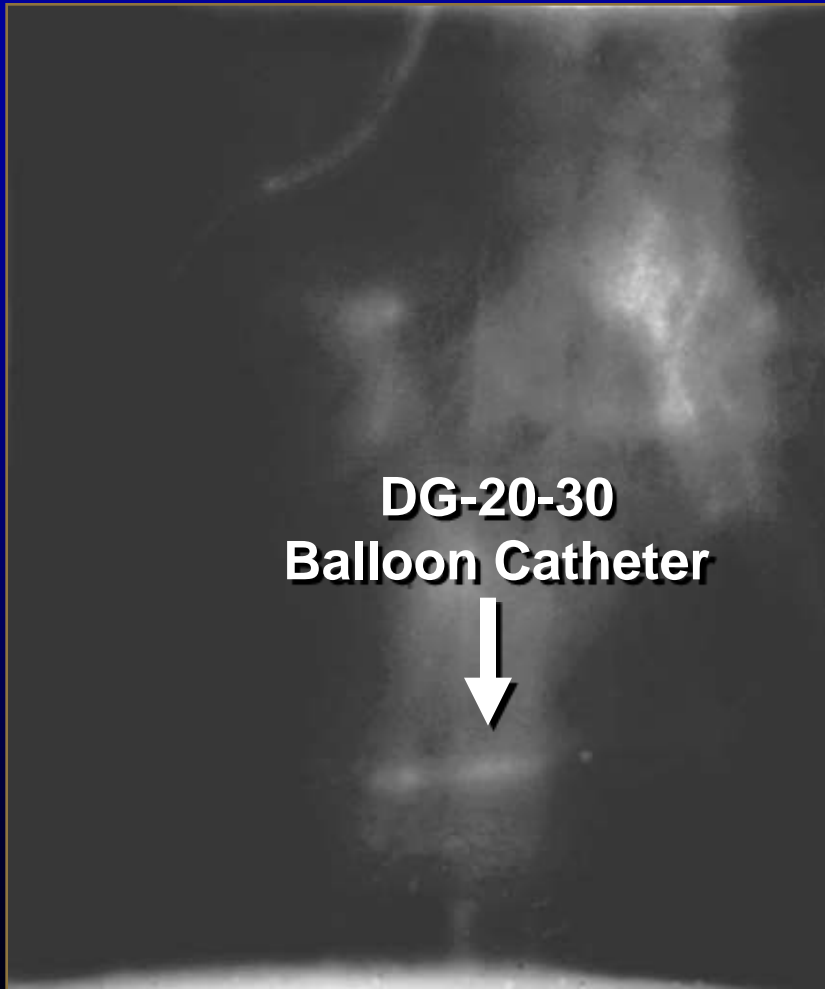
1989

2016

G.R. March 1982: Successful PTCA of LAD Unable to Cross LCX Lesion



G.R. March 1982: Successful PTCA of RCA-PL



***“A great teacher never strives to explain his vision:
he simply invites you to stand beside him and see for yourself”***

Rev. R. Inman

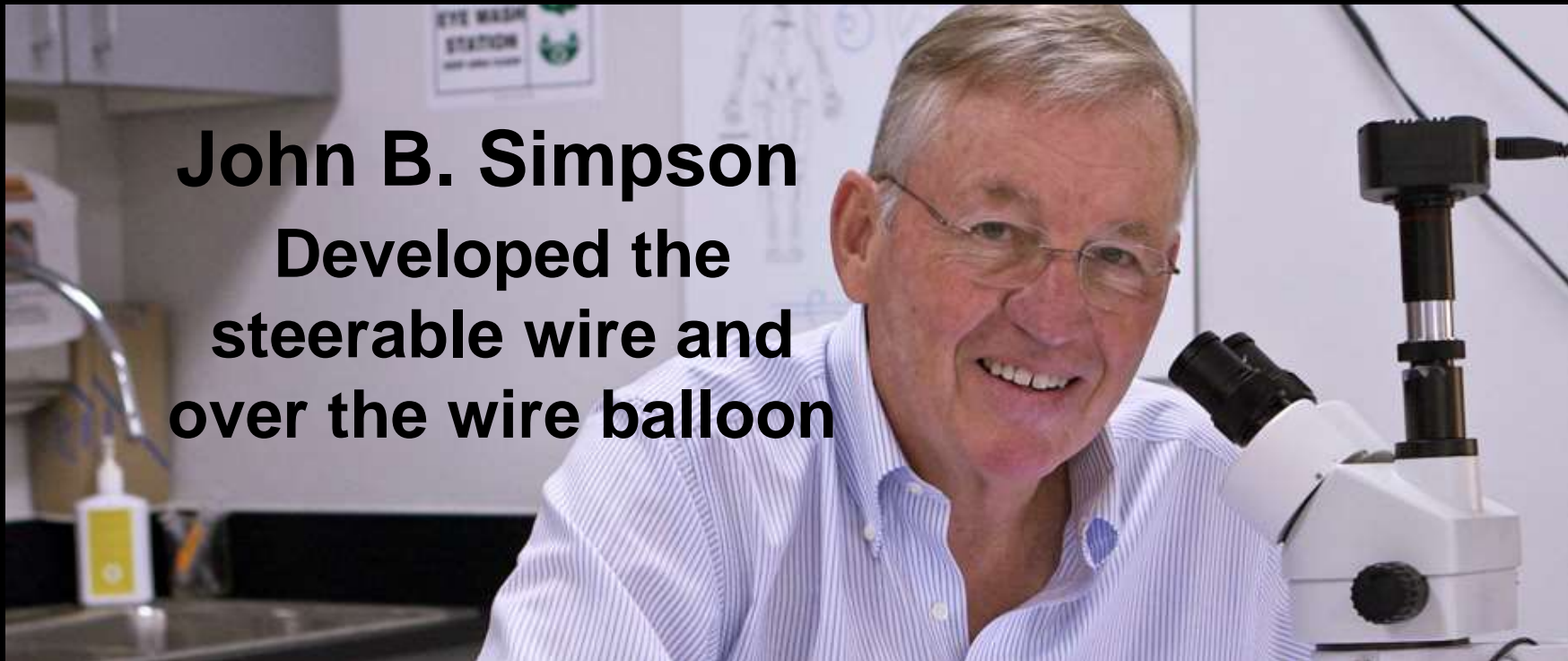


Geoffrey O. Hartzler, MD • 1946-2012



**First PTCAs in USA in 1980
Done on same day on East
and West coasts**

Richard Myler Simon Stertzer

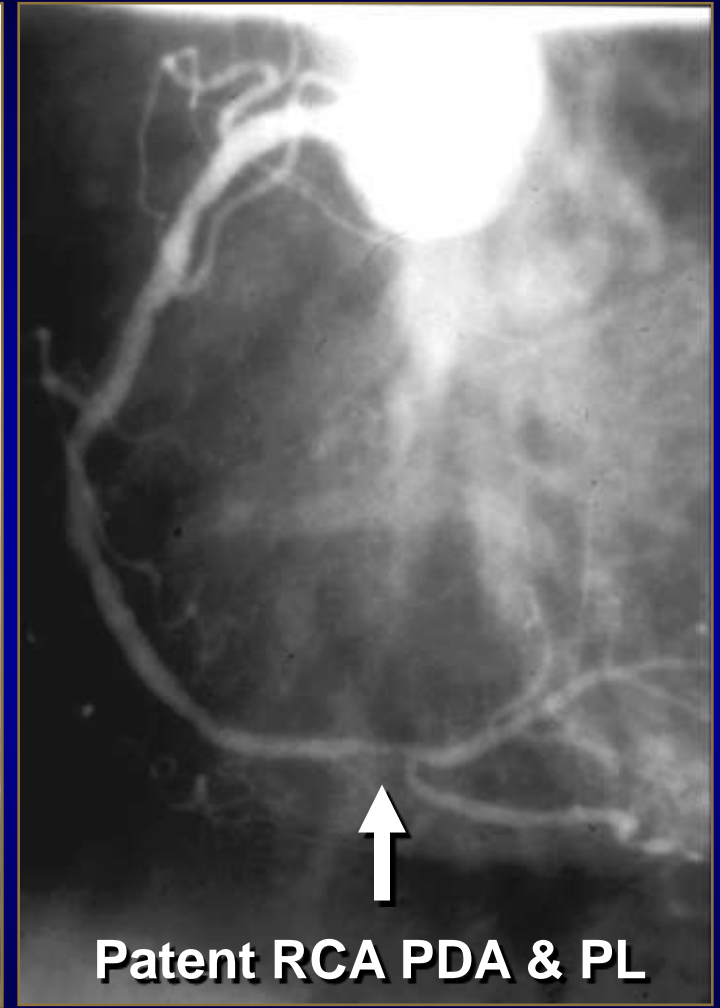
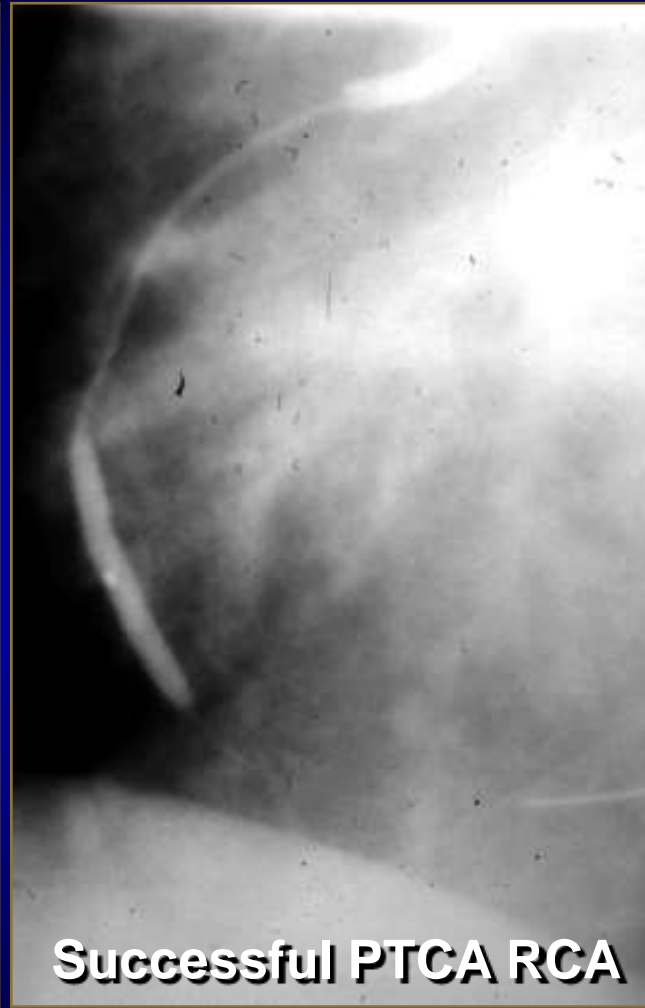
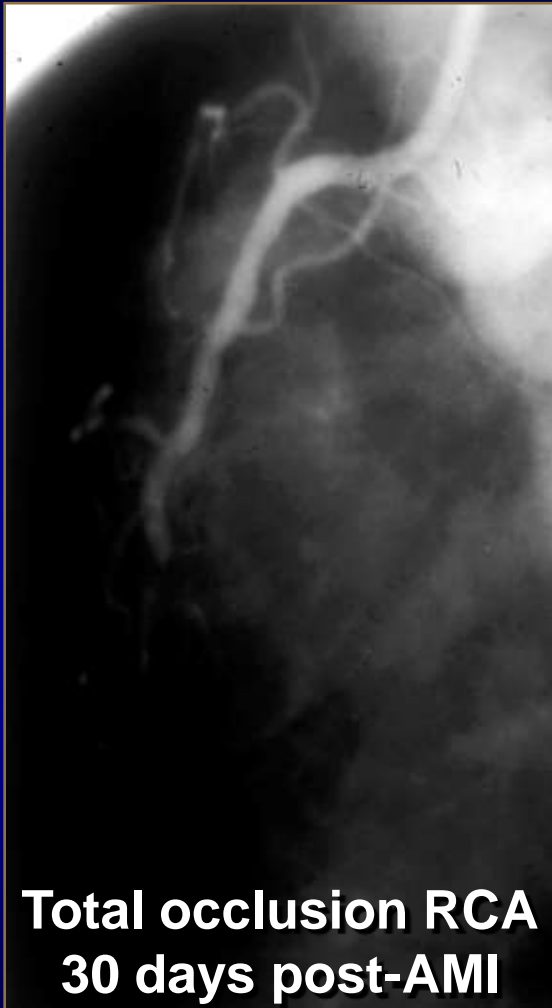


**John B. Simpson
Developed the
steerable wire and
over the wire balloon**

G.R. 46-Year-Old Male, Rhodes Scholar Director – IMF, Washington, DC

- **Nov. 1988** Resume cig. Intake
Bleeding ulcer, D/C aspirin
- **Dec. 1988** Recurrent angina with exertion
- **Jan. 1989** Vacation in New Zealand
- **Feb 2, 1989** Sustained acute inferior infarct
CPK 1000. No complication
Received no thrombolytic agent,
no PTCA
- **March 1989** Returned to USA
- **Mar 7, 1989** Repeat Coronary Angio, MAHI

G.R. March 1989



LAD was patent. Successful PTCA of LCX with steerable wire and over-the-wire balloon

Thursday, April 29, 1982

PERCUTANEOUS CORONARY ANGIOPLASTY WITH AND WITHOUT PRIOR STREPTOKINASE INFUSION FOR TREATMENT OF ACUTE MYOCARDIAL INFARCTION, Geoffrey O. Hartzler, M.D., F.A.C.C.; Barry D. Rutherford, M.D., F.A.C.C.; David R. McConahay, M.D., F.A.C.C., Mid-America Heart Institute, St. Luke's Hospital, Kansas City, Missouri.

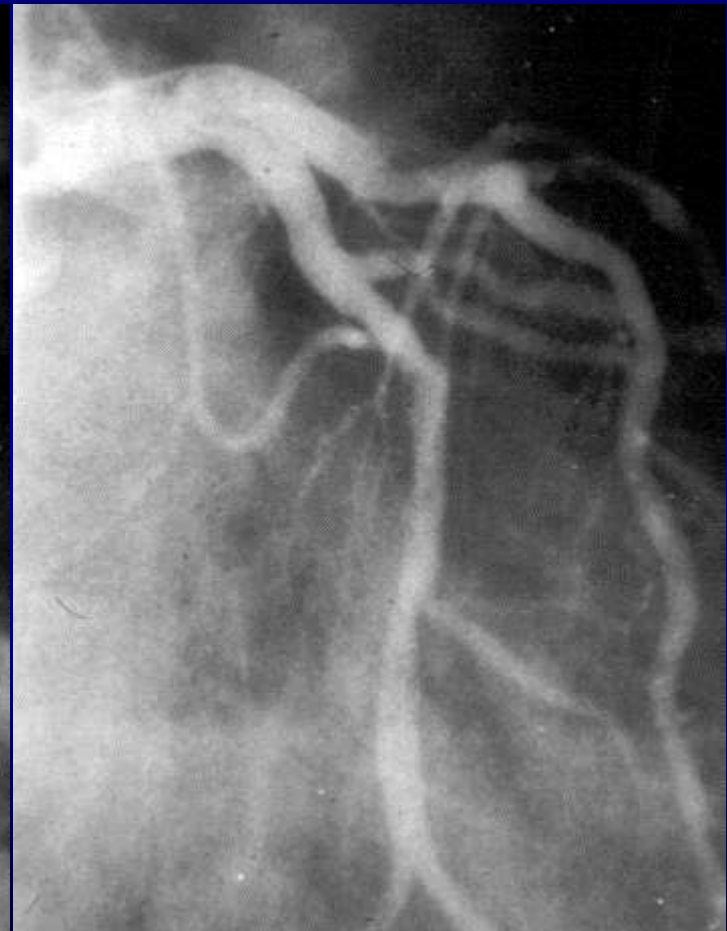
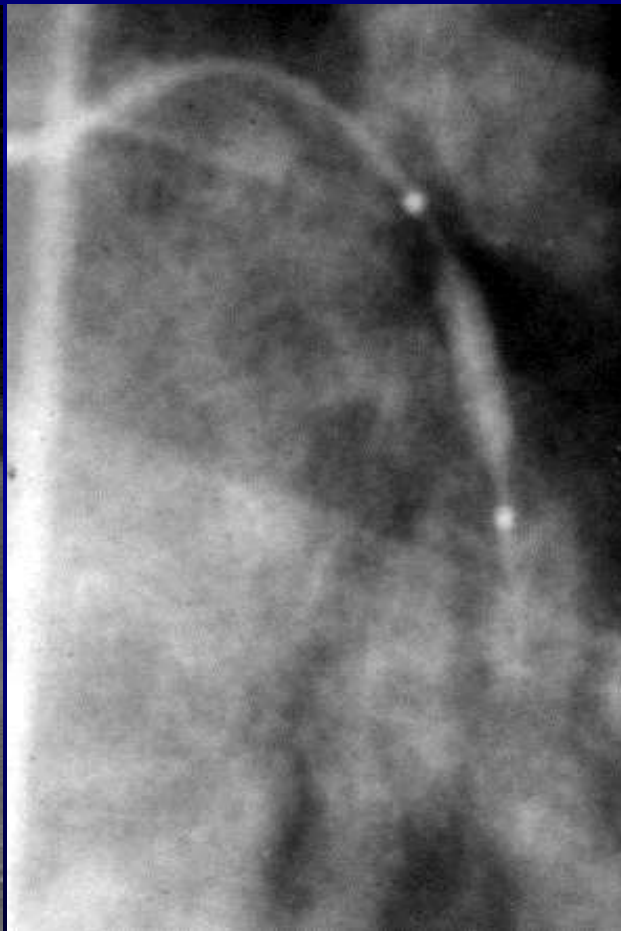
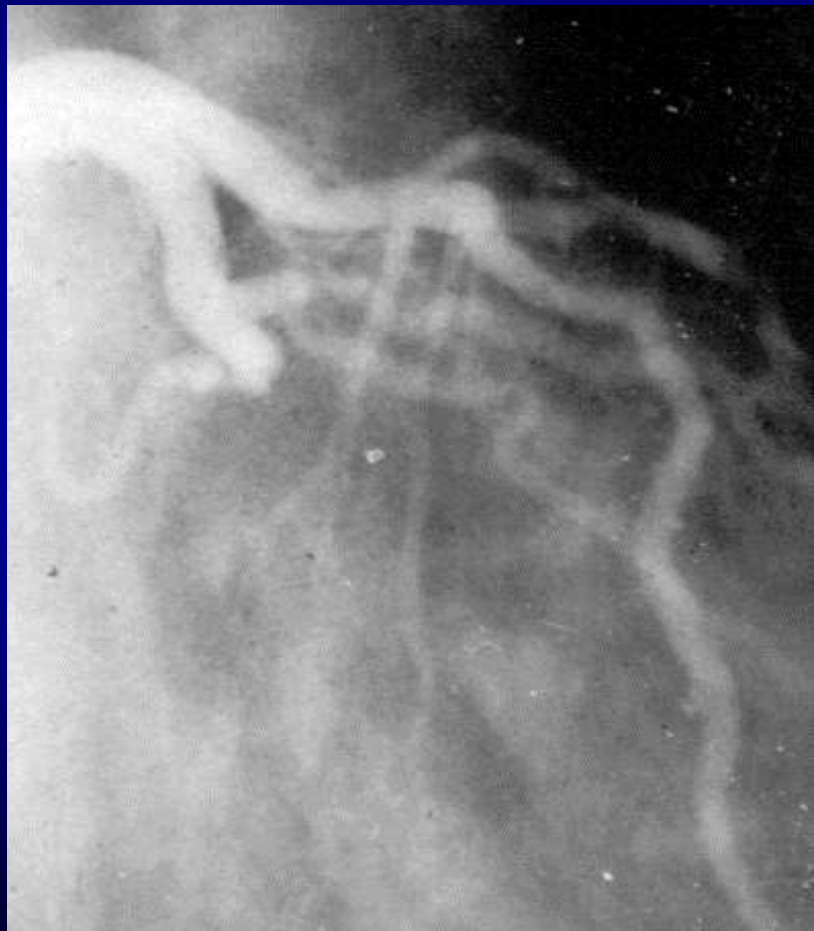
Coronary angioplasty (PTCA) was successfully performed in 16 pts during acute myocardial infarction (AMI). There were 13 males and 3 females with mean age of 62 yrs (46-74 yrs) catheterized at mean 3.3 hrs (1-10 hrs, mode 2.5 hrs) following onset of continuous chest pain with ST segment elevation in 13 pts, ST depression in 3 pts and new Q-waves in 6 pts. Intracoronary streptokinase (ICSK) opened 6 of 8 total occlusions and removed thrombus in 2 pts with subtotal occlusions (STO) prior to PTCA of residual high-grade atheromatous stenoses. PTCA without ICSK was performed in 2 pts with total occlusions and 6 pts with STO. Twenty segments were dilated including LAD - 8 pts, RCA - 6 pts, Circ - 5 pts, and vein graft - 1 pt. Mean residual stenosis was 28% with reduction of intracoronary pressure gradients from mean 67 mm Hg. to 0-10 mm Hg. One laboratory death occurred following hemodynamically and angiographically successful PTCA in a pt with LV ejection fraction of 7%. A second pt underwent coronary bypass surgery because of additional inaccessible coronary stenoses. The post-procedure course was stable in all pts. Repeat cath in 11 pts at 12 days (5-36 days) showed patency of all dilated segments, improved ejection fraction in 10 pts and improved regional wall motion in 10 pts. At follow-up of 6 mo (1.5-12.5 mo) no AMI have occurred, 13 pts are asymptomatic and 2 pts are functional-Class II. We conclude that urgent PTCA w/without ICSK can relieve pain, stabilize the course and limit myocardial infarction in selected pts with AMI.

“PTCA without ICSK was performed in 2 pts with total occlusions and 6 pts with STO.”

“Repeat cath in 11 pts at 12 days showed patency of all dilated segments...”

“At follow-up of 6 mo no AMIs have occurred...”

Inferior MI Total Occlusion LCX 1981



Comparison of Invasive and Conservative Strategies after Treatment with Intravenous Tissue Plasminogen Activator in Acute Myocardial Infarction

Results of the Thrombolysis in Myocardial Infarction (TIMI) Phase II Trial

“PTCA offered no advantage in terms of reductions in mortality or reinfarction over a more conservative strategy, according to which these procedures were provided only to patients with recurrent ischemia; the latter strategy was less complex and less costly.” **NEJM 1989;320:618-27**



Eric Topol MD

“Balloon angioplasty no longer indicated for acute myocardial infarct patients”

“The air is out of the balloon”

“Balloon Angioplasty for AMI: Was It Buried Alive?” – Bernhard Meier, MD

“Primary PCI for STEMI pts set back a decade”

GWS to GOH – 1989

“We have to do a randomized trial of direct angioplasty vs. thrombolytic therapy in AMI”

GOH response

“I can’t do that. Too many patients in the study would die. The best interest of the patient is the only interest to be considered (Dr. Charles Mayo)”

When asked to recommend a lytic regimen for acute infarct patients, it is *“a rapid injection of 100 milligrams of polyethylene on a balloon catheter”*

~ Geoffrey O. Hartzler, MD

The New England Journal of Medicine

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Volume 328

MARCH 11, 1993

Number 10

A COMPARISON OF IMMEDIATE ANGIOPLASTY WITH THROMBOLYTIC THERAPY FOR ACUTE MYOCARDIAL INFARCTION

CINDY L. GRINES, M.D., KEVIN F. BROWNE, M.D., JEAN MARCO, M.D., DONALD ROTHBAUM, M.D.,
GREGG W. STONE, M.D., JAMES O'KEEFE, M.D., PAUL OVERLIE, M.D., BRYAN DONOHUE, M.D.,
NORM CHALLIAH, M.D., GERALD C. TIMMIS, M.D., RONALD E. VLIETMAN, M.D.,
KIMBERLY A. WILSON, R.N., SYLVIA PUCHROWICZ-OCHOCKI, M.D., AND WILLIAM W. O'NEILL, M.D.
PRIMARY ANGIOPLASTY IN MYOCARDIAL INFARCTION STUDY



Cindy L. Grines, MD

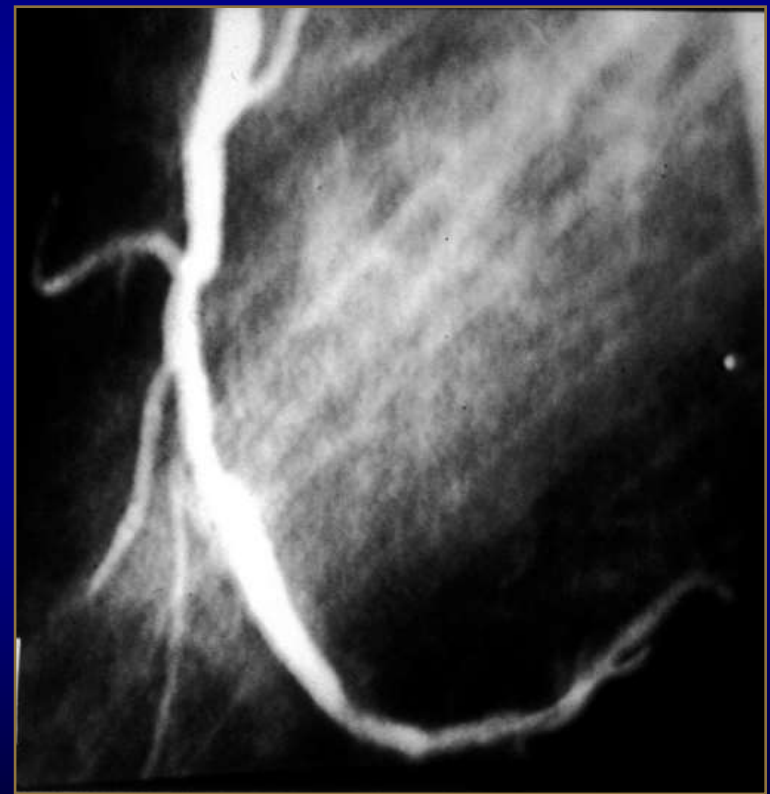
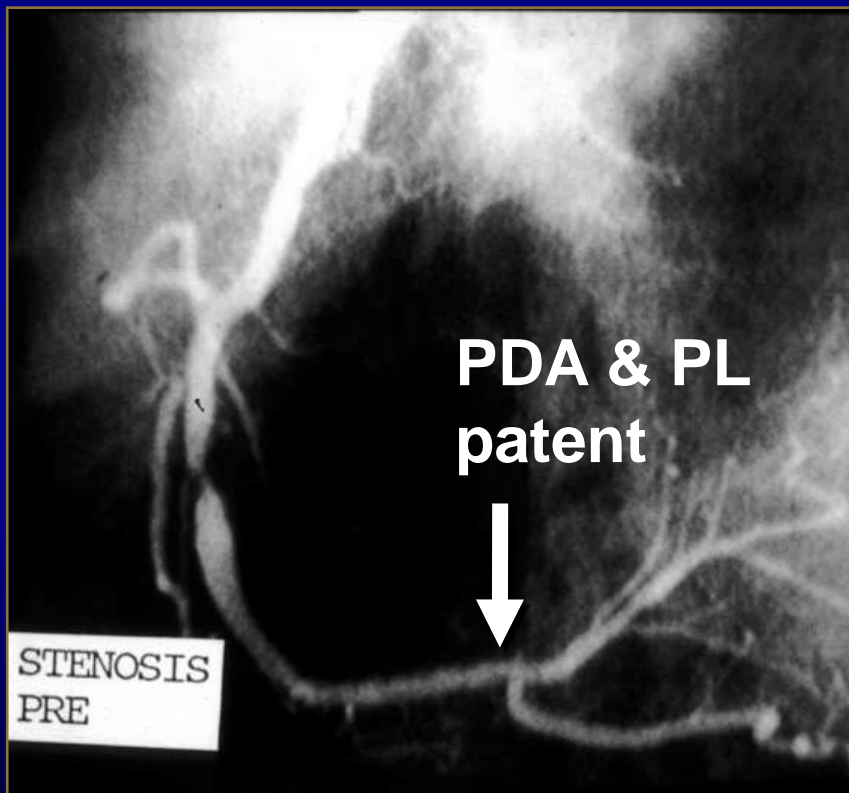
***The
“Saviors” of
PTCA in AMI***



William W. O'Neill, MD

G.R. July 28, 1989

- Recurrent angina
- Repeat cor angio, restenosis of RCA. Successful PTCA by Dr. K. Kent, Washington Hospital Center (DC)



What Interventional Techniques were available at that time?



Hans Wallsten

- First stent implanted in 1986 in Toulouse, France and then at Lausanne, Switzerland
- By 1989, 1200 Wallstents had been implanted!



The NEW ENGLAND
JOURNAL of MEDICINE

Intravascular Stents to Prevent Occlusion and Re-Stenosis after Transluminal Angioplasty

Ulrich Sigward, MD; Jacques Puel, MD; Velimir Mirkovitch, MD; Francis Joffre, MD;
and Lukas Kappenberger, MD

NEJM 1987;316:701-706

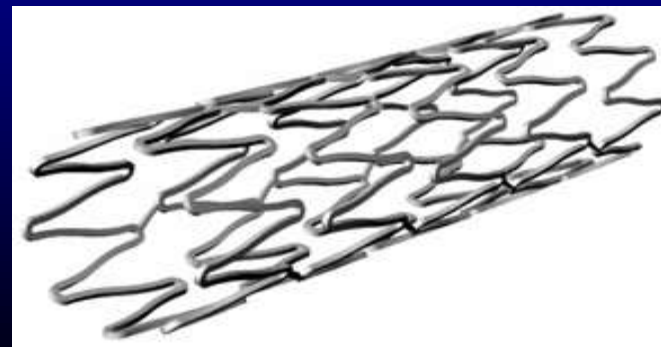


Ulrich Sigward

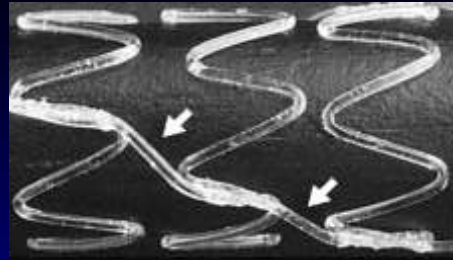
Julio Palmaz and Richard Schatz



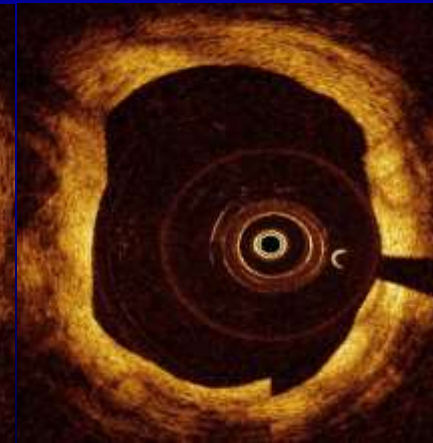
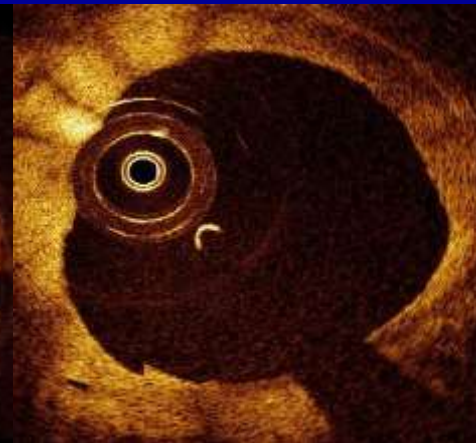
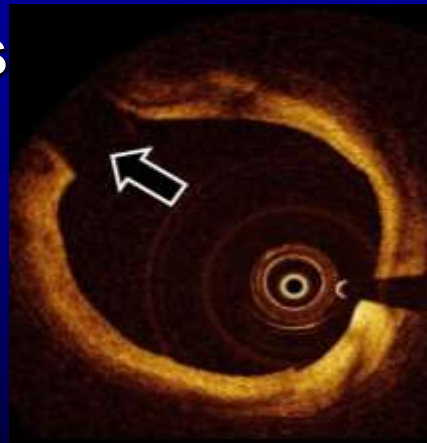
**Palmaz-Schatz:
First BMS in 1994**



Igaki-Tamai Scaffold



1. Polymer: PLLA
2. Deployment: Complex-Self expanding & balloon inflation w/ heated contrast
3. BMS like results in FIM coronary trial of 50 pts
4. No coronary implants for 10 yrs
5. Pts at 10 year F/U raise no safety concerns for PLA



Tamai Circulation 2000:102:399; 10-yr OCT F/U – Golden Tube
Tamai CCT 04; Onuma EuroIntervention 2009

G.R.

1994 – Now residing in London, England

- Recurrent angina
- Stenting of RCA with BMS – Dr Anthony Rickards, Royal Brompton Hospital, London

1996

- Asymptomatic abnl stress test with LAD ischemia
- New lesion of Proximal LAD stented with DES by Dr Anthony Rickards

2008

- Retired and living in New Zealand
- Asymptomatic

G.R.: October 2015, 80 years old



**Asymptomatic
34 years after
multivessel
angioplasty**

A Brief History of Angioplasty: *Evolution of an Art*

- Incredible innovation and persistence in technical development
- Daring, aggressive, thoughtful physicians and engineers
- International network of dedicated interventional cardiologists
- Extraordinary and courageous patients

