Tissue Valve Prosthesis Implantation in 801 Cases

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Between 1976 and 1989 1,017 tissue valve prostheses were implanted in 801 patients. During the same period 1,321 patients received mechanical valve prosthesis. The hospital mortality was 8.1%. Till 1989 148 bioprostheses (14.5%) in case of 113 patients (14.1%) had to be removed and replaced by other valve prostheses. There are no significant difference concerning the mortality between the first (8.1%) and the second operations (9.1%), or the durability of the various types of bioprostheses used, however, calcification, degeneration and other complications occurred more frequently and earlier in case of mitral (15.5%), than in aortic (12.4%) bioprostheses, and in younger patients than in the older ones, as well. The mean age of patients was 46 years at the first, and 39 years at the time of the second operation. The incidence of reoperations was the highest in the seventh year after the first surgical intervention. In general one size smaller prostheses were used in course of valve replacements after the removal of the first bioprosthesis.

(Key Words: Tissue valve prosthesis, Valve replacement, Porcine bioprosthesis)

INTRODUCTION
The first tissue valve prosthesis was implanted in mitral position in our Department in 1976 (9). In the following years, like other cardiac surgeons, we also performed porcine bioprosthesis replacements in an increasing number, experiencing the several well-known advantages of the tissue valve prostheses. (1, 2, 4, 7). The sudden boom was followed by a gradual decline. There can be read more and more about the calcification and degeneration of the biological valves, leaflet disruptions, structural failures, etc. (3, 5, 6, 8).

Although, in those days the bioprosthese implanted by us were still too young, and it would be rather early to draw conclusions from our data, nowadays, we thought that time has arrived to do so.

MATERIALS AND METHODS
Between 1976 and 1989 1,017 tissue valve prostheses (Carpentier-Edwards, Hancock, Xenomedica, etc.) were implanted in 801 patients at the Department of Cardiovascular Surgery of the Semmelweis Medical University.

During the same period 1,321 patients received mechanical valve prostheses (Björk-Shiley, Sorin, St. Jude-Medical etc.). The mean age of patients who had got bioprostheses was 46 years. 472 (59.1%) of them were females and 328 (41.1%) were males. The hospital mortality was 8.1%.

Table I shows the number of the simple and the multiple valve replacements and the percent of hospital mortalities. Operations were performed in hypothermic extracorporeal circulation. Myocardial protection was obtained by infusion of cold (4°C) cristalloid cardioplegic solution in the aortic bulb, or directly in the ostiums of the coronary arteries. Patients remained in the postoperative intensive care unit in average during 48 hours. Anticoagulant treatment started on the second postoperative day and was continued in general during three months. Patients who had atrial fibrillation and/or large left atrium were full anticoagulated indefinitely.
Table 1 Number of single and multiple valve replacements, and per cents of hospital mortality.

<table>
<thead>
<tr>
<th></th>
<th>Number of pts</th>
<th>Hospital mortality(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVR</td>
<td>374</td>
<td>6.7</td>
</tr>
<tr>
<td>AVR</td>
<td>201</td>
<td>6.9</td>
</tr>
<tr>
<td>MVR + AVR</td>
<td>198</td>
<td>10.6</td>
</tr>
<tr>
<td>MVR + TVR</td>
<td>15</td>
<td>13.3</td>
</tr>
<tr>
<td>MVR + AVR + TVR</td>
<td>13</td>
<td>15.3</td>
</tr>
<tr>
<td>SUM TOTAL:</td>
<td>801</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

During the period past till 1989, 148 bioprostheses (14.5%) had to be removed and replaced by other valve prostheses in case of 113 patients (14.1%). The mean age of this group was 59 years and their hospital mortality 9.1%.

The reason for the removal of the bioprostheses was:
- calcification and/or leaflet disruption in 99 patients,
- paravalvular leak in 10 patients,
- prosthetic valve endocarditis in 4 patients.

Table II lists the size of the 390 bioprostheses implanted in aortic position. The number and the size of the 48 (12.4%) removed aortic bioprostheses are demonstrated in Table III and the number and the size of valves replaced in aortic position are presented in Table IV.

Comparing the two tables (III–IV), it can be seen that the replaced were slightly smaller than those implanted first.

Table V demonstrates the number of the various types of aortic bioprostheses. As a matter of fact, the use rate of the various types of tissue valve prostheses which were implanted at various occasions, were depending rather on their acquisition possibilities than on their durability.

The size of the 599 bioprostheses implanted in mitral position is demonstrated in Table VI. Ninety-three of them (15.5%) have been removed and similarly as in case of aortic valve replacements, in general smaller valve prostheses were replaced (Table VII and Table VIII).

The number of the various types of implanted and removed mitral bioprostheses are listed in Table IX.

It can be seen in Table X that seven out of the 28 bioprostheses implanted in the tricuspid position have been removed. Because of the small number the graphic representation of the results would by falsifying.

As it is demonstrated by Figure 1, the incidence of reoperations was the highest in the seventh year after the first surgical intervention.

REFERENCES
Table I  Number and size of bioprostheses implanted in aortic position (n=390).

<table>
<thead>
<tr>
<th>Valve size</th>
<th>No. of valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-22</td>
<td></td>
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<tr>
<td>23</td>
<td></td>
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<tr>
<td>24</td>
<td></td>
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<td>25</td>
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<td>27</td>
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<tr>
<td>28</td>
<td></td>
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<tr>
<td>29</td>
<td></td>
</tr>
<tr>
<td>30-32</td>
<td></td>
</tr>
</tbody>
</table>

Table III  Number and size of the removed aortic bioprostheses (n=98).

<table>
<thead>
<tr>
<th>Valve size</th>
<th>No. of valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-22</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
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<td></td>
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<td>25</td>
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<td>26</td>
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<td>27</td>
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<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

Table IV  Number and size of the replaced valve prostheses in aortic position (n=48).

<table>
<thead>
<tr>
<th>Valve size</th>
<th>No. of valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-22</td>
<td></td>
</tr>
<tr>
<td>23</td>
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<tr>
<td>29</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
Table V  Number of the various types implanted and removed aortic bioprostheses

<table>
<thead>
<tr>
<th></th>
<th>No. of implanted bioprostheses</th>
<th>No. of removed bioprostheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpentier-Edwards</td>
<td>191</td>
<td>24</td>
</tr>
<tr>
<td>Cenomedica</td>
<td>91</td>
<td>5</td>
</tr>
<tr>
<td>Hancock</td>
<td>83</td>
<td>16</td>
</tr>
<tr>
<td>Nitroflow</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Liotta</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Ionescu-Shilley</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>390</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

Table VII  Number and size of removed mitral bioprostheses (n = 93).
Table VIII  Number and size of replaced valve prostheses in aortic position (n = 93).

<table>
<thead>
<tr>
<th>Valve size</th>
<th>No. of valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-22</td>
<td></td>
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<tr>
<td>23-24</td>
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<td>25-26</td>
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<td>28</td>
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<td>29</td>
<td></td>
</tr>
<tr>
<td>30-31</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Table IX  Number of the various types implanted and removed mitral bioprostheses

<table>
<thead>
<tr>
<th>Bioprosthesis Type</th>
<th>No. of Implanted Bioprostheses</th>
<th>No. of Removed Bioprostheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpentier-Edwards</td>
<td>197</td>
<td>40</td>
</tr>
<tr>
<td>Xenomedica</td>
<td>223</td>
<td>18</td>
</tr>
<tr>
<td>Hancock</td>
<td>148</td>
<td>31</td>
</tr>
<tr>
<td>Mitroflow</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Liotta</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>599</td>
<td>93</td>
</tr>
</tbody>
</table>

Table X  Number of the various types implanted and removed bioprostheses in tricuspid position

<table>
<thead>
<tr>
<th>Bioprosthesis Type</th>
<th>No. of Implanted Bioprostheses</th>
<th>No. of Removed Bioprostheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpentier-Edwards</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Xenomedica</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Hancock</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>7</td>
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</tbody>
</table>
Fig. 1 Durability of bioprostheses. The arrow indicates that the removal rate of the 7 years old bioprostheses is the highest.