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Comparison of early treatment outcomes after aortic valve replacement with sutureless, bioprosthetic, and mechanical valves: Our single-center experience with 140 patients

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ABSTRACT

Objectives: The aim of the present study was to comparatively assess the perioperative findings and early therapeutic outcomes in patients who underwent aortic valve replacement (AVR) with sutureless, bioprosthetic, and mechanical valves.

Patients and methods: This prospective cohort included a total of 140 patients (78 males, 62 females; mean age 68.5 years range, 36 to 82 years) who underwent AVR in the cardiovascular surgery department of a tertiary care center between January 2013 and September 2016. The patients were divided into three groups according to the valve implanted: sutureless (Group 1, n=48), bioprosthetic (Group 2, n=44), and mechanical (Group 3, n=48) valve groups. Baseline demographic and clinical characteristics, comorbidities, pre- and postoperative echocardiographic findings, hemodynamic parameters, additional interventions, complications, and early therapeutic outcomes were recorded in three patient groups.

Results: Ejection fraction was significantly lower (p=0.026) and the New York Heart Association functional class was significantly higher (p=0.002) in the sutureless valve group. Duration of operation, cross-clamp time, and duration of cardiopulmonary bypass were significantly shorter in the sutureless valve group (p<0.001 for all). Duration of intubation, the amount of erythrocyte suspension transfusion and drainage, and the length of hospitalization and intensive care unit stay were shorter in the sutureless valve group (p<0.001). Comparison of pre- and postoperative echocardiographic findings within each group revealed that maximum and mean aortic gradients were improved in three groups after the operation. However, there was no statistically significant difference in ejection fraction and pulmonary arterial pressure postoperatively among the groups.

Conclusion: Based on our study findings, we conclude that selection of the valves before AVR procedure must be made according to the characteristics of the patient including comorbidities and hemodynamic profile.

Keywords: Aortic valve, bioprosthesis, sutureless, transcatheter aortic valve replacement.

Increased life expectancy of the overall population led to an increase in the prevalence of patients with valvular heart disease suitable for aortic valve replacement (AVR). Surgical replacement of the aortic valve constitutes the most effective mode of treatment in patients with severe symptomatic aortic stenosis.[1,2] Replacement of the valve not only improves the systolic and diastolic functions of the left ventricle, but also leads to improved clinical outcomes.[3-5]

The increased incidence of aortic stenosis is currently associated with substantial co-morbidities. Aortic valve replacement has been popularized to avoid risks related to aortic stenosis. For this purpose, various techniques and alternative options have been developed for aortic valve surgery. The seek for minimally invasive methods with reduction of surgical trauma, as well as increased cost-efficacy has been sustained. In addition to the mechanical valve and bioprosthetic valves, sutureless valves have been introduced to eliminate the risks associated with the placement of sutures and to reduce cross-clamp and cardiopulmonary bypass (CPB) duration.[4,6] The use

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of different valve materials may provide advantages such as enhancement of complex cardiac procedures, maintenance of sufficient hemodynamic parameters, and a decrease in paravalvular leak.[6]

The choice of the appropriate valve prosthesis in patients with severe and symptomatic aortic stenosis is still under debate. The therapeutic policy should be based on the growth potential which restricts the number of interventions. Mechanical prostheses have superior durability over tissue prostheses, particularly in adolescents; however, they lack the growth potential.[7]

Aortic valve replacement using bioprosthetic materials is the method of choice in elderly. This modality yields satisfactory hemodynamic outcomes and postoperative durability devoid of complications attributed to warfarin.[2] Nevertheless, additional data are still necessary to compare and document the therapeutic efficacy of AVR procedures with different valves.[6]

Selection of the appropriate valve may improve the quality of life with acceptable safety and avoidance of complications such as pacemaker implantation, paravalvular leaks, and increased neurological events.[8]

In the present study, we aimed to comparatively assess the hemodynamic variables, perioperative findings, and early therapeutic outcomes in aortic stenosis patients who underwent AVR with sutureless, bioprosthetic, or mechanical valves.

PATIENTS AND METHODS

This prospective cohort was conducted in the Cardiovascular Surgery Department of Recep Tayyip Erdoğan University, Training and Research Hospital between January 2013 and September 2016. A total of 140 patients (78 males, 62 females; mean age 68.5 years range, 36 to 82 years) who underwent AVR for aortic stenosis were included. All patients were operated by a single surgical team. Inclusion criteria were as follows: having a scheduled surgical valve replacement with severe and symptomatic aortic valve disease, and New York Heart Association (NYHA) functional Class ≥2. The study was conducted in accordance with the principles of the Declaration of Helsinki.

The patients were divided into three groups according to the valve implanted: sutureless (Group 1, n=48), bioprosthetic (Group 2, n=44), and mechanical (Group 3, n=48) valve groups. Data including baseline demographic and clinical characteristics, comorbidities, pre- and postoperative echocardiographic findings, hemodynamic parameters, additional interventions, complications, and early therapeutic outcomes were recorded in three groups. The selection of the valves was made according to the optimal effective orifice area regarding the body surface area for every patient. The types and sizes of valves used in three groups of our series are listed in Table 1. The Enable® (Medtronic Inc., MN, USA), Perceval S® (SorinBiomedica Cardio Srl, Sallugia, Italy), Edwards Intuity® (Edwards Lifesccience Inc., CA, USA), St. Jude mechanical valve® (St. Jude Medical Inc., MN, USA), Vascutek® (Vascutek, Scotland, UK), and ATS mechanical valves (Medtronic Inc., MN, USA) were the valves mainly preferred in the current series. Sutureless valves were particularly popularized in patients with a high operative risk and candidates for additional surgical procedures.

All operations were carried out by a single cardiovascular surgeon in our tertiary care center. After induction of general anesthesia and orotracheal intubation, patients were kept on CPB following a thorough sternotomy. For myocardial protection, antegrade and retrograde administration of cold crystalloid cardioplegic solution (Plegisol®, Abbott Laboratories, Abbott Park, IL, USA) was performed during induction. Maintenance of this regimen was provided with the retrograde administration of cold blood cardioplegic doses every 20 min.

The patients were maintained on conventional CPB circuit with a roller pump. Antegrade potassium chloride-added Calafiore solution (Politecnico di Torino, Italy) was administered for myocardial protection. When necessary, it was repeated during the intervention through the left and right coronary artery orifices.

Surgical procedures for AVR with different types of valves were performed as described in the current literature.[3-5] Transesophageal echocardiography was implemented to assess the structural and functional cardiac parameters before AVR and at discharge.

Baseline characteristics (age, gender), body surface area, smoking habit, history of hypertension, diabetes mellitus, cerebrovascular disease, carotid artery disease, chronic obstructive pulmonary disease, and renal failure were noted. Pre- and postoperative

Table 1
The types and sizes of valves used in sutureless, bioprosthetic, and mechanical valve groups

Valve types								
Sutureless (n=48)			Bioprosthetic (n=44)			Mechanical (n=48)		
Type	Size (mm)	n	Type	Size (mm)	n	Type	Size (mm)	n
Edwards Intuity®	21	14	Carpentier Edwards® supraannular valve (Labcor)	19	2	St. Jude® Aortic mechanical HP	19	1
	23	12		23	6		21	2
Sorin Perceval S®	S (21)	8		25	1		23	3
	M (23)	8	Sorin Mitroflow® aortic bioprosthetic valve	19	2		25	4
	L (25)	3		21	8	St. Jude Aortic Regent® mechanical valve	21	5
Enable®	23	2		23	7		23	7
	25	1		25	1		25	1
			Carpentier Edwards® perimount bioprosthesis	19	2	ATS® mechanical valve	22	7
				21	6		24	7
				23	5	Sorin Bileaflet® mechanical valve	21	3
			St. Jude® Aortic Epic valve	25	1		23	6
			St. Jude® Aortic Trifecta bioprosthesis	19	1		25	1
			Vascutek Aspire® bioprosthetic valve	21	1		27	1

hemodynamic variables, and intraoperative findings were recorded and compared among the groups. Postoperative alterations in echocardiographic and other hemodynamic indicators following surgery were also investigated six months after AVR. The mean and maximum aortic gradient, thicknesses of the interventricular septum and posterior wall, ejection fraction, presences of mitral, aortic and tricuspid insufficiency, pulmonary arterial pressure, left ventricular end systolic and diastolic diameters, aortic root diameter, and ascending aorta diameter on echocardiography were recorded before and after the operation. The NYHA and EuroSCORE results were comparatively analyzed. Intraoperative parameters evaluated included operation time, cross-clamp time, coronary artery bypass grafting (CABG), ascending aorta surgery, root enlargement procedure, intubation time, inotropic agent use, amount of drainage and erythrocyte suspension transfusion, and length of intensive care unit stay and hospitalization.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 20.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD), median (min-max) or number and frequency. Normality of distribution for variables was tested using the Shapiro-Wilk test. Parametric tests were used for variables with normal distribution, while variables without a normal distribution were evaluated with non-parametric tests. Analysis of variance (ANOVA) (post-hoc Tamhane) and Kruskal-Wallis tests were used for the analysis of data. The Bonferroni-corrected Mann-Whitney U test was carried out to examine the origin of difference among the groups. A paired t-test and Wilcoxon test were performed to compare the parameters within each group before and after surgery. A p value of <0.05 was considered statistically significant with 95% confidence interval (CI).

Table 2
Baseline demographic and clinical characteristics of study population

Variable	Groups: Sutureless Mean±SD	Bioprosthetic Mean±SD	Mechanical Mean±SD	KW χ^2	*p*
Age (year)	76.3±2.8	73.6±2.7	55.7±9.7*	55.83	<0.0001
Body surface area	1.8±0.3	1.7±0.7	1.8±0.7	2.30	0.316
Ejection fraction (%)	52.4±12.0	57.1±11.1	61.1±6.7	7.34	0.026*
New York Heart Association	3.4±0.5	2.6±0.6	2.7±0.7	12.77	0.002*
EuroSCORE	9.7±2.2	7.2±2.4	3.9±1.6	32.11	<0.0001*

SD: Standard deviation; * Statistically significant; KW χ^2: Kruskal Wallis χ^2; ANOVA has been used for age, while other variables were tested with Kruskal Wallis χ^2.

RESULTS

Table 2 demonstrates a comparison of baseline descriptive and clinical parameters in our series. The patients receiving mechanical valve during AVR were significantly younger than the other groups (p<0.001). Ejection fraction of the patients in the sutureless vale group was significantly lower than the patients who had a mechanical valve during AVR (p=0.026). The NYHA class for sutureless valve group was significantly higher than the other groups (p=0.002). In addition, all three groups had significantly different EuroSCORE results. Accordingly, the sutureless valve group had the highest scores, whereas the mechanical valve group had the lowest EuroSCORE results.

Perioperative data are presented in Table 3. Accordingly, duration of operation, cross-clamp time, and duration of CPB were significantly shorter in the sutureless valve group (p<0.001 for all). Similarly, duration of intubation, amounts of erythrocyte suspension transfusion and drainage, and the length of hospitalization and intensive care unit stay were shorter in the sutureless valve group (p<0.001).

Echocardiographic findings obtained pre- and postoperatively are summarized in Tables 4 and 5. Additional procedures performed in three groups are shown in Table 6. Comparison of pre- and postoperative echocardiographic findings within each group revealed that the maximum and mean aortic

Table 3
Perioperative data of study population

Variable	Groups: Sutureless Mean±SD	Bioprosthetic Mean±SD	Mechanical Mean±SD	KW χ^2	*p*
Duration of operation (minutes)	172.9±30.6	242.9±13.8	235.6±29.6	24.60	<0.0001*
Cardiopulmonary bypass time (minutes)	79.2±21.1	148.4±10.4	139.8±28.9	29.31	<0.0001*
Cross-clamp time (minutes)	57.8±19.9	94.8±11.4	91.6±17.1	20.64	<0.0001*
Intubation time (hours)	6.2±2.2	9.6±3.4	9.4±2.3	14.56	0.001*
Drainage (mL)	496.4±284.5	861.1±410.4	752.8±320.1	9.92	0.007*
Erythrocyte suspension (unit)	2.36±1.2	4.2±2.0	4.3±1.36	14.94	0.001*
Length of intensive care unit stay (days)	2.3±0.6	3.2±0.9	3.2±1.2	10.45	0.005*
Length of hospital stay (days)	7.7±0.9	11.2±2.0	10.6±2.0	24.29	<0.0001*

SD: Standard deviation; * Statistically significant; KW χ^2: Kruskal Wallis χ^2.

Table 4
Echocardiographic findings before AVR in three valve groups

Variable	Groups: Sutureless Mean±SD	Bioprosthetic Mean±SD	Mechanical Mean±SD	KW χ^2	p
Maximum aortic gradient (mmHg)	80.4±21.3	76.8±10.4	85.6±30.2	0.71	0.495
Mean aortic gradient (mmHg)	48.4±12.0	47.1±8.1	54.1±18.2	2.66	0.264
Interventricular septum (mm)	13.4±1.4	13.8±1.6	14.3±1.7	1.51	0.470
Posterior wall (mm)	11.9±1.2	12.4±1.3	12.9±1.1	5.72	0.057
Ejection fraction (%)	52.4±12.0	57.1±11.1	61.1±6.7	7.34	0.026*
Pulmonary arterial pressure (mmHg)	36.6±6.0	36.6±11.0	35.2±12.5	2.01	0.366
Left ventricular end diastolic diameter (mm)	48.8±4.8	49.8±8.9	49.5±6.1	0.09§	0.913
Left ventricular end systolic diameter (mm)	31.4±4.6	35.6±8.0	33.2±4.7	3.15	0.207
Root of aorta	29.6±1.6	31.6±4.3	30.1±3.2	1.51§	0.231
LA (left atrium)	44.3±5.7	41.3±3.4	43.2±3.7	3.30	0.192
Ascending aorta	37.2±2.0	40.4±7.3	38.8±7.5	2.02	0.365

SD: Standard deviation; * Statistically significant; § Analyzed with ANOVA; KW χ^2: Kruskal Wallis χ^2.

gradients were improved in all three groups after the operation (Table 7). Similarly, a posterior wall and interventricular septal thicknesses significantly decreased following AVR. However, no statistically significant changes were observed in ejection fraction and pulmonary arterial pressure postoperatively. Recovery of the left ventricular end systolic diameter was evident in only Group 2.

Table 5
Echocardiographic findings six months after AVR in three valve groups

Variable	Groups: Sutureless Mean±SD	Bioprosthetic Mean±SD	Mechanical Mean±SD	KW χ^2	p
Maximum aortic gradient (mmHg)	19.8±5.9	23.9±9.5	23.4±10.1	1.57	0.455
Mean aortic gradient (mmHg)	10.8±3.5	12.2±4.6	12.6±5.6	0.89	0.640
Interventricular septum (mm)	11.9±1.3	12.7±0.9	12.3±1.5	2.58	0.275
Posterior wall (mm)	10.8±0.9	11.2±0.9	11.3±1.2	2.14	0.343
Ejection fraction (%)	58.8±6.7	56.7±9.3	60.4±3.2	2.35	0.308
Pulmonary arterial pressure (mmHg)	35.6±10.4	34.1±11.3	32.3±5.6	1.95	0.377
Left ventricular end diastolic diameter (mm)	45.7±3.8	45.6±3.7	46.8±4.4	0.89	0.642
Left ventricular end systolic diameter (mm)	29.3±3.7	30.1±4.7	31.4±5.1	2.48	0.289
Root of aorta	28.5±2.6	30.4±4.1	28.1±2.5	3.45	0.068
LA (left atrium)	42.7±4.2	42.5±5.7	42.9±4.4	0.17	0.938
Ascending aorta	35.7±4.0	38.8±4.8	35.6±3.4	4.02	0.056

SD: Standard deviation; * Statistically significant; § Analyzed with ANOVA; KW χ^2: Kruskal Wallis χ^2.

Table 6
Additional procedures performed in sutureless, bioprosthetic, and mechanical valve groups

	Valve type		
	Sutureless	Bioprosthetic	Mechanical
Additional procedure	n	n	n
Coronary artery bypass grafting	16	11	12
Mitral ring annuloplasty + coronary artery bypass grafting	0	1	2
Ascending aorta graft replacement + coronary artery bypass grafting	1	1	2
Ascending aorta graft replacement	3	0	3
Bentall procedure	0	1	4
Root enlargement procedure	0	1	2
Tricuspid ring annuloplasty	0	1	2
Tricuspid ring annuloplasty + atrial septal defect closure	1	0	0

DISCUSSION

Stenosis of the aortic valve is the most common cardiac valve disease in developed countries affecting approximately 3% of elderly patients. In parallel with the growth of the aging population, aortic stenosis becomes a more remarkable morbidity. Since more elderly patients are recruited as candidates for AVR, morbidities and concomitant risk factors should be considered before the choice of the operative technique.[9-14]

Muneretto et al.[15] suggested that the use of transcatheter AVR in patients with an intermediate-to-high-risk profile was linked with a significantly higher incidence of perioperative complications and decreased survival at short and mid-term compared to conventional surgery and sutureless valve implantation. In this perspective, the choice of the appropriate valve for every patient is a key point in planning the surgical management of symptomatic aortic stenosis.

The primary aim of the present study was to determine and compare early therapeutic outcomes after AVR with sutureless, bioprosthetic, and mechanical valves. Our study results demonstrated that AVR maintained its position as the mainstay of treatment in patients with severe and symptomatic aortic stenosis. Improvement in cardiac functions is reflected in echocardiographic findings such as mean and maximum aortic gradient, as well as the thickness of the posterior wall and interventricular septum. However, early postoperative data did not yield any noteworthy alterations regarding ejection fraction and pulmonary arterial pressure. Hence, more accurate conclusions require further analyses of long-term therapeutic results.

Perioperative data in our series showed that durations of operation and cross-clamp and the length of hospitalization and intensive care unit stay were shorter in Group 1. However, these favorable results for sutureless valves may be associated with the characteristics of patients and comorbidities. Cost-efficacy and the establishment of treatment strategy on an individualized basis for every patient are other key points to be considered. Although the initial ejection fractions of patients in the sutureless valve group were lower than the other groups, this difference disappeared after AVR procedure. Based on these findings, it can be speculated that sutureless valves may result in more obvious beneficial effects in the short-term.

Good clinical and hemodynamic outcomes have been accomplished with AVR procedures with sutureless, bioprosthetic, and mechanical valves. On the other hand, determination of specific patient selection criteria and the establishment of guidelines is mandatory for optimizing treatment outcomes. Aortic valve replacement using bioprostheses is more preferential in elderly, whereas conventional AVR in this population has an operative mortality ranging between 4 to 10%.[16] Mataraci et al.[4] reported that there was no mortality during hospital stay in the sutureless valve group. Whether root enlargement procedure increases mortality is still under debate.[17,18] In our study, we observed that additional procedures were accompanied with substantial morbidity compared to AVR procedures alone.

Table 7
Intra- and inter-group comparison of pre- and postoperative echocardiographic findings

	Group		
	Sutureless	Bioprosthesis	Mechanical
Variable	Mean±SD	Mean±SD	Mean±SD
Maximum aortic gradient (mmHg)			
Preoperative	80.4±21.3	76.8±10.4	85.6±30.2
Postoperative	19.8±5.9	23.9±9.5	23.4±10.1
p-value	**0.001**	**<0.0001**	**<0.0001**
Mean aortic gradient (mmHg)			
Preoperative	48.4±12.0	47.1±8.1	54.1±18.2
Postoperative	10.8±3.5	12.2±4.6	12.6±5.6
p-value	**0.001**	**<0.0001**	**<0.0001**
Interventricular septum (mm)			
Preoperative	13.4±1.4	13.8±1.6	14.3±1.7
Postoperative	11.9±1.3	12.2±0.9	12.3±1.5
p-value	**0.034**	**0.042**	**0.005**
Posterior wall (mm)			
Preoperative	11.9±1.2	12.4±1.3	12.9±1.1
Postoperative	10.8±0.9	11.2±0.9	11.3±1.2
p-value	**0.032**	**0.012**	**0.005**
Ejection fraction (%)			
Preoperative	52.4±12.0	57.1±11.1	61.1±6.7
Postoperative	58.8±6.7	56.7±9.3	60.4±3.2
p-value	0.198	0.796	0.300
Pulmonary arterial pressure (mmHg)			
Preoperative	36.6±6.0	36.6±11.0	35.2±12.5
Postoperative	35.6±10.4	34.1±11.3	32.3±5.6
p-value	0.398	0.295	0.850
Left ventricular end diastolic diameter (mm)			
Preoperative	48.8±4.8	49.8±8.9	49.5±6.1
Postoperative	45.7±3.8	45.6±3.7	46.8±4.4
p-value	**0.044**	0.072	0.229
Left ventricular end systolic diameter (mm)			
Preoperative	31.4±4.6	35.6±8.0	33.2±4.7
Postoperative	29.3±3.7	30.1±4.7	31.4±5.1
p-value	0.064	0.010	0.319
Root of aorta			
Preoperative	29.6±1.6	31.6±4.3	30.1±3.2
Postoperative	28.5±2.6	30.4±4.1	28.1±2.5
p-value	0.084†	0.446†	0.090†
Left atrium			
Preoperative	44.3±5.7	41.3±3.4	43.2±3.7
Postoperative	42.7±4.2	42.5±5.7	42.9±4.4
p-value	0.196	0.342	0.451
Ascending aorta			
Preoperative	37.2±2.0	40.4±7.3	38.8±7.5
Postoperative	35.7±4.0	38.8±4.8	35.6±3.4
p-value	0.056	0.556	0.254

SD: Standard deviation; † Analyzed with paired t-test; all of the other variables were tested with Wilcoxon test. Statistically significant differences are shown in bold.

Table 8
Comorbidities and postoperative complications in three valve groups

Complication	Time	Group Sutureless	Cause	Group Bioprosthetic	Cause	Group Mechanical	Cause
Mortality	In hospital	0		1	Low output	2	LCO, CVO
	Postoperative 1st month	1	CRF, CVO	1	CVO	0	
	Postoperative 6th month	0		2	CVO, other causes	2	CRF, CVO
Neurological complication	In hospital	0		1	TIA	1	TIA
	Postoperative 1st month	1		1	CVO	1	CVO
	Postoperative 6th month	0		1	CVO	1	CVO
Paravalvular leak	In hospital	0		0		0	
	Postoperative 1st month	0		1 (mild)		0	
	Postoperative 6th month	1 (mild)		2 (mild)		0	
Central leak	In hospital	0		1 (mild)		1 (mild)	
	Postoperative 1st month	0		1 (mild)		1 (mild)	
	Postoperative 6th month	0		1 (mild)		2 (mild)	
AV complete block / Permanent pacemaker	In hospital	0		1		1	
	Postoperative 1st month	0		1		0	
	Postoperative 6th month	0		0		0	
Infective endocarditis	In hospital	0		0		0	
	Postoperative 1st month	0		0		0	
	Postoperative 6th month	0		0		0	
Valve dehiscence	In hospital	0		0		0	
	Postoperative 1st month	0		0		0	
	Postoperative 6th month	0		0		0	
Valve dysfunction	In hospital	0		0		0	
	Postoperative 1st month	0		0		0	
	Postoperative 6th month	0		0		0	
Valve migration	In hospital	0		0		0	
	Postoperative 1st month	0		0		0	
	Postoperative 6th month	0		0		0	
Reoperation		2*	Bleeding	2†	Bleeding	2§	Bleeding
		0	Valve dehiscence	0	Valve dehiscence	0	Valve dehiscence
		0	Infective endocarditis	0	Infective endocarditis	0	Infective endocarditis
		0	Valve dysfunction	0	Valve dysfunction	0	Valve dysfunction

Additional procedures in patients who underwent reoperation included * CABG, † CABG and supracoronary ascending aorta replacement, and § CABG and CABG + ascending aorta replacement; LCO: Left coronary artery occlusion; CVO: Cerebrovascular occlusion; CRF: Chronic renal failure; TIA: Transient ischemic attack; CABG: Coronary artery bypass grafting.

In the current study, we presented our short-term experience with three different valve types. Although our data were insufficient for statistical analysis, complications including mortality, neurological hazards, central and paravalvular leak, and valve dehiscence and migration were evaluated. Interestingly, mortality and need for reoperation after AVR were more frequent in the patients who underwent additional surgical procedures such as CABG and root enlargement procedure (Table 8). Dhareshwar et al.[18] also proposed that root enlargement procedure was a contributor to mortality in the univariate analysis; however, multivariate analysis results did not support this hypothesis.

The improvement in the mean and maximum aortic gradients after surgery was consistent with the report by Borger et al.[19] In parallel with the report of Pollari et al.,[20] we also observed that sutureless valve interventions were associated with decreased operative and cross-clamp time and shorter duration of

hospitalization and intensive care unit stay. Therefore, this option can be of choice in elderly patients who require additional procedures.[3-5] Furthermore, reduction of operative time and cross-clamp time may avoid side effects such as hemolysis, oxidative stress, and hemolysis, thereby, improving the rates of morbidity and mortality.[21]

Among complications encountered after AVR, paravalvular leakage deserves a particular attention. It has been suggested that insufficient sizing or inappropriate decalcification of the annulus may be responsible for this problem. Even if it may be time-consuming, the prosthesis must be positioned properly and accurately.[22] Root enlargement procedures are supposed not to amplify the surgical risk; however, they should be omitted in elderly patients with severely calcified aortic walls.[23]

Sutureless valves have been manufactured to facilitate valve procedures, although they constitute a technical challenge, and a learning curve is required. Considering that sutureless procedures are not completely devoid of risks, treatment strategy must be tailored on an individualized basis for every candidate of AVR. Increased awareness on complications and close follow-up after surgery are crucial to achieve reduced rates of morbidity and mortality.

Nonetheless, this study has some limitations including the lack of long-term results and data restricted to the experience of a single institution. Many unidentified risk factors may have been considered during decision-making process of clinicians. Procedure-related costs constitute another important aspect of AVR interventions. Moreover, we were unable to perform a cost-efficacy analysis among the treatment methods. Differences among the groups regarding baseline characteristics such as age, ejection fraction, NYHA class, and EuroSCORE mandate a more cautious interpretation of our data. The effects of social, environmental, and genetic factors can be deemed other limitations before extrapolation of our results to larger populations.

In conclusion, AVR procedures are the mainstay of treatment for severe and symptomatic aortic stenosis. Selection of sutureless, bioprosthetic, and mechanical valves must be made according to the characteristics of the patient including comorbidities and hemodynamic profile. Further prospective, multi-center trials on larger series are warranted to determine the safety, efficacy, durability, advantages and disadvantages of each valve type.

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