Supplementary File

**Table 1:** Description of selected studies.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Design** | **Number of centers and**  **countries** | **Inclusion Criteria** | **Exclusion Criteria** | **Group** | **N** | **Age** | **Male (%)** | **Follow up** | **Comments** |
| Gao 2004 | O | 1  USA | First-time AVR | Combined valve replacement | Carpentier | 1021 | 74 | 59 | 2.5 | This study was excluded from meta-analysis as it compared the second-generation Carpentier prosthesis against a first-generation porcine prosthesis implanted in different periods (1991 to 2002 and 1974 to 1996, respectively). |
| Porcine | 518 | 74 | 62 | 6.4 |
| Chan 2010 | O | 1  Canada | First-time AVR | Redo-sternotomy or concomitant valve surgery | Carpentier | 638 | 73 | 59 | 3.9 | Known confounders were controlled via multivariable modeling, prosthesis type was not associated with survival or valve-related complications. |
| Porcine | 1021 | 73 | 70 | 5.6 |
| Jamieson 2006 | O | 2  France and Canada | AVR | NA | Carpentier | 1430 | 69 | 70 | 5.4 | Although Carpentier group presented better early and late mortality, the porcine group had a higher proportion of patients who had previous or concomitant CABG. |
| Porcine | 1825 | 69 | 69 | 7.9 |
| Tourneau 2002 | O | 1  France | AVR with SAV or CEP between 1989 and 1993 | Predominant AR, DVR | Carpentier | 75 | 72 | 49 | 6.5 | Patients were matched for sex, age, body surface area, valve size and left ventricular ejection fraction. |
| Porcine | 75 | 72 | 49 |
| Risteski 2009 | RCT | 1  Germany | Older than  75 years and severe AS | DVR and prior valvular surgery | Carpentier | 20 | 79 | 40 | 5 | All preoperative clinical characteristics including age, gender, body surface area, hypertension, NYHA functional class and echocardiographic parameters were similar between groups. |
| Stentless | 20 | 78 | 55 |
| Cohen 2010 | RCT | 3  Canada | Primary  elective AVR for aortic valve stenosis | Concomitant cardiac procedures  other than CABG, inability to return for follow-up | Carpentier | 53 | 69 | 62 | 10.3 | Preoperative clinical characteristics including age, body surface area, NYHA functional class, hypertension, presence of coronary artery disease, and LV grade were similar between groups. |
| Stentless | 46 | 72 | 67 |
| Chambers 2006 | RCT | 1  United Kingdom | Single  bioprosthetic AVR | NA | Carpentier | 85 | 72 | 52 | 1 | Demographic characteristics were similar between groups. AS was the most common valve disease. |
| Stentless | 75 | 72 | 51 |
| Borger 2005 | O | 1  Canada | Bioprosthetic AVR  between 1998 and 2001 | NA | Carpentier | 427 | 72 | 60 | 2.3 | Excluded from meta-analysis because it was the only observational stentless study. Stentles patients were younger, had larger body surface area, and were more likely to be male. Stented patients had more hypertension and peripheral vascular disease, and AS as the primary aortic valve pathology. |
| Stentless | 310 | 65 | 68 |
| Tourneau 1999 | O | 1  France | Isolated AVR with second generation  pericardial valve | NA | Carpentier | 81 | 70 | 55 | 4.8 | There were no differences in age, gender, prevalence of atrial fibrillation or NYHA functional class before operation. |
| Pericardial | 81 | 71 | 55 | 4.4 |
| Stassano 2009 | RCT | 2  Italy | Single AVR | Previous cardiac surgery, aortic root disease, endocarditis, warfarin contra- indication | Carpentier | 147 | 63 | 50 | 8.8 | There were no clinical or periprocedural differences between groups. This study was excluded from meta-analysis because considered pericardial and porcine prostheses together. |
| Mechanical | 149 | 64 | 42 |
| Badhwar 2012 | O | 4  USA | Primary cardiac operations | Limited 5-year survival based on comorbidity  assessment by the implanting surgeon | Carpentier | 103 | 59 | 54 | 3.9 | This study was excluded from meta-analysis because considered pericardial and porcine prostheses together. |
| Mechanical | 69 | 53 | 52 |
| Khan 2001 | O | 1  USA | Adults who underwent MVR or AVR | Homografts or a combination of both  porcine and mechanical valves or if they had any prior valve  replacement | Carpentier | 1193 | 72 ± 13 | 60 | 20 | This study was excluded from meta-analysis because considered pericardial and porcine prostheses together. |
| Mechanical | 1340 | 64 ± 13 | 51 |
| Brown 2008 | O | 1  USA | 50 - 70  years old and AVR using St Jude mechanical  bileaflet valve or CEP prosthesis | Mitral, tricuspid or  pulmonary valve surgery and aortic or aortic root surgery | Carpentier | 220 | 67 | 70 | 6.3 | Groups were matched one-to-one according to age, sex, need for CABG and valve size. Except for age, the patients’ characteristics were similar between groups. The bioprosthesis group was 0.9 years older. |
| Mechanical | 220 | 66 | 71 | 8.6 |
| Carrier 2001 | O | 1  Canada | 55 -65 years old and AVR using mechanical  or CEP prosthesis between 1982 and 1999 | NA | Carpentier | 158 | 61 | 76 | 7 | There were no differences between groups regarding age, gender, NYHA functional class, reoperation or associated revascularization. |
| Mechanical | 363 | 61 | 70 | 4 |
| Weber 2012 | O | 1  Switzerland | 60 years old or younger and AVR between January 2000 and  December 2009 | Additional valve replacement | Carpentier | 103 | 55 | 83 | 2.7 | No significant differences were observed in the matched parameters; however, age and the incidence of acute aortic dissection differed between the 2 groups and were adjusted for in the multivariate analysis |
| Mechanical | 103 | 50 | 84 | 2.4 |
| Sakamoto 2005 | O | 1  Japan | Isolated AVR between 1995 and 2002 | NA | Carpentier | 49 | 69 | 47 | 3.5 | There were significant differences between groups in age, body surface area, type of valve lesion and follow up |
| Mechanical | 46 | 54 | 91 | 6.2 |
| Accola 2008 | O | 1  USA | Older than 65 years, isolated AVR between 1989 and 2003 | NA | Carpentier | 398 | 74 | NA | 6.3 | Propensity scoring was used to establish homogeneity of the groups and reduce bias. |
| Mechanical | 403 | 74 | NA | 5.3 |
| Forcillo 2013 | O | 1  Canada | AVR with CEP  between November 1981 and March 2011 | Repair  or replacement of another valve or  a Bentall procedure | Carpentier | 2405 | 71 | 60 | 6 | Most patients were in NYHA class II (35%) or III (55%) at the time of surgery. Most patients (95%) did not have a previous cardiac surgery.  Most patients (85%) underwent AVR for AS and 42% had concomitant CABG. |
| Frater 1992 | O | 10  USA | Isolated AVR | NA | Carpentier | 496 | 64 | 63 | 7 | Most patients were in NYHA class II or III at the time of surgery (62%) and underwent AVR for AS (63.4%). 48% had concomitant CABG. |
| Ayegnon 2011 | O | 1  France | MVR using CEP prosthesis  between 1984 and 2009 | NA | Carpentier | 401 | 68 | 45 | 8.9 | Degenerative disease was the most common etiology (33%), 62% of patients had MR, 27.7% were repeat MVR, 57.6% were in NYHA class III or  IV and 36.9% had concomitant CABG. |
| Banbury 1998 | O | 1  USA | AVR using CEP between 1982 and 1985 | NA | Carpentier | 310 | 64 | 61 | 8.8 | Most patients were in NYHA class III or IV at the time of surgery (66%), 12.8% were reoperations, 30% had AS and 50% mixed lesions.  Significant coronary artery disease was present in 41.4% and 20.7% had other coexisting valvular disease. |
| Marchand 2001 | O | 7  France, United Kingdom,  Canada, Sweden, and Belgium | Valve replacement using CEP between 1984 and 1989 | NA | Carpentier | 435 | 61 | 41 | 8.1 | The most common etiology was rheumatic disease (53.9%), with insufficiency (44.4%), stenosis (25.7%), and mixed disease (21.3%) reported as the most common diagnoses, 76.6% underwent isolated MVR and 23.4% DVR. 78.2% were in NYHA functional class III or IV. |
| Arinaga 2011 | O | 1  Japan | AVR using CEP prosthesis between 1996 and 2007 | Multiple valve replacement | Carpentier | 244 | 72 | 46 | 4.1 | The most common etiology was AS (55.3%), CABG was performed in 12.7%, mitral valvuloplasty in 7.4%, and root replacement surgery in 4.9%. |
| Pellerin 1995 | O | 1  France | Isolated  AVR using CEP prosthesis between 1980 and 1985 | NA | Carpentier | 124 | 65 | 54 | 7.7 | The most common etiology was AS (76%), the average NYHA was 2.5 ±0.7. CABG was performed in 7.2%, mitral valvuloplasty in 5.6%. |
| Torka 1995 | O | 1  Germany | AVR using CEP prosthesis between 1986 and 1993 | NA | Carpentier | 482 | 72 | 60 | 1.7 | The most common etiology was AS (80%), CABG was performed in 38.4% and 55% had an isolated AVR. |
| Neville 1998 | O | 1  France | Isolated AVR or MVR using CEP prosthesis  between 1984 and 1995 | Multiple valve replacement | Carpentier | 787 | 67 | 67 | 4.8 | AVR was performed in 81.8% and MVR in 18.2%. CABG was performed in 15.2% of AVR and 12.6% of MVR patients. |
| Poirer 1998 | O | 1  Canada | AVR using CEP prosthesis between 1981 and 1996 | NA | Carpentier | 812 | 65 | 55 | 4.8 | AVR was performed in 73%, MVR in 18.4% and DVR in 8.0%. 69% were in NYHA class III or IV at the time of surgery. Associated surgical procedures included CABG in 27%, tricuspid or mitral valve repair in 5%. 18.3% of the patients had previous cardiac surgery. |
| Dellgren 2002 | O | 1  Canada | AVR using CEP prosthesis between 1984 and 1995 | NA | Carpentier | 254 | 71 | 46 | 5 | Associated surgical procedures included CABG in 51%, MVR or mitral repair in 8%. Preoperatively, 85% were in NYHA class III or IV |

Age is expressed as mean and SD whenever available.

AS: aortic stenosis; AVR: aortic valve replacement; DVR: double valve replacement; LV: left ventricle; MVR: mitral valve replacement; N: number of participants; NA: not available; NYHA: New York Heart Association functional class; O: observational study; RCT: Randomized clinical trial; SAV: supra-annular valve; USA: United States of America.