CONSENSUS STATEMENT ON VALVULAR HEART DISEASE
Abridged version

Coordinators
Jorge Lax[MTSAC] - Pablo Stutzbach[MTSAC]

Secretaries
Martín Beck - Francisco Martín Perea

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Hugo Grancelli[MTSAC]
Daniel Piñeiro[MTSAC]
Horacio Prezioso[MTSAC]
Ricardo Sarmiento[MTSAC]

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Rodolfo Pizarro[MTSAC]
Gonzalo Pombo
Pablo Roura
Manuel Vázquez Blanco[MTSAC]
Verónica Volberg[MTSAC]

INTRODUCTION

WITH SO MANY CONSENSUS STATEMENTS ON VALVULAR HEART DISEASE, WHY ANOTHER ONE?

Consensuses are valuable documents to impart the best diagnostic and treatment strategies. However, there are several consensuses on valvular heart disease, so we might ask why we should have another one.

In this Consensus, the approach allows sharing internationally accepted information and criteria, and includes a local concept from the data and information existing in our country, adapted to the characteristics of available resources which vary in distinctive geographical areas and in different economic and access to health care levels. Most of the literature, whose information is used to establish consensuses, comes from central countries and emphasizes the importance of social, cultural and economic contrasts. Although the same differences exist in these countries, in Latin America the contrasts deepen, turning the extrapolation of results a complex and not always accurate task. Rheumatic fever is one of the most descriptive examples of these difficulties, an anecdotic disease in many countries of the Northern Hemisphere and still active in our region. This reality impacts on different aspects such as decision making in mitral regurgitation, based on studies that did not include this etiology, and which might lead to wrong therapeutic decisions. Another distinguishing characteristic is our statistics on the application of resources and results, also compelling to a different vision at the moment of decision making, as these data do not always agree with those reported in other countries.

The other particular aspect of the available information on valvular heart diseases is the reduced number of large randomized, controlled studies (level of evidence A) to support recommendations and the high number of decisions taken from a level of evidence C, i.e., from expert opinion. When we try to extrapolate these decisions to our reality without further ado, we must bear in mind that we are applying the experience accumulated from results obtained in the reality of those countries, from which experts have formed their opinions.

Despite this is the best valid evidence to be applied in the context of origin, the same results cannot be necessarily expected in a different reality, where the etiology of a disease or its evolution may change, or the human and technological diagnostic and therapeutic resources are not similar. Therefore, in a disease with high level of recommendations based on level of evidence C, we must develop and report our experts' opinions, or at least that of physicians in our setting with experience and good disposition to think and try to solve these issues, as they express the best experience formulated from our daily reality.

During the development of the Consensus we have certainly found many coincidental aspects with international recommendations, but in various opportunities we have differed, based on local experience results and their application to the differences provided by our country, where we also found disparity due to a distinctive regional development and dissimilar access to healthcare for different social groups. The criteria postulated here reflect the current diagnostic and treatment strategies, but should also help to unify principles and behaviors, rationalize diagnostic and therapeutic resources, emphasize the value of guide-

lines as educational source and promote the exchange of information and experience. In turn, they should not be interpreted dogmatically, but rather flexibly, able to adapt to the conditions of diagnostic and therapeutic resources and to the results obtained with the adopted treatments, which are different for each region and social status. Hence, in certain circumstances it may be appropriate to depart from these guidelines.

METHODOLOGY

A working team was formed to cover every specific methodological aspects included in the Consensus. All participants had access to revise the document, in order to homogenize criteria and reduce discrepancies. The following classification was used to establish the class recommendation achieved in this Consensus:

- **Class I:** conditions for which there is evidence and/or general agreement that the treatment or procedure is beneficial, useful and effective. A Class I indication does not mean that it is the only acceptable procedure.
- **Class II:** conditions for which there is conflictive evidence and/or opinion discrepancies regarding the usefulness/efficacy of the procedure or treatment.
- **IIa:** the weight of evidence/opinion favors usefulness/efficacy.
- **IIb:** the usefulness/efficacy is less well established by evidence/opinion.
- **Class III:** conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/effective and in some cases may be harmful.

The following scheme was used to categorize the level of evidence upon which the endorsed recommendation is based:

- **Level of evidence A:** solid evidence, arising from controlled, randomized clinical trials or meta-analyses. It implies the analysis of multiple groups of the population at risk (3 to 5). General consistency must be achieved in the direction and magnitude of the effect.
- **Level of evidence B:** evidence derived from a single, controlled, randomized clinical trial or from large non-randomized trials. The number of groups of the population at risk are more limited (2 or 3)
- **Level of evidence C:** consensus or expert opinion and/or small or retrospective studies, or registries.

ANTIBIOTIC PROPHYLAXIS FOR INFECTIVE ENDOCARDITIS

Over the last years, several cardiology societies have reviewed the prophylactic indications for infective endocarditis. Some, as the European Society of Cardiology and American Societies recommend their use only in high risk patients and in those cases in which a probable endocarditis would have more serious consequences, while others, as the National Institute for Clinical Excellence (NICE) (3) recommend their suppression.

Although there are no randomized clinical trials on the use of antibiotic prophylaxis against infective endocarditis in patients with valvular heart disease, we believe that patients at high risk, as those with previous history of infective endocarditis, valve prostheses, unrepaired, recently repaired or with residual short circuit congenital heart defects, should receive prophylactic treatment before potentially bacteriemic procedures (Class I recommendation, level of evidence C).

Since the most frequent valve disease etiologies in the Argentine population cannot be extrapolated to those in the American or European populations, that the change in prophylaxis indications is not based on new evidence but rather on its absence, and that in national series an invasive procedure prior to the diagnosis of infective endocarditis was found in more than 25% of cases, the recommendation of this Consensus for moderate risk cases is IIa, with level of evidence C. The moderate risk group includes the remaining congenital heart defects [except for isolated ostium secundum atrial septal defect (ASD), ASD, ventricular septal defect (VSD) and repaired ductus arteriosus after 6 months without residual defect], acquired valve dysfunction due to rheumatic disease, hypertrophic cardiomyopathy with outflow tract obstruction, mitral valve prolapse with regurgitation and/or increased leaflet thickness and heart transplantation.

The procedures exhibiting the highest possibilities of inducing bacteremia are:

Dental procedures: those with possibility of bleeding or mucosa perforation.

Respiratory tract procedures: Tonsil or adenoid removal and biopsies.

Digestive tract maneuvers: surgical treatment of esophageal varices and esophageal dilations, any surgery affecting the intestinal mucosa or the bile duct, as well as endoscopic retrograde colorectal angiography.

Genitourinary procedures: cystoscopy, urethral dilatations, prostate surgery, delivery with chorioamnionitis and abortion.

Table 1 shows the therapeutic plans for dental, respiratory tract and upper digestive tract procedures and Table 2 for lower digestive tract and genitourinary procedures.

We cannot fail to mention that the most important steps for infective endocarditis prophylaxis are based on general measures as the promotion of adequate oral hygiene, as well as periodic dental controls and general asepsis during invasive procedures.

Table 1. Antibiotic prophylaxis for dental, respiratory tract or upper digestive tract procedures

Condition	Antibiotics	Route	Adult dose	Child dose	Time
Not allergic	Amoxicillin	oral	2 g	50 mg/kg	1 hour before
Allergic to penicillin	Erythromycin	oral	1 g	20 mg/kg	1 hour before
	Cephalexin	oral	2 g	50 mg/kg	1 hour before
	Clindamycin	oral	600 mg	20 mg/kg	1 hour before
	Clarithromycin	oral	500 mg	15 mg/kg	1 hour before
Unable to swallow	Ampicillin	IV or IM	2 g	50 mg/kg	30 min before
Allergic to penicillin and unable to swallow	Clindamycin	IV	600 mg	20 mg/kg	30 min before
	Cefazolin	IV or IM	1 g	25 mg/kg	30 min before
	Teicoplanin	IM or IV	400 mg	10 mg/kg	30 to 60 min before

IV: Intravenous. IM: Intramuscular.

Table 2. Antibiotic prophylaxis for lower digestive tract and genitourinary procedures

Condition	Antibiotics	Route	Adult dose	Child dose	Time
Not allergic	Ampicillin plus	IV	2 g	50 mg/kg	30 min before
	gentamicin and amoxicillin	IV or IM	1.5 mg/kg	1.5 mg/kg	
		- oral	1 g	25 mg/kg	6 hours after
Allergic to penicillin	Vancomycin plus gentamicin	IV	1 g	20 mg/kg	1 hour before
		IV or IM	1.5 mg/kg	1.5 mg/kg	
	Teicoplanin plus gentamicin	IV or IM	400 mg	10 mg/kg	30 min before
		IV or IM	1.5 mg/kg	1.5 mg/kg	

IV: Intravenous. IM: Intramuscular.

MITRAL STENOSIS

Indication of percutaneous balloon mitral valvuloplasty

Recommendation	Class	Level of evidence
- Moderate or severe mitral stenosis or restenosis, symptomatic despite medical treatment, with echocardiographic score ≤ 8.	I	B
- Symptomatic pregnant women with moderate to severe mitral stenosis, in functional class III-IV despite medical treatment, with echocardiographic score ≤ 12.	I	B
- Symptomatic moderate to severe mitral stenosis, with contraindications or high surgical risk, and echocardiographic score ≤ 12.	I	B
- Symptomatic moderate to severe mitral stenosis, with pulmonary hypertension (pulmonary pressure > 50 mm Hg at rest or > 60 mm Hg during exercise).	IIa	B
- Moderate or severe mitral stenosis or restenosis, symptomatic despite medical treatment, with echocardiographic score from 9 to 12.	IIa	B
- Asymptomatic severe mitral stenosis, with echocardiographic score < 12, requiring urgent extracardiac surgery.	IIa	C
- Moderate to severe mitral stenosis, asymptomatic or in functional class I-II, in patients who plan pregnancy with score < 12.	IIa	C
- Moderate to severe mitral stenosis, symptomatic despite medical treatment, with echocardiographic score ≤ 8 and mitral regurgitation grade I-II.	IIa	C
- Asymptomatic moderate to severe mitral stenosis, with pulmonary pressure > 50 mm Hg at rest and > 60 mm Hg during exercise.	IIa	B
- Moderate to severe mitral stenosis in asymptomatic patients with echocardiographic score ≤ 8, with risk of thromboembolism or history of thromboembolic events, spontaneous dense contrast in the left atrium, recent atrial fibrillation or paroxysmal atrial fibrillation.	IIa	B
- Moderate to severe mitral stenosis, symptomatic despite medical treatment, with score ≥ 12.	III	C
- Asymptomatic moderate or severe mitral stenosis without pulmonary hypertension.	III	C
- Moderate to severe mitral stenosis, symptomatic despite medical treatment, with mitral regurgitation grade III-IV.	III	C
- Moderate to severe mitral stenosis, symptomatic despite medical treatment, and with thrombus in left chambers.	III	C
- Moderate to severe mitral stenosis, symptomatic despite medical treatment, with pulmonary hypertension and organic tricuspid regurgitation.	III	C

Indications of surgery in mitral stenosis

Recommendation	Class	Level of evidence
- After percutaneous valvuloplasty without clinical improvement.	I	C
- After complicated percutaneous valvuloplasty with acute severe mitral regurgitation.	I	C
- Symptomatic moderate to severe mitral stenosis not accepted for percutaneous valvuloplasty (left atrial thrombus, mitral regurgitation grade III-IV, score > 12).	I	C
- Presence of organic tricuspid regurgitation or other severe valvular disease needing repair.	I	C
- Recent mitral infective endocarditis.	I	C
- Associated symptomatic coronary disease.	I	C
- Recurrent systemic embolism.	I	C
- Symptomatic moderate to severe mitral stenosis despite medical treatment and echocardiographic score from 9 to 11.	II	C
- Mitral stenosis that may receive percutaneous valvuloplasty.	III	C

MITRAL REGURGITATION

ACUTE MITRAL REGURGITATION

Indications of surgical treatment for acute mitral regurgitation

Recommendation	Class	Level of evidence
- Acute severe mitral regurgitation with refractory heart failure.	I	B
- Acute severe mitral regurgitation secondary to organic valve injury with good response to medical treatment and hemodynamic stability.	II	C
- Acute severe mitral regurgitation with reduced severity and hemodynamic stability in response to medical treatment and without rectifiable anatomic alterations.	III	C

ORGANIC OR CHRONIC PRIMARY MITRAL REGURGITATION

Indications of surgical treatment in chronic mitral regurgitation

Recommendation	Class	Level of evidence
- Severe mitral regurgitation with symptoms attributable to the valvular disease, EF > 30% and end-systolic diameter < 55 mm.	I	B
- Asymptomatic severe mitral regurgitation with ventricular dysfunction parameters (EF ≤ 60% and/or end-systolic diameter ≥ 45 mm).	I	B
- Severe mitral regurgitation with indication of coronary artery bypass graft surgery.	I	C
- Mitral valve repair should be the technique of choice relative to valve replacement in patients with chronic mitral regurgitation with surgical indication and high expected durability.	I	C
- Asymptomatic severe mitral regurgitation with preserved ventricular function, and pulmonary hypertension > 50 mm Hg at rest or pulmonary hypertension > 60 mm Hg during exercise.	IIa	C
- Asymptomatic severe mitral regurgitation with preserved ventricular function, presenting with new onset atrial fibrillation.	IIa	C
- Asymptomatic severe mitral regurgitation due to flail valve, with intermediate ventricular function parameters, low surgical risk, high feasibility of valve repair (> 90%) and high expected durability.	IIa	C
- Valvular surgery should be considered in asymptomatic patients with severe mitral regurgitation, intermediate ventricular function parameters (ESD 40-44 mm), low surgical risk and high feasibility of valve repair (> 90%), presenting with left atrial volume index > 60 ml/m2 and/or progression of neurohormonal activation (progressive increase of natriuretic peptides).	IIa	C
- Symptomatic severe mitral regurgitation with severe left ventricular function impairment (EF between 20% and 30%) refractory to medical treatment (including resynchronization therapy), low comorbidities and highly feasible valve repair.	IIa	C
- Asymptomatic severe mitral regurgitation with preserved ventricular function, adequate effort tolerance, low surgical risk, highly feasible valve repair (> 90%) and high expected durability.	IIb	C
- Symptomatic severe mitral regurgitation with severe left ventricular function impairment (EF between 20% and 30%) refractory to medical treatment (including resynchronization therapy), low comorbidities and low probability of valve repair.	IIb	C
- Asymptomatic severe mitral regurgitation with preserved left ventricular systolic function, adequate effort tolerance and low probability of valve repair.	III	C

EF: Ejection fraction. ESD: End-systolic diameter.

FUNCTIONAL MITRAL REGURGITATION

Indications of surgical treatment for functional mitral regurgitation

Recommendation	Class	Level of evidence
- Severe mitral regurgitation with indication of revascularization, and EF > 30%.	I	C
- Moderate mitral regurgitation with indication of myocardial revascularization (annuloplasty).	IIa	C
- Symptomatic patients with severe mitral regurgitation, EF > 30%, scheduled for myocardial revascularization and with evidence of extensive viability (annuloplasty).	IIa	C
- Surgery may be considered in patients with severe mitral regurgitation, EF > 30%, symptomatic despite optimal medical treatment (including resynchronization when necessary), with few comorbidities and no indication of revascularization.	IIb	C

EF: Ejection fraction.

AORTIC STENOSIS

CURRENT CLASSIFICATION OF AORTIC STENOSIS SEVERITY

Evaluation of aortic stenosis severity (AS) is made through aortic valve peak velocity, mean gradient (MG), effective aortic valve area (AVA) and the AVA index obtained by Doppler echocardiography. Mean valve gradient depends on valvular flow and must be registered from the view in which peak velocity is maximal, including the right paresternal view using transducer with and/or without image (Pedoff). Aortic valve area calculation depends on the operator, especially the measurement of outflow tract diameter and should be normalized by body surface area (AVA index, AVAI) to avoid overestimating the degree of stenosis in patients with small surface area. Due to the discordance between AVA and MG from previously published guidelines, an AVA of 1 cm2 correlating with MG of 26 mm Hg should be considered according to the Gorlin equation; therefore, severe AS is defined as AVA < 0.8 cm2, which corresponds to a MG of 41 mmHg. Aortic valve area alone should not be used to classify the degree of stenosis but with the collective data of gradient, valvular flow, ventricular function, the degree of hypertrophy and type of ventricular geometry, the degree of valve calcification and arterial pressure. The dimensionless ratio (integer of blood flow through the outflow tract / integer of aortic flow) allows evaluating the presence of severe AS in patients in whom left ventricular outflow tract diameter cannot be measured (LVOT) due to inadequate ultrasound window (Table 1).

Cut-off points should be considered in patients with normal ejection fraction (EF) and normal stroke volume index (SVI) (> 35 ml/m2). The term "critical" AS is reserved for AVA < 0, 6 cm2 and/or AVAI 0.36 cm2/m2. Some patients with severe stenosis (AVA < 0.8 cm2) may present low gradient (MG < 40 mm Hg) and reduced EF (< 40%) and should be differentiated from patients with "pseudo-stenosis". In these cases dobutamine test should be performed, to confirm the severity of the stenosis if AVA increases < 0.2 cm2 or persists in values < 0.8 cm2. The presence of left ventricular (LV) flow reserve can also be obtained if stroke volume (SV) increases > 20%. More recently, patients with severe AS, with MG < 40 mm Hg and normal EF (> 50%), in whom SVI is decreased (< 35 ml / m2) have been described, a condition called "paradoxical" AS.

In patients with hypertension (HT), the study should be performed once blood pressure is normalized. As in patients with small aortic root (sinotubular junction < 30 mm), the phenomenon of pressure recovery may overestimate the degree of stenosis, pressure recovery should be substracted from peak and mean gradients obtained by Doppler echocardiography according to the following formula:

Pressure recovery = 4 ($V_{Ao}2$ - $V_{LVOT}2$). 2 (AVAc / Ao). [1 - (AVA_c/ Ao)]

where
AVAc (**vena contracta area**) is the valvular area obtained using the continuity equation and Ao is the area at the level of the sinotubular junction. Velocities at the aortic level and at LVOT must be maximum or average according to the gradient (peak or average) to be corrected.

The transvalvular aortic gradient is a reliable indicator of aortic stenosis but it is important to rule out the causes of increase (hyperdynamic circulatory conditions, associated aortic valve regurgitation, etc.) or of secondary decrease (low cardiac output condition, etc.); in these situations, the gradient becomes more dependent on the transvalvular flow rate than on the degree of stenosis. It should be borne in mind that MG obtained by Doppler echocardiography may be slightly higher than that obtained during catheterization because, unlike the former, which reports the maximum instantaneous gradient, the latter assesses "peak to peak" gradient, resulting from comparing LV and aortic systolic pressures.

Some alternative parameters suggestive of severe aortic stenosis are:
- Maximum valve resistance > 500 dynes/s/cm^{-5}.
- Average valve resistance > 300 dynes/s/cm^{-5}.
- Maximum left ventricular outflow tract velocity /

	Mild	Moderate	Moderately severe	Severe
AVA (cm^2)	> 1.5	1.5-1	1-0.8	< 0.8
AVAI (cm^2/m^2)*	> 0.9	0.9-0.6	0.6-0.48	< 0.48
Mean gradient (mm Hg)	< 13	13-25	26-39	≥ 40
Peak velocity (m/s)	2-3	3-3.5	3.6-3.9	≥ 4
Dimensionless ratio				≤ 0.25

*for body surface area of 1.67 m2
AVA: Aortic valve area. AVAI: Aortic valve area index.

Table 1. Measurements of aortic stenosis severity

aortic jet velocity < 0.25.
- Fractional shortening / maximum aortic transvalvular gradient<0.7.
- Time to peak flow / left ventricular ejection time > 0.5.

It should be noted that in published studies on aortic valve resistance there is a significant dispersion of confidence intervals, making it difficult to establish the cutoff point between severe, moderate and mild forms.

Serial echocardiography is also important in the asymptomatic patient who develops systolic dysfunction (LVEF < 50%); although rare, this finding is an indication for aortic valve replacement.

SURGICAL TREATMENT

Indications of surgical treatment in aortic stenosis

Class I
- Symptomatic patients with moderately severe or severe aortic stenosis, (Level of evidence B)
- Asymptomatic patients with moderately severe or severe aortic stenosis, with positive exercise test (due to development of symptoms or drop in blood pressure) (Level of Evidence B).
- Patients with moderately severe or severe aortic stenosis requiring cardiac surgery for other reasons (Level of Evidence B).
- Patients with moderately severe or severe aortic stenosis with LV dysfunction (LVEF <50%) (Level of Evidence C).
- Symptomatic patients with moderately severe to severe aortic stenosis with low flow, low gradient and impaired ejection fraction in whom the presence of contractile reserve is demonstrated (Level of Evidence C).

Class IIa
- Symptomatic patients with moderately severe or severe aortic stenosis with low flow, low gradient (< 40 mm Hg) and normal ejection fraction (Level of Evidence C).
- Symptomatic patients with moderately severe or severe aortic stenosis with low flow, low gradient and impaired ejection fraction after ruling out the necrotic mass due to coronary heart disease as a cause of ventricular dysfunction, and without contractile reserve (Level of Evidence C)*.

* Only centers with surgical experience and possibility of circulatory assistance.

BALLOON VALVULOPLASTY

It involves balloon dilatation of the aortic valve. It was initially used only in young patients with congenital stenosis with no calcification, until later Cribier et al. began to use it in adult patients as a palliative therapy. The mechanisms by which balloon valvuloplasty increases the valve area are varied and related to the etiology of valvular stenosis. In patients with degenerative calcified valvular stenosis, the main mechanism is the fracture of leaflet calcium deposits. In cases of rheumatic fever the predominant mechanism is commissure separation. The balloon also causes stretching of the valve apparatus in the unfused commisures.

Valvuloplasty series show that although the area improves, complication rate reaches 12%, and actuarial survival at 1, 3 and 5 years is 55% ± 3%, 25% ± 3% and 22% ± 3% and event-free actuarial survival is 33% ± 2%, 13% ± 2% and 2% ± 1%, respectively. The poor short-term results are due to an almost unacceptable restenosis rate, in addition to a high rate of general and vascular access complications, leading to virtual procedure abandonment after the initial enthusiasm. However, in recent years it has resurfaced, and not as a definitive treatment, but as a palliative measure, as bridge to more definitive treatment, either endovascular or surgical, especially in patients in poor clinical or hemodynamic condition in whom stability is desired before proceeding with another intervention, or in those symptomatic patients who require more urgent noncardiac surgery.

PERCUTANEOUS AORTIC VALVE REPLACEMENT

Recommendations for percutaneous aortic valve replacement

Class I
- Transcatheter valve implantation is indicated in patients with symptomatic severe aortic stenosis who are not considered candidates for surgical treatment by the cardiology team, and who have the chance to improve their quality of life and life expectancy for more than one year despite the presence of comorbidities (Level of Evidence B).

Class IIa
- Transcatheter valve implantation may be considered in patients with symptomatic severe aortic stenosis, with high- surgical risk according to the American Society of Thoracic Surgery score, EuroSCORE or ArgenSCORE, who are considered candidates for surgery, but in whom the cardiology team estimates indicating this treatment based on the risk-benefit ratio (Level of Evidence B).

Class III
- Symptomatic patients with severe aortic stenosis, with moderate and low surgical risk or with no criteria for ruling out the operation (Level of Evidence B).
- Symptomatic patients with severe aortic stenosis, with comorbidities that generate a life expectancy of less than one year (Level of Evidence C).

AORTIC REGURGITATION

Indications of surgical treatment for acute aortic regurgitation

Recommendation	Class	Level of evidence
- Patients with acute severe aortic regurgitation and heart failure.	I	A
- Patients with acute mild to moderate aortic regurgitation without heart failure and no other indication for surgery for his/her underlying disease.	III	C

Indications of surgical treatment for acute aortic regurgitation: special situations

Recommendation	Class	Level of evidence
- Patients with acute aortic regurgitation by infectious endocarditis, without heart failure, with persistent sepsis despite adequate antibiotic therapy.	I	B
- Patients with acute aortic regurgitation by infectious endocarditis without heart failure, diagnosed with valvular ring abscess with or without clinical manifestations (atrioventricular block, pericardial effusion).	I	B
- Patients with aortic regurgitation secondary to dissecting proximal aortic aneurysm.	I	A
- Patients with acute aortic regurgitation by infectious endocarditis of fungal origin, without heart failure.	I	B
- Patients with acute aortic regurgitation by prosthetic infectious endocarditis with echocardiographic signs of partial prosthesis detachment.	I	C
- Patients with acute aortic regurgitation by acute prosthetic dysfunction (biological prosthesis apex rupture).	I	C
- Patients with acute aortic regurgitation by infectious endocarditis without heart failure and vegetation > 10mm by echocardiography, if progressive vegetation increase is demonstrated despite adequate treatment.	II	C

Indications of surgical treatment for chronic aortic regurgitation

Recommendation	Class	Level of evidence
- Symptomatic patients with chronic severe aortic regurgitation, (dyspnea or angina) attributable to valvular dysfunction independently of ventricular function.	I	B
- Asymptomatic patients with chronic severe aortic regurgitation with left ventricular dysfunction evidenced by values close to any of the following parameters: systolic diameter of 55 mm, shortening fraction < 25% or resting ejection fraction < 50%.	I	B
- Patients with chronic severe aortic regurgitation scheduled to undergo coronary artery bypass graft surgery, ascending aorta surgery or other valve surgery.	I	C
- Asymptomatic patients with chronic severe aortic regurgitation, with LVEF > 50%, but with extreme left ventricular dilatation (diastolic diameter > 75 mm).	IIa	B
- Patients with moderate chronic aortic regurgitation scheduled to undergo coronary artery bypass graft surgery, ascending aorta surgery or other valve surgery.	IIa	C
- Patients with chronic severe aortic regurgitation and normal left ventricular systolic function at rest (ejection fraction > 50%), when the degree of left ventricular dilatation exceeds 70 mm diastolic diameter or 50 mm systolic diameter, there is evidence of progressive left ventricular dilatation, decreased exercise tolerance or abnormal hemodynamic response to effort.	IIa	C
- Asymptomatic patients with normal systolic function and adequate effort tolerance.	III	C

LVEF: left ventricular ejection fraction.

Indications of surgical treatment for chronic aortic regurgitation

Recommendation	Class	Level of evidence
- In patients without bicuspid valve or genetic / familial causes of aortic dilatation, the recommended threshold for elective surgery is an aortic diameter of 55 mm (degenerative thoracic aneurysms, chronic aortic dissection, intramural hematoma, penetrating atherosclerotic ulcers, mycotic aneurysms or pseudoaneurysms), with or without severe aortic regurgitation.	I	B
- Patients with Marfan syndrome and ascending aorta dilatation equal to or greater than 50 mm.	I	C
- Ascending aorta dilatation equal to or greater than 45 mm in patients with Marfan syndrome and risk factors (family history of aortic dissection and growth rate of more than 5 mm/year), desire for pregnancy, with or without aortic regurgitation.	IIa	C
- Ascending aorta dilatation equal to or greater than 50 mm and bicuspid aortic valve with risk factors (coarctation of the aorta, hypertension, family history of dissection and growth rate of more than 5 mm / year).	IIa	C
- Severe symptomatic coronary artery disease not treatable by angioplasty with moderate or severe aortic regurgitation.	IIa	C

TRICUSPID VALVE DISEASE

TRICUSPID STENOSIS

Recommendations for treatment of tricuspid stenosis

Recommendation	Class	Level of evidence
- Beta blockers in symptomatic patients.	I	C
- Calcium channel blockers, digoxin.	I	C
- Diuretics in the presence of signs of congestion.	I	C
- Balloon valvuloplasty in symptomatic patients with severe, tricuspid stenosis without concomitant severe tricuspid regurgitation.	I	C
- Valve replacement in symptomatic patients with severe tricuspid stenosis scheduled for heart surgery.	I	C
- Pharmacological treatment in patients with systemic congestion and a tendency to hypotension.	III	C
- Valvuloplasty in patients with associated severe tricuspid regurgitation.	III	C

TRICUSPID REGURGITATION

Recommendations for treatment of tricuspid regurgitation

Recommendation	Class	Level of evidence
- Medical treatment including diuretics and angiotensin-converting enzyme inhibitors in symptomatic patients.	I	C
- Tricuspid valve repair or replacement in patients with symptomatic severe tricuspid regurgitation	I	C
- Tricuspid valve repair in patients with severe tricuspid regurgitation and surgical indication for mitral valve disease.	I	B
- Tricuspid valve repair in patients with moderate regurgitation and tricuspid annulus > 40 mm or > 21 mm / m2 and surgical indication for mitral valve disease.	IIa	B
- Tricuspid valve repair in patients with moderate tricuspid regurgitation or leaflet tethering > 1 cm and surgical indication for mitral valve disease.	IIa	B
- Tricuspid valve repair or replacement in patients with severe tricuspid regurgitation after mitral surgery, with right heart failure or progressive right ventricular dilatation or ventricular dysfunction.	IIa	B
- Tricuspid valve repair or replacement in patients with severe tricuspid regurgitation and severe right ventricular dysfunction.	IIb	C
- Tricuspid valve repair or replacement in patients with severe right and left ventricular dysfunction or severe pulmonary hypertension.	III	C

PULMONARY STENOSIS

Indication of catheterization and surgical treatment for pulmonary stenosis

Recommendation	Class	Level of evidence
- Percutaneous valvuloplasty in symptomatic severe pulmonary stenosis due to dyspnea, angina or syncope.	I	B
- Surgery in severe pulmonary stenosis if valvuloplasty is contraindicated (dysplastic pulmonary valve, hypoplastic pulmonary annulus, subvalvular and supravalvular stenosis, moderate to severe pulmonary regurgitation). Surgery is preferred in patients with severe tricuspid regurgitation.	I	C
- Percutaneous valvuloplasty in asymptomatic severe pulmonary stenosis.	IIa	C
- In moderate pulmonary stenosis, the intervention should be considered in the presence of: - Symptoms associated with pulmonary stenosis. - Right ventricle dysfunction. - Significant arrhythmias. - Cyanosis at rest or exercise	IIa	C
- Asymptomatic moderate pulmonary stenosis.	IIb	C
- Mild pulmonary stenosis.	III	C

PULMONARY REGURGITATION

Recommendations of pulmonary valve replacement in patients with severe pulmonary regurgitation operated on for tetralogy of Fallot or with severe pulmonary regurgitation and similar physiologysis

Recommendation	Class	Level of evidence
- Pulmonary valve surgery in asymptomatic severe pulmonary regurgitation with two or more of the following criteria: - RVEDV > 150 ml/m2 (established pathological cut-off value relative to normal values to indicate intervention). - RVESV > 80 ml/m2. - RVEF<47%. - LVEF <55%. - Significant RVOT aneurysm. - QRS > 140 ms. - Sustained tachyarrhythmia due to right ventricular overload. - Another associated anomaly as: RVOT obstruction ≥ 2/3 of RV systolic pressure with respect to systemic pressure, severe pulmonary branch stenosis, moderate to severe tricuspid regurgitation, severe aortic regurgitation, dilatation of the ascending aorta > 50 mm, and residual shunt with Qp / Qs> 1.5: 1.	I	B C
- Pulmonary valve surgery in asymptomatic severe pulmonary regurgitation with one of the following criteria: - Late surgical repair (age > 3 years). - Women with childbearing potential with severe pulmonary regurgitation and RV dysfunction	I	C

RVEDV: right ventricular end-diastolic volume. RVESV: right ventricular end-systolic volume. LVEF: left ventricular ejection fraction. RV: right ventricular. RVOT: Right ventricular outflow tract.

VALVULAR PROSTHESES

VALVE SELECTION

Recommendations for the selection of the type of prosthesis

Recommendation	Class	Level of evidence
- Patient preference should be taken into account after adequate information on the benefits and limitations of using mechanical or biological prosthesis regarding the risk of anticoagulation versus the need for future reoperation.	I	C
- A mechanical prosthesis is recommended if there are no anticoagulation therapy contraindications or in patients who are already under such treatment due to the presence of another mechanical prosthesis or chronic atrial fibrillation.	I	C
- A biological prosthesis is recommended when there are anticoagulation contraindications (high risk of bleeding comorbidities, lifestyle or occupation) or difficulty to maintain an adequately controlled anticoagulation therapy.	I	C
- A mechanical prosthesis is recommended if there is risk of accelerated structural deterioration (<40 years, hyperparathyroidism).	I	C
- A biological prosthesis is recommended for thrombosed mechanical prosthesis replacement, despite adequate anticoagulation therapy.	I	C
- Implantation of a biological prosthesis should be considered in patients > 70 years, in sinus rhythm or in those with a limited life expectancy, lower than the alleged prosthesis durability.	IIa	C
- Life preferences should be considered in patients between 60 and 70 years of age, to define the use of mechanical or biological prosthesis.	IIa	C
- Implantation of a mechanical prosthesis should be considered in patients < 60 years of age or in those with a reasonable life expectancy in whom a new surgery might be avoided.	IIa	C
- Implantation of a biological prosthesis should be considered in young women contemplating pregnancy, unless after proper information the patient decides otherwise.	IIa	C
- The Ross procedure has its main application in children; it may also be considered in special populations of young adults (professional athletes, women contemplating pregnancy).	IIa	C

PROSTHETIC VALVE THROMBOSIS TREATMENT

Recommendations for the management of prosthetic valve thrombosis

Recommendation	Class	Level of evidence
- Transthoracic echocardiography is indicated in patients with suspected prosthetic valve thrombosis to evaluate hemodynamic behavior.	I	B
- Transesophageal echocardiogram and/or cinefluoroscopy are indicated in patients with suspected prosthetic valve thrombosis to assess leaflet motion and the presence of thrombi.	I	B
- Emergency surgery for left prosthetic valve thrombosis in patients in NYHA functional class III-IV.	IIa	C
- Emergency surgery for left prosthetic valve thrombosis with the presence of large thrombus (> 0.8 cm2 or > 10 mm).	IIa	C
- Fibrinolytic therapy for left-sided prosthetic thrombosis in patients in NYHA functional class I-II and with small thrombus.	IIa	C
- Fibrinolytic therapy for right-sided prosthetic valve thrombosis in patients in NYHA functional class III-IV or with large thrombus.	IIa	C
- Surgery for left-sided prosthetic thrombosis with persistent small thrombus despite anticoagulation in patients with recurrent embolism.	IIb	C
- Fibrinolytic therapy for left-sided prosthetic thrombosis in patients in NYHA functional class III-IV and with small thrombus, in patients at high surgical risk or without surgery availability.	IIb	C
- Fibrinolytic therapy for left-sided obstructive prosthetic thrombosis in patients in NYHA functional class II-IV and with large thrombus, in patients at high surgical risk or without surgery availability.	IIb	C
- Unfractionated heparin is an alternative to fibrinolytic therapy in patients with prosthetic thrombosis in NYHA functional class I-II and with small thrombus, in patients at high surgical risk or without surgery availability.	IIb	C

NYHA: New York Heart Association.

PREGNANCY AND HEART VALVE DISEASES

PATIENTS WITH VALVE PROSTHESES

Recommendations for patients with mechanical valve prostheses

Recommendation	Class	Level of evidence
- In all patients with mechanical valve prostheses, anticoagulation with heparin in the first trimester and then vitamin K antagonists until week 36, returning to heparin or to vitamin K antagonists exclusively in patients at high risk of embolism..	I	B
- Cesarean delivery in all patients who have not replaced in a timely manner oral anticoagulants for heparin.	I	B