Aortic Valve Replacement with and without Concomitant Coronary Artery Bypass Surgery in the Elderly: Risk Factors Related to Long-term Survival

Lars I. Thulin, Johan L. Sjögren
Department of Cardiac Surgery, University Hospital, Lund, Sweden

Objective. Preoperative coronary angiography often reveals significant coronary artery lesions in elderly people (≥75 years of age) referred to hospital for aortic valve replacement (AVR). However, the possible benefit of concomitant coronary artery bypass grafting (CABG) in elderly is still under debate. In an effort to contribute to this discussion, we evaluated our data on elderly patients undergoing aortic valve replacement.

Methods. Between January 1990 and December 1993, 219 patients (86 men and 133 women), aged 75 years and older, underwent AVR with or without concomitant CABG at the Department of Cardiac Surgery, University Hospital, Lund. A retrospective review of patient medical records and abstracted data, including patient age, sex, primary diagnosis, concomitant diseases and postoperative complications (Table 1), was made. The patients were between 75 and 91 years old (mean±SD, 78.6±2.9). Majority (66%) was between 75 and 79 years old. There were 121 patients (55%) who underwent a single aortic valve replacement procedure (AVR group) and 98 patients (45%) who had aortic valve replacement with coronary artery bypass grafting (AVR+CABG group).

Results. Early mortality (<30 days) was 0.8% in the AVR group and 4.1% in the AVR+CABG group. Overall actuarial survival was 77.7±4.4% at 52 months. There was a significantly longer survival in patients with mechanical valve implant in the AVR group. None of the other 5 investi gated variables had a significant influence on the long-term survival.

Conclusion. Our results suggest that AVR done in elderly is a treatment with excel lent surgical results. We could not identify concomitant CABG as a predictor of poor long-term surgical outcomes.

Keywords: aortic valve replacement; bioprosthesis; cardiac surgery; complications; coronary artery by pass grafting; elderly; mechanical valve; risk factors.
A follow-up was performed in June 1994 and included a total of 469 patient-years. The data collection was performed via a direct telephone contact with the patient or a family member and a complete review of all patients' postoperative records.

In statistical analysis, we used chi-square test and Student's t-test for inter-group comparisons. Value *p*<0.05 was considered statistically significant. There were no statistically significant differences between the AVR group and the AVR+CABG group in the age, sex, valve type, valve size, and presence of diabetes mellitus. Actuarial survival estimates were calculated and plotted applying the Kaplan-Meier method (10). Cox-Mantel log-rank test was used for the comparison of the actuarial overall survival between groups (11).

**Results**

Early mortality (defined as in-hospital death or death within 30 days after operation) was 0.8% in the AVR group and 4.1% in the AVR+CABG group. Mean aortic cross-clamp time was 71 minutes for AVR and 93 minutes for AVR+CABG (mean perfusion time was 96 and 131 minutes, respectively). Reoperation due to early bleeding had to be done in 8% of the patients in the AVR group and in 15% of the AVR+CABG patients.

Overall actuarial survival of the patients at risk was 89.7±2.2% at 24 months (n=113) and 77.7±4.4% at 48 months (n=26) (Fig. 2).

Long-term survival rate was 76.0±6.4% in the AVR group and 78.7±5.3% in the AVR+CABG group at 52 months. The influence of concomitant CABG was not statistically significant (*p*=0.5, Fig. 3). Beside concomitant CABG, five more variables (age, sex, type of prosthesis, size of prosthesis, and diabetes mellitus) were investigated with univariate analysis with regard to differential effects on a long-term survival in the AVR group and in the AVR+CABG group, respectively.

The long-term survival rates in patients ≥80 years were 69.1±12.5% in the AVR group and 76.5±10.8% in the AVR+CABG group at 52 months, but this difference was not significant (*p*=0.9).

To examine whether sex of the patient affected the long-term survival differently in patients who underwent AVR or AVR+CABG, we investigated the variables of the two groups. The actuarial survival of men in the AVR and AVR+CABG groups was 75.1±8.7% and 75.6±8.8%, respectively, at 52 months. This difference was not significant (*p*=0.8). The long-term survival of women in AVR group was 76.4±8.6%, and in AVR+CABG group it was 81.3±6.9% at 52 months (*p*=0.2).

We compared the patients from both groups who received small valves (19 mm and 21 mm). The actuarial

![Figure 1](image1.png)  Patients ≥75 years undergoing aortic valve replacement (AVR) with (open bars) or without (closed bars) concomitant coronary artery bypass grafting (CABG) at our Department, 1990-1993.

**Figure 1.** Patients ≥75 years undergoing aortic valve replacement (AVR) with (open bars) or without (closed bars) concomitant coronary artery bypass grafting (CABG) at our Department, 1990-1993.

![Figure 2](image2.png)  Actuarial survival in patients ≥75 years undergoing aortic valve replacement (AVR) with or without concomitant coronary artery bypass surgery (CABG).

**Figure 2.** Actuarial survival in patients ≥75 years undergoing aortic valve replacement (AVR) with or without concomitant coronary artery bypass surgery (CABG).

**Table 1.** Preoperative clinical characteristics of patients aged ≥75 years undergoing aortic valve replacement (AVR, n=121) and aortic valve replacement with concomitant coronary artery bypass surgery (AVR+CABG, n=98)

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>No. (%) of patients undergoing AVR</th>
<th>No. (%) of patients undergoing AVR+CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td>42 (35%)</td>
<td>44 (45%)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td>79 (66%)</td>
<td>54 (55%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>mean</strong></td>
<td>78.7</td>
<td>78.4</td>
</tr>
<tr>
<td><strong>median</strong></td>
<td>78.0</td>
<td>78.0</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>3.0</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>range</strong></td>
<td>75-91</td>
<td>75-91</td>
</tr>
<tr>
<td><strong>≥80 years</strong></td>
<td>38 (31%)</td>
<td>32 (31%)</td>
</tr>
<tr>
<td><strong>Aortic valve lesion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>aortic stenosis</strong></td>
<td>94 (77%)</td>
<td></td>
</tr>
<tr>
<td><strong>aortic insufficiency</strong></td>
<td>2 (2%)</td>
<td>87 (89%)</td>
</tr>
<tr>
<td><strong>combined pathology</strong></td>
<td>25 (21%)</td>
<td>11 (11%)</td>
</tr>
<tr>
<td><strong>Preoperative comorbidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>cerebrovascular accident</strong></td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>diabetes mellitus</strong></td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><strong>pulmonary insufficiency</strong></td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td><strong>cardiomyopathy</strong></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>arthritis</strong></td>
<td>13</td>
<td>14+</td>
</tr>
</tbody>
</table>

#Two patients had more than one concomitant diagnosis.

Kaplan-Meier method (10). Cox-Mantel log-rank test was used for the comparison of the actuarial overall survival between groups (11).
long-term survival rate at 52 months was slightly better in the AVR+CABG group (79.4±7.8%) than in the AVR group (67.4±9.8%), but the difference was not significant. The same was done for large heart valve prostheses (≥23 mm): the long-term survival rate at 52 months in the AVR group was 88.8±4.8%, compared with 78.3±7.8% in the AVR+CABG group (p=0.5).

We analyzed separately the effect of mechanical heart valve prosthesis on the survival of AVR and AVR+CABG groups. The long-term survival rate at 52 months was 95.7±3.0% in the AVR group, which was significantly better than 73.2±9.0% in the AVR+CABG group (p=0.006) (Fig. 4). The long-term survival at 52 months in the biological valve subgroup was 53.7±11.5% for AVR group and 80.4±7.2% for AVR+CABG group (Fig. 5), but this difference was not statistically significant (p=0.2).

**Discussion**

The elderly population in the Western world is constantly increasing. In Sweden, there were almost 750,000 persons who were 75 or more years old in 1995 (8.5% of a total population of 8.8 million inhabitants). This age group has increased by 8% between 1990-1995. According to calculations, there will be a further increase by almost 40% until year 2025. Over 1,000,000 (11% of total population) individuals in Sweden will be ≥75 years of age in year 2025 (12). Life expectancy at 75 years of age is an additional 9.23 years for men and 11.76 for women. Due to this demographic change, there has been an increased number of elderly people referred to open-heart surgery.

The present study demonstrated that AVR performed in the elderly was a treatment that produced satisfactory long-term surgical results. Previous studies have reported similar results, but there is still an increased risk in the very elderly (4). Cardiac surgery requires careful assessment of its benefits and risks and the responsible surgeon has to make the crucial decision whether or not to perform an advanced surgical procedure on a fragile organism and with fewer margins. Full assessment of operation risks requires identification and eventual quantification of all factors that affect early and long-term survival in an elderly patient. The preoperative selection of patients is the most important determinant of the surgical outcome (13,14).

Since coronary artery lesions frequently occur in elderly patients, this raises an important question. Should concomitant revascularization be performed, since this procedure makes the surgery more complicated and requires a longer perfusion time? This issue has not been clearly demonstrated in elderly patients and previous studies have presented contradictory results (2,7). Some studies have shown a less severe aortic stenosis in patients undergoing concomitant CABG (8). Also, there may be a reduced risk of ischemic events in patients with a...
non-significant luminal narrowing of the coronary arteries. We could not identify concomitant CABG as a predictor of poor long-term surgical outcome, although it may reduce the risk in patients initially referred for AVR. We could not extract from the patients' data whether they were primarily referred for ischemia pathology or valvular disease. However, we identified the difference between long-term survivors in the sub-group of elderly patients in AVR and AVR + CABG groups who received mechanical heart valve implants. Patients undergoing AVR and receiving mechanical valves had better long-term survival than patients with concomitant revascularization. However, we could not demonstrate any significant difference between elderly patients receiving mechanical implants and those receiving bioprostheses. One should bear in mind the potential bias of the present study, since the choice between mechanical and biological heart valves depended on the individual surgeon. Benefits of the use of both mechanical and biological implants in selected elderly patients have been demonstrated in recent studies (14-18). When implanting mechanical heart valves in elderly patients, it is of utmost importance that the control of the mandatory anticoagulation therapy is efficient. Since this is the case in our region, we do not hesitate to implant mechanical valves in this patient group.

The question of concomitant revascularization has not been fully resolved and there is a need for additional studies with longer follow-up time, which could reveal the important differences between the two patient groups. This would enable surgeons to make the correct choice of a suitable implant. Further research is needed to reveal whether concomitant revascularization in elderly patients undergoing AVR is an independent risk factor.

References


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Correspondence:
Lars I. Thulin
Department of Cardiac Thoracic Surgery
Lund University Hospital
SE-221 85 Lund, Sweden
lars_thulin@hotmail.com