OPCAB: A second or a conventional approach
The aorta non-touch technique using the “π-graft”

Sotirios N. Prapas, MD FECTS
Director, A’ Cardiac Surgery Department
Henry Dunant Hospital Center
1964: First successful clinical OPCAB


Mammary artery-coronary artery anastomosis as method of treatment for angina pectoris

V. I. Kolesov, M.D.,* Leningrad, U.S.S.R.

Vasilii Kollesov
(1904 – 1992)
1967

FIRST CABG (SVG’s), Favaloro
Classic CABG, vein grafts
USE OF LIMA, Green

Historical milestones

1969

1969: GIANT STEPS

Left internal thoracic artery with pedicle
Historical study

IMA on LAD better than SVG


CABG, LIMA + vein grafts
1974

BILATERAL IMA’s, Barner, Kay, Suzuki, Edwards
1987

USE OF GEA, Suma, Pym, Carter

Hisayoshi Suma

1987: Coronary Artery Bypass Grafting by Utilizing In Situ Right Gastroepiploic Artery
1991

RE-USE OF RADIAL, Acar

Alain Carpentier

1971: First use of Radial
1985

Institution of OPCAB (Buffolo-Benetti)


BENETTI, F. J.
Direct coronary artery surgery with saphenous vein bypass without either cardiopulmonary bypass or cardiac arrest.

Direct Myocardial Revascularization without Cardiopulmonary Bypass:
Technique and Results
E. Buffolo, J.C.S. Andrade, J. Succi, E.V. Leao, and C. Gallucci

Division of Cardiothoracic Surgery, Escola Paulista de Medicine, Sao Paulo, Brazil
Commercial Stabilizers

1993

Traditional stabilization of the heart. First years of OPCAB

Commercial stabilizer. The modern approach.
OVERCOME THE DIFFICULTY

We have overcome this difficulty since 1993 by placing several stitches in the posterior portion of the pericardial sac in such a way that there is exposure of the posterior arteries (OMB) with no hemodynamic stability.
1993 Intraluminal Shunt – Rivetti
Brompton 1989-1991

Post training period, Brompton, London U.K.

Darryl Shore

My teacher in adult and pediatric surgery in London and the man who set up my thoughts

1991, Brompton Hospital.
N.Moat, D.Taggart, S.Prapas, V.Tsang
The efforts of innovators

BENETTI (Argentina)

CALAFIORE (Italy)

SUPRAMANIAN (USA)
Patients material

❖ **Age:** 1/3 of the patients >70 ετών with increased pressure [STS Data,98].

❖ **Atherosclerosis of the aorta:** 13% of patients, percentage increases as age increases [Wareing TH, 92].

❖ **REDO:** Increase of percentage, STS mortality 6.25%.

❖ **Diabetics:** 30% of the patients planned for CABG.

❖ **High risk patients (↓ EF, COPD, CRF, Previous stroke, PVD etc.):** increased acceptance with the beating heart technique

---

Increasing Number of Patients Aged over 65
Years in the Next Decade
Konstantinides S et al.

1) Note dramatic increase in number and percentage of aged population

2) Can address the future operative volume in cardiothoracic surgery
My attitude in OPCAB since my involvement

- Demands special training and loyalty in the method.
- It can not be part of a surgery practice.
- May estimate the natural flow of diseased vessels avoiding competition
- Great choice of suitable point for anastomoses.
My interest in OPCAB was lead by the sense that the most disastrous consequences, in the classic bypass procedure, are generated by the use of CPB and the manipulation of the aorta; especially in high risk patients, which was later on confirmed in literature.

Started OPCAB in 1997 at the Onassis Cardiac Surgery Center

In 2001, founded the Cardiac Surgery dpt at the Henry Dunant Hospital Center, and focused from the beginning on Off pump, aorta non-touch technique with the use of arterial grafts.

The need for more peripheral anastomoses lead me to the inspiration of the π Graft.
My attitude in OPCAB since my involvement

Partial x-clamping of the pulsative aorta

A procedure that I was worried about dissection or stroke
My attitude in OPCAB since my involvement

OPCAB
Aorta non-touch
Total arterial

The Π- graft method

Creation of a secondary arterial circuit attached to the diseased coronary one
A New Pattern for Using Both Thoracic Arteries to Revascularize the Entire Heart: The π-graft (Greek pi)

Sotirios N. Prapas, MD, Constantinos E. Anagnostopoulos, MD, V. N. Kotsis, MD, G. P. Stavropoulos, MD, A. V. Sidiropoulos, MD, O. G. Ananiadou, MD, and George M. Palatianos, MD

Department of Cardiac Surgery, Henry Dunant Hospital, Athens, Greece; Department of Cardiac Surgery, Columbia University College of Physicians and Surgeons at St. Luke’s/Roosevelt Hospital Center, New York, New York, and Onassis Cardiac Surgery Center, Athens, Greece.

We present a complex graft for total arterial revascularization based on bilateral skeletonized internal thoracic arteries (ITA). The lower two-thirds of the free right ITA is anastomosed to the proximal segment of the left in situ ITA using the T-graft technique (Tector-Barner-Calafiore). The free, transected distal part of the left ITA is then anastomosed end-to-side on free right ITA (T-on-T anastomosis). In addition, the technique may use another graft extending the proximal third of the in situ right ITA with the free radial artery for right-sided revascularization. The entire operation can be performed off-pump to avoid any procedure on the ascending aorta.

(Ann Thorac Surg 2002;73:000–00)
© 2002 by The Society of Thoracic Surgeons
2 IMA’s are better than one


ANAORTIC
CORONARY SURGERY
Frequency of stroke according to aortic manipulation

CENTRAL ILLUSTRATION: Coronary Artery Bypass Grafting With and Without Manipulation of the Ascending Aorta

SUPERIORITY OF OPCAB
Off pump vs. On pump

7083 OPCABG (48%) vs 7683 ONCABG (52%)

High risk patients

The survival benefit of OPCABG appears when predicted mortality risk >2.5%

The survival benefit of OPCABG increases as predicted mortality increases.
42,471 patients in STS database analysed by 32 clinical risk factors
OPCABG benefits both genders but females > males

<table>
<thead>
<tr>
<th>OUTCOME</th>
<th>Adjusted OR (95% CI) for OPCABG</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEATH</td>
<td>0.83 (0.69, 0.98)</td>
<td>0.03</td>
</tr>
<tr>
<td>Stroke</td>
<td>0.65 (0.52, 0.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MI</td>
<td>0.67 (0.54, 0.84)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MACE</td>
<td>0.71 (0.63, 0.81)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LOS &gt; 14 days</td>
<td>0.70 (0.63, 0.78)</td>
<td>&lt;0.001</td>
</tr>
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</table>
### Off pump vs. On pump

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>Studies</th>
<th>Patients</th>
<th>OR</th>
<th>p</th>
<th>NNT</th>
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<tr>
<td>Mortality</td>
<td>28</td>
<td>100,066</td>
<td>0.67</td>
<td>&lt;0.001</td>
<td>189</td>
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<tr>
<td>Stroke</td>
<td>22</td>
<td>55,290</td>
<td>0.42</td>
<td>&lt;0.001</td>
<td>104</td>
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<tr>
<td>Myocardial Infarct</td>
<td>14</td>
<td>35,951</td>
<td>0.97</td>
<td>.86</td>
<td>2685</td>
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<tr>
<td>AF</td>
<td>11</td>
<td>29,343</td>
<td>0.92</td>
<td>.20</td>
<td>79</td>
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<tr>
<td>Renal Failure</td>
<td>17</td>
<td>38,866</td>
<td>0.60</td>
<td>&lt;.0001</td>
<td>82</td>
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<tr>
<td>Prolonged ventilation</td>
<td>6</td>
<td>8,675</td>
<td>0.71</td>
<td>.01</td>
<td>116</td>
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<tr>
<td>IABP support</td>
<td>7</td>
<td>9,703</td>
<td>0.60</td>
<td>.01</td>
<td>245</td>
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<tr>
<td>Inotropic Support</td>
<td>7</td>
<td>6,153</td>
<td>0.59</td>
<td>.02</td>
<td>8</td>
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<tr>
<td>ReOP for bleeding</td>
<td>14</td>
<td>39,480</td>
<td>0.76</td>
<td>.06</td>
<td>195</td>
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<tr>
<td>RBC transfusion</td>
<td>8</td>
<td>16,685</td>
<td>0.36</td>
<td>&lt;.001</td>
<td>9</td>
</tr>
<tr>
<td>Wound Infection</td>
<td>13</td>
<td>33,030</td>
<td>0.59</td>
<td>&lt;.001</td>
<td>314</td>
</tr>
</tbody>
</table>

**Meta-analysis**

38 propensity matched studies of 123,137 patients

Off-pump versus on-pump CABG: A systematic review and meta-analysis of propensity score analyses. JKuss O, von Salviati B, Borgermann JTCVS 2010

**OPCABG Reduces All Mortality and Morbidity**
OPCAB – Neurologic complications meta-analysis

Neurologic complications after off-pump coronary artery bypass grafting with and without aortic manipulation: Meta-analysis of 11,398 cases from 8 studies

Martin Misfeld, MD, PhD, a R. John L. Brereton, FRACS, b Elizabeth A. Sweetman, MHM, c and Gordon S. Doig, PhD c

Acquired Cardiovascular Disease

RR: 0.46; 95% CI 0.29-0.72; p=0.0008
Off-Pump versus On-Pump Coronary-Artery Bypass Grafting in Elderly Patients

2539 patients > 75 years
Experience: 322 OPCAB vs 578 ON
Predicted mortality 3.8%
Mean number of grafts 2.7 vs 2.8

1-Year Event Free Survival
HR=0.93 (0.76-1.16;p=0.48)

<table>
<thead>
<tr>
<th>Event</th>
<th>N=2539: 1 yr</th>
<th>OFF %</th>
<th>ON %</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>13.1</td>
<td>14.0</td>
<td></td>
<td>.48</td>
</tr>
<tr>
<td>Death</td>
<td>7.0</td>
<td>8.0</td>
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<td>.38</td>
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<tr>
<td>MI</td>
<td>2.1</td>
<td>2.4</td>
<td></td>
<td>.7</td>
</tr>
<tr>
<td>Stroke</td>
<td>3.5</td>
<td>4.4</td>
<td></td>
<td>.26</td>
</tr>
<tr>
<td>New dialysis</td>
<td>2.9</td>
<td>3.5</td>
<td></td>
<td>.37</td>
</tr>
<tr>
<td>REVASC</td>
<td>3.1</td>
<td>2.0</td>
<td></td>
<td>.11</td>
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</table>

<table>
<thead>
<tr>
<th>Event</th>
<th>N=2539: 30 d</th>
<th>OFF %</th>
<th>ON %</th>
<th>p</th>
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<tbody>
<tr>
<td>Primary</td>
<td>7.8</td>
<td>8.2</td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>Death</td>
<td>2.6</td>
<td>2.8</td>
<td></td>
<td>.55</td>
</tr>
<tr>
<td>MI</td>
<td>1.5</td>
<td>1.7</td>
<td></td>
<td>.79</td>
</tr>
<tr>
<td>Stroke</td>
<td>2.2</td>
<td>2.7</td>
<td></td>
<td>.47</td>
</tr>
<tr>
<td>New dialysis</td>
<td>2.4</td>
<td>3.1</td>
<td></td>
<td>.80</td>
</tr>
<tr>
<td>REVASC</td>
<td>1.3</td>
<td>0.4</td>
<td></td>
<td>.04</td>
</tr>
</tbody>
</table>
Disadvantages

Tendency towards incomplete Revascularization in OP

Figure 2. Standardized mean difference in the number of grafts performed in trials of off-pump compared with conventional coronary surgery.
Disadvantages

Tendency towards low rates of graft patency

Figure 2. Rates of Graft Patency in Each Territory in the On-Pump and Off-Pump Groups.
Disadvantages

What happens when OPCAB needs conversion to CCAB

Conversion rate (early period of OPCAB) 1.1% TO 16.3% Reported

- 1644 OPCAB
- 3.7% CONVERSION (Elective conversion mortality: 6.1% Urgent: 32%)
- MORTALITY: 18% vs. 2.7% matched CCAB
- INFARCT: 10.7% vs. 1.1%
- ARREST: 25% vs >1.1%
- MULTI-ORGAN FAILURE: 10.7% vs 0.6%

(Edgerton ,Mack Ann Thorac Surg 2003;76:1138-43)
Tatoulis’ experience

target

stenosis
Our anaortic method

OPCAB
Aorta non-touch
Total arterial
The Π-graft

- An arterial circuit with the use of:
  ✓ Pre-constructed composite grafts
  ✓ Sequential anastomoses
  ✓ Extensions

- Connected on the diseased coronary network without touching the aorta (aorta non-touch).

- The circuit is based on the natural flow of one or both IMAs

- The technique is used in cases that all of the peripheral targets have severe and similar stenoses

---

*If a peripheral target has moderate to severe stenoses, a special graft is placed, mainly a venous one, provided that the ascending aorta is healthy*
The technique: Pre-constructions

Left sided

EXTENSIONS (I - graft)
With radial, SVG or d. LIMA

T-GRAFT (Tector)
Π-GRAFT (Prapas)
Y-GRAFT (Calafiore)

SEQUENCIAL USE

radial
proxRIMA
d. LIMA
RIMA
The need to prove the reliability and safety of our method

5 years analysis
The π-graft method

Material

- Gene
  - Males: 1159
  - Females: 200
- Age: 34 – 94 years (mean 64.9)

MATERIAL 1359 pts

Risk Factors for Neurological Event

- Previous Stroke or TIA: 64 (4.7%)
- P.V.D.: 85 (6.3%)
- Diseased ascending aorta: 138 (12.3%)
- Diabetes mellitus: 437 (32.2%)
- Age over 79: 62 (4.6%)
- Preop. AF.: 8 (0.7%)
- Reoperation: 78 (5.7%)
- Acute coronary syndrome: 212 (15.6%)
- LV dysfunction ≤EF<50% → 288 (21.2%)
  ≤ 35% → 98 (7.2%)
- COPD: 68 (5%)
- Renal failure: 109 (8%)
- Renal dialysis: 19 (1.4%)
- Obesity: 295 (21.7%)
- Arterial hypertension: 584 (43%)
The π-graft method

30 Days mortality

<table>
<thead>
<tr>
<th></th>
<th>7 DAYS MORTALITY</th>
<th></th>
<th>30 DAYS MORTALITY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>NO</td>
<td>1356</td>
<td>99,8</td>
<td>1338</td>
<td>98,5</td>
</tr>
<tr>
<td>YES</td>
<td>3</td>
<td>0,2</td>
<td>21</td>
<td>1,5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1359</td>
<td>100</td>
<td>1359</td>
<td>100</td>
</tr>
</tbody>
</table>

15 cases with Euroscore > 8
0 cases with Euroscore < 3
The π-graft method
Mid-term results (5 years)

Octagenarians
P=NS

Diabetes
P=NS

Renal Failure
P=NS

Gender
P=NS
EMERGENCY

MORTALITY FROM ANY REASON

MORTALITY FROM CARDIAC REASON

Cox Regression

$P = 0.0005$

Cumulative percent (%)

Time (months)
POOR LV PERFORMANCE

MORTALITY FROM ANY REASON

MORTALITY FROM CARDIAC REASON

Cox Regression

\( p < 0.005 \)

\( p < 0.005 \)
<table>
<thead>
<tr>
<th>ΜΕΤΑΒΛΗΤΕΣ</th>
<th>ΧΑΜΗΛΟ (EF ≤35%)</th>
<th>ΚΑΛΟ-ΜΕΤΡΙΟ (EF &gt;35%)</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>ΣΥΝΟΛΙΚΗ ΘΝΗΤΟΤΗΤΑ</td>
<td>17 (17,3)</td>
<td>48 (3,8)</td>
<td>p&lt;0,0005</td>
</tr>
<tr>
<td>ΕΝΔΟΝΟΣΟΚΟΜΕΙΑΚΗ ΘΝΗΤΟΤΗΤΑ</td>
<td>8 (8,2)</td>
<td>13 (1,0)</td>
<td>p&lt;0,0005</td>
</tr>
<tr>
<td>ΘΑΝΑΤΟΣ ΑΠΟ ΚΑΡΔΙΑΚΗ ΑΙΤΙΑ</td>
<td>10 (58,8)</td>
<td>24 (50)</td>
<td>0,583</td>
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<tr>
<td>ΘΝΗΤΟΤΗΤΑ 7 ΗΜ.</td>
<td>0 (0,0)</td>
<td>3 (0,2)</td>
<td>1,000</td>
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<tr>
<td>STROKE</td>
<td>0 (0,0)</td>
<td>3 (0,2)</td>
<td>1,000</td>
</tr>
<tr>
<td>N.A.</td>
<td>3 (3,1)</td>
<td>27 (2,1)</td>
<td>0,473</td>
</tr>
<tr>
<td>ΠΝΕΥΜΟΝΟΛΟΓΙΚΕΣ ΕΠΙΠΛΟΚΕΣ</td>
<td>6 (6,1)</td>
<td>75 (5,9)</td>
<td>0,827</td>
</tr>
<tr>
<td>ΜΗΧΑΝΙΚΟΣ ΑΕΡΙΣΜΟΣ ΓΙΑ&gt;48h.</td>
<td>5 (5,1)</td>
<td>34 (2,7)</td>
<td>0,196</td>
</tr>
<tr>
<td>ΛΟΙΜΩΞΗ ΤΡΑΥΜΑΤΟΣ ΣΤΕΡΝΟΥ</td>
<td>4 (1,9)</td>
<td>9 (0,7)</td>
<td>0,011</td>
</tr>
<tr>
<td>ΚΟΛΠΙΚΗ ΜΑΡΜΑΡΥΓΗ</td>
<td>17 (17,3)</td>
<td>256 (20,3)</td>
<td>0,600</td>
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<tr>
<td>ΕΠΙΑΝΔΙΑΝΟΙΞΗ</td>
<td>0 (0,0)</td>
<td>9 (0,7)</td>
<td>1,000</td>
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<tr>
<td>ΙΑΒΡ</td>
<td>6 (6,1)</td>
<td>15 (1,2)</td>
<td>0,103</td>
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<td>ΔΙΑΤΑΡΑΧΕΣ ΟΥΡΟΠΟΙΗΤΙΚΟΥ</td>
<td>0 (0,0)</td>
<td>8 (0,6)</td>
<td>1,000</td>
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<td>ΔΙΑΤΑΡΑΧΕΣ ΓΕΣ</td>
<td>4 (4,1)</td>
<td>32 (2,5)</td>
<td>0,323</td>
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<td>ΨΥΧΙΑΤΡΙΚΕΣ ΔΙΑΤΑΡΑΧΕΣ</td>
<td>7 (0,6)</td>
<td></td>
<td>0,451</td>
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</table>
PREDICTORS OF MORTALITY

- **FEMALE GENDER**: 2.5 times more likely
- **EMERGENCY**: 5.1 times more likely
- **POOR EF**: 61% more likely
- **PREOP. IABP**: 5.5 times more likely
Female risk using OPCAB, pi-circuit, and aorta no-touch coronary revascularization.

Prapas SN, Panagiotopoulos IA, Ayvad MA, Kotsis VN, Protogeros DA, Linardakis IN, Tzanavaras TP, Danou FN.
Department of Cardiac Surgery, Henry Dunant Hospital, Mesogion 107, Athens GR 11521, Greece. sprapas@durantospital.gr

Impact of obesity on outcome of patients undergoing off-pump coronary artery bypass grafting using aorta no-touch technique

1Department of Cardiac Surgery, Henry Dunant Hospital, Athens, Greece
2Faculty of Medicine, Department of Cardiac Thoracic Surgery, Assiut University, Assiut, Egypt
Department of Cardiology, Henry Dunant Hospital, Athens, Greece
3ICU, Henry Dunant Hospital, Athens, Greece
Received 4 February 2010; revised in revised form 7 May 2010; accepted 11 May 2010.

Microbiologically documented nosocomial infections after coronary artery bypass surgery without cardiopulmonary bypass.

Falagas ME, Rosmarakis ES, Reilos K, Michalopoulos A, Samonis G, Prapas SN.
Alfa Institute of Biomedical Sciences, Athens, Greece. m.falagas@aiibs.gr

Predictors of prolonged mechanical ventilation following aorta no-touch off-pump coronary artery bypass surgery.

Prapas SN, Panagiotopoulos IA, Hamed Abdelsalam A, Kotsis VN, Protogeros DA, Linardakis IN, Danou FN.
Department of Cardiac Surgery, Henry Dunant Hospital, Athens, Greece.

Nosocomial infections after off-pump coronary artery bypass surgery: frequency, characteristics, and risk factors

1Alfa Institute of Biomedical Sciences (AIBS), Athens, Greece
2Department of Cardiac Surgery, Henry Dunant Hospital, Athens, Greece
3Intensive Care Unit, Henry Dunant Hospital, Athens, Greece
4Department of Medicine, University of Crete, School of Medicine, Heraklion, Crete
5Department of Medicine, Henry Dunant Hospital, Athens, Greece
6Department of Medicine, Tufts University School of Medicine, Boston, Massachusetts, USA
Received 2 July 2007; received in revised form 6 September 2007; accepted 7 September 2007

Xiphoid lower-sternotomy approach for multivessel revascularization of the left internal mammary artery to the left anterior descending artery and right internal mammary artery inflow to the other vessels.

Benetti F, Prapas S, Angeletti E, Ameriso JL, Cicalle E, Klokocovnik T, Knezevic I, Gensak B.
Benetti Foundation, Rosario, Argentina. federicobenetti@hotmail.com
12 years analysis
Isolated use of IMAs
Cases with isolated use of IMAs

Results analysis in 12 years
### Results

#### Postoperative MACCE (N=1005)\(^*\)

<table>
<thead>
<tr>
<th>Event</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All death</td>
<td>80 (8.0%)</td>
</tr>
<tr>
<td>Cardiac Death</td>
<td>17 (1.7%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>12 (1.2%)</td>
</tr>
<tr>
<td>MI</td>
<td>9 (0.9%)</td>
</tr>
<tr>
<td>Repeat revascularization</td>
<td>34 (3.4%)</td>
</tr>
</tbody>
</table>

*Patients who were lost-to-follow up were excluded*

#### Perioperative 7 days mortality

- 3 patients (0.3%)

#### Hospital 8-30 days mortality

- 11 patients (1.1%)

#### All-cause 10-years postoperative mortality

- 80 patients (8.0%)

#### Total number of deaths

- 94/1005 pts (9.4%)

---

**MACCE**

![Graph showing MACCE events]

**Cumulative survival**

![Graph showing cumulative survival]

---

**Henry Dunant Hospital**
Results

5-year SYNTAX study

Arbitrary comparison of our results to SYNTAX study

5-year SYNTAX mortality

Total Mortality

One Minus Cum Survival

Months after surgery

Henry Dunant Hospital
15 years analysis
Total arterial revascularization: The case of BIMA

TOTAL ARTERIAL REVASCULARIZATION ON OPCABG WITH THE EXCLUSIVE USE OF TWO INTERNAL MAMMARY ARTERIES

SOTIRIOS PRAPAS
DIRECTOR, CARDIAC SURGERY DEPARTMENT
HENRY DUNANT HOSPITAL CENTER
ATHENS, GREECE
Anaortic Surgical Myocardial Revascularization Using The \( \Pi \)-Circuit Improves Brain Protection

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MATERIAL
Isolated CABG n=3517: February 2001 – May 2016

- <70 y: 61.1%
- 70-79 y: 32.2%
- ≥80 y: 6.7%
Isolated CABG n=3517: February 2001 – May 2016
Isolated CABG n=3517: February 2001 – May 2016

8.0

2.3
Isolated CABG n=3517: February 2001 – May 2016

- pre CRF: 6.3%
- dialysis: 1.6%
- pre CVA: 4.0%
- redo: 5.1%
- COPD: 7.1%
Ejection fraction

Isolated CABG n=3517: February 2001 – May 2016

- >50%: 65.0%
- ≤35%: 7.3%
- 36-50%: 27.6%
METHOD
Isolated CABG n=3517: February 2001 – May 2016

- Distal anastomoses: 2.8
- Arterial anastomoses: 2.5
Arterial conduits, n=6813 (1.94/pt)

LITA, n=3466 (0.98/pt)

RA, n=868 (0.25/pt)

RITA, n=2479 (0.71/pt)

Isolated CABG n=3517: February 2001 – May 2016
Isolated CABG $n=3517$: February 2001 – May 2016

Arterial conduits

2, $n=2212$ (62.9%)

1, $n=712$ (20.2%)

3, $n=559$ (15.9%)

0, $n=34$ (1.0%)
Distribution of the arterial conduits, n=6813

Isolated CABG n=3517: February 2001 – May 2016

- BITA, n=1920 (54.6%)
- BITA+RA, n=559 (15.9%)
- LITA, n=695 (19.8%)
- LITA+RA, n=292 (8.3%)
- RA, n=17 (0.5%)
- no AC, n=34 (1.0%)
Aorta non-touch: 92.3%

Aortic top ends: 7.7%

Central anastomoses:
- 297 in 257 patients

Top end - grafts:
- SVG: 205
- Radial: 30
- Free RIMA: 62
RESULTS
Isolated CABG n=3517: February 2001 – May 2016

Primary end points

- 30d mortality: 1.22%
- CVA: 0.45%
- AMI: 0.26%
Postoperative complications

Isolated CABG n=3517: February 2001 – May 2016

- AKI: 4.2%
- AF: 19.4%
- Lung: 6.5%
- Reopening: 1.0%
- Post IABP: 1.3%
Stepwise logistic regression for early mortality

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>P value</th>
<th>univariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.06 (1.02-1.10)</td>
<td>0.0010</td>
<td>74 vs 67</td>
</tr>
<tr>
<td>Dialysis</td>
<td>6.9 (2.2-21.9)</td>
<td>0.0011</td>
<td>7.3% vs 1.1%</td>
</tr>
<tr>
<td>Emergency</td>
<td>5.7 (2.9-11.3)</td>
<td>&lt;0.0001</td>
<td>6.4% vs 0.8%</td>
</tr>
<tr>
<td>Female G</td>
<td>2.1 (1.0-4.5)</td>
<td>0.0499</td>
<td>2.4% vs 1.0%</td>
</tr>
<tr>
<td>PVD</td>
<td>4.1 (1.9-8.7)</td>
<td>0.0003</td>
<td>3.4% vs 1.0%</td>
</tr>
</tbody>
</table>

Isolated CABG n=3517: February 2001 – May 2016
Isolated CABG n=3517: February 2001 – May 2016

Stepwise logistic regression for early mortality

Cut point >70 years

AUC 0.700
sensitivity 67%
specificity 66%
p<0.0001

Sensitivity vs. 100-Specificity graph for age ranges, indicating a cut point of >70 years with specified AUC and statistical significance.
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<th>OR (95%CI)</th>
<th>P value</th>
<th>P value (univariate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary Complications</td>
<td>5.2 (1.7-16.4)</td>
<td>0.0048</td>
<td>1.8% vs 0.4%</td>
</tr>
<tr>
<td>PVD</td>
<td>3.5 (1.1-11.1)</td>
<td>0.0301</td>
<td>1.2% vs 0.4%</td>
</tr>
</tbody>
</table>

Stepwise logistic regression for postoperative CVA
<table>
<thead>
<tr>
<th>Variable</th>
<th>OR(95%CI)</th>
<th>P value</th>
<th>Univariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic anast</td>
<td>4.2(1.02-17.5)</td>
<td>0.0462</td>
<td>0.9% vs 0.2%</td>
</tr>
<tr>
<td>BMI</td>
<td>0.7(0.6-0.9)</td>
<td>0.0088</td>
<td>24 vs 27</td>
</tr>
<tr>
<td>Pulmonary Complications</td>
<td>6.7(1.6-27.5)</td>
<td>0.0088</td>
<td>1.3% vs 0.2%</td>
</tr>
</tbody>
</table>

Stepwise logistic regression for postoperative AMI
Stepwise logistic regression for postoperative AMI

Isolated CABG $n=3517$: February 2001 – May 2016

- AUC 0.775
- Sensitivity 89%
- Specificity 58%
- $p=0.0001$

Cut point $\leq 26$

AUC 0.775
sensitivity 89%
specificity 58%
p=0.0001
THANK YOU!