

# Hybrid Revascularization: The Wave of the Future or a Boutique Item?

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# Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

## Affiliation/Financial Relationship

- **Grant/Research Support**
- **Consulting Fees/Honoraria**

## Company

- Sanofi/BMS- Significant
- Astra Zeneca, Regado Biosciences, Abbott Vascular, Ortho McNeal

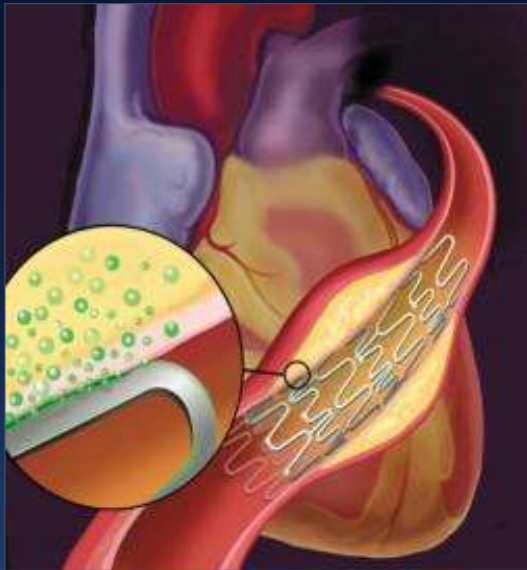


# Factors to Consider in Hybrid Procedures

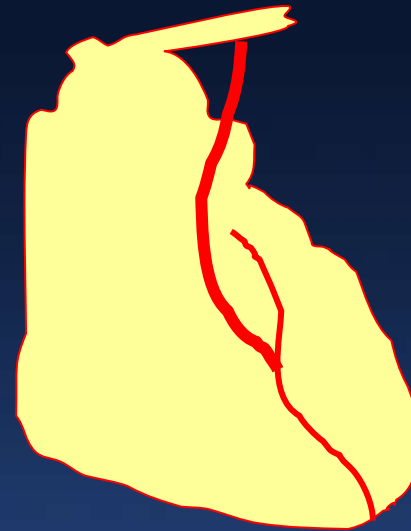
- Patient Selection
- Techniques
- Pharmacology
- Team approach



# Hybrid Coronary Revascularization



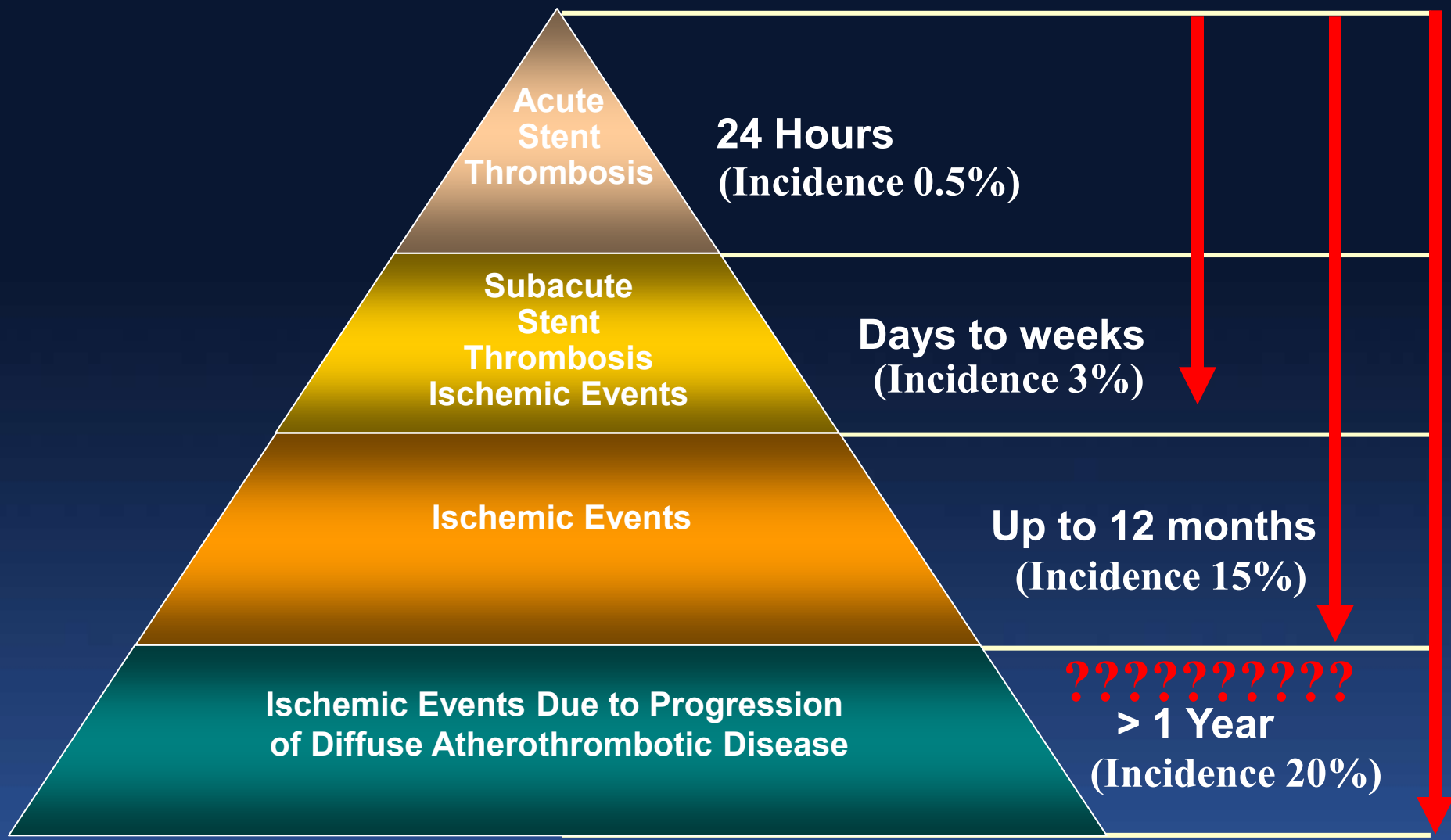
PCI of Non-LAD targets



LIMA to LAD



# “PYRAMID OF RISK” and BENEFIT w/ ADP Receptor Antagonism:

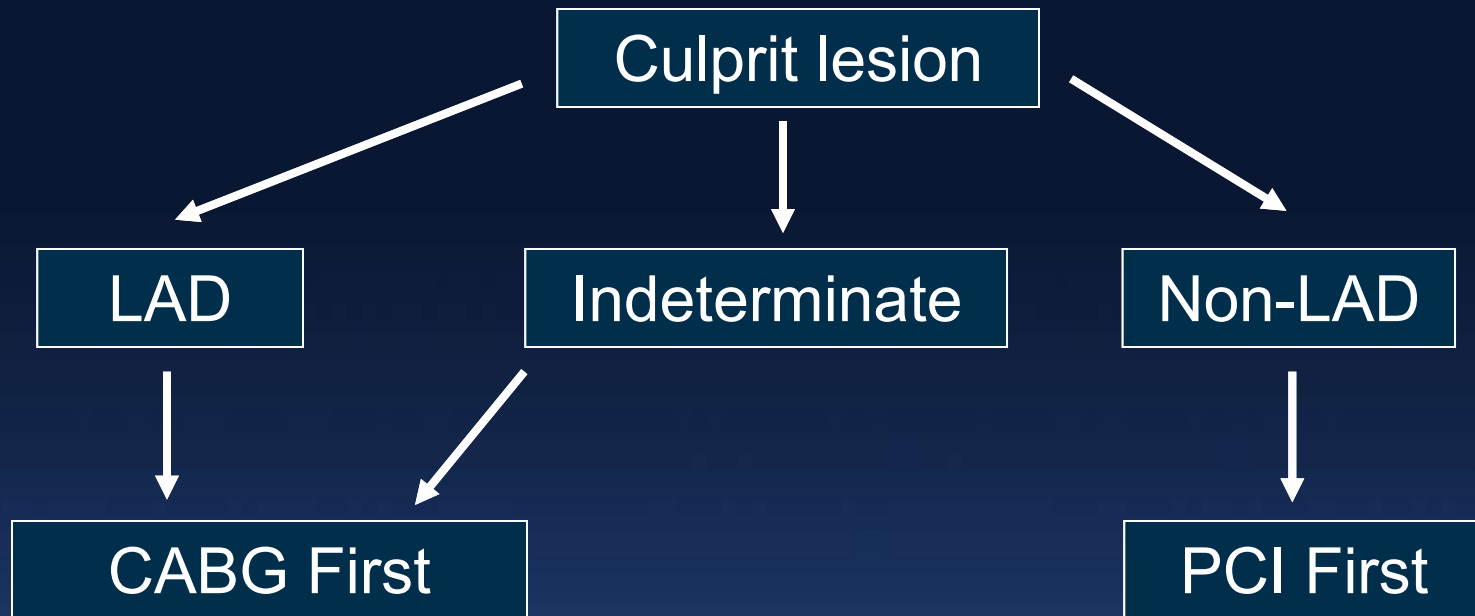


# Hybrid Revascularization

- **Two – staged approach**
  - Advantages
    - The need for anticoagulation and surgical hemostasis occurs at different times
  - Disadvantages
    - Patients sometimes less accepting
    - Longer time to completion



# Two- staged Hybrid Logistics



# Two-staged hybrid

- **CABG first**
  - Advantages
    - Graft patency assessment (angiogram)
  - Disadvantages
    - PCI failure may result in need for re-operation
    - Potential perioperative risk from unrevascularized areas





# Two-staged hybrid

- **PCI first**
  - Advantages
    - A PCI failures or complication easily handled by multi-vessel CABG
    - Leave the OR completely revascularized
  - Disadvantages
    - Need to perform the operation on clopidogrel



# Two-staged hybrid pharmacology

<b>CABG</b>	<b>Preoperative</b>	<b>Intraoperative</b>	<b>POD 0</b>	<b>POD 1...</b>
ASA	81mg PO QD	10 gr. PR	81mg PO QD	81mg PO QD
Clopidogrel			75mg PO in 6 hr	75mg PO QD
Heparin		180-250 mg/kg		
Protamine		Full reversal		

<b>PCI</b>	<b>Preoperative</b>	<b>Intraoperative</b>	<b>POD 0</b>	<b>POD 1...</b>
ASA	81mg PO QD		81mg PO QD	81mg PO QD
Clopidogrel		600mg Load	75mg PO QD	
Heparin		100-200 mg/kg		



# Hybrid Revascularization

- **Single – staged approach (simultaneous)**
  - **Advantages**
    - Immediate graft patency assessment
    - Time efficient (for the patient)
    - Potential more cost effective
    - Higher patient acceptance
    - Collaboration building
  - **Disadvantages**
    - Anticoagulation/surgical hemostasis conflict
    - Scheduling cooperation

# Hybrid Operating Room



**EUH HYBRID OR**

# Single-staged hybrid pharmacology

<b>HYBRID</b>	<b>Preoperative</b>	<b>Intraop CABG</b>	<b>Intraop PCI</b>	<b>POD 0</b>	<b>POD 1...</b>
ASA	81mg PO QD			81mg PO QD	81mg PO QD
Clopidogrel	75mg PO x 2-3			300mg load	75mg PO QD
Heparin		200-300 mg/kg	100-200 mg/kg		
Protamine		Full reversal	No reversal		



# Single-staged Hybrid Protocol

- Preoperative aspirin and clopidogrel (2-3 doses)
- Heparin 180mg/kg (ACT  $\geq$  350)
- LIMA to LAD surgery with meticulous hemostasis
- Full protamine reversal
- Spray synthetic sealant on IMA harvest bed, IMA pedicle and anastomosis
- 20-30 min “changeover” time
- Heparin 100mg/kg
- PCI
- Clopidogrel 300-600mg load upon arrival to ICU
- Daily clopidogrel (75mg) and aspirin (81mg)
- Cannot predict the clopidogrel response

# Single-stage Hybrid Alternative Drug Protocol \*

- Bivalirudin 0.75mg/kg load followed by 1.75mg/kg/hr infusion
- Clopidogrel 600mg load followed by 75mg daily
- ECA 81mg six hours later and then daily

*\* Kiaii et al. Simultaneous integrated coronary revascularization with long-term angiographic followup. JTCVS 2008;136:702-8*

# Reported Hybrid Series (1999-2008)

Series	Year	Institution	n	Diabetes (%)	30-Day Mortality	LIMA Patency (%)	TLR (%)	Follow-up (Months)	Redo CABG	1 year event-free survival (%)
Zenati	1999	Pittsburgh	31	25	0	100	10	11	1	90
Wittwer	2000	Hanover	35	23	0	100	NA	NA	NA	NA
Presbitero	2001	Italy	42	17	2	92	12	18	1	83
Cisowski	2002	Poland	50	42	0	100	13	6-24	0	87
Riess	2002	Hamburg	57	11	0	98	14	24	1	NA
Stahl	2002	Multi-US	54	33	0	100	NA	12	0	87
Davidavicius	2005	Belgium	22	18	0	100	0	19	0	100
Katz	2006	Multi-US	27	15	0	100	29.6	9	0	70
Vassiliades	2006	Emory	47	53	0	100	8.5	7	0	89
Kon	2008	Maryland	15	27	0	100	6.7	12	0	93
Gilard	2007	France	70	30	1	100	NA	33	0	96
Vassiliades	2008	Emory	91	43	0	100	NA	30	0	95 *
Kiaii	2008	Canada	58	23	0	93	3.4	20	0	93

**Total = 599**

\* Overall survival



# Considerations for the future

- Clinical trial comparing hybrid therapy to CABG or PCI or both
- Expand the technical capabilities of minimal access revascularization without creating more invasion
- New drugs for anticoagulation
- Foster collaboration and cross training between cardiac surgery and interventional cardiology

