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CLINICAL RESEARCH

Characteristics, aetiological spectrum and management of valvular heart disease in a Tunisian cardiovascular centre

Les particularités, le profil étiologique et la prise en charge des valvulopathies acquises dans un centre cardiovasculaire en Tunisie

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KEYWORDS
Valvular heart disease;
Cardiac surgery;
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Summary
Background. — Valvular heart diseases occur frequently in Tunisia, but no precise statistics are available.
Aim. — To analyse the characteristics of patients with abnormal valvular structure and function, and to identify the aetiological spectrum, treatment and outcomes of valvular heart disease in a single cardiovascular centre in Tunisia.
Methods. — This retrospective study included patients with abnormal valvular structure and function, who were screened by transthoracic echocardiography at a single cardiology department between January 2010 and December 2013. Data on baseline characteristics, potential aetiology, treatment strategies and discharge outcomes were collected from medical records.
Results. — There were 959 patients with a significant valvular heart disease (mean age 53 ± 17 years; female/male ratio 0.57). Valvular heart disease was native in 77% of patients. Mitral stenosis was the most frequent lesion (44.1%), followed by multiple valve disease (22.3%).

Abbreviations: ARF, acute rheumatic fever; EHS, Euro Heart Survey; PBMV, percutaneous balloon mitral valvuloplasty; RHD, rheumatic heart disease; VHD, valvular heart disease.

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Rheumatic origin (66.6%) was the most frequent aetiology, followed by degenerative (17.2%) or ischaemic (8.1%) causes, endocarditis (1.4%) and congenital (0.9%) causes. Native valve disease was severe in 589 patients (61.4%). Percutaneous mitral balloon valvuloplasty was performed in 36.9% of patients with mitral stenosis. Among patients with severe valvular heart disease, surgical treatment was indicated for 446 (75.7%) patients. Only 161 (36.1%) patients were finally operated. Postoperative mortality was 13.6% for all valvular heart diseases.

Conclusion. — This retrospective study has shown that the main cause of valvular heart disease in Tunisia is rheumatic fever. Mitral stenosis and multiple valve disease are the most frequent valvular heart diseases in Tunisia. Percutaneous mitral balloon valvuloplasty and prosthetic valve replacement are the preferred treatment methods for valvular heart disease.

MOTS CLÉS
Valvulopathies ;
Chirurgie valvulaire ;
Valve cardiaque ;
Valvulopathies rhumatismales

Résumé

Contexte. — Les valvulopathies sont très fréquentes dans notre pays, la Tunisie, mais on manque d'études épidémiologiques qui précisent des statistiques exactes.

Objectifs. — Analyser les caractéristiques cliniques des patients atteints de valvulopathies et identifier les étiologies de ces valvulopathies ainsi que les modalités thérapeutiques proposées dans un centre de cardiologie en Tunisie.

Méthodes. — C'est une étude rétrospective monocentrique incluant tous les patients atteints de valvulopathies significatives confirmés par échocardiographie entre janvier 2010 et décembre 2013. Le recueil des données s'est fait à travers notre base de données informatisée.

Résultats. — Notre population est faite de 959 patients. L'âge moyen des patients était de 53 ± 17 ans, le sex-ratio est de 0,57. La majorité des patients avaient une valvulopathie native (77 %). Le rétrécissement mitral était la valvulopathie la plus fréquente (44,1 %), suivi par les valvulopathies multiples (22,3 %). L'origine rhumatismale était l'étiologie la plus fréquente (66,6 %), suivie par l'étiologie dégénérative dans 17,2 %, l'ischémique dans 8,1 %, l'endocardite infectieuse dans 1,4 % et l'origine congénitale dans 0,9 %. Les valvulopathies isolées étaient sévères chez 589 patients (61,4 %). La dilatation mitrale percutanée est réalisée dans seulement 36,9 % des cas de rétrécissement mitraux Parmi les patients ayant une valvulopathie sévère, le traitement chirurgical était indiqué chez 446 patients (75,7 %). Seulement 161 patients (36,1 %) ont été finalement opérés. La mortalité postopératoire était de 13,6 %, toutes valvulopathies confondues.

Conclusion. — La cause majeure de valvulopathies dans notre contexte est rhumatismale. Le rétrécissement mitral et les valvulopathies multiples sont les valvulopathies les plus fréquentes en Tunisie. La dilatation mitrale percutanée et le remplacement valvulaire ont été les moyens thérapeutiques de choix dans notre série.

Background

Valvular heart diseases (VHDs) are the most common causes of mortality and morbidity after coronary artery disease, hypertension and heart failure [1]. The prevalence of VHD is 2.5% in developed countries [2]. In developing countries, rheumatic heart disease (RHD) is the primary cause of VHD [3].

Echocardiography is one of the most effective means of assessing valvular structure and function, and is widely used for VHD screening in clinical practice; it can provide helpful information regarding the aetiology of valvular disorders [4]. No echocardiographic study of VHD has been done in Tunisia or North Africa. The objective of the present study was to analyse the characteristics, aetiological spectrum and management of VHD as assessed by echocardiography, in a contemporary series from Tunisia.

Methods

Study design

This retrospective study was conducted in the Department of Cardiology of Hédi Chaker University Hospital, one of the major cardiac referral centres in Tunisia. The hospital receives referrals from other health institutions for the investigation and/or management of suspected heart

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disease. All data over a 4-year period from January 2010 to December 2013 were reviewed.

Patient population and criteria

Patients were selected in accordance with the criteria of the Euro Heart Survey (EHS) on VHD [4]: age ≥ 18 years; and primary and significant VHD defined by echocardiography; and aortic stenosis with a maximal jet velocity ≥ 2.5 m/s; or mitral stenosis with a valve area ≤ 2 cm^2; or mitral regurgitation with a grade ≥ 2/4; or aortic regurgitation with a grade ≥ 2/4; or a diagnosis of suspected or definite endocarditis, as assessed by Duke University criteria.

Severe VHD was defined as aortic stenosis with a valve area ≤ 1 cm^2, mitral stenosis with a valve area ≤ 1.5 cm^2, aortic regurgitation with a grade ≥ 3/4, or mitral regurgitation with a grade ≥ 3/4.

Under standard echocardiographic criteria [5], rheumatic VHD was diagnosed on the basis of a history of rheumatic fever and echocardiographic criteria defined according to the World Heart Federation by the presence of any definite evidence of valve regurgitation or stenosis, and at least two morphological abnormalities, such as restricted leaflet mobility, focal or generalized valvular thickening, and abnormal subvalvular thickening of the affected valve [6].

Degenerative VHD was defined according to echocardiographic criteria for calcified valve disease, and ischaemic VHD was identified based on a medical history of ischaemic heart disease.

Data collected

Data on baseline characteristics, potential aetiology and treatment strategies were collected from electronic medical records. A 30-day follow-up was completed for patients who underwent an intervention.

Statistical analyses

Statistical analyses were carried out using SPSS software, version 18.0 (IBM, Armonk, NY, USA). Continuous variables are expressed as means ± standard deviations, and comparisons between groups were made using the Welch analysis of variance test. Categorical variables are expressed as percentages, and were analysed using Pearson's χ^2 test if the conditions for application were verified (theoretical numbers ≥ 5), and Fisher's exact test otherwise. Operative mortality was analysed using univariate and multivariable analysis. We used a binary logistic regression model with a stepwise backwards process. We introduced all factors with $P \leq 0.25$ into the univariate analysis into the multivariable analysis. Two-sided P values < 0.05 were accepted as significant.

Results

Population

A total of 24,422 echocardiographic examinations were performed over the 4-year study period. There were 959 patients with a significant VHD as defined by the criteria of the EHS on VHD. The type of VHD was detailed in all patients. The characteristics of the population are reported in Table 1.

Among the single native left-sided valve diseases, mitral stenosis was most frequent (44.1%), followed by mitral regurgitation (20.6%), aortic stenosis (8.8%) and aortic regurgitation (4.2%). Multiple valve disease was a significant subgroup (22.3%):

Table 1 Clinical characteristics and investigations performed in patients with valve disease.

	All cases (n = 959)	MS (n = 423)	MR (n = 198)	AS (n = 84)	AR (n = 40)	MVD (n = 214)	P
Women	64	81	37	50	55	62	< 0.001
Age (years)	53 ± 17	48 ± 14	62 ± 16	69 ± 16	46 ± 19	51 ± 16	< 0.001
Aetiology							
Rheumatic	66.6	100	13.6	6.0	52.5	76.2	< 0.001
Degenerative	17.2	0	25.3	86.9	30.0	14.0	< 0.001
Endocarditis	1.4	0	3.5	0	10[a]	0.9	0.001
Ischaemic	8.1	0	39.4[b]	0	0	0	< 0.001
Congenital	0.9	0	0	7.1[c]	5.0	0.5	< 0.001
Other	3.9	0	18.2[d]	0	2.5	0	< 0.001
Multiple	1.9	0	0	0	0	8.4[e]	< 0.001
TOE	20.5	25.0	17.6	7.1	17.5	21.0	0.003
Coronary angiography	12.9	6.4	11.6	26.2	15.0	21.5	< 0.001

Data are expressed as % or mean ± standard deviation. AS: aortic stenotic; AR: aortic regurgitation; MR: mitral regurgitation; MS: mitral stenosis; MVD: multiple valvular disease; TOE: transoesophageal echocardiography.
[a] P value was calculated between patients with AR and the others.
[b] P value was calculated between patients with MR and the others.
[c] P value was calculated between patients with AS and the others.
[d] P value was calculated between patients with MR and the others.
[e] P value was calculated between patients with MVD and the others.

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- 79.7% of cases involved double valve disease;
- 15.6% involved triple valve disease;
- 4.7% involved quadruple valve disease.

Most previous interventions were conservative (88.6%), 73.3% of which were percutaneous balloon mitral valvuloplasty (PBMV).

The most common cause of VHD was rheumatic in 66.6%, followed by degenerative in 17.2%. The only cause of mitral stenosis and the most common cause of aortic regurgitation and multiple valve disease was rheumatic, whereas aortic stenosis was primarily degenerative, and mitral regurgitation was degenerative and ischaemic (Table 1).

Whereas aortic stenosis increased with age, mitral stenosis decreased. The most important symptom was dyspnoea (48.4%). Syncope was common in aortic stenosis, and palpitations were frequent in mitral stenosis.

Investigations

Transoesophageal echocardiography was performed in 20.5% of the total population (Table 1). Coronary angiography was performed in 12.9% of cases in total, and in 76.4% of operated patients. In the global population, transoesophageal echocardiography showed the presence of coronary artery disease in 16% of cases, involving one vessel in 10%, two vessels in 4% and three vessels in 2%.

Subgroup of patients with severe valve disease

Native valve disease was severe in 589 patients (61.4%). Multiple valve disease ($n = 186$) and mitral stenosis ($n = 179$) were the most common severe valve diseases. Of the 589 patients with severe VHD, 360 (61.1%) were women. The mean age was lower in patients with mitral stenosis (49 ± 14 years) or aortic regurgitation (46 ± 20 years) than in those with aortic stenosis or mitral regurgitation (69 ± 15 and 61 ± 18 years, respectively) ($P < 0.001$). Female sex was predominant in mitral stenosis and aortic regurgitation (80.4 and 56.3%, respectively). The most common cause of severe VHD was rheumatic in 60.3%, followed by degenerative in 24.4% (Table 2).

The mean valve area in case of mitral stenosis was $1.19 \pm 0.26\ cm^2$, with a mean pressure gradient of 11.7 ± 5.7 mmHg. In aortic stenosis, the mean transvalvular pressure gradient was 47 ± 20 mmHg, but the aortic valve area was not available at all debriefings.

Table 2 Clinical and echocardiographic characteristics of patients with severe valve disease.

	All cases ($n = 589$)	MS ($n = 179$)	MR ($n = 112$)	AS ($n = 80$)	AR ($n = 32$)	MVD ($n = 186$)	*P*
Woman	61.1	80.4	43.0	49.0	56.3	60.0	< 0.001
Age (years)	55 ± 17	49 ± 14	61 ± 18	69 ± 15	46 ± 20	52 ± 16	< 0.001
Aetiology							
Rheumatic	60.3	100	16.0	6.3	53.1	73.1	< 0.001
Degenerative	24.4	0	39.3	88.7	31.3	10.2	< 0.001
Endocarditis	2.0	0	5.4	0	12.5[a]	1.1	0.003
Ischaemic	3.9	0	20.5[b]	0	0	0	< 0.001
Congenital	1.0	0	0	5[c]	3.1	0.5	0.004
Other	3.6	0	18.8[d]	0	0	0	< 0.001
Multiple	4.8	0	0	0	0	15.1[e]	< 0.001
Functional capacity (NYHA class)							
I	22.0	20.7	16.0	18.8	53.2	23.1	0.003
II	56.8	63.1	50.0	58.7	40.6	57.0	0.09
III	16.0	11.2	28.5	20.0	6.2	12.4	< 0.001
IV	5.2	5.0	5.5	2.5	0	7.5[f]	0.25
Comorbid risk factors							
Hypertension	16.0	11.2	20.5	31.3	21.9	10.2	< 0.001
Diabetes mellitus	9.5	6.7	14.3[g]	12.5	3.1	9.1	0.06
Smoking	28.5	14.0	44.6	38.8	25.0	29.0	< 0.001
LVEF (%)	50.3 ± 17.1	55.4 ± 12.5	43.4 ± 20.2	50.3 ± 13.2	48.4 ± 20	49.8 ± 18.2	< 0.001
SPAP (mmHg)	44.7 ± 15.1	44.3 ± 14	46.6 ± 14.5	38.8 ± 14.1	34.6 ± 15.6	47.2 ± 15.9	< 0.001

Data are expressed as % or mean ± standard deviation. AS: aortic stenotic; AR: aortic regurgitation; LVEF: left ventricular ejection fraction; MR: mitral regurgitation; MS: mitral stenosis; MVD: multiple valve disease; NYHA: New York Heart Association; SPAP: systolic pulmonary artery pressure.

[a] *P* value was calculated between patients with AR and the others.
[b] *P* value was calculated between patients with MR and the others.
[c] *P* value was calculated between patients with AS and the others.
[d] *P* value was calculated between patients with MR and the others.
[e] *P* value was calculated between patients with MVD and the others.
[f] *P* value was calculated between patients with MVD and the others.
[g] *P* value was calculated between patients with MR and the others.

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Table 3 Type of surgical intervention in severe single native left-sided valve disease.

	Total cases ($n = 403$)	Mitral stenosis ($n = 179$)	Mitral regurgitation ($n = 112$)	Aortic stenosis ($n = 80$)	Aortic regurgitation ($n = 32$)
Mechanical prosthesis (n)	66	36	13	11	6
Bioprosthesis (n)	15	1	2	9	3
Valve repair (n)	11	0	11	0	0
Total surgical intervention (n)	92	37	26	20	9

The most common clinical indications and referrals for echocardiography were dyspnoea (58%) and the presence of a heart murmur on clinical examination (25.9%).

The clinical and echocardiographic characteristics of patients with severe valve disease are detailed in Table 2.

Type of intervention

Among patients with severe single mitral stenosis ($n = 179$), 103 underwent valve intervention. Percutaneous mitral balloon valvuloplasty was indicated for 66 patients (36.9), and was conducted in 100% of cases (64% of mitral interventions). Prothetic valve replacement was conducted in 37 patients, with a bioprothesis in only one case (Table 3).

Among patients with severe VHD, surgical treatment was indicated for 446 (75.7%) patients. Only 161 (36.1%) patients were finally operated on; the others were lost to follow-up or refused surgical treatment.

Among patients with severe single native left-sided valve disease ($n = 403$; Table 3), 92 underwent valve surgery, with 81 prosthetic valve replacements. A bioprosthesis was applied in 15 patients (18.5%) (12 [80.0%] in the aortic position). Mitral valve repair was carried out in 42.3% of cases of operated single severe mitral regurgitation.

Concomitant surgical intervention was performed in 28 patients; a concomitant aortocoronary bypass graft was performed most often (46.4%).

Reasons for selecting the type of intervention

The reason for choosing valve replacement in 37 patients with mitral stenosis was unfavourable anatomy at percutaneous mitral balloon valvuloplasty in 100% of cases.

The reasons for choosing valve replacement with a mechanical valve in patients with aortic stenosis were young age ($n = 3$), anticoagulation for another purpose ($n = 4$), a mechanical valve in another position ($n = 2$) or patient preference ($n = 2$).

The reasons for choosing valve replacement over valve repair in patients with mitral regurgitation (57.7%) were unfavourable anatomy ($n = 14$) and failure of valve repair ($n = 1$). The reasons for choosing a mechanical prosthesis were anticoagulation for atrial fibrillation ($n = 10$), a mechanical prosthesis in another position ($n = 2$) or patient preference ($n = 3$).

Operative mortality and morbidity

The aetiologies of the valve diseases in operated patients are detailed in Fig. 1. Early major postoperative complications (within 30 days or during the same hospitalization after the operation) occurred in 39 (24.2%) patients. Among the most frequent major preoperative complications were infective endocarditis (7.4%), followed by bleeding (1.3%) and tamponade (1.3%). Perioperative myocardial infarction and auriculoventricular block were rare (0.6%).

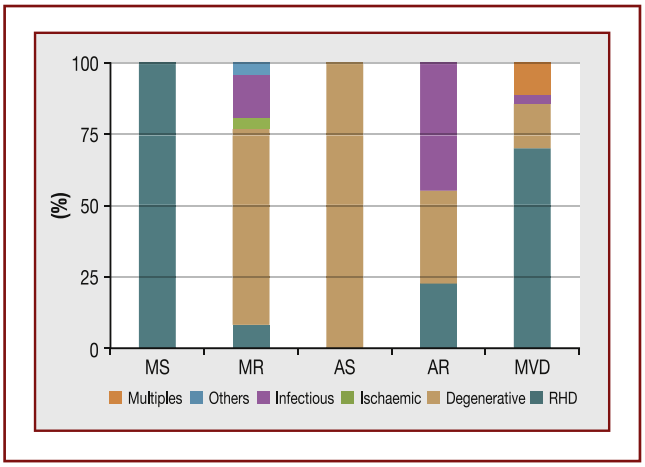

Figure 1. The aetiologies of the valve diseases in patients who underwent valve intervention. AR: aortic regurgitation; AS: aortic stenosis; MR: mitral regurgitation; MS: mitral stenosis; MVD: multiple valvular disease; RHD: rheumatic heart disease.

There were 22 (13.6%) early deaths (within 30 days or during the same hospitalization after the operation) in the group of the patients who underwent valve surgery:

- four (10.8%) patients with mitral stenosis;
- six (23.1%) with mitral regurgitation;
- one (4.5%) with aortic stenosis, one (11.1%) with aortic regurgitation;
- 10 (14.5%) with multiple valve disease.

The univariate and multivariable analyses did not show any statistically significant relationship between the different clinical and echocardiographic variables and early mortality in operated patients ($n = 161$) (Table 4).

Discussion

In this study, we have described the clinical and echocardiographic characteristics of 959 patients who were managed in one of the major cardiovascular referral units in Tunisia over a 4-year period because of moderate or severe VHD. The spectrum of VHD was based on clear echocardiographic criteria. We found that VHD was more common in young people, was frequent among women, and the most common cause of VHD was acute rheumatic fever (ARF). The most frequent

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Table 4 Predictive risk factors of early postoperative death in operated patients ($n = 161$).

Risk factor	Number of patients (%)	Number of deaths (%)	*P*	OR [95% CI]
Sex				
Female	84 (52.2)	14 (16.7)	0.24	1.72 [0.68–4.54]
Male	77 (47.8)	8 (10.4)		
Age				
≥ 65 years	35 (21.7)	6 (17.1)	0.57	1.42 [0.51–3.9]
< 65 years	126 (78.3)	16 (12.7)		
Diabetes mellitus				
Yes	17 (10.6)	2 (11.8)	1.00	0.82 [0.1–3.8]
No	144 (89.4)	20 (13.9)		
CKD				
Yes	3 (1.9)	1 (33.3)	0.35	3.26 [0.2–37.5]
No	158 (98.1)	21 (13.3)		
Functional class (NYHA class)				
I	6 (3.7)	2 (33.3)	0.17	3.37 [0.58–19.63]
II	117 (72.7)	13 (11.1)	0.11	0.48 [0.19–1.2]
III	27 (16.8)	4 (14.8)	0.76	1.12 [0.3–3.6]
IV	11 (6.8)	3 (27.2)	0.18	2.58 [0.6–10.6]
Valve involvement				
MS	37 (23.0)	4 (10.8)	0.97	0.71 [0.2–2.2]
MR	26 (16.2)	6 (23.1)	0.11	2.23 [0.7–6.3]
AS	20 (12.5)	1 (5.0)	0.07	0.30 [0.03–2.3]
AR	9 (5.5)	1 (11.1)	1.00	0.78 [0.09–6.5]
MVD	69 (42.9)	10 (14.5)	0.79	1.13 [0.4–2.7]
SPAP				
≥ 50 mmHg	57 (35.4)	11 (19.2)	0.13	2.02 [0.8–5]
< 50 mmHg	104 (64.6)	11 (10.5)		
Aetiology				
RHD	89 (55.2)	12 (13.4)	0.94	0.96 [0.3–2.3]
Degenerative	52 (32.2)	7 (13.4)	0.95	0.97 [0.3–2.5]
Ischaemic	1 (0.7)	0 (0)	1	–
Infectious	10 (6.2)	1 (10.0)	1	0.68 [0.08–5.7]
Other	1 (0.7)	0 (0)	1	–
Multiple	8 (5.0)	2 (25.0)	0.3	2.2 [0.4–11.7]
LVEF				
> 50%	119 (73.9)	18 (15.1)	0.42	1.69 [0.53–5.32]
≤ 50%	42 (26.1)	4 (9.5)		

AR: aortic regurgitation; AS: aortic stenosis; CI: confidence interval; CKD: chronic kidney disease; LVEF: left ventricular ejection fraction; MR: mitral regurgitation; MS: mitral stenosis; MVD: multiple valve disease; NYHA: New York Heart Association; OR: odds ratio; RHD: rheumatic heart disease; SPAP: systolic pulmonary artery pressure.

native valve diseases were mitral stenosis and multiple valve disease. PBMV was the most common treatment modality for mitral stenosis, mechanical prosthetic valve replacement was the most common treatment modality for other VHDs, and the early death rate was 13.6%.

Regarding the distribution of VHD, mitral stenosis was the most frequent native valve disease. The incidence of mitral stenosis is 15% in Turkey [7], 0.1% in USA and 9% in Europe [2,4]; this indicates that mitral stenosis is more common in Tunisia and Turkey than in the USA and Europe. In our study, ARF accounted for all cases of mitral stenosis (100%). ARF is the most common cause of mitral stenosis [8]. The EHS study, which is the most comprehensive epidemiological work evaluating VHD aetiology, tests, treatment and results, reported that ARF was the cause of mitral stenosis in 85.4% of patients [4].

The most frequent VHD aetiology in our study was ARF (66.6%). In a South African centre [9], the prevalence of rheumatic VHD was reported as being 72% between 2006 and 2007. In a Turkish survey, rheumatic VHD accounted for 46% of all VHD patients [7]. However, rheumatic VHD as a second cause of VHD was present in only 22% of patients, according to a European epidemiological survey [10]. These findings might be explained by socioeconomic development; indeed, in developed countries, where precautions are taken against rheumatic fever, degenerative VHD predominates, but rheumatic aetiology is prevalent in developing countries [1,11,12].

While some surveys have indicated that the frequency of VHD is similar in both sexes, others have shown that mitral regurgitation is more common among men [13–15]. In our study, VHD was more frequent in women (64% of patients),

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which can be explained by the frequency of RHD, especially mitral stenosis. We know that RHD is more frequent in women than in men [2,12,16,17]. However, mitral regurgitation was more common among men in our study, which can be explained by the ischaemic origin of mitral regurgitation in the majority of cases. The frequency of aortic stenosis was similar in both sexes.

In Europe and the USA, valve disease frequency seems to increase with age [4,13]. Our study, as in the Turkish registry [7], also showed that whereas the incidence of aortic stenosis incidence increased with age, the incidence of mitral stenosis decreased, and there were no important differences between the other VHDs regarding age.

Investigations

Coronary angiography was the second most frequently performed investigation in our study (12.9% overall, and 20.8% in the severe valvulopathies). Coronary angiography is recommended in a diagnostic workup if there is a risk of coronary artery disease in a patient with symptomatic and significant VHD [8,18]. In the EHS study, coronary angiography was performed in 43% of patients. This investigation was used less commonly in our trial because of the lower mean age of our patients and the lower number of operated patients.

Subgroup of patients with severe valve disease

RHD was, by far, the leading cause of severe valvular disease in our study, accounting for 60% of severe VHDs, followed by degenerative aetiology in 24%. Severe VHD occurred in young people and most often in women. The preponderance of young female patients with severe VHD in our study is similar to the conventional epidemiological picture of VHD in developing and emerging countries, where the RHD is the most frequent aetiology [9].

In the present study, 78.8% of patients with severe valve diseases had New York Heart Association class I–II symptoms, indicating a relatively early diagnosis. These findings are similar to the results of the Turkish registry [7], where 64% of patients had New York Heart Association class I–II symptoms.

Our study has shown that smoking (29%) and hypertension (16%) occur frequently in individuals with VHD, but diabetes mellitus is less frequently associated with VHD (10%). However, it was reported in the EHS study that smoking (38.7%), hypertension (49.1%), diabetes mellitus (15.3%), hyperlipidaemia (35.5%) and family history (25.7%) frequently accompany VHD [4,13].

Intervention performed

Among patients with severe VHD, either surgical or percutaneous treatment was indicated for 446 (75.7%) patients. The reasons for advising against surgical intervention in patients with severe VHD were cardiac, extracardiac or both. As detailed in previous studies, the reasons for advising against surgery were severe depression of left ventricular function, recent myocardial infarction, severe coronary disease, which can seldom be bypassed unless diffuse and distal, and the presence of multiple comorbidities [4]. Actually, according to the guidelines, percutaneous treatment may be indicated in selected cases of severe VHD after a Heart Team discussion [18]. Unfortunately, transcatheter aortic valve implantation and the MitraClip (Abbott Vascular, Santa Clara, CA, USA) were not available in our centre.

Prosthetic valve replacement was the most suggested treatment in severe VHD in our study. A bioprosthesis was applied in only 18.5% of cases, and 80% of bioprosthetic valve replacements were in the aortic position.

Age has been reported as the most important factor in prosthetic valve implantation. Bioprosthetic valve replacement was preferred in aortic stenosis patients aged > 65 years [4,19,20]. In our study, there were few patients with a bioprosthesis. The reasons for choosing valve replacement with a mechanical valve were young age and anticoagulation for another purpose.

In mitral valve disease, more conservative techniques are gaining popularity. In the Euro Heart Survey, 46.5% of the patients presenting mitral regurgitation underwent mitral valve repair [4]. This encouraging figure probably reflects increasing confidence in the technique, arising from the accumulation of data showing its good short- and long-term efficacy. Our study indicates that valve repair is suggested for treatment of mitral regurgitation, which occurs with an incidence of 42.3%, not lower than that reported by the EHS study. This finding can be explained by the frequency of degenerative and ischaemic origins of mitral regurgitation (39.3 and 20.5% respectively), which make it suitable for repair.

PBMV was the most frequent intervention used in mitral stenosis in our study (64% of interventions). In the ESH study, PBMV was applied in only 33.9% of mitral stenosis cases. The lower rate of PBMV in the EHS study might be attributed to old age, calcifications and deformation in the mitral valve [4,11,21]. The reasons for the difference between our results and the ESH study findings may be the increased incidence of rheumatic fever as the origin of mitral stenosis (100%), the relatively young age of our mitral stenosis study group and valve structure. In the literature, PBMV is frequently preferred in the treatment of rheumatic VHD [22], confirming our findings.

Operative mortality and morbidity

The risk of mortality associated with valve replacement was low in the aortic position [4]. Our findings confirm the lower risk of valve replacement in the aortic position, but in mitral stenosis, mortality was higher in our experience. Overall mortality and morbidity rates after intervention in our study were higher than in the EHS study, but in the EHS survey, mortality and morbidity rates after valve intervention were slightly lower than in most surgical registries, such as the Society of Thoracic Surgeons' database in the USA and the United Kingdom Cardiac Surgical Register [4,23–26].

In the present study, there were no significant predictive risk factors for early postoperative mortality. The mortality rate was higher in women and in older patients (> 65 years), but with no significant difference. The anatomical site of the repaired valve and the number of repaired valves were also associated with higher mortality rates, but with no

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significant difference. The lack of significance might result from the small size of the study group.

Study limitations

The main limitations of this study are that it was a retrospective cohort study, and that the findings were mostly based on a regional single-centre database. Therefore, national multicentre epidemiological prospective surveys are needed to reduce selection bias and confirm these findings.

Conclusions

The most frequent cause of VHD in Tunisia is ARF. Mitral stenosis and multiple valve disease are the most common forms of VHD. PBMV and valve replacement are frequently suggested treatments for mitral stenosis. The effective primary prevention of rheumatic fever and increased awareness among the public would significantly decrease the burden of VHD in our country.

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Disclosure of interest

The authors declare that they have no competing interest.

References

[1] Maganti K, Rigolin VH, Sarano ME, Bonow RO. Valvular heart disease: diagnosis and management. Mayo Clin Proc 2010;85:483—500.
[2] Nkomo VT, Gardin JM, Skelton TN, Gottdiener JS, Scott CG, Enriquez-Sarano M. Burden of valvular heart diseases: a population-based study. Lancet 2006;368:1005—11.
[3] Marijon E, Ou P, Celermajer DS, et al. Prevalence of rheumatic heart disease detected by echocardiographic screening. N Engl J Med 2007;357:470—6.
[4] Iung B, Baron G, Butchart EG, et al. A prospective survey of patients with valvular heart disease in Europe: the Euro Heart Survey on Valvular Heart Disease. Eur Heart J 2003;24:1231—43.
[5] Valvular stenosis and valvular, regurgitation.Otto CM, editor. Textbook of clinical echocardiography. Philadelphia: Saunders; 2004. p. 281—320.
[6] Remenyi B, Wilson N, Steer A, et al. World Heart Federation criteria for echocardiographic diagnosis of rheumatic heart disease–an evidence-based guideline. Nat Rev Cardiol 2012;9:297—309.
[7] Demirbag R, Sade LE, Aydin M, Bozkurt A, Acarturk E. The Turkish registry of heart valve disease. Turk Kardiyol Dern Ars 2013;41:1—10.
[8] Bonow RO, Carabello BA, Chatterjee K, et al. Focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease): endorsed by the Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. Circulation 2008;118:e523—661.
[9] Sliwa K, Carrington M, Mayosi BM, Zigiriadis E, Mvungi R, Stewart S. Incidence and characteristics of newly diagnosed rheumatic heart disease in urban African adults: insights from the heart of Soweto study. Eur Heart J 2010;31:719—27.
[10] Iung B, Vahanian A. Epidemiology of acquired valvular heart disease. Can J Cardiol 2014;30:962—70.
[11] Paar JA, Berrios NM, Rose JD, et al. Prevalence of rheumatic heart disease in children and young adults in Nicaragua. Am J Cardiol 2010;105:1809—14.
[12] Soler-Soler J, Galve E. Worldwide perspective of valve disease. Heart 2000;83:721—5.
[13] Iung B, Vahanian A. Epidemiology of valvular heart disease in the adult. Nat Rev Cardiol 2011;8:162—72.
[14] Klodas E, Enriquez-Sarano M, Tajik AJ, Mullany CJ, Bailey KR, Seward JB. Surgery for aortic regurgitation in women. Contrasting indications and outcomes compared with men. Circulation 1996;94:2472—8.
[15] Mohty D, Orszulak TA, Schaff HV, Avierinos JF, Tajik JA, Enriquez-Sarano M. Very long-term survival and durability of mitral valve repair for mitral valve prolapse. Circulation 2001;104:I1—7.
[16] Seckeler MD, Hoke TR. The worldwide epidemiology of acute rheumatic fever and rheumatic heart disease. Clin Epidemiol 2011;3:67—84.
[17] Stewart BF, Siscovick D, Lind BK, et al. Clinical factors associated with calcific aortic valve disease. Cardiovascular Health Study. J Am Coll Cardiol 1997;29:630—4.
[18] Vahanian A, Alfieri O, Andreotti F, et al. Guidelines on the management of valvular heart disease (version 2012). Eur Heart J 2012;33:2451—96.
[19] Hammermeister K, Sethi GK, Henderson WG, Grover FL, Oprian C, Rahimtoola SH. Outcomes 15 years after valve replacement with a mechanical versus a bioprosthetic valve: final report of the Veterans Affairs randomized trial. J Am Coll Cardiol 2000;36:1152—8.
[20] Taylor K. The United Kingdom Heart Valve Registry: the first 10 years. Heart 1997;77:295—6.
[21] Iung B, Baron G, Tornos P, Gohlke-Barwolf C, Butchart EG, Vahanian A. Valvular heart disease in the community: a European experience. Curr Probl Cardiol 2007;32:609—61.
[22] Fawzy ME. Mitral balloon valvuloplasty. J Saudi Heart Assoc 2010;22:125—32.
[23] Edwards FH, Grover FL, Shroyer AL, Schwartz M, Bero J. The Society of Thoracic Surgeons National Cardiac Surgery Database: current risk assessment. Ann Thorac Surg 1997;63:903—8.
[24] Jamieson WR, Edwards FH, Schwartz M, Bero JW, Clark RE, Grover FL. Risk stratification for cardiac valve replacement. National Cardiac Surgery Database. Database Committee of the Society of Thoracic Surgeons. Ann Thorac Surg 1999;67:943—51.
[25] Keogh BE, Kinsman R, Walton PKH, editors. National Adult Cardiac Surgical Database Report 1999-2000. The United Kingdom Cardiac Surgical Register. Henley-on-Thames: Dendrite Clinical Systems Limited; 2001.
[26] The Society of Thoracic Surgeons. STS National Database. Available at: http://www.sts.org/national-database.

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