Coronary artery surgery results
2011, in Japan

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Official home-page of JACAS : http://www.jacas.org
Coronary artery bypass grafting (CABG), 2011

<table>
<thead>
<tr>
<th>Total cases</th>
<th>12,425</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated CABG</td>
<td>8,990 (72%) (previous year: 74%)</td>
</tr>
<tr>
<td>Concomitant CABG</td>
<td>3,435 (28%) (previous year: 26%)</td>
</tr>
</tbody>
</table>

Isolated CABG

<table>
<thead>
<tr>
<th>Initial elective</th>
<th>7,454</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-pump</td>
<td>4,972</td>
</tr>
<tr>
<td>On-pump</td>
<td>2,482</td>
</tr>
<tr>
<td>847 Off-pump rate</td>
<td>67%</td>
</tr>
<tr>
<td>(previous year: 65%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extra initial elective</th>
<th>1,536</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-pump</td>
<td></td>
</tr>
<tr>
<td>On-pump</td>
<td></td>
</tr>
<tr>
<td>689 Off-pump rate</td>
<td>55%</td>
</tr>
<tr>
<td>(previous year: 53%)</td>
<td></td>
</tr>
</tbody>
</table>

(Off-pump rate : 67%)  (Off-pump rate : 55%)
(previous year : 65%)  (previous year : 53%)
Changes in OPCAB frequency rate of initial elective CABG
<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cases of initial elective</td>
<td>7,454</td>
<td>100%</td>
</tr>
<tr>
<td>On-pump (cardiac arrest)</td>
<td>1,622</td>
<td>21.8%</td>
</tr>
<tr>
<td>On-pump (cardiac beating)</td>
<td>860</td>
<td>11.5%</td>
</tr>
<tr>
<td>Off-pump (total cases)</td>
<td>4,972</td>
<td>66.7%</td>
</tr>
<tr>
<td>Off-pump (complete)</td>
<td>4,782</td>
<td></td>
</tr>
<tr>
<td>On-pump (convert)</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>OPCAB complete rate</td>
<td>96.2%</td>
<td></td>
</tr>
<tr>
<td>Off to on-pump convert rate</td>
<td>3.8%</td>
<td></td>
</tr>
<tr>
<td>(previous year: 2.3%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mortality of isolated CABG: **2.72%**
(previous year: **1.45%**)

Mortality of initial elective CABG: **2.12%**
(previous year: **0.75%**)

- On-pump (cardiac arrest): **1.05%**
- On-pump (cardiac beating): **3.95%**
- Off-pump (total cases): **2.15%**
- Off-pump (complete): **2.11%**
  (previous year: **0.53%**)
- On to on-pump (convert): **3.16%**
  (previous year: **4.17%**
Changes in mortality of CABG

- Initial elective cases:
  - 2.72% in 2011
  - 2.12% in 2010
  - 1.45% in 2009
  - 1.20% in 2008
  - 0.75% in 2007

- Total cases:
  - 2.12% in 2010
  - 2.72% in 2011
Changes of mortality for procedures (Initial elective CABG)

Off to on-pump (conversion)

- Off-pump (complete)
- On-pump (beating)
- On-pump (arrest)
Surgical results according to diseased vessels

(Initial elective cases: 7,454, mortality: 2.12%)
Surgical results according to diseased vessels

(Initial elective off-pump (complete): 4,782, mortality: 2.11%)
Surgical results according to diseased vessels

(Initial elective on-pump (arrest): 1,622, mortality: 1.05%)
Surgical results according to diseased vessels

Initial elective off to on-pump (conversion): 190, mortality: 3.16%
Surgical results according to diseased vessels

(Initial elective on-pump (beating): 860, mortality: 3.95%)

Mortality (%)

1VD (16.67%)

2VD (0%)

3VD (5.04%)

LMT + 1VD (0%)

LMT + 2VD (0%)

LMT + 3VD (4.98%)
Surgical results according to diseased vessels

(Extra initial elective cases: 1,536, mortality: 5.66%)

- 1VD: 5.94%
- 2VD: 6.22%
- 3VD: 4.03%
- LMT: 8%
- LMT + 1VD: 9.09%
- LMT + 2VD: 5.16%
- LMT + 3VD: 6.48%
Surgical results according to procedures
(Except initial elective cases: 1,536, mortality: 5.66%)

Mortality (%)

- Off-pump (total): 3.42%
- On-pump (beating): 11.57%
- On-pump (arrest): 5.40%
Number of grafts according to surgical procedures

<table>
<thead>
<tr>
<th>Surgical Procedures</th>
<th>Total Cases</th>
<th>Mean Grafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-pump (arrest)</td>
<td>1</td>
<td>2.96 (2.99)</td>
</tr>
<tr>
<td>On-pump (beating)</td>
<td>2</td>
<td>3.17 (3.18)</td>
</tr>
<tr>
<td>Off to on (conversion)</td>
<td>3</td>
<td>3.08 (3.07)</td>
</tr>
<tr>
<td>Off-pump (complete)</td>
<td>4</td>
<td>3.25 (3.05)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2.86 (2.90)</td>
</tr>
</tbody>
</table>

Legend:
- Dark blue: 1 graft
- Light blue: 2 grafts
- Light brown: 3 grafts
- Dark brown: 4 grafts or more
Surgical procedures according to number of grafts

1 graft
- Off-pump
- Off to on-pump (conversion)
- On-pump (beating)
- On-pump (arrest)

2 grafts
- Off-pump
- Off to on-pump (conversion)
- On-pump (arrest)

3 grafts
- Off-pump
- Off to on-pump (conversion)
- On-pump (arrest)

4 or more grafts
- Off-pump
- Off to on-pump (conversion)
- On-pump (arrest)
Surgical procedures according to diseased vessels

1 vessel
- Off-pump
- On-pump (conversion)
- On-pump (beating)

2 vessels
- Off-pump
- On-pump (conversions)
- On-pump (beating)

3 vessels
- Off-pump
- On-pump (conversions)
- On-pump (beating)

LMT
- Off-pump
- On-pump (conversions)
- On-pump (beating)

LMT +1
- Off-pump
- On-pump (conversions)
- On-pump (beating)

LMT +2
- Off-pump
- On-pump (conversions)
- On-pump (beating)

LMT +3
- Off-pump
- On-pump (conversions)
- On-pump (beating)
Surgical results of off-pump (complete) vs. on-pump (arrest) according to diseased vessels

<table>
<thead>
<tr>
<th>Mortality (%)</th>
<th>1 vessel</th>
<th>2 vessels</th>
<th>3 vessels</th>
<th>LMT</th>
<th>LMT +1</th>
<th>LMT +2</th>
<th>LMT +3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 vessel</td>
<td>0.62</td>
<td>1.49</td>
<td>0.59</td>
<td>0.85</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.62</td>
</tr>
<tr>
<td>2 vessels</td>
<td>2.12</td>
<td>2.17</td>
<td>2.17</td>
<td>2.62</td>
<td>2.24</td>
<td>2.80</td>
<td>1.96</td>
<td>2.12</td>
</tr>
<tr>
<td>3 vessels</td>
<td>0.59</td>
<td>0.59</td>
<td>0.59</td>
<td>0.85</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.59</td>
</tr>
<tr>
<td>LMT</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.85</td>
</tr>
<tr>
<td>LMT +1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LMT +2</td>
<td>2.62</td>
<td>2.24</td>
<td>2.80</td>
<td>1.96</td>
<td>1.96</td>
<td>1.96</td>
<td>1.96</td>
<td>2.11</td>
</tr>
<tr>
<td>LMT +3</td>
<td>2.80</td>
<td>2.24</td>
<td>2.80</td>
<td>1.96</td>
<td>1.96</td>
<td>1.96</td>
<td>1.96</td>
<td>2.11</td>
</tr>
<tr>
<td>Total</td>
<td>2.11</td>
<td>2.12</td>
<td>2.17</td>
<td>2.62</td>
<td>2.24</td>
<td>2.80</td>
<td>1.96</td>
<td>2.11</td>
</tr>
</tbody>
</table>
Off to on-pump conversion rate according to diseased vessels (total: 3.8%)

1 vessel:
- Off-pump
- Conversion rate: 1.2%

2 vessels:
- Off-pump
- Conversion rate: 2.8%

3 vessels:
- Off-pump
- Conversion rate: 3.4%

LMT:
- Off-pump
- Conversion rate: 1.7%

LMT+1:
- Off-pump
- Conversion rate: 4.4%

LMT+2:
- Off-pump
- Conversion rate: 5.2%

LMT+3:
- Off-pump
- Conversion rate: 6.1%
On-pump (arrest) vs. off-pump (Initial elective CABG)

- **RCA**
  - On-pump: 64%
  - Off-pump: 57%

- **LAD**
  - On-pump: 85%
  - Off-pump: 86%

- **LCX**
  - On-pump: 75%
  - Off-pump: 65%
Off-pump vs. off to on-pump conversion (Initial elective CABG)

<table>
<thead>
<tr>
<th>Bypass</th>
<th>No.</th>
<th>Off to on-pump(conversion)</th>
<th>Conversion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCA(+)</td>
<td>2,813</td>
<td>Off-pump</td>
<td>3.7%</td>
</tr>
<tr>
<td>LAD(+)</td>
<td>4,264</td>
<td>Off-pump</td>
<td>3.7%</td>
</tr>
<tr>
<td>LCX(+)</td>
<td>3,268</td>
<td>Off-pump</td>
<td>4.3%</td>
</tr>
<tr>
<td>RCA(−)</td>
<td>2,159</td>
<td>Off-pump</td>
<td>3.9%</td>
</tr>
<tr>
<td>LAD(−)</td>
<td>708</td>
<td>Off-pump</td>
<td>4.8%</td>
</tr>
<tr>
<td>LCX(−)</td>
<td>1,704</td>
<td>Off-pump</td>
<td>3.0%</td>
</tr>
</tbody>
</table>
Age distribution (Initial elective cases)

- **Male**: 78.3%
- **Female**: 21.7%

**Age Distribution**
- **60-69**: 464 cases
- **70-79**: 828 cases
- **80+**: 278 cases
- **49+**: 41 cases

- **Total Male Cases**: 2402
- **Total Female Cases**: 2154

**Observations**
- The majority of cases are in the 60-69 age group for both males and females.
Changes in elderly patients (Initial elective cases)

- 70 or more years: 51.5%
- 80 or more years: 10.7%
Changes in mortality according to age (Initial elective cases)

- 49 y.o.
- 50-59 y.o.
- 60-69 y.o.
- 70-79 y.o.
- 80 y.o. ≤

Graft selection
(Total number of grafts: 24,110 grafts)
Changes in graft selection
Complication rate of postoperative stroke according to surgical procedures

Total complication rate: 83/8990 (isolated CABG) = 0.92%

No significant differences between 4 groups by Kruskal-Wallis test (p=0.182)
Results of emergency CABG after complications of PCI (within 24 hours after PCI)

Total cases: 94
Frequency rate: 94/8990 (isolated CABG); 1.0%
Death cases: 16
Mortality: 17.02%

Results according to surgical procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cases</th>
<th>Death Cases</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 vessel bypass</td>
<td>31</td>
<td>6</td>
<td>19.35</td>
</tr>
<tr>
<td>2 vessels bypass</td>
<td>29</td>
<td>3</td>
<td>10.34</td>
</tr>
<tr>
<td>3 vessels bypass</td>
<td>21</td>
<td>3</td>
<td>14.29</td>
</tr>
<tr>
<td>4 vessels bypass</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other procedures</td>
<td>8</td>
<td>4</td>
<td>50.00</td>
</tr>
</tbody>
</table>
Changes in mortality of VSP

2011;
Total cases: 184, death cases: 56 (Mortality: 30.4%)
Results of VSP (1)

Total cases

- Alive: 128
- Death: 56
- Total: 184 (mortality: 30.4%)

Bypass (+)

- Alive: 46
- Death: 23
- Total: 69 (mortality: 33.3%)

Bypass (-)

- Alive: 82
- Death: 33
- Total: 115 (mortality: 28.7%)
Results of VSP (2)

Anterior infarction (mortality 25.2%)
- Dagett: 25 alive, 8 death, 33 total (mortality: 24.2%)
- Komeda: 72 alive, 25 death, 97 total (mortality: 25.8%)
- Others: 1 alive, 1 death, 1 total (mortality: 0.0%)

Post-inferior infarction (mortality 43.4%)
- Dagett: 16 alive, 8 death, 24 total (mortality: 33.3%)
- Komeda: 13 alive, 14 death, 27 total (mortality: 51.9%)
- Others: 2 alive, 1 death, 3 total (mortality: 50.0%)
Changes in mortality of papillary muscle rupture of LV

2011;
Total cases: 21, death cases: 6 (mortality: 28.6%)
Results of papillary muscle rupture

Total cases
- 15 alive
- 6 death
- 21 (mortality: 28.6%)

Bypass (+)
- 3 alive
- 0 death
- 3 (mortality: 0%)

Bypass (-)
- 12 alive
- 6 death
- 18 (mortality: 33.3%)
Changes in mortality of cardiac rupture

2011;
Total cases: 150, death cases: 46 (mortality: 30.7%)
Results of cardiac rupture

**Total cases**
- Alive: 104
- Death: 46
- Total: 150 (mortality: 30.7%)

**Blowout type**
- **Bypass (+)**
  - Alive: 30
  - Death: 33
  - Total: 63 (mortality: 52.4%)
  - Mortality: 25.0%
- **Bypass (-)**
  - Alive: 24
  - Death: 31
  - Total: 55 (mortality: 56.4%)

**Oozing type**
- **Bypass (+)**
  - Alive: 74
  - Death: 13
  - Total: 87 (mortality: 14.9%)
  - Mortality: 27.3%
- **Bypass (-)**
  - Alive: 66
  - Death: 10
  - Total: 76 (mortality: 13.2%)
Changes in mortality of left ventricle aneurysm

2011;
Total cases: 286, death cases: 23 (mortality: 8.0%)
Results of left ventricular-plasty (including left ventriculectomy) against LV aneurysm and/or ischemic cardiomyopathy

Total cases: 161 (mortality: 2.48%)
- Bypass (+): 129 (mortality: 2.33%)
  - Alive: 126
  - Death: 3
- Bypass (-): 32 (mortality: 3.13%)
  - Alive: 31
  - Death: 1
Results of mitral valvuloplasty and replacement against ischemic mitral regurgitation

Mitral valvuloplasty
- Total cases
  - Total cases: 509 (mortality: 4.50%)
  - Bypass (+): 401 (mortality: 3.37%)
  - Bypass (-): 84 (mortality: 0.0%)

Mitral valve replacement
- Total cases
  - Total cases: 108 (mortality: 8.47%)
  - Bypass (+): 69 (mortality: 9.21%)
  - Bypass (-): 39 (mortality: 7.13%)

Number of cases and mortality rates are shown in the diagram.
Results of LV aneurysm and or ischemic cardiomyopathy concomitant with mitral valve regurgitation

Total cases

LV-plasty + MV-plasty

<table>
<thead>
<tr>
<th>Total cases</th>
<th>Alive</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV-plasty + MV-plasty</td>
<td>106</td>
<td>19</td>
</tr>
<tr>
<td>LV-plasty + MV-plasty + bypass (+)</td>
<td>94</td>
<td>11</td>
</tr>
<tr>
<td>LV-plasty + MV-plasty + bypass (-)</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>LV-plasty + MV replacement</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>LV-plasty + MV replacement + bypass (+)</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>LV-plasty + MV replacement + bypass (-)</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Mortality:
- LV-plasty + MV-plasty: 15.20%
- LV-plasty + MV-plasty + bypass (+): 10.50%
- LV-plasty + MV-plasty + bypass (-): 10.53%
- LV-plasty + MV replacement: 40.00%
- LV-plasty + MV replacement + bypass (+): 30.80%
- LV-plasty + MV replacement + bypass (-): 57.10%
Conclusions (1)

1. The rate of isolated CABG was reduced, in contrast, that of concomitant surgery with CABG was increased.

2. The mortality of isolated CABG and initial elective CABG were 2.72%, and 1.45% respectively, indicating worst results, in last 10 years.

3. Of all initial elective CABG, 67% cases underwent off-pump CABG (OPCAB), showing high frequency rate. The mortality of OPCAB was 2.11%, which was highest value, in recent years.

4. Of 4 or more bypass surgery, 57% cases underwent OPCAB.

5. CABG cases have been getting older; the rate of 70 or more years old was 52%, 80 or more years old was 11%.
Conclusions (2)

6. The frequency use rate of arterial grafts was 58%, on the other hand, that of vein graft (42%) gradually increased in recent years.

7. Postoperative stroke rate of CABG was 0.92% and there were no significantly differences between surgical procedures.

8. Emergency CABG after complications of PCI were performed 1.0% of isolated CABG cases, demonstrating high mortality (17.0%).

9. As for the results of complications after myocardial infarction, post-inferior wall VSP, rupture of papillary muscle of LV, and blowout type of cardiac rupture were still bad, indicating high mortality.