Cardiologie interventionnelle - histoire et future du traitement de la maladie coronarienne

Dr. Christan Roguelov
Service de Cardiologie CHUV

Histoires de vaisseaux…

The ten advances that have defined modern cardiology

*Eugene Braunwald**

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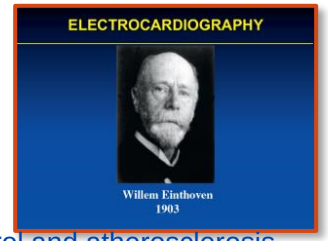
Department of Medicine, Harvard Medical School, Boston, MA, USA

Electrocardiography



Cholesterol and atherosclerosis

This truly seminal paper led ultimately to the cholesterol theory of atherogenesis, which in turn resulted in successful attempts to lower serum cholesterol in order to reverse, prevent, or at least retard the development of atherosclerosis and its complications.

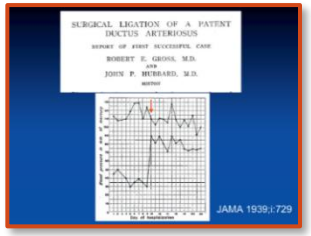
Anitschkow: Zentralblful Allgemeine Pathol Und Pathol Anat 1913;24:1

Cardiac catheterization

First carried out by Forssmann in 1929, a urologist, won the Nobel Prize

Cardiovascular surgery

The first cardiovascular operation in 1939, ligation of a patent ductus arteriosus in a seven and a half-year old girl



Coronary angiography and percutaneous coronary angioplasty

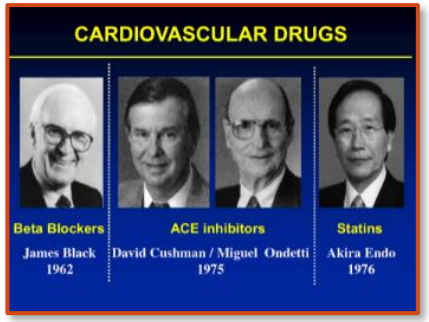
In 1958, while performing an angiogram of the aortic root, the tip of the catheter accidentally slipped into the ostium of the right coronary artery.

Sones et al: Circulation 20:773, 1959

The coronary care unit

In 1961, Desmond Julian, a registrar (fellow/resident) in cardiology at the Royal Infirmary in Edinburgh, wrote a brief paper describing the coronary care unit that was published in Lancet, in which he stated:

Cardiovascular drugs



Preventive cardiology

Kannel et al: The Framingham study Ann Intern Med 55:33, 1961

Cardiac imaging: Echocardiography

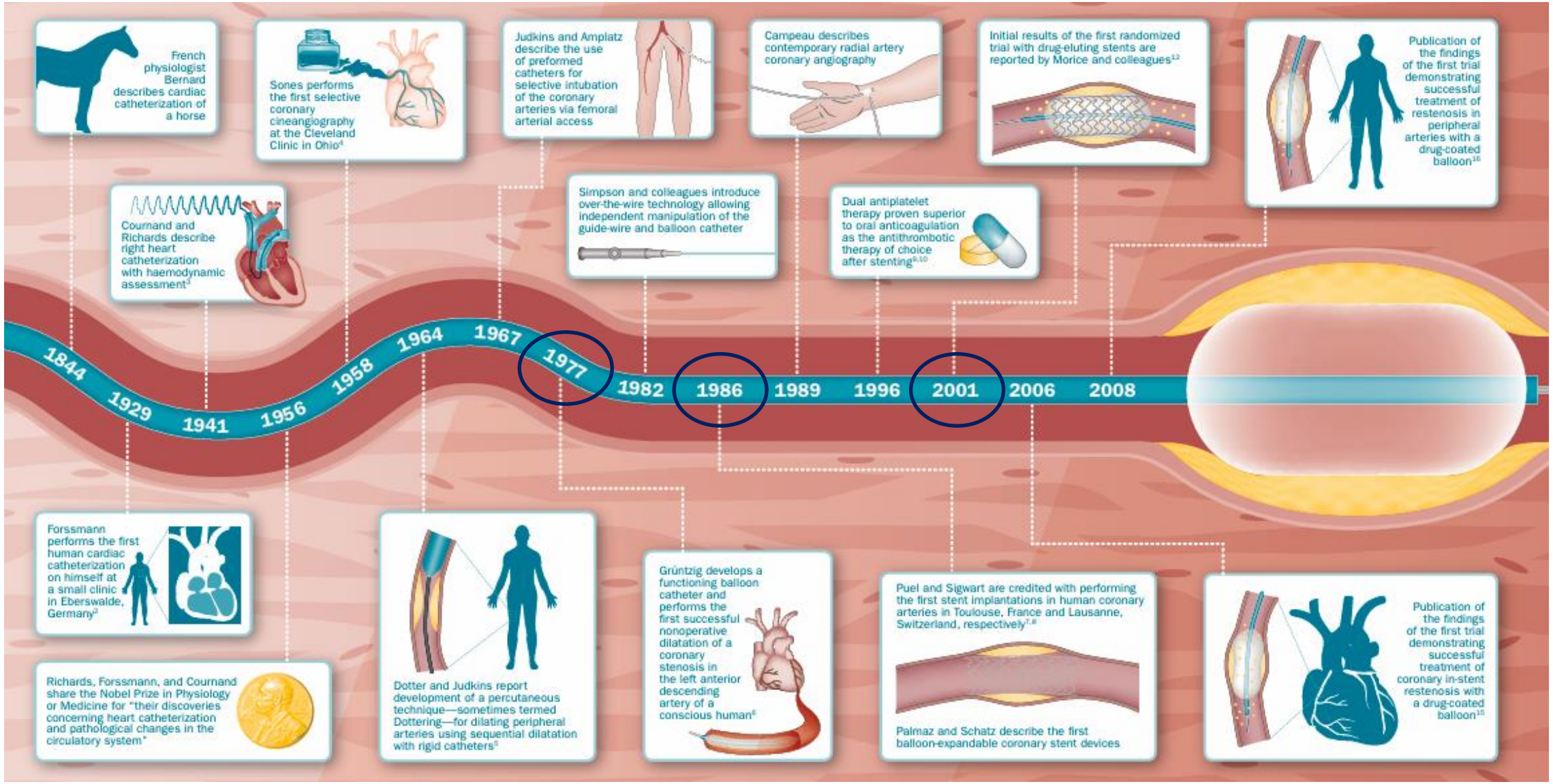
During World War II, ultrasound was widely used to detect submarines and to track torpedoes. The collaboration between two brilliant Norwegians, an emeritus Professor of Cardiology, Inge Edler, and an engineer, Helmut Hertz, led to the development of echocardiography.

Edler and Hertz: Kungl Fysiogr Sallsk Lund Forth24, 1954

Cardiac pacemakers and defibrillation

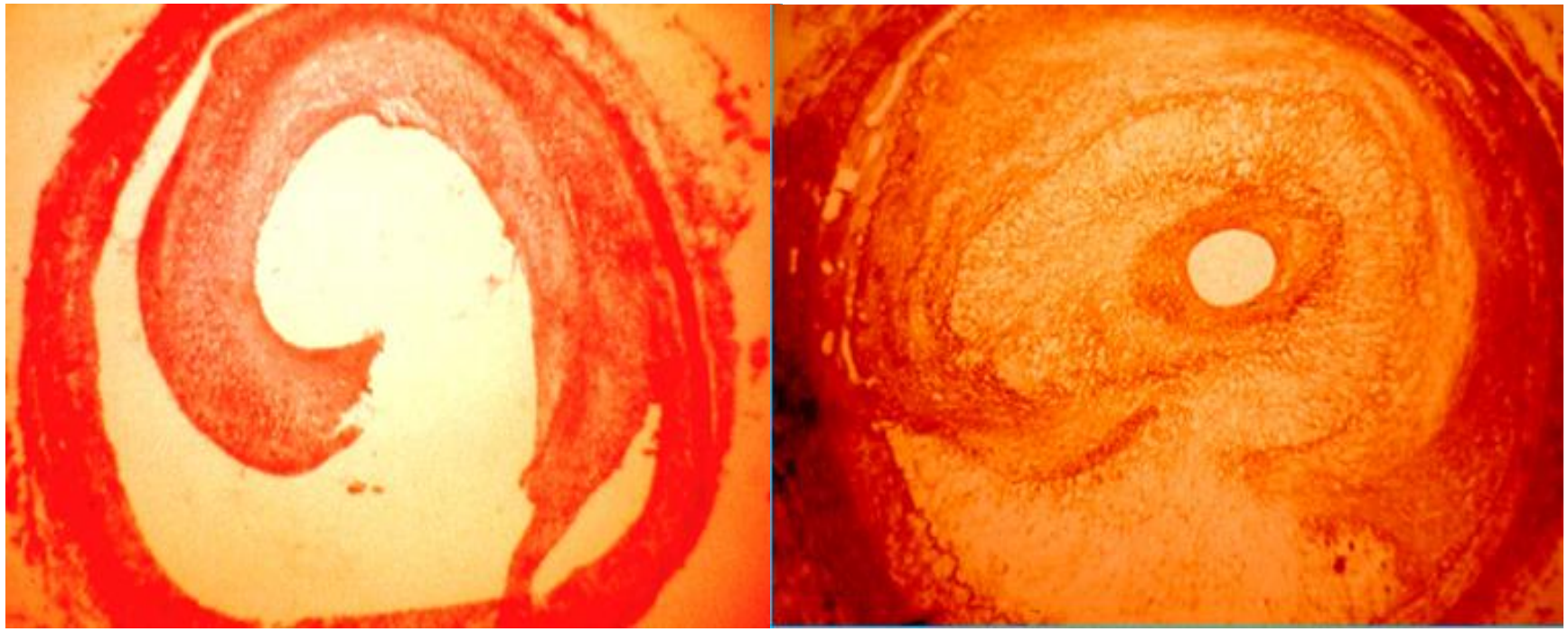
Mirowski et al:N Engl J Med 303:322, 2098

Courthesy of A Lerman, Braunwald et al: Trends in Cardiovascular Medicine 24:179, 2014


1844
French physiologist Bernard describes cardiac catheterization of a horse
1929
Forssmann performs the first human cardiac catheterization on himself at a small clinic in Eberswalde, Germany[2]
1941
Cournand and Richards describe right heart catheterization with haemodynamic assessment[3]
1956
Richards, Forssmann, and Cournand share the Nobel Prize in Physiology or Medicine for "their discoveries concerning heart catheterization and pathological changes in the circulatory system"
1958
Sones performs the first selective coronary cineangiography at the Cleveland Clinic in Ohio[4]
1964
Dotter and Judkins report development of a percutaneous technique—sometimes termed Dottering—for dilating peripheral arteries using sequential dilatation with rigid catheters[5]
1967
Judkins and Amplatz describe the use of preformed catheters for selective intubation of the coronary arteries via femoral arterial access
1977
Grüntzig develops a functioning balloon catheter and performs the first successful nonoperative dilatation of a coronary stenosis in the left anterior descending artery of a conscious human[6]
1982
Simpson and colleagues introduce over-the-wire technology allowing independent manipulation of the guide-wire and balloon catheter
1986
Campeau describes contemporary radial artery coronary angiography
1989
Puel and Sigwart are credited with performing the first stent implantations in human coronary arteries in Toulouse, France and Lausanne, Switzerland, respectively[7,8]
1996
Palmaz and Schatz describe the first balloon-expandable coronary stent devices
2001
Dual antiplatelet therapy proven superior to oral anticoagulation as the antithrombotic therapy of choice after stenting[9,10]
2006
Initial results of the first randomized trial with drug-eluting stents are reported by Morice and colleagues[12]
2008
Publication of the findings of the first trial demonstrating successful treatment of restenosis in peripheral arteries with a drug-coated balloon[15]
Publication of the findings of the first trial demonstrating successful treatment of coronary in-stent restenosis with a drug-coated balloon[15]

The pioneers

The pre stent era



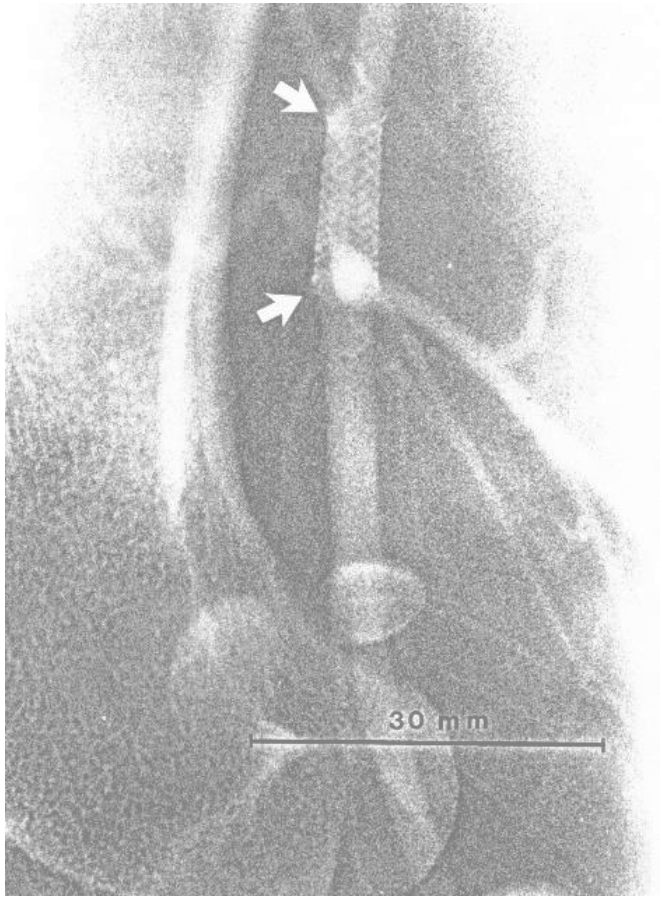
The pre stent era

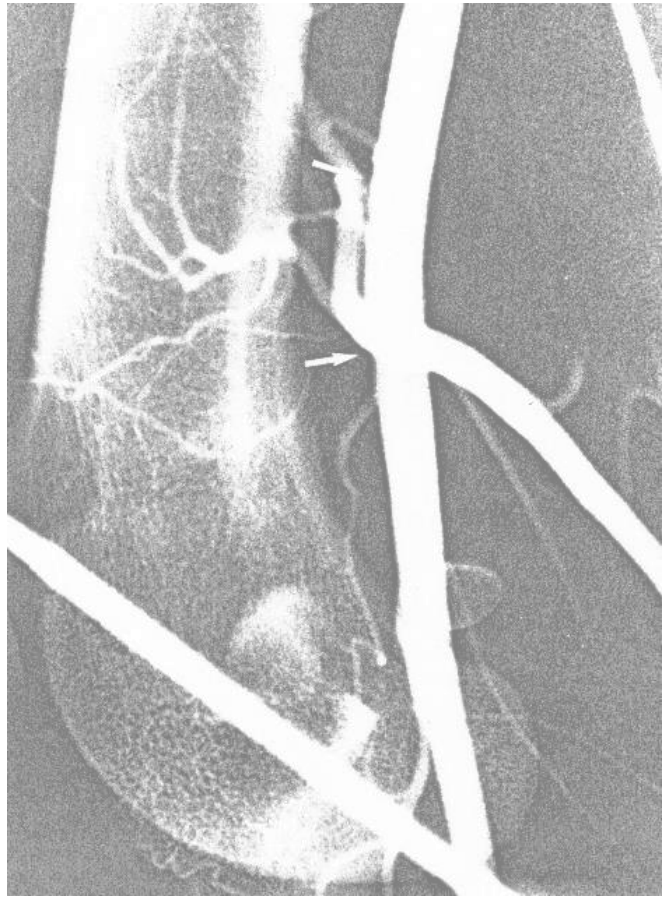
1991 Carport	(Tx A2-rptr antagnst) Circulation
1992 Mercator	(Cilazapril) Circulation
1993 Park	(Ketanserin) Circulation
1993 Marcator	(Cilazapril) Circulation
1995 Helvetica	(Hirudin) NEJM
1999 Flare	(Fluvastatin) European Heart J
2000 Eurocare	(Carvedilol) European Heart J
2001 Trapist	(Trapidil) European Heart J
2002 Presto	(Tranilast) Circulation
2002 Italics	(Antisense) JACC
2002 LIPS	(Fluvastatin) JAMA

The stent

“Wallsten was a Swedish engineer who, in the early 1960s, invented a system to print out both sides of a newspaper page simultaneously. As a result of this quite revolutionary invention he quickly made a fortune and early in his career decided to retreat to the country of retired millionaires: Switzerland. At a social party in 1980 he met one of his compatriots, Senning, a prominent surgeon working in Zurich (the father of the so-called “Senning operation” for congenital heart disease). Senning was concerned by the high mortality of acute surgery in patients suffering acute dissection of the ascending and descending aorta. Wallsten proposed an ingenious mechanical device which could be introduced percutaneously and would scaffold the dissection flap in the aorta.”

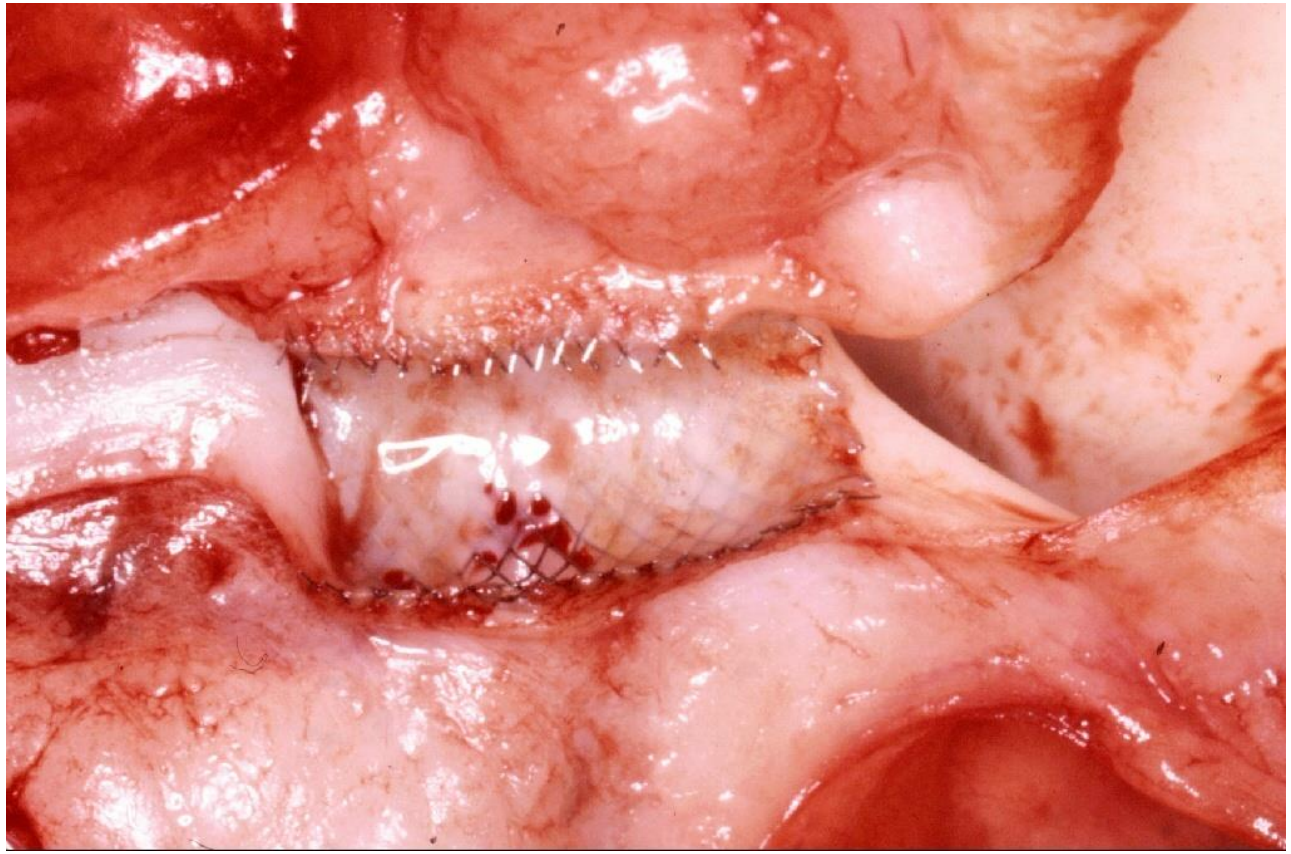
The stent



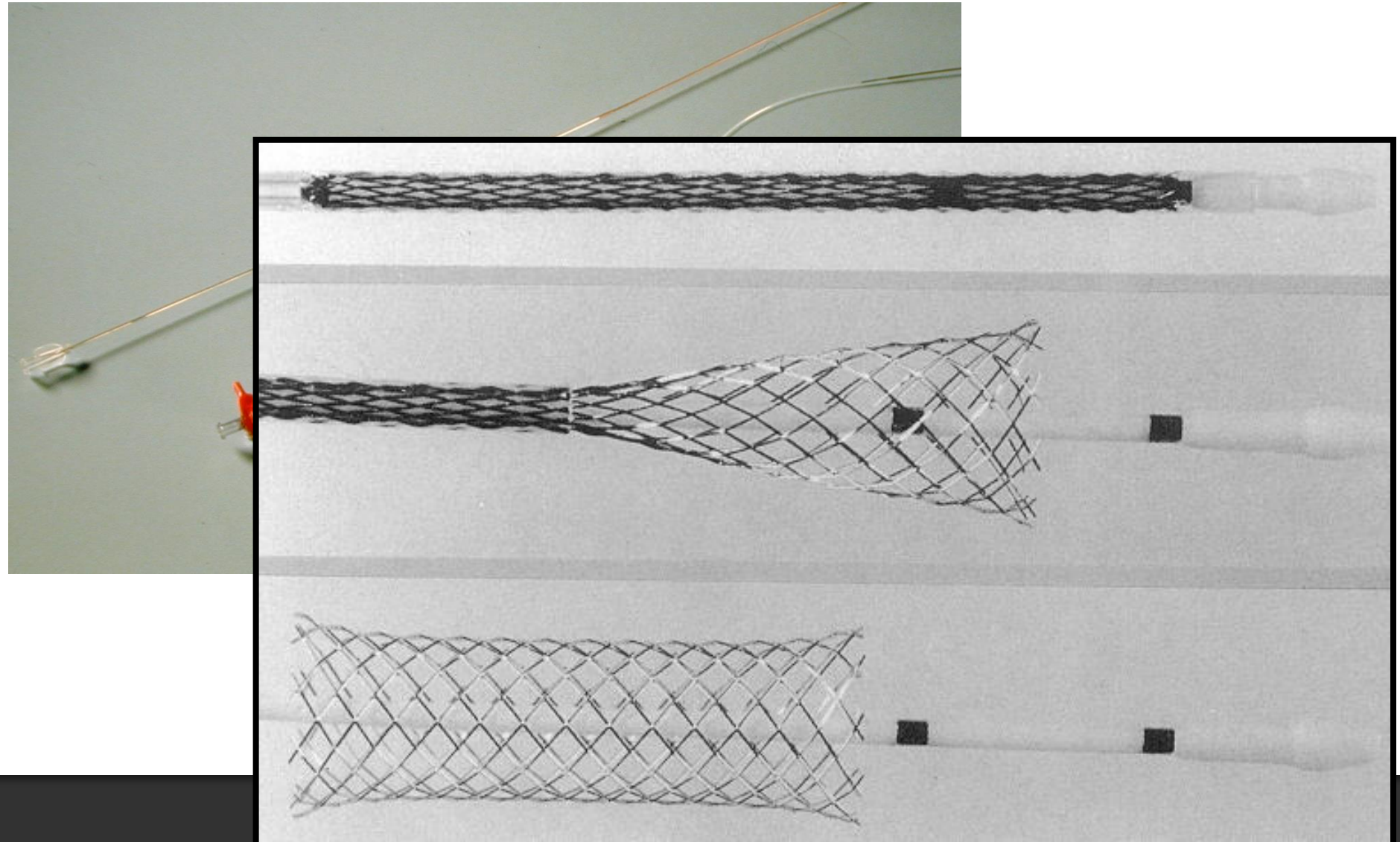


U. Sigwart (1985) First stent implant in canine artery

The stent

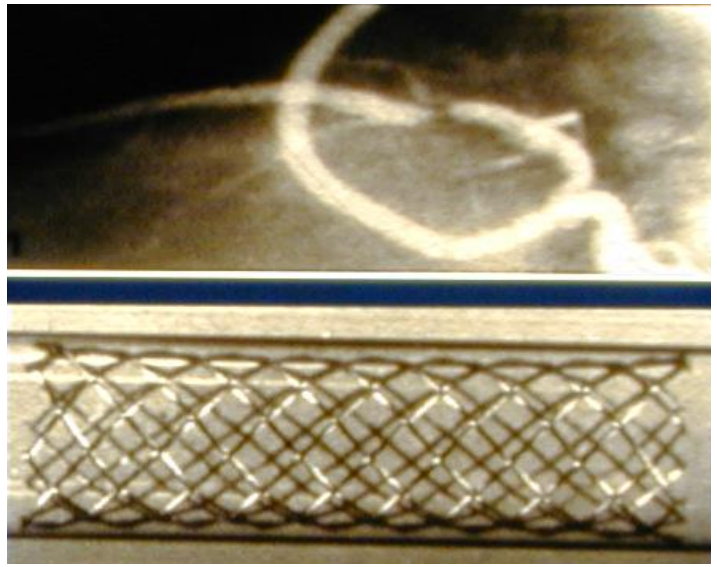


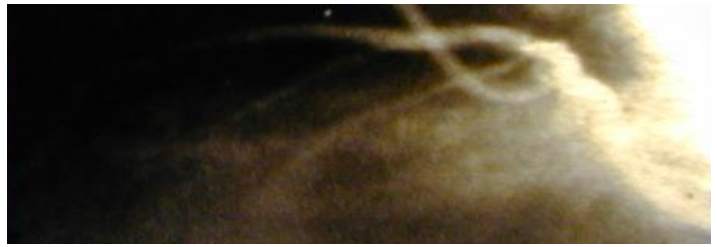
The stent



The stent

The first stent
in a human being
28.03.1986
J. Puel
Toulouse



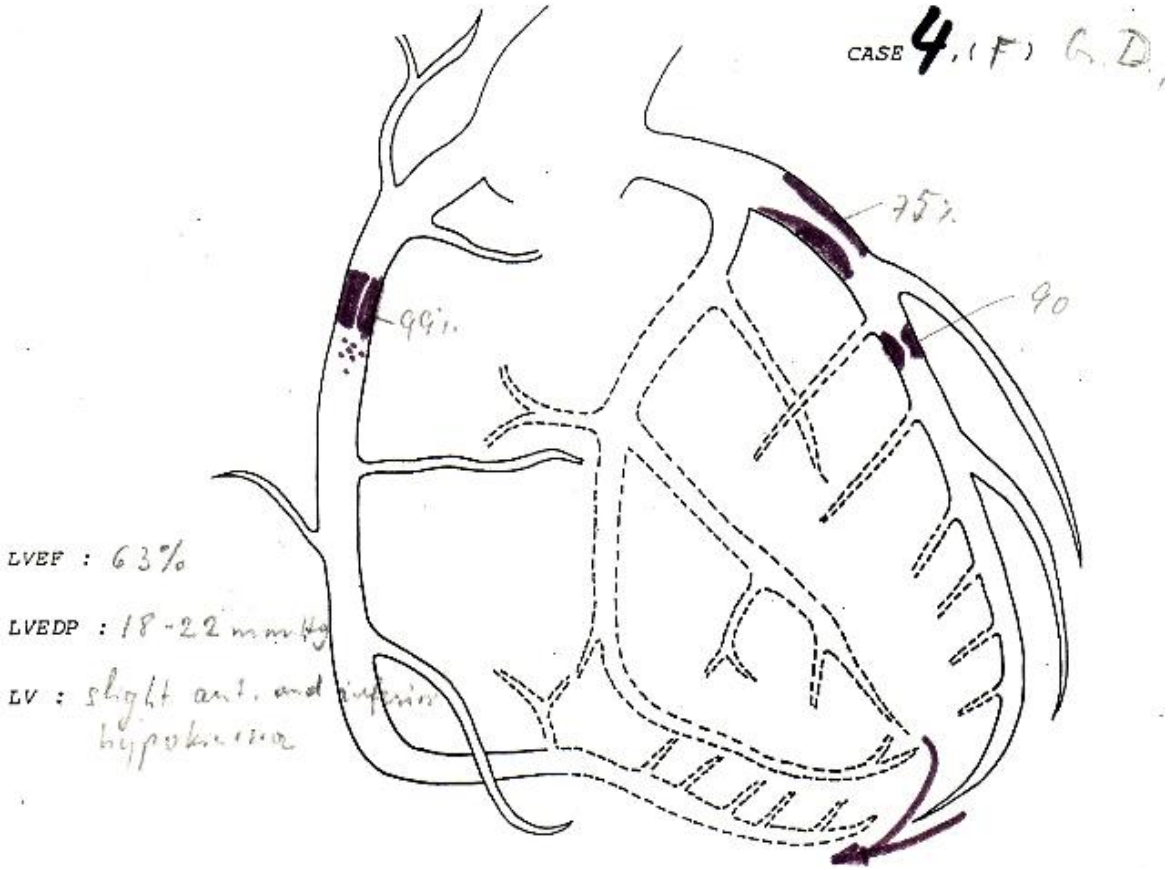


CENTRE HOSPITALIER UNIVERSITAIRE VAUDOIS

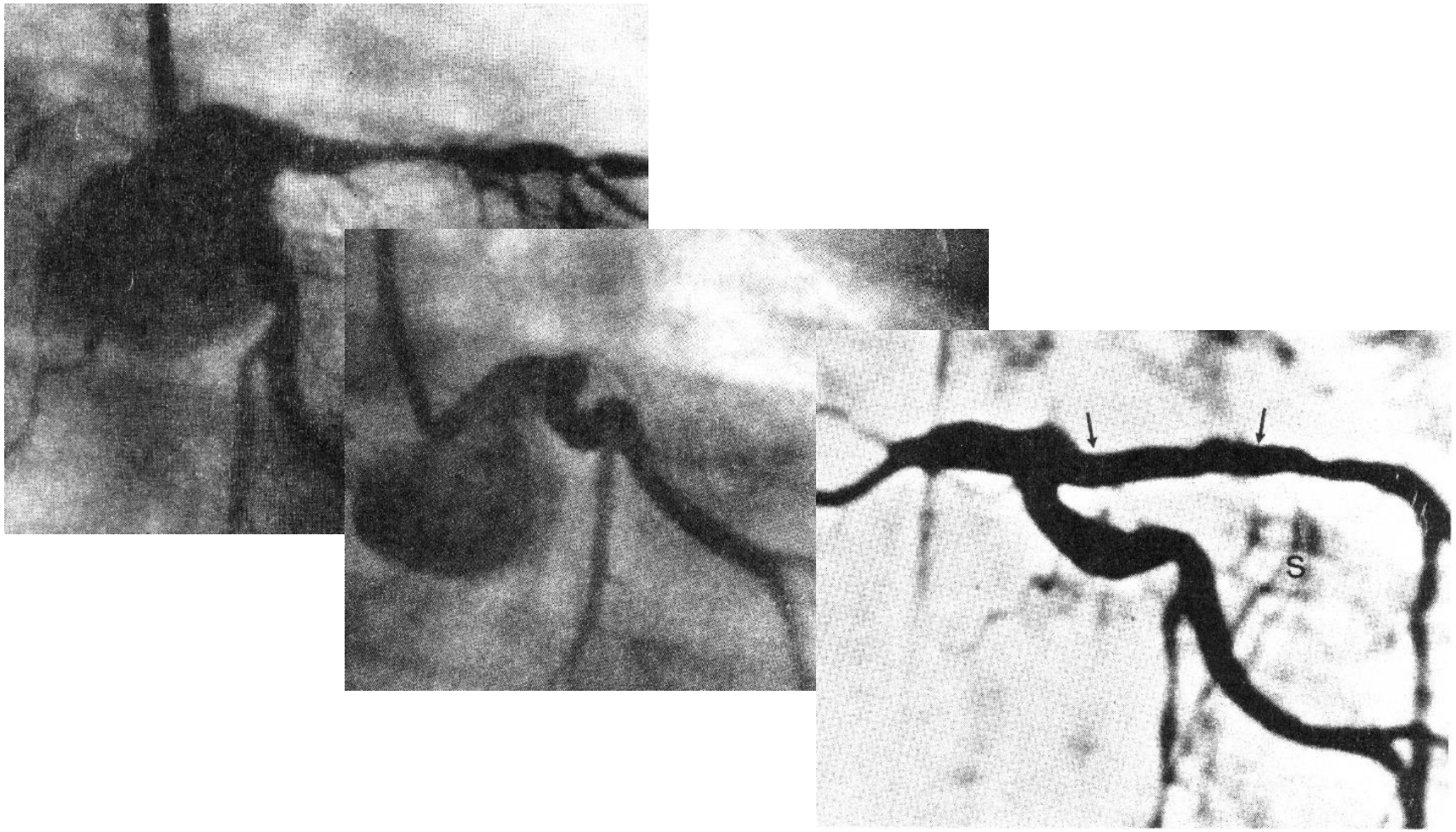
June 13, 1986
CH-1011 Lausanne, Switzerland

Limited Participation

Program



The stent



The stent

Diagnostic anatomo-pathologique:

Infarctus aigu apico-basal antéro-septal du myocarde (env. 40%).

Nécrose fraîche des piliers postérieurs de la mitrale.

Plaque d'artériosclérose sur l'IVA à 1,5 cm de son départ.

Status 3 jours après dilatation de l'IVA et mise en place d'une prothèse endoluminale.

Thrombose très récente dans la lumière de la prothèse.

25.04.1986 – U. Sigwart - Lausanne


100

The stent

Angiographic follow-up after placement of a self-expanding coronary-artery stent
Serruys et al, NEJM 1991

BACKGROUND. The placement of stents in coronary arteries after coronary angioplasty has been investigated as a way of treating abrupt coronary-artery occlusion related to the angioplasty and of reducing the late intimal hyperplasia responsible for gradual restenosis of the dilated lesion.

METHODS. From March 1986 to January 1988, we implanted 117 self-expanding, stainless-steel endovascular stents (Wallstent) in the native coronary arteries (94 stents) or saphenous-vein bypass grafts (23 stents) of 105 patients. Angiograms were obtained immediately before and after placement of the stent and at follow-up at least one month later (unless symptoms required angiography sooner). The mortality after one year was 7.6 percent (8 patients). Follow-up angiograms (after a mean [+/- SD] of 5.7 +/- 4.4 months) were obtained in 95 patients with 105 stents and were analyzed quantitatively by a computer-assisted system of cardiovascular angiographic analysis. The 10 patients without follow-up angiograms included 4 who died.

RESULTS. **Complete occlusion occurred in 27 stents in 25 patients (24 percent)**; 21 occlusions were documented within the first 14 days after implantation. Overall, immediately after placement of the stent there was a significant increase in the minimal luminal diameter and a significant decrease in the percentage of the diameter with stenosis (changing from a mean [+/- SD] of 1.88 +/- 0.43 to 2.48 +/- 0.51 mm and from 37 +/- 12 to 21 +/- 10 percent, respectively; P less than 0.0001). Later, however, there was a significant decrease in the minimal luminal diameter and a significant increase in the stenosis of the segment with the stent (1.68 +/- 1.78 mm and 48 +/- 34 percent at follow-up). Significant restenosis, as indicated by a reduction of 0.72 mm in the minimal luminal diameter or by an increase in the percentage of stenosis to greater than or equal to 50 percent, occurred in 32 percent and 14 percent of patent stents, respectively.

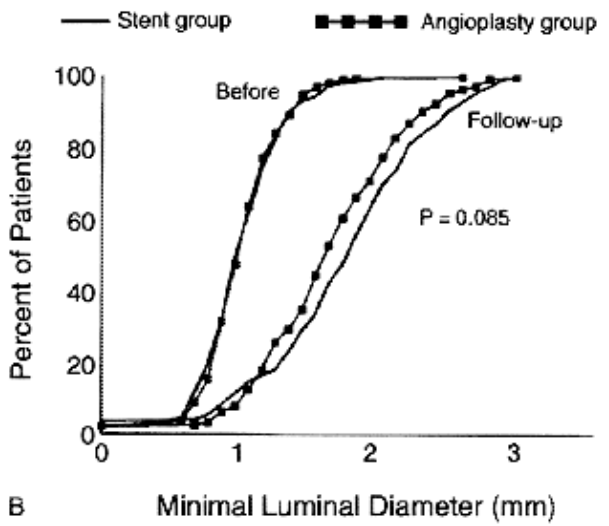
CONCLUSIONS. Early occlusion remains an important limitation of this coronary-artery stent. Even when the early effects are beneficial, there are frequently late occlusions or restenosis. The place of this form of treatment for coronary artery disease remains to be determined.

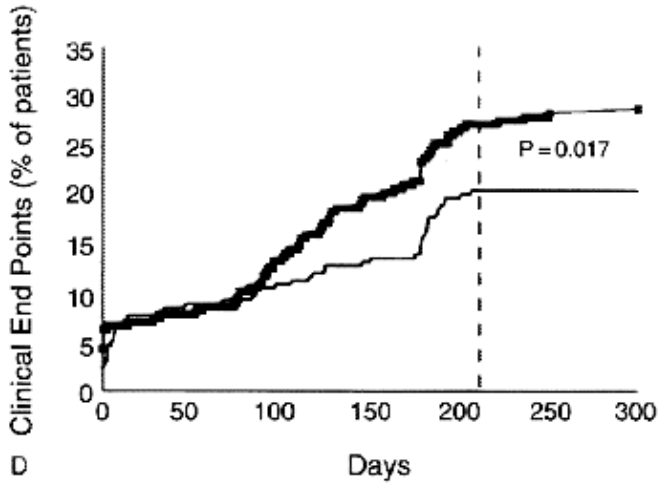
The stent

BENESTENT I

STRESS I

NEJM 1994





Event	Angioplasty (N = 257)	Stent (N = 259)	Relative Risk (95% CI)
	number (percent)		
Death			
In hospital	0	0	—
At 7 mo	1 (0.4)	2 (0.8)	1.98 (0.18–21.75)
All events	1 (0.4)	2 (0.8)	1.98 (0.18–21.75)
Cerebrovascular accident			
In hospital	1 (0.4)	0	—
At 7 mo	2 (0.8)	0	—
All events	2 (0.8)	0	—
Q-wave MI			
In hospital	2 (0.8)	5 (1.9)	2.48 (0.49–12.67)
At 7 mo	4 (1.6)	7 (2.7)	1.74 (0.51–5.86)
All events	5 (1.9)	7 (2.7)	1.39 (0.45–4.32)
Non–Q-wave MI			
In hospital	6 (2.3)	4 (1.5)	0.66 (0.19–2.32)
At 7 mo	6 (2.3)	4 (1.5)	0.66 (0.19–2.32)
All events	7 (2.7)	4 (1.5)	0.57 (0.17–1.91)
Urgent CABG			
In hospital	4 (1.6)	5 (1.9)	1.24 (0.34–4.57)
At 7 mo	4 (1.6)	5 (1.9)	1.24 (0.34–4.57)
All events	5 (1.9)	6 (2.3)	1.19 (0.37–3.85)
Elective CABG			
In hospital	0	3 (1.2)	—
At 7 mo	6 (2.3)	8 (3.1)	1.32 (0.47–3.76)
All events	6 (2.3)	10 (3.9)	1.65 (0.61–4.48)
Repeat PTCA			
In hospital	3 (1.2)	1 (0.4)	0.33 (0.03–3.16)
At 7 mo	53 (20.6)	26 (10.0)	0.49 (0.32–0.75)
All events	60 (23.3)	35 (13.5)	0.58 (0.40–0.85)
Any event			
In hospital	16 (6.2)	18 (6.9)	1.12 (0.58–2.14)
At 7 mo	76 (29.6)	52 (20.1)	0.68 (0.50–0.92)

Variable†	Angioplasty (N = 240)	Stent (N = 237)	P Value
	mean ±SD		
Reference diameter (mm)			
Before	3.01±0.46	2.99±0.45	NS
After	3.09±0.44	3.16±0.43	0.045
Follow-up	3.05±0.49	2.96±0.48	0.04
Minimal luminal diameter (mm)			
Before	1.08±0.31	1.07±0.33	NS
After	2.05±0.33	2.48±0.39	<0.001
Follow-up	1.73±0.55	1.82±0.64	0.09‡
Stenosis (%)			
Before	64±10	64±10	NS
After	33±8	22±8	<0.001
Follow-up	43±16	38±18	0.003
Restenosis rate (%)	32	22	0.02
Gain (mm)	0.97±0.39	1.40±0.44	<0.001
Loss (mm)	0.32±0.47	0.65±0.57	<0.001
Net gain (mm)	0.65±0.59	0.75±0.66	0.09

*"All events" refers to the total count of events at seven months (i.e., if a patient required repeat angioplasty and later coronary-artery bypass grafting, the total count at seven months would reflect both events, not just the first that occurred). CI denotes confidence interval, MI myocardial infarction, CABG coronary-artery bypass graft, PTCA percutaneous transluminal coronary angioplasty, and NS not significant.

†Reference values are the interpolated diameters of normal vessels; gain, the minimal luminal diameter after the procedure minus the value obtained before the procedure; loss, the minimal luminal diameter after the procedure minus the follow-up value; and net gain, the minimal luminal diameter at follow-up minus the value obtained before the procedure.

‡P = 0.08 and P = 0.03 for the difference in minimal luminal diameter between the two study groups at follow-up when the pre-intervention lumen and vessel size, respectively, were used as covariates.

The stent

- P. Barragan et al
  Cathet Cardiovasc Diagn 1994

- Ticlopidine & subcutaneous heparin as an alternative regimen following coronary stenting

The stent

Intracoronary Stent Implantation Without Ultrasound Guidance and With Replacement of Conventional Anticoagulation by Antiplatelet Therapy

30-Day Clinical Outcome of the French Multicenter Registry

Gaetan J. Karrillon, MD; Marie Claude Morice, MD; Edgar Benveniste, MD; Pierre Bunouf, MSC; Pierre Aubry, MD; Simon Cattan, MD; Bernard Chevalier, MD; Philippe Commeau, MD; Alain Cribier, MD; Charles Eiferman, MD; Gilles Grollier, MD; Yves Guerin, MD; Michel Henry, MD; Thierry Lefevre, MD; Bernard Livarek, MD; Yves Louvard, MD; Jean Marco, MD; Serge Makowski, MD; Jean Pierre Monassier, MD; Jean Marc Pernes, MD; Philippe Rioux, MD; Christian Spaulding, MD; Gilles Zemour, MD

Circulation 1996

N = 2,900 – stent thrombosis : 1.8%

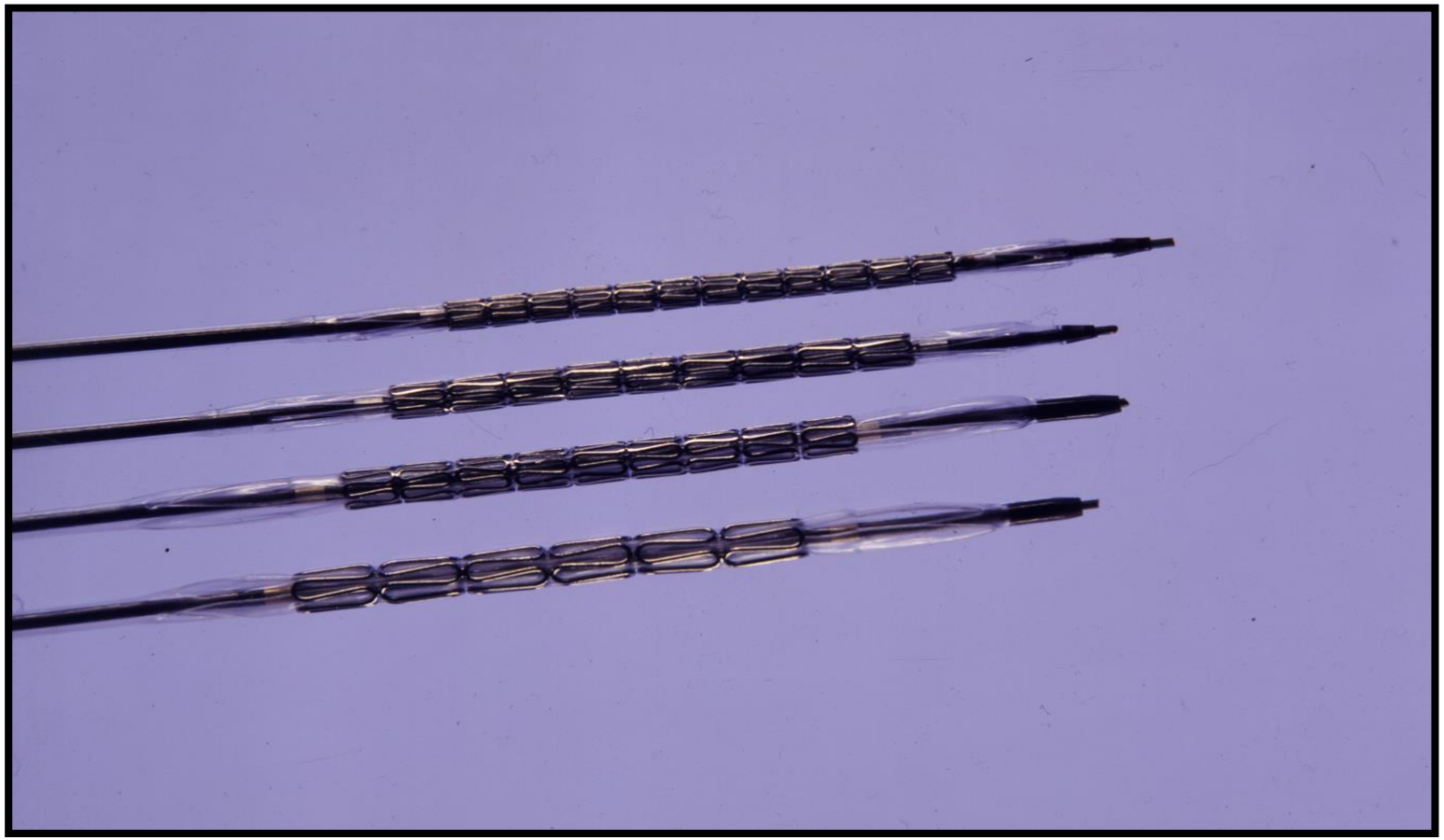
The stent

stent thrombosis (unless specified otherwise)

Trial	No pts	ASA & thienopyridine	ASA & warfarin	Characteristic
ISAR*	517	0.8%	5.4%	
FANTASTIC°	473	0.4%	3.5%	Subacute thrombosis
STARS**	1096	0.5%	2.7%	Angiographic thrombosis
MATTIS°°	350	5.6%	11%	Composite end point

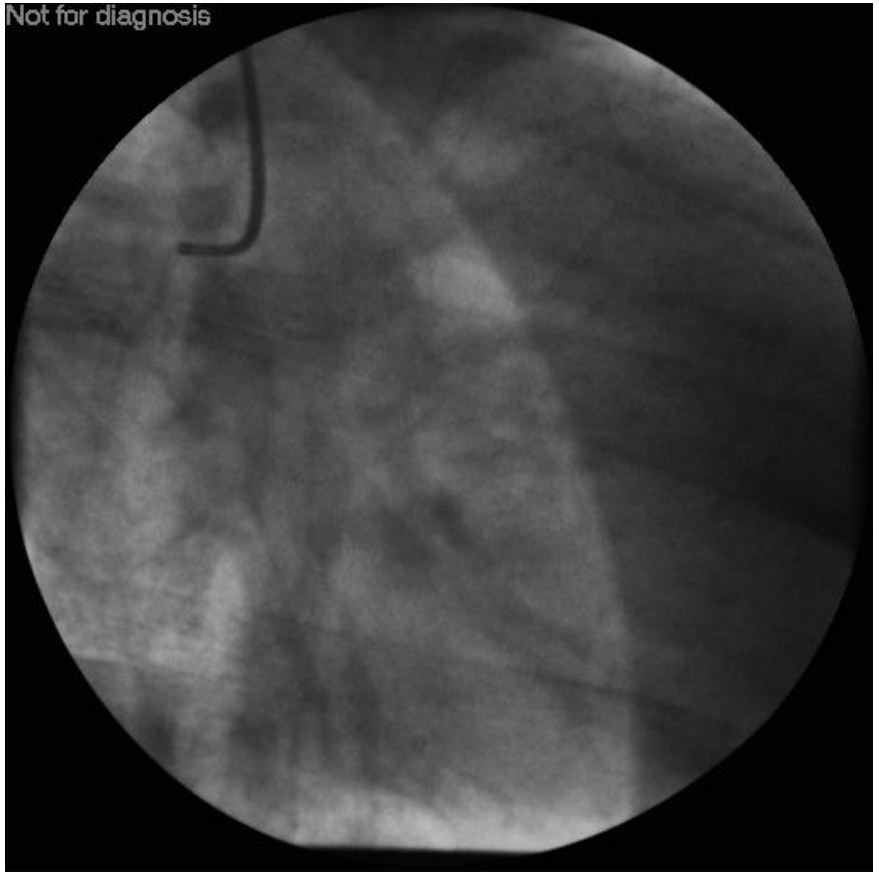
*Schomig et al, NEJM 1996 - ° Bertrand et al, Circulation 1998
** Leon et al, NEJM 1998 - °° Urban et al, Circulation 1998

The stent



Cas Clinique

- 2001 : juste avant Noël
- Homme de 42 ans, dans une situation de divorce
- N’a jamais consulté un médecin
- Check-up de routine pour des DRS atypiques
- Test d’effort chez son cardiologue – Fibrillation ventriculaire. CEE. Rythme sinusal (15 h vendredi)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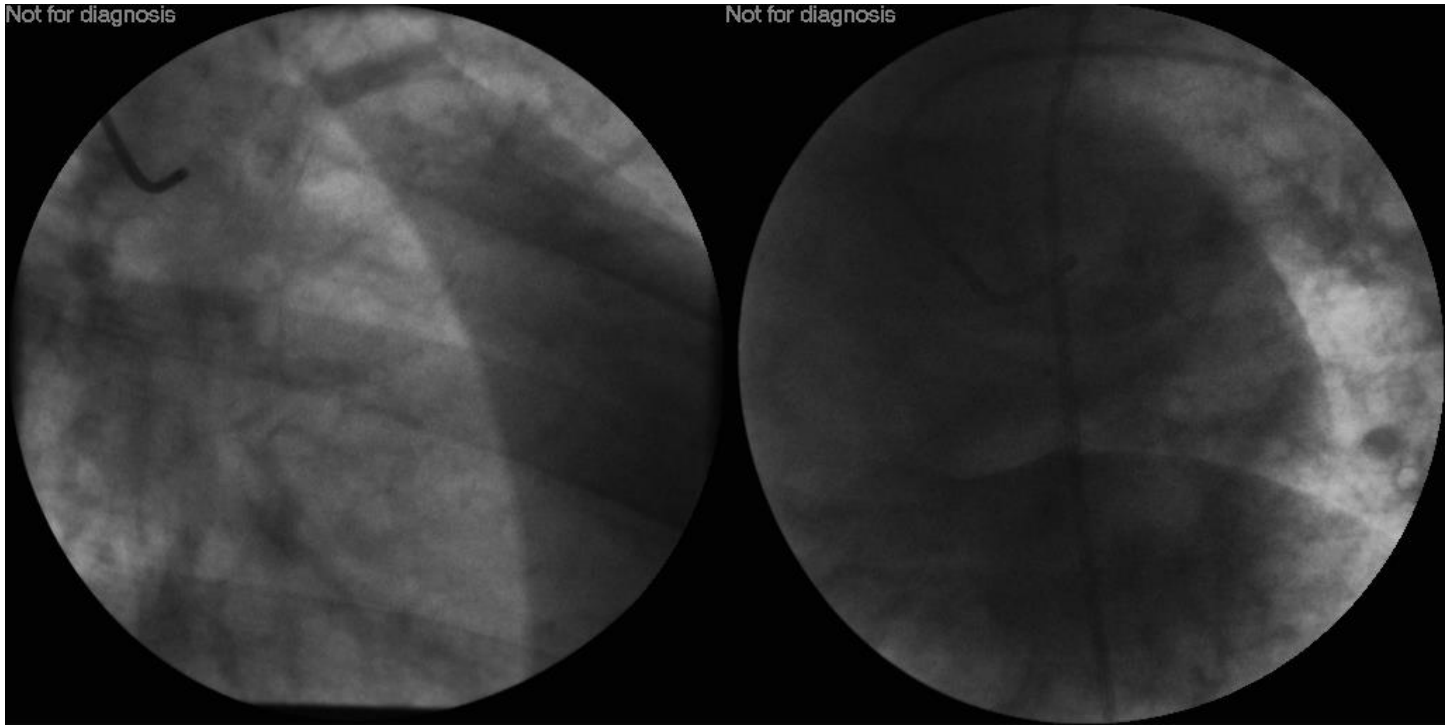
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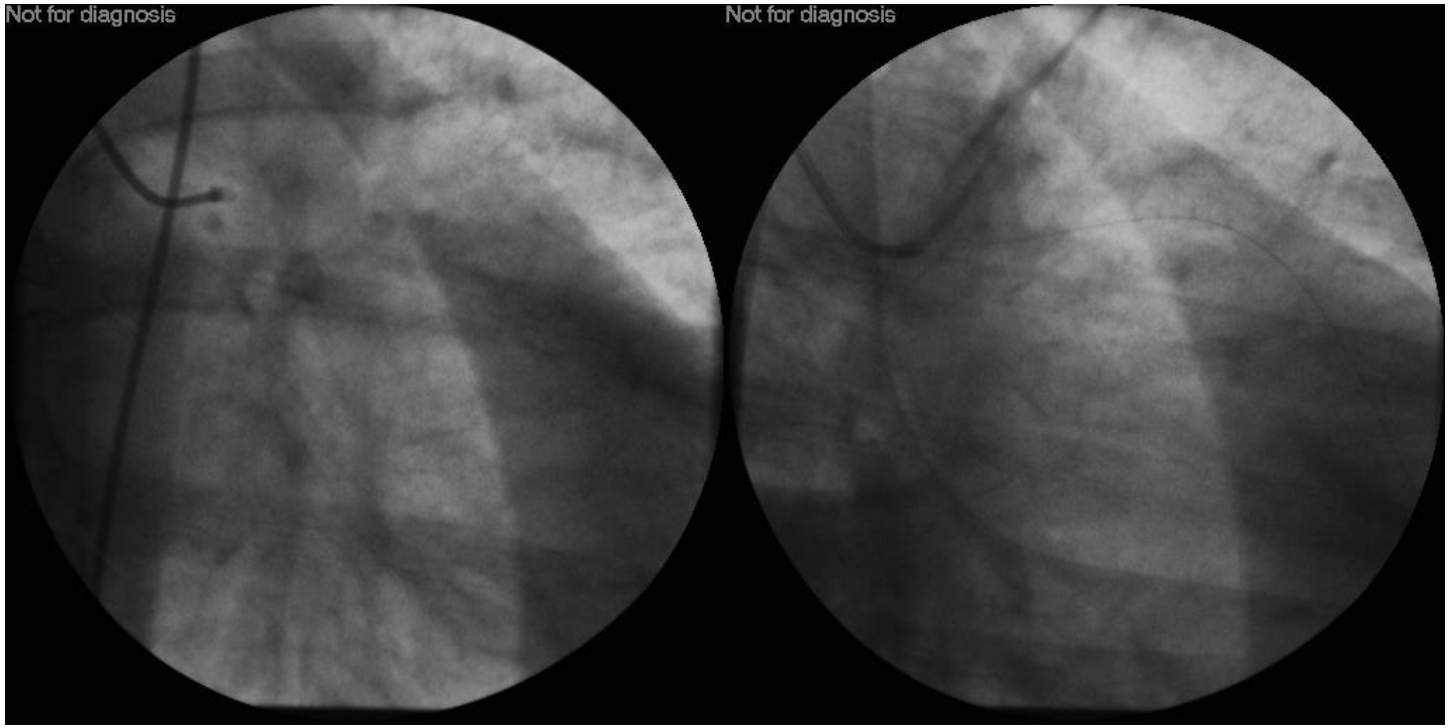
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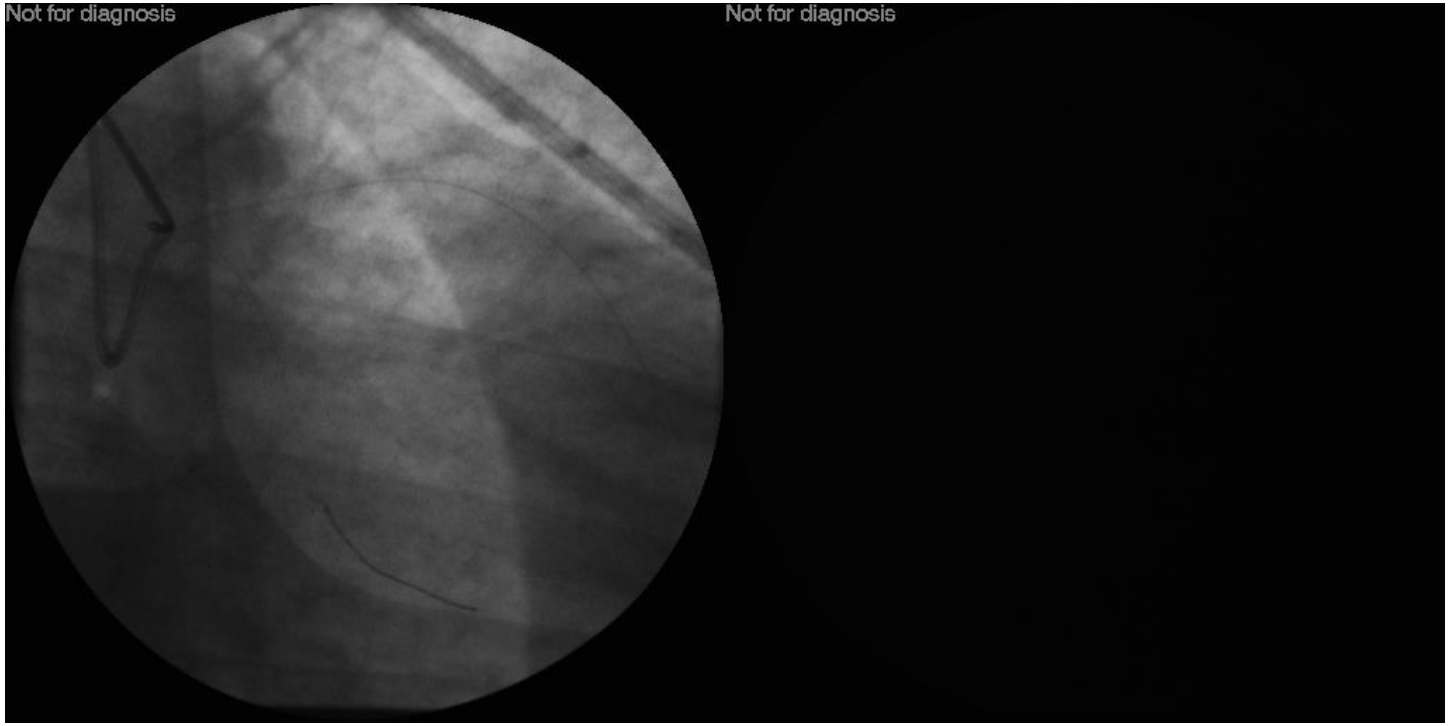
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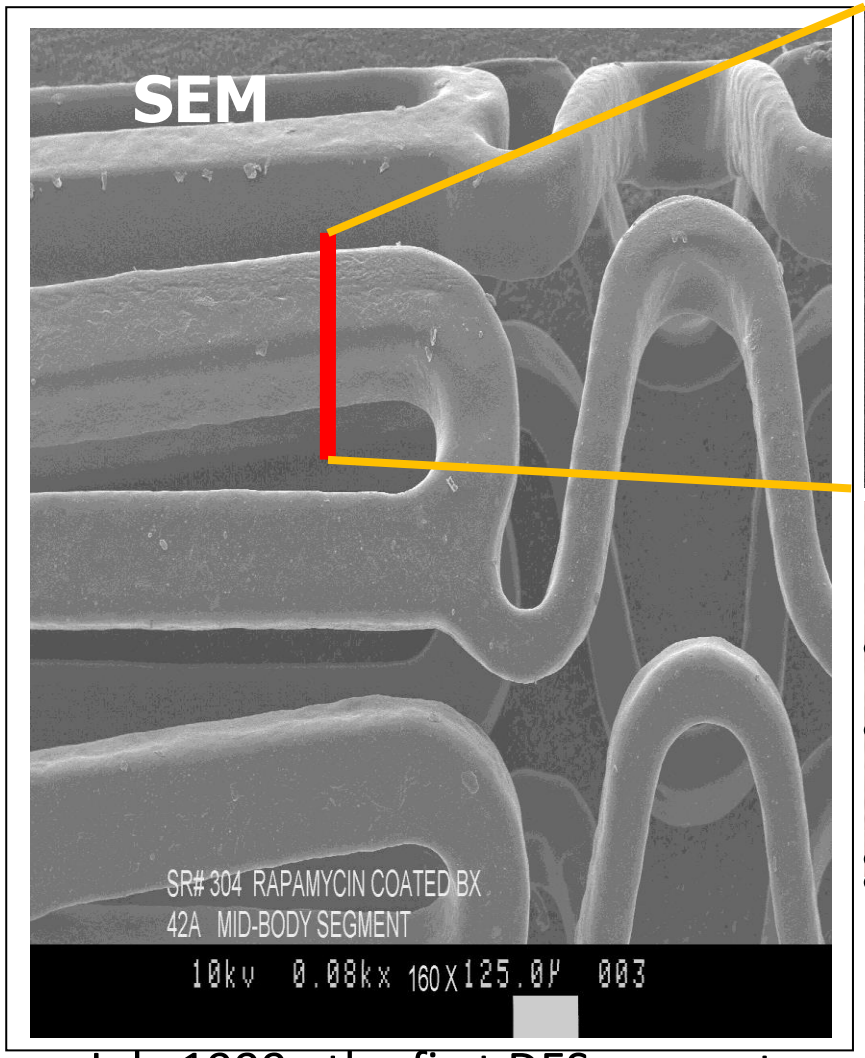
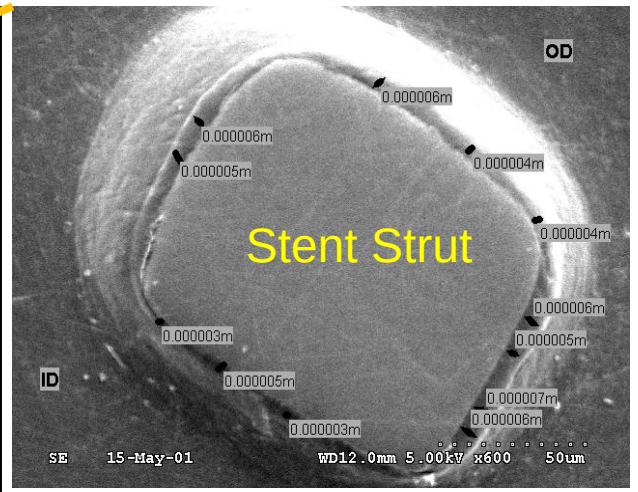
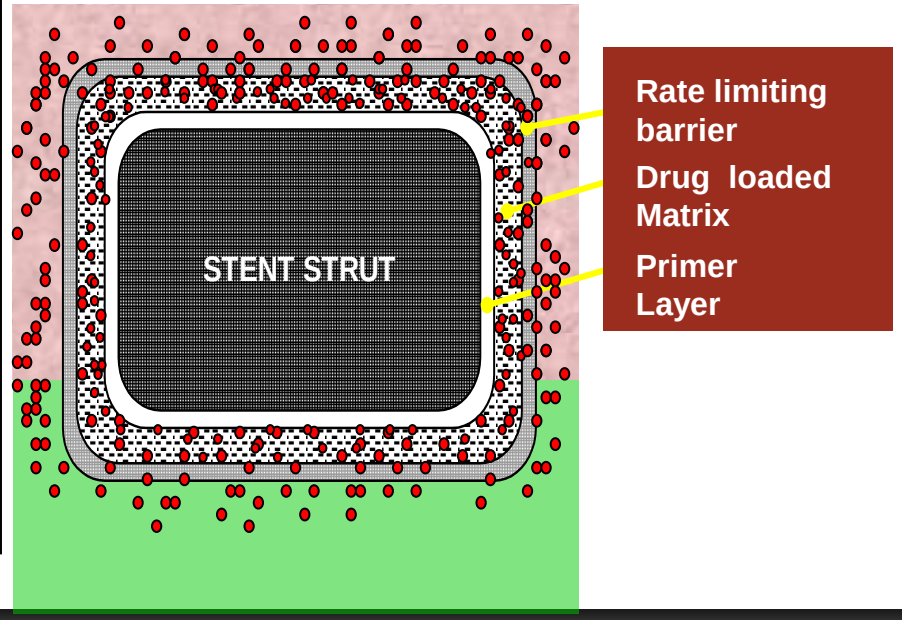
The Drug Eluting Stent – The REVOLUTION



July 1999 : the first DES concept





RAVEL

A RAndomised, double-blind study with the Sirolimus-eluting Bx VElocity™ balloon expandable stent in the treatment of patients with *de novo* native coronary artery Lesions

Authors:
J. Fajadet, M. Perin, E. Ban Hayashi, A. Colombo, G. Schuler, P. Barragan, C. Bode, J.E. Sousa, M.C. Morice, P.W. Serruys

Conclusion

This randomized double-blind trial demonstrated complete abolition of neo-intimal proliferation at 6 months:

- MLD (2.42 mm)

  remains basically unchanged compared to

- MLD post deployment (2.43 mm)
- No late loss (-0.01 mm)
- Restenosis (0%)
- No evidence of edge effect

First Four-Year Clinical Follow-Up from a Randomized Trial of a Polymer-Based, Paclitaxel-Eluting Stent: TAXUS I

Eberhard Grube[a], Sigmund Silber[b], Karl E. Hauptman[c], Mary E. Russell[d,*] for the TAXUS I Investigators

[a]Heart Center Siegburg, [b]Cardiology Practice and Hospital, Munich [c]Krankenhaus der Barmherzigen Bruder, [d]Boston Scientific Corporation

*Employee and stockholder of Boston Scientific Corporation

Background

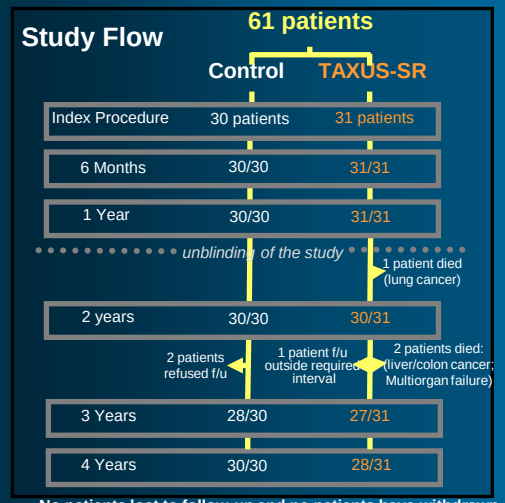
❖TAXUS I is a prospective, randomized, double-blind study to evaluate safety and performance of coronary artery stenting with a paclitaxel-eluting stent (TAXUS NIRx) for the treatment of de novo and restenotic lesions.
❖The first human use study evaluating the TAXUS slow-release stent showed continued safety and sustained reduction in target lesion revascularization through 3 years post implantation.
❖We now present results from the first 4-year follow-up of the TAXUS NIRx stent.

Objective

To evaluate the 4-year clinical outcomes from the first human trial of a polymer-based paclitaxel-eluting stent (TAXUS NIRx™) vs a bare metal stent (NIR™)

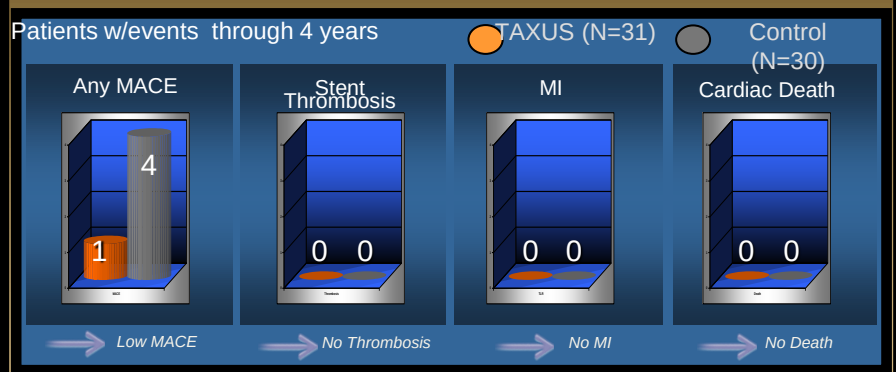
Patient Population (Methods)

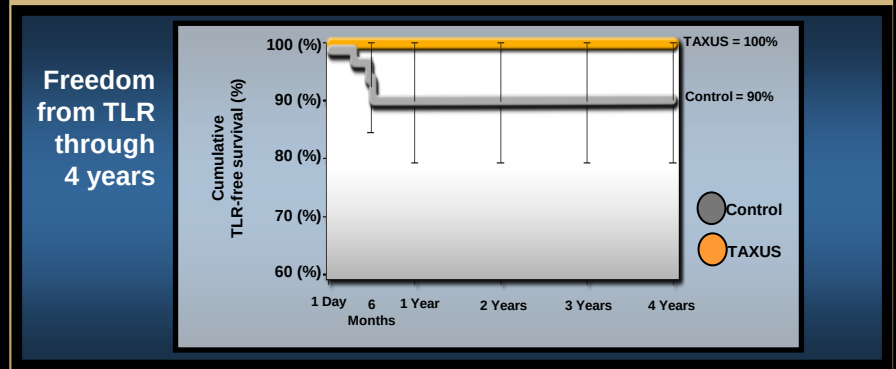
❖ 61 patients, 3 centers
❖ 1st patient enrolled Oct. 12, 2000 and last patient Mar. 1, 2001
❖ No statistically differences in baseline patient characteristics between groups.
❖ No statistically significant differences in lesion classification
❖ Procedural success was 100% for both study & control populations
❖ TAXUS slow-release (SR) stent vs. bare metal stent
❖ Primary endpoint: 30-day MACE (cardiac death, myocardial infarction and TVR)

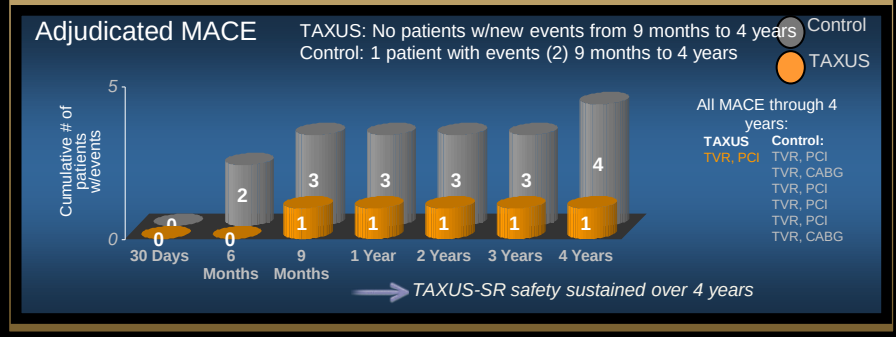


No patients lost to follow-up and no patients have withdrawn consent

Results







Summary

❖No cases of stent thrombosis, death, or MI were reported in the TAXUS or Control groups through 4 years follow-up.
❖No TLR for the TAXUS group through 4 years follow-up.
❖The cumulative 4-year MACE rate was 3.57% (1/28) in the TAXUS NIRx group versus 13.33% (4/30) for the control group.
❖The single MACE in TAXUS NIRx was a target vessel revascularization occurring outside the target lesion 200 days post-index procedure.
❖No new MACE occurred in TAXUS between 9 months and 4 years post-index procedure.
❖TAXUS NIRx is stable out to 4 years

Conclusions

❖Absence of stent thrombosis through 4 years and no new MACE after 9 months post-stent implantation confirm the excellent, continued long-term safety of this polymer-based, paclitaxel-eluting stent.
❖Prolonged exposure of the vessel wall to a paclitaxel-eluting stent does not result in safety concerns.
❖The results of this first-in-man study indicate that the TAXUS-SR stent reduces the need for repeat revascularization and its safety profile remains durable over long periods of time.

Meta-analysis

- **Meta-analysis**
- Meta-analysis
- Meta-analysis

The XIENCE V / PROMUS Everolimus-Eluting Stent: Comprehensive Update of the Clinical Trial Program

Featuring the First Presentation of the SPIRIT III 3-Year Results

Gregg W. Stone, MD
Columbia University Medical Center
The Cardiovascular Research Foundation

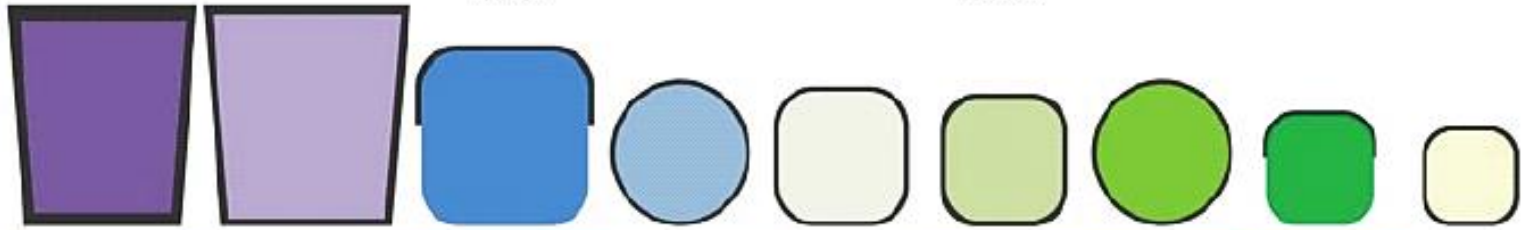
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Comparison of Zotarolimus-Eluting and Everolimus-Eluting Coronary Stents

Patrick W. Serruys, M.D., Ph.D., Sigmund Silber, M.D., Ph.D., Scot Garg, M.B., Ch.B., M.R.C.P., Robert Jan van Geuns, M.D., Ph.D., Gert Richardt, M.D., Pawel E. Buszman, M.D., Ph.D., Henning Kelbæk, M.D., Adrianus Johannes van Boven, M.D., Ph.D., Sjoerd H. Hofma, M.D., Ph.D., Axel Linke, M.D., Ph.D., Volker Klauss, M.D., Ph.D., William Wijns, M.D., Ph.D., Carlos Macaya, M.D., Ph.D., Philippe Garot, M.D., Carlo DiMario, M.D., Ph.D., Ganesh Manoharan, M.B., B.Ch., M.D., F.R.C.P., Ran Kornowski, M.D., Thomas Ischinger, M.D., Ph.D., Antonio Bartorelli, M.D., Jacintha Ronden, Ph.D., Marco Bressers, M.Sc., Pierre Gobbens, B.Sc., Manuela Negoita, M.D., Frank van Leeuwen, M.D., and Stephan Windecker, M.D.

Evolution of DES



	Taxus	Cypher	BioMatrix Nobori	Endeavor	Yukon PC	Xience Promus	Resolute	Synergy	Orsiro
Platform material	SS	SS	SS	CoCr	SS	CoCr PtCr	CoCr	PtCr	CoCr
Strut thickness (µm)	132	140	120	91	87	81	91	74	60
Polymer type	Durable	Durable	Biodegradable	Durable	Biodegradable	Durable	Durable	Biodegradable	Biodegradable
Polymer material	SIBS	PEVA/PBMA	PDLLA	MPC/LMA/HPMA/ 3-MPMA	PDLLA	PBMA/PVDF-HFP	PBMA/PNMA/ PVP/PVA	PLGA	PLLA
Coating distribution	Circumferential	Circumferential	Abluminal	Circumferential	Circumferential	Circumferential	Circumferential	Abluminal	Circumferential
Polymer thickness (µm)	22	13	10	6	5	8	6	4	7
Additional coating	-	-	-	-	-	-	-	-	Silicon carbide
Drug released	Paclitaxel	Sirolimus	Biolimus	Zotarolimus	Sirolmus	Everolimus	Zotarolimus	Everolimus	Sirolmus

DES

- Excellent long term results (3-5% restenosis rate, <0.5% LST)
- Patients live longer
- Use in different clinical settings
- Longer lesions
- Smaller vessels
- Excellent immediate results

The future of stents

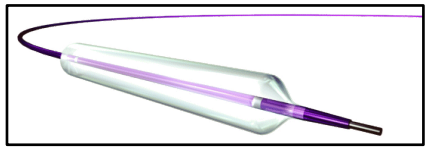
Thinner struts

No (durable) polymer

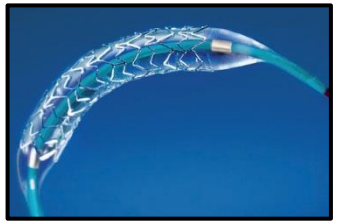
No permanent struts

Interventional cardiology

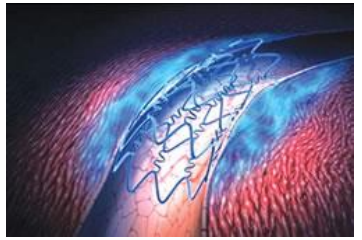
Balloon angioplasty 1977



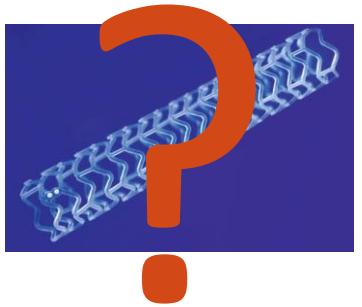
BMS 1986



DES 2001



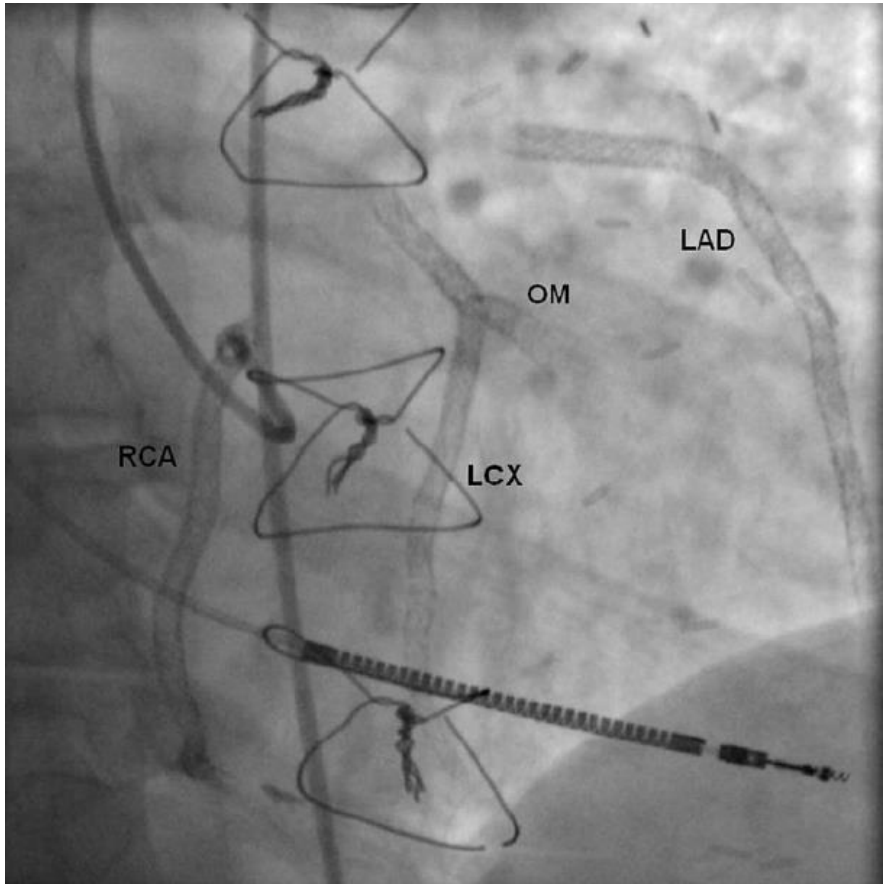
BVS 2011



DES: limitations

- Future interventions

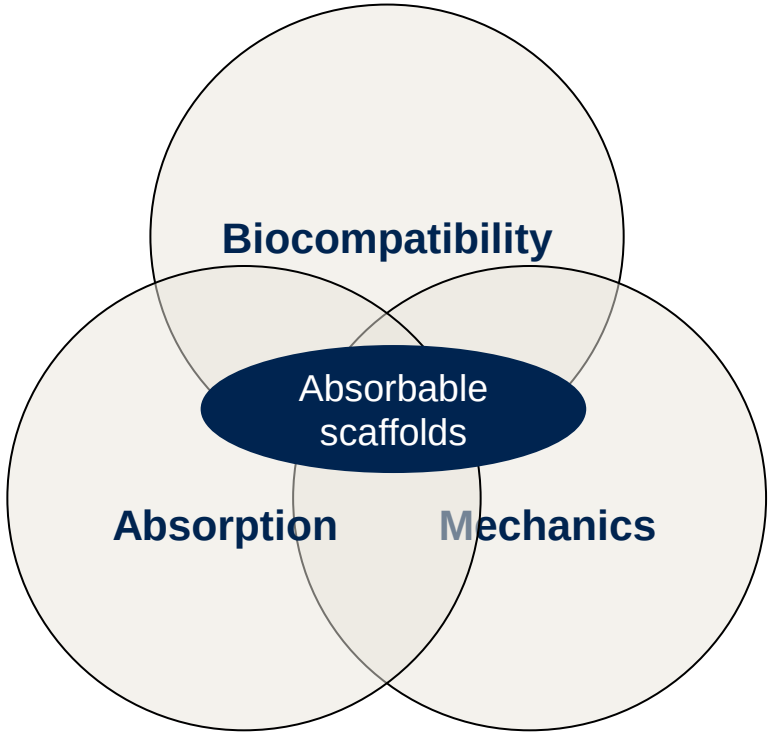
  56 yo male – 10 years treatment, 28 coronary angiographies…and implantation of **67 stents!**



JACC, 2010

Bioresorbables stents

- Developped since early 1990
- Technical problems to be solved
  - Radial strength and « recoil »
  - Optimal stent scaffold
  - Restenosis
  - Visibility

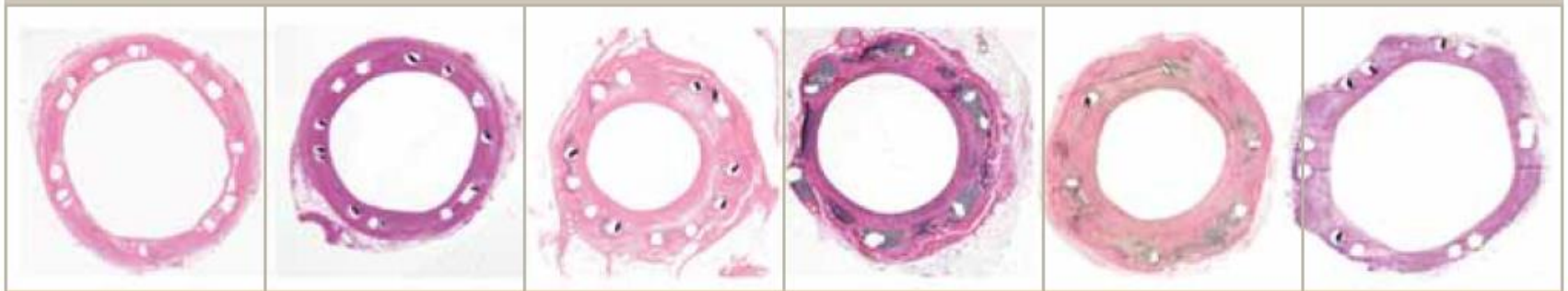


Company	Product	Description	Drug eluting	Status
Abbott	ABSORB	Fully bioabsorbable balloon-expandable scaffold based on poly-lactic acid that elutes everolimus; 2nd-gen version has reduced maximal circular unsupported scaffold area and a different proprietary manufacturing process of the polymer; provides everolimus elution over 3 months and mechanical support over 6 months; full mass loss and bioresorption occurs over 2 years	Yes	CE Mark; U.S. pivotal trial planned
Amaranth Medical	PLLA Stents	Amaranth is developing proprietary PLLA bioresorbable stents. Amaranth has a worldwide exclusive license to the technology from Nanyang Technological University	No	In Development
ART	ART Bioresorbable Stent	Hemocompatible, biocompatible, bioresorbable PLA stent that minimizes thrombus and inflammation; it is designed to provide good mechanical resistance over first 3 to 4 months	No	FIM expected in 2012
Biotronik	DREAMS	Magnesium bioresorbable scaffold featuring a bioresorbable matrix as the drug carrier; initial drug eluted was paclitaxel but company is moving to a limus compound for improved efficacy	Yes	FIM completed
Elixir	DESolve	Fully biodegradable drug-eluting scaffold comprises a fully bioresorbable polymer (polylactide-based) scaffold coated with a polylactide-based resorbable polymer-drug matrix; drug eluted is novolimus	Yes	CE Mark trial underway
Huaan	Xinsorb	A fully bioabsorbable, sirolimus-loaded poly-l-lactic acid stent	Yes	Preclinicals
Kyoto Medical	IGAKI-TAMAI	Bioabsorbable stent formed from poly-L-lactic acid (PLLA); dissolves into water and carbon dioxide and absorbed into vessel tissue within a "few years" after implantation	Yes	FIM completed
Meril	MeRes	Merilimus-eluting stent with a biodegradable scaffold	Yes	In Development
REVA Medical	ReSolve	Fully resorbable scaffold featuring stent with "slide and lock." Rapamycin on abluminal side	Yes	FIM underway
S3V	Avatar	Bioresorbable drug-coated scaffold specifically designed to be cost-effective. DES releases anti-proliferative drugs for the first 90 days and pro-healing drugs during its dissolving phase	Yes	Preclinicals
Sahajanand	Bioresorbable	Balloon expandable bioabsorbable scaffold with PLLA and heparinized PLLA	Yes	In Development
Xenogenics	Ideal BioStent	Fully bioabsorbable scaffold synthesized entirely from salicylate-based polymer; coating layer elutes sirolimus	Yes	FIM completed
Zorion Medical	Bioabsorbable DES	Bioabsorbable scaffold that combines "novel" biomaterials with known drug and drug delivery technology	Yes	Preclinicals

Stent Abbott Bioresorbable Vascular Scaffold (BVS)

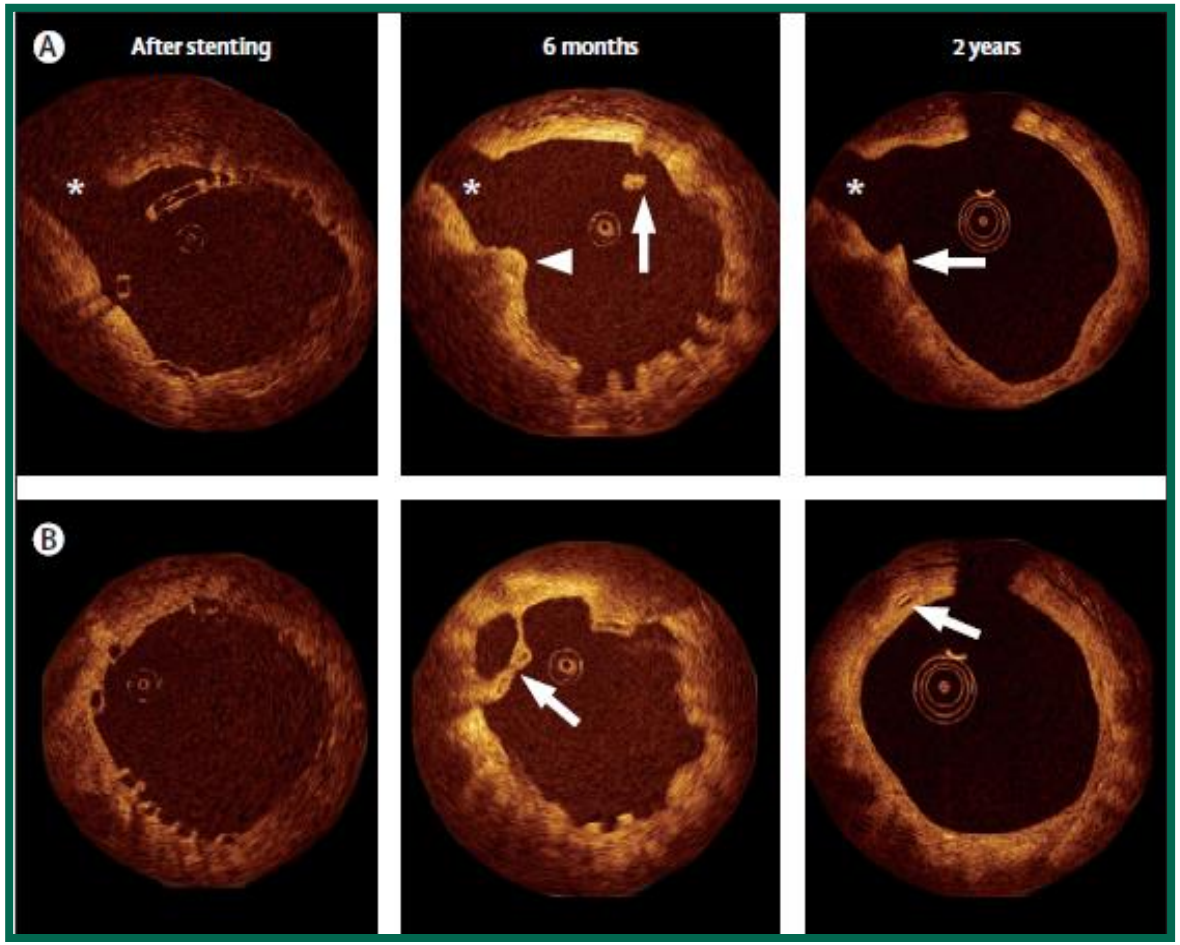
1 mois	6 mois	1 an	2 ans	3 ans	4 ans

Stent actif



1 mois	6 mois	1 an	2 ans	3 ans	4 ans

OCT Follow-up

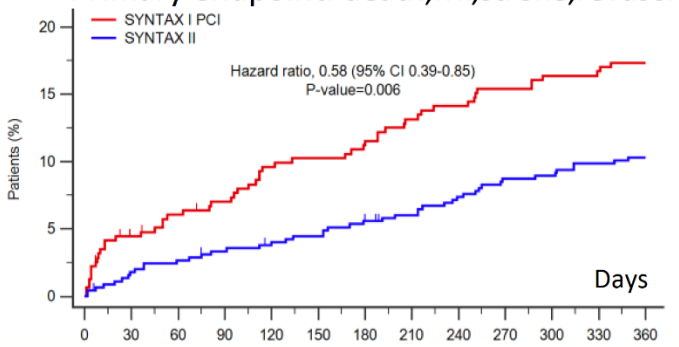


Serruys PW, Lancet 2009;373(9667):897-910.

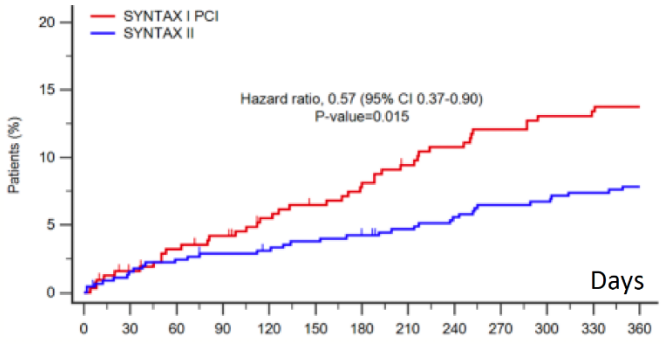
PCI – current status in 2020 ?

Patients with 3-Vessel Coronary Artery Disease
– SYNTAX II trial –

Primary endpoint: death,MI,stroke,revasc.



Revascularization

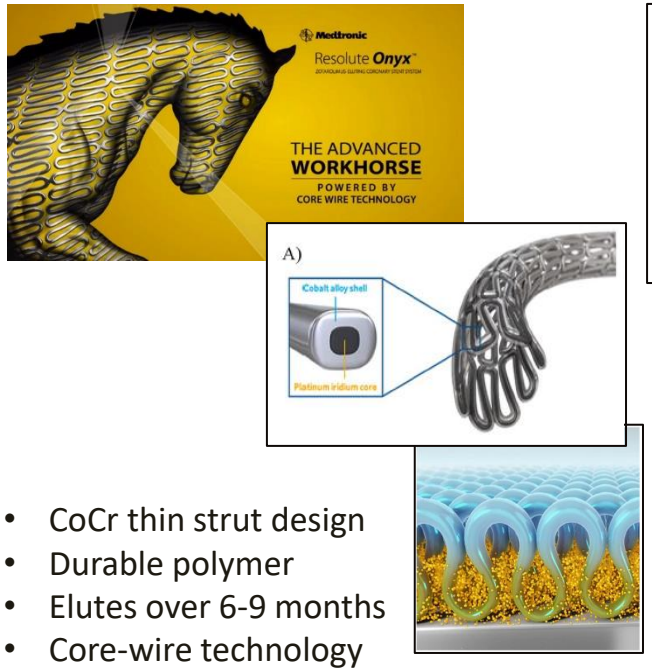


DES technology – heart team approach – pharmacotherapy – physiological assessment
Adjunctive invasive imaging

PCI – current status in 2023 ?

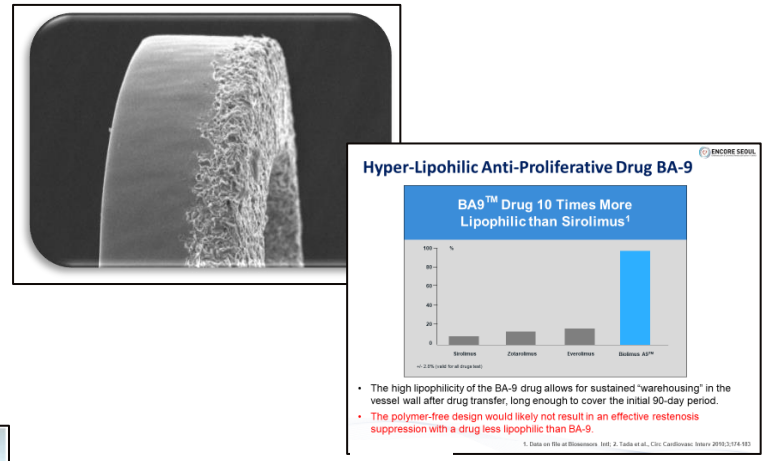
Resolute Onyx™ and BioFreedom™ Stent Designs

Onyx™ Design typical for general modern stent



- CoCr thin strut design
- Durable polymer
- Elutes over 6-9 months
- Core-wire technology
- Fluoroscopically visible

BioFreedom™ Design specific for Short DAPT



- Polymer-free design
- Drug-free at 28 days
- Super lipophilic drug
- Safety of BMS, Efficacy of DES

Outline

- From balloon angioplasty (PCTA) to stent to scaffold, a history of trends, technology and techniques
- From luminology to physiology (& advanced invasive imaging)
- **New trends, technologies & techniques for the years ahead**

Current daily interventional practice

- Safe contrast medium
- Digitized immediate image processing – fusion imaging
- Very low X-ray doses
- 3th or 4th generation of drug-eluting stents
- Impressive balloon & wire technology
- Booming of radial access, vascular closure devices for femoral access
- Adequate cardiovascular drugs
- Physiological lesion assessment & booming of invasive coronary imaging
- Mature technology for lesion subsets (bifurcation, left main disease, chronic total occlusions)
- The heart-team approach
- Interventional STEMI management
- Social media – robotics – the world : a village…


CorPath 200 System
Control Console
Interventional Cockpit
Cockpit Monitors (Live/Reference Angio, Hemo)

Que retenir?

- Maturité du stent actif
  - Supériorité ou non-infériorité?
- Opportunités à court terme
  - Réduction DAPT
  - Optimisation des plateformes
- Maladie coronaire du diabétique reste un challenge
- BRS: Possible espoir mais pour l'instant – uniquement dans des études
- Nouveaux stents actifs avec « mélange » de médicaments
  – antiprolifératif et anticoagulant (NOAC) localement

Merci de votre attention