Coronary Artery Bypass Graft vs. Drug Eluting Stents

University of Colorado - Department of Surgery
Grand Rounds
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Coronary Artery Disease

- 13.7 million people in the US
  - Over 115 new cases per 10,000 people per year

- Mortality
  - #1 cause of death in the US
  - 31 deaths per 10,000 per year

National health and Nutrition Surveys
Coronary Artery Disease

- Number of CABG operations per year are decreasing
- Isolated CABG:
  - 1997: 192,543
  - 2004: 149,680

STS National Database
Coronary Artery Disease

- Number of percutaneous stent procedures are increasing
- Percutaneous stent placement
  - 1997: 400,000
  - 2004: 800,000
Several Randomized Studies compare CABG to Stents

Drug Eluting Stents are new
- First approved by the FDA in 2003

No good data support Drug Eluting Stents are superior to CABG

No Long term data on Drug Eluting Stents
CABG vs Stents

- Stent or Surgery (SoS)
- Arterial Revascularization Therapies Study (ARTS)
Stent or Surgery Trial

- Multicenter trial in Europe and Canada
- Randomized 988 patients from Nov 1996 to Dec 1999 with multivessel coronary artery disease
- CABG (500) and Stents (488)
- 1 year follow up 100%
- 2 year follow up 61%
- Primary outcome was rate of revascularization
<table>
<thead>
<tr>
<th>Revascularization</th>
<th>Stent</th>
<th>CABG</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-yr</td>
<td>17%</td>
<td>4%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2-yr</td>
<td>21%</td>
<td>6%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Stent or Surgery Trial

- CABG also had lower death rates
  - 5% (22) in stent group
  - 2% (8) in CABG group (p=0.01)
Stent or Surgery Trial

Conclusions:
- CABG has lower revascularization rates than Stents in patients with multivessel coronary disease
- Also a survival advantage in CABG patients
ARTS Trial

- Multicenter Randomized trial
- 1205 patients from April 1997 to June 1998
- CABG (605) Stents (600)
- 1, 3, and 5 year follow ups
- 97% follow up at 5 years
- Primary Outcomes: cardiac and cerebral events, revascularization rates
ARTS Trial

- Excluded patients with:
  - LVEF <30%
  - Left Main Disease
  - Transmural MI in previous week
  - Hepatic or renal disease
## ARTS Trial

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<tr>
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<th>CABG</th>
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<tbody>
<tr>
<td>Death</td>
<td>8.0%</td>
<td>7.6%</td>
<td>0.83</td>
</tr>
<tr>
<td>CVA or MI</td>
<td>18.2%</td>
<td>14.9%</td>
<td>0.14</td>
</tr>
<tr>
<td>Revascularization</td>
<td>30.3%</td>
<td>8.8%</td>
<td>&lt;0.001</td>
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ARTS Trial

- Also analyzed patients with Diabetes
- 208 patients
- CABG (96)  Stent (112)
## ARTS Trial

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<tr>
<td>Death</td>
<td>13.4%</td>
<td>8.3%</td>
<td>0.27</td>
</tr>
<tr>
<td>CVA or MI</td>
<td>25.0%</td>
<td>19.8%</td>
<td>0.41</td>
</tr>
<tr>
<td>Revascularization</td>
<td>42.9%</td>
<td>10.4%</td>
<td>&lt;0.001</td>
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ARTS Trial

Conclusions:
- CABG has lower revascularisation rates than Stents in patients with multivessel coronary disease
- This is also seen in patients with diabetes
- No survival advantage in CABG or Stents in patients with or without diabetes
CABG vs Drug Eluting Stents

- Drug Eluting Stents offer lower revascularization rates than Bare Metal Stents.
- Therefore Drug Eluting Stents will be superior to CABG.
CABG vs Drug Eluting Stents

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NO
CABG vs Drug Eluting Stents

- ARTS II
ARTS II

- Population similar to ARTS I
- Multivessel Disease
- Compared 607 patients receiving Sirolimus-Eluting Stents to the patients in ARTS Trial
- Compared 1-year follow-up
- NOT Randomized
# ARTS II

<table>
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<tr>
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<th>CABG Arts</th>
<th>Stent Arts</th>
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<tbody>
<tr>
<td>Death, CVA or MI</td>
<td>3.1%</td>
<td>4.0%</td>
<td>9.3%</td>
</tr>
<tr>
<td>MACCE</td>
<td>10.4%</td>
<td>11.6%</td>
<td>26.5%</td>
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<tr>
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<td>8.5%</td>
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MACCE = Major Adverse Cardiac and Cerebrovascular Event
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MACCE = Major Adverse Cardiac and Cerebrovascular Event
ARTS II

- MACCE similar in DES and CABG
- Still increased revascularization rates in DES compared to CABG
- Not Randomized
CABG vs Drug Eluting Stents

- Studies Comparing Drug Eluting Stents to Bare Metal Stents
  - RAVEL Trial (Sirolimus-Eluting Stents)
  - SIRIUS Trials (Sirolimus-Eluting Stents)
  - TAXUS Trials (Paclitaxel-Eluting Stents)

- All show decreased revascularization in DES groups
CABG vs Drug Eluting Stents

- All restricted to highly selected patients with favorable lesions
  - RAVEL excluded:
    - lesions longer than 18mm or diameter less than 2.5mm, ostial or calcified lesions
  - SIRIUS excluded:
    - AMI, left main, ostial or calcified lesions, LVEF<25%
  - TAXUS excluded:
    - AMI, LVEF<30%, recent stroke, lesions longer than one stent
CABG vs Drug Eluting Stents

- Primary end points were target lesion or target vessel restenosis
- SIRIUS had 13.3% need for revascularization (target or other vessel) at one year.
- ARTS at one year
  - CABG: 3.8% revascularization
CABG vs Drug Eluting Stents

- Mayo Clinic review of 550 patients who underwent CABG from March 1999 to December 2001
- Only 6% met criteria for SIRIUS study

Powell, et.al. Mayo Clinic Proc. 2007;79:796-772
CABG vs Drug Eluting Stents

- FREEDOM trial
  - Ongoing
  - Comparing DES to CABG in Diabetic patients
  - Randomized
CABG vs Drug Eluting Stents

Jury is out
CABG vs Drug Eluting Stents

- Advancements in CABG
  - LIMA to LAD offers 90% patency at 15 years
  - Off-pump CABG
  - Minimally Invasive Direct Coronary Artery Bypass (MIDCAB)
Conclusion

- Drug Eluting Stents have not been shown to be superior to CABG
- Need long term data
- Advances in CABG
- Combination of the two techniques?
Conclusion

Hype
Conclusion

Proven