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Characteristics of Reintervened Patients Due to Prostetic Valvular Disfunction on a Fourth Level Hospital

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1. Introduction

Life expectancy has been lengthening with the pass of time and with the introduction of new technologies and scientific medical advances, early detection of valvular disease and timely management provide an increase of valvular surgery and in the same way reintervention. The useful life of prosthetic valves is limited, being biologic valves the most affected with the pass of time, and the ones with a higher incidence of reintervention in 15 years, close to 11% or even progression of aortic disease on previous replacement surgeries [1, 2]. Considering the different levels of adhesions, scaring tissue and comorbidities associated that the patient will develop with time until the new intervention, reintervention presents a higher level of technical difficulty on the surgical approach and general perioperative management.

Considering that the most frequent reintervention is on patients with a biologic valve, especially on mitral valve replacement surgery, the election of the type of prosthetic valve becomes highly relevant. Reports of people under the age of 60 who have been indicated with a biologic valve to avoid long term oral anticoagulation and its different adverse effects have been increasing, as a consequence there has been an increase in the probability of long-term reintervention [3].

Some authors have tried to estimate and analyze the mortality of reintervention in patients taken to valve replacement, obtaining similar results between each other. Jones and Colls 8.6%, Lytle 10.9%, Cohn 10.1%, Akins 7.3%, Pansini 9.6% and Tyers and Cols 11% [3, 5]. On the other hand, coronary artery bypass graft, advanced age, feminine sex and reduced ventricular function are variables that increase mortality risk up to 15% in the valvular surgery reintervention [1, 4, 5], although discrepancies and cofounding variables remain relevant for these statements [6].

On the study done by Yashutosh and Cols on 2018 [7] they were able to determine that the most common causes of valvular reintervention were valve structural deterioration (44%), endocarditis (18%) and prosthetic valve dehiscence (13%). Agreeing with previous studies done by Ankins and Cols [4] and Jones and Cols [5].

3. Methodology

An observational descriptive cross-sectional study was carried out through the review of clinical charts of patients who attended the Cardiovascular Surgery Unit at Hospital Universitario San Ignacio (Bogota, Colombia) between 2009 and 2019 who met the inclusion criteria.

The information registered on the database included demographic information such as sex, age, relevant medical history, information regarding the first valvular surgery (date, type of disfunction, affected valve, type of prosthetic valve used), information about the reason and the reintervention surgery (functional class at time of admission, type of disfunction, type of procedure, type of prosthetic valve, intraoperative and postoperative complications, time in Intensive Care Unit and total hospital stay time, mortality during

hospitalization).

3.1. Inclusion Criteria

- Patients over the age of 18 who underwent aortic or mitral valve replacement with a mechanic or biologic valve taken to reintervention due to prosthetic disfunction and who received a new valvular change

3.2. Exclusion Criteria

- Patients taken to reintervention due to other causes

- Patients who during the time of reintervention did not require a new valve (valvuloplasty, valve cleaning, etc.)

3.3. Ethical Considerations

The present study was approved by the scientific committee and the ethics committee of the Pontificia Universidad Javeriana/ Hospital Universitario San Ignacio. It goes accordingly with the principles established in the Helsinki declaration for medical investigations on human beings. It is considered a low-risk study that will not compromise the anonymity of any of the patients included. The authors declare no conflict of interest, the study was not funded by any public or private entity.

4. Results

Table 1 shows the demographic characteristics of 23 patients included on the current study. The average age is 60.9 years (27-77) of which 56% where over the age of 65 at the time of admission, 61% of the patients were male. Relevant medical history included 30% of patients presented arterial hypertension, 13% diabetes mellitus type 2, 9% had had a stroke and 4% had chronic kidney disease. 26% of patients had been smokers, however by the time of admission none of the patients were active smokers.

During the preoperative evaluation 26% of patients were admitted with a New York Heart Association (NYHA) functional class of I/IV, 30% were class II/IV, 35% class III/IV, only 4% were class IV/IV and one patient was not able to be classified. The vast majority of patients (78%) had a preserved left ventricle ejection fraction (LVEF>50%), 2 patients (9%) had a LVEF under 30% and 3 patients (13%) had a LVEF between 30-50%. 3 of the patients (13%) had undergone reinterventions prior to being admitted into our institution (or prior to the time included in the study) and none of the analyzed patients required a second reintervention due to valvular disfunction in our institution during the established time period.

On average patients presented valvular disfunction 10.3 years after the previous valvular replacement (including cases that required reinterventions in different hospitals or outside the time frame established). A case of disfunction due to endocarditis within 3 months was identified and the maximum time period free of intervention was 30 years. Independent of the position of de dysfunctional valve, 52% of patients presented disfunction within 10-20 years since previous surgery, 17% between 5-10 years and 21% within the first 5 years. There was no information available regarding the previous interventions in any of the cases.

80% of mechanical valves had a disfunction free period superior to 10 years. Of the 5 patients included who presented mitral valve prosthetic disfunction, 4 had received a biologic valve in the previous surgery and at the time of disfunction the age range went from 10-20 years old. 17% of the patients presented with bacterial endocarditis associated to the valvular disfunction, 52% presented disfunction due to regurgitation, 26% had a mix component and 22% was due to stenosis.

Prosthetic disfunction of the aortic valve was the main cause of reintervention. Of the total of patients, 74% was admitted due to aortic valve disfunction, 22% due to mitral valve disfunction and 4% due to both. Regardless of the position of the prosthetic valve (aortic or mitral), the disfunction of biological valves was 70%. The relation between the position of the valve and the type of dysfunctional valve (biologic or mechanic) is shown on table 2 and the relation with the time of disfunction is shown on table 3.

52% of the procedures were aortic valve replacement, 21% mitral valve replacement and 26% were mixed procedures including one double valve replacement with tricuspid valvuloplasty and 6 procedures on the ascending aorta. None of the cases required coronary artery bypass grafting in the same surgical time. Independent of the position or the type of valvular disfunction, 65% of patients received a biologic valve at the time of reintervention (Table 4, Figure 1 and 2).

Intraoperative complications were found in 17% of cases, all related to bleeding and half occurred during surgical dissection, associated with depolishing (right atrium or right ventricle) due to adhesion syndrome. 3 patients required packing and a second surgical time for mediastinum closure, 1 patient developed a mediastinum abscess and was the only case of surgical site infection.

48% of reintervened patients required blood components transfusion intraoperatively, 13% required a second intervention due to bleeding in the postoperative period, 65% required use of step maker due to postoperative blockage and 9% presented transitory kidney failure during the Intensive Care Unit stay. The average hospital stay was 17 days with a 7-day stay in the ICU. The found mortality in the immediate postoperative period (in the same hospital stay) was 9%. The present study does not calculate mortality after hospital discharge.

Table 1: Characteristics of the population in the study

Total (n)	23
Sex	n(%)
Male	14 (61%)
Female	9 (39%)
Age (years)	60.9 (27-77)
Under 50 years	6 (26%)
50 to 65 years	4 (17%)
Over 65 years	13 (57%)
Previous medical history	n (%)
Arterial Hypertension	7 (30%)
Diabetes M. type 2	3 (13%)
Stroke	2 (9%)
Chronic kidney disease	1 (4%)
Functional class on admission	n (%)
I	6 (26%)
II	7 (30%)
III	8 (35%)
IV	1 (4%)
Not valorable	1(4%)
LVEF on admission	
<30%	2 (9%)
30-50%	3 (13%)
>50%	18 (78%)
Endocarditis on admission	4 (17%)
Initial surgery	n=27
AVR	19 (70%)
MVR	5 (19%)
Mixed *	3 (11%)
Previous reinterventions	3 (13%)
Time on disfunction (years)	10.36 (0-30)
Type of disfunctional prothesis	
Biologic	16 (70%)
Mechanical	7 (30%)
Intraop. complications	4 (17%)
Intraop. transufion	11 (48%)
Other procedures on the same surgical time	
CAGG	0
Ascendeng aortic procedure	6 (26%)
Surgery site infection	1 (4%)
Postoperative step maker	15 (65%)
POP acute kidney failure	2 (9%)
Reintervention due to bleeding	3 (13%)
In hospital mortality	2 (9%)
ICU stay	7 (1-35)
***1 Correspondst to immediate POP mortality**	
Holspital stay	17.7 (5-106)

Table 2: Valvular disfunction characterization

	Regurgitation	**Stenosis**	**Mix**	**Total**
Aortic n (%)	9 (53%)	5 (29%)	3 (18%)	17
Biologic	7 (58%)	3 (25%)	2 (17%)	12
Mechanic	2 (40%)	2 (40%)	1 (20%)	5
Mitral	2 (40%)	0	3 (60%)	5
Biologic	1 (25%)		3 (75%)	4
Mechanic	1			1
Both	1			1
Mechanic	1			1
Total	12 (52%)	5 (22%)	6 (26%)	23

Table 3: Time of valvular disfunction characterization

	< 5 years	**5-10 years**	**10-20 years**	**>20 years**	**Total**
Aortic n (%)	5	4	7	1	17
Biologic	4 (33.3%)	4 (33.3%)	4 (33.4%)		12
Mechanic	1 (20%)		3 (60%)	1 (20%)	5
Mitral	0	0	4	0	5
Biologic			4 (100%)		4
Mechanic					1*unknown
Both			1		1
Mechanic			1 (100%)		1
Total	5	4	12	1	23

Table 4: Disfunctional prothesis *1 missing data

New prothesis	Biologic	Mechanic	**Total**
Mechanic	3 (43%)	4 (57%)	7
Biologic	13 (87%)	2 (13%)	15
Total	**16**	**6**	**22**

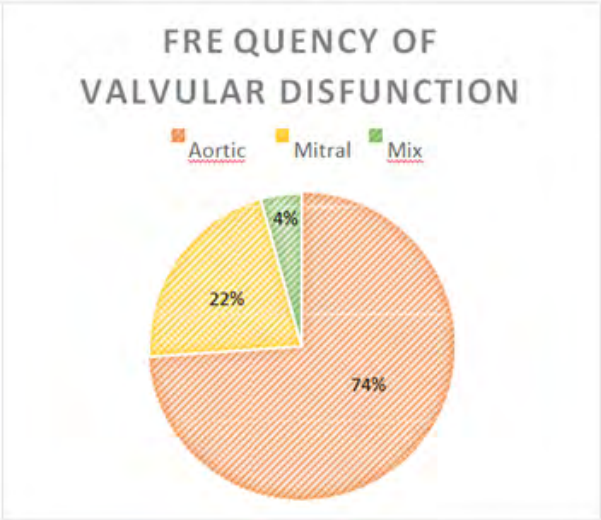

Figure 1: Frequency of valvular disfunction in Hospital Universitario San Ignacio

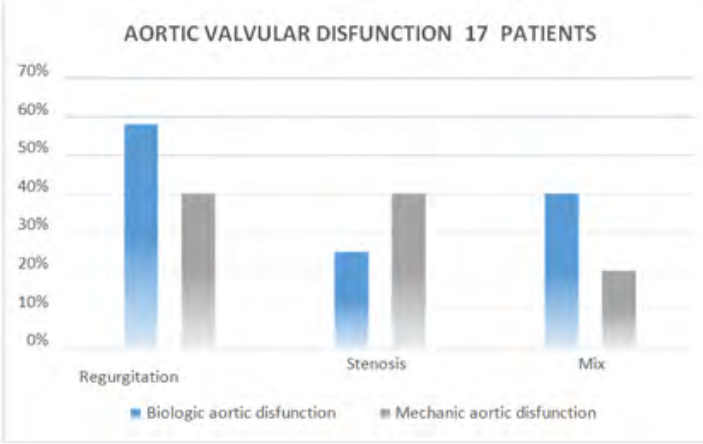

Figure 2: Frequency of aortic valve disfunction in biologic and mechanic replacement

5. Discussion

The higher rate of reintervention for this study was presented in patients with previous biologic valve replacement, which is according to data previously reported in literature. However, we differ fron some results obtained by Ross DN, English TAH and Cols. And Barnett SDD and Cols [1, 2] who estimated a higher proportion of reinterventions on patients with mitral valve replacement. We calculated that 70% of the reinterventions on our hospital were in patients with aortic valve disfunction, and valve regurgitation was the main cause of reintervention.

We adjusted the presentation frequency of specific demographic variables to calculate proportions, and we reported a greater presentation frequency in patients age 65 and higher that was similar to the results calculated by Cary W. Akins, MD and Cols of 64.3 ± 8 [3]. The higher rate of reintervention mentioned by different authors were female patients over the age of 84 [4]. We found a sex adjusted mean higher in male patients, similar to the one calculated by Yashutosh Joshi and Cols, and Sorel Goland [5, 6].

Different authors list advanced age, previous smoking and reduced LVEF as multivariate risk factors with various degree of causality for surgical reintervention [7], we found that the highest proportion of reintervened patients presented a preserved LVEF and only 22% had some level of decrease regarding this parameter. On the same way a low proportion of reintervened patients had a history of smoking under the consideration of not being active smokers during the time of surgery.

Prosthetic valvular reintervention is most common with biologic valves, with a time sensitive variability [8]. 70% of our reinterventions had a previous biologic valve replacement and most where aortic valves, which may be according to a higher rate of aortic valve replacement on a global scale and conditioned to a faster deterioration process than biologic mitral valves due to smaller valvular area diameter. Although third generation biologic valves appear to offer better quality and greater duration time [9], we have no reliable data of follow-up considering the recent use of this valves in our institution. In contrast, aortic mechanical valve replacement has a greater durability, in our study most of the reintervention procedures on this type of valves was even after 10 years of use.

Prosthetic valve endocarditis may present early (<12 months) or late (>12 months) depending on different risk factors [10]. One of our patients developed prosthetic valve bacterial endocarditis of early presentation as cause of valvular disfunction. Aortic and mitral mechanical valves are the most frequently affected by this type of infection, with a global incidence that oscillates between 1-6% of the total implanted [10, 11]. In our reintervened population we found an incidence of 17.3% of bacterial endocarditis as cause of valvular disfunction, with a higher affection rate of aortic mechanical valve.

In-hospital mortality of patients with prosthetic valve bacterial endocarditis may be up to 40% according to descriptive studies [12]. On our studied population reintervened due to this cause we found a mortality of 50%, with major bleeding and requirement of massive transfusion in 100% of patients and the need to reintervene half of them.

6. Conclusions

Valve structural deterioration had a greater proportion in aortic valve replacement in spite of it being the most common primary intervention performed in our hospital. Reintervention on structural biologic valve deterioration on any position was higher on a significant percentage. Bacterial endocarditis caused valvular disfunction, specially in aortic valve primary surgery with a substantially higher mortality rate during reintervention. Early detection and treatment of bacterial endocarditis may have an impact in avoiding valvular disfunction progression and associated mortality.

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