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Research Article

Preliminary Results of Conservative Mitral Valve Surgery at The Andre Festoc Center of The Mother -Child "Luxembourg" In Mali

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Abstract

In developed countries rheumatic disease has become a virtual disease. On the other hand it remains the most frequent cause of cardiovascular morbidity and mortality in people under 40 years of age in our developing countries.

The aim of this work is to present the preliminary results of mitral valve repair in a developing country. This is a 52-month mono-centric retro-prospective descriptive study from September 10, 2018 to December 31, 2022.The study was carried out at the André Festoc center of the mother-child university hospital center ' Le Luxembourg' in Bamako. During the period of our study 490 patients underwent heart surgery, 174 patients or 35.51% had mitral surgery and mitral plasty on rheumatic valvulopathy was performed in 35 patients or 20.11% of mitral surgeries and 7.14% of all cardiac operations.

We collected 33 cases, 2 patients were lost to follow-up. 72% of patients were female, with a sex ratio of 0.4. Mean age was 12.9 ±3.9 years, with extremes of 5 and 25 years.

Valvular retraction was the most common lesion, accounting for 81.8% of cases. All patients underwent surgery under CEC ranging from 81 to 245 min, with an average of 131.40 ± 40 min. The mean aortic clamping time was 87.72 ± 31.60 min, with extremes of 26 and 169 min. Attendance time ranged from 7 to 105 min, with a mean of 31.33 ± 20.94 min.

Mitral plasty is a preferred alternative to valve replacement in children. The complexity of the lesions involved makes this procedure difficult, and good results can only be achieved through rigorous patient selection and precise lesion analysis.

Keywords: conservative; mitral surgery; result

1.Introduction

Rheumatic fever (RF) or BOUILLAUD's disease is an inflammatory disease complicating infection with group A streptococcus [1].

Of all the conditions secondary to rheumatic fever, rheumatic valvulopathy is the most dreaded, and currently represents one of the main causes of cardiovascular disease in schoolchildren and young adults in most developing countries [2].

Of all the conditions secondary to AAR, rheumatic valvulopathy is the most dreaded and currently represents one of the main cardiovascular disorders in school-age children and young adults in most developing countries [2].

The frequency of these rheumatic valvulopathies is estimated at 21.5 per 1000 in Cambodia; 30.4 per 1000 in Mozambique; 7.5 per 1000 in Senegal [24].

The development of Doppler echocardiography has led to better assessment of cardiac valve damage, improved follow-up and thus a clear improvement in the management of rheumatic valve disease. [25]

Mitral plasty, also known as mitral reconstructive or reparative surgery, is a preferred alternative to mitral valve replacement. The advantages of this type of reconstructive surgery are low postoperative mortality, better preservation of left ventricular function and conservation of the native valve, thus avoiding the problem of anticoagulant treatment [3]. This surgery is well suited to developing countries, where the cost of cardiac prostheses, with or without lifelong anticoagulation, is exorbitant.

The complexity of rheumatic mitral valve lesions and their potential for evolution mean that repairs are often more difficult than in degenerative or ischemic pathology. Short- or long-term results may be altered by possible lesion evolutivity in a fairly young population. [23]

To date, no such study has been carried out in our country.

2-Materials and methods:

This was a 52-month mono-centric retro-prospective descriptive study from September 10, 2018 to December 31, 2022.

The study was carried out at the André Festoc center of the mother-child university hospital center le Luxembourg in Bamako.

- Study population:

All patients with rheumatic mitral valve disease who had been to the ANDRE FESTOC center of the mother and child hospital « le Luxembourg ».

- Inclusion criteria:

Patients who underwent mitral plasty for rheumatic valvulopathy at of the mother and child hospital « le Luxembourg » in Bamako were included in this study.

- Exclusion criteria:

The following were not included in this study:

- Patients having undergone mitral valve replacement in another country.

- Patients who had undergone mitral valve replacement

- Patients with incomplete records

3-Results:

Dyspnea on exertion was the main symptom observed in all patients, followed by palpitations (45.5%) (Figure 1).

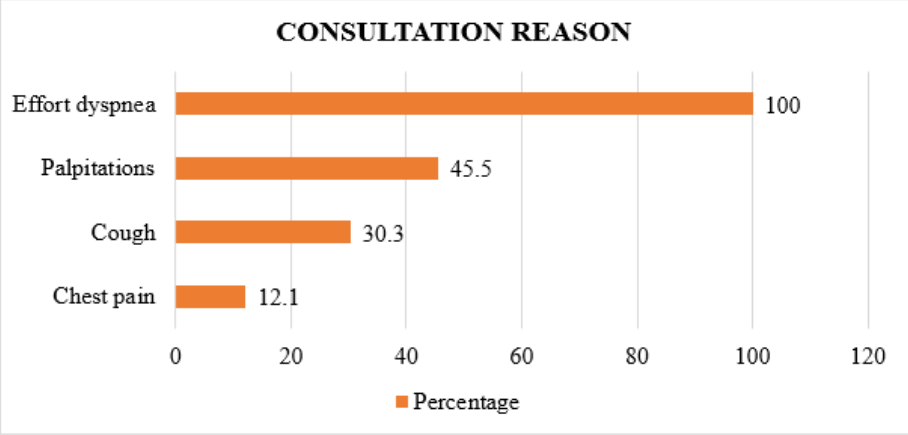

Figure 1: Distribution of patients by reason for consultation

Physical signs were dominated by the systolic murmur of mitral insufficiency and hepatomegaly, with 87.9% and 24.2% respectively (figure 2).

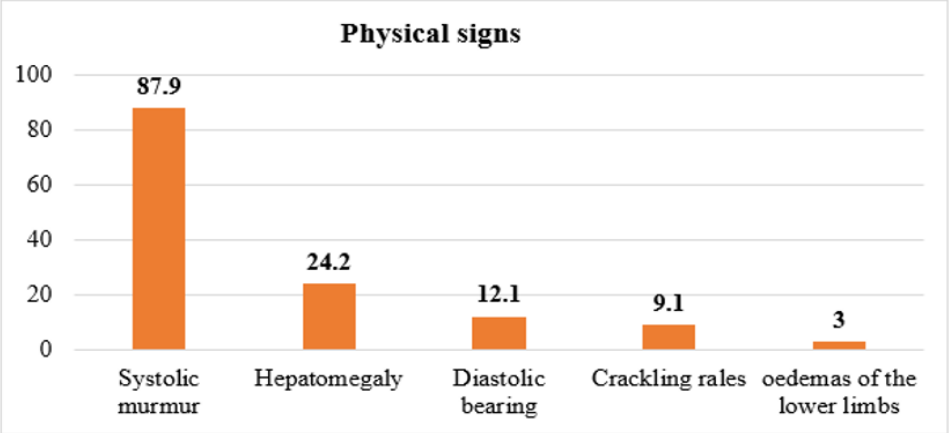

Figure 2: Physical signs

Cardiomegaly was found in 90.9% of patients. The mean cardiothoracic index was 0.63 ±0.09, with extremes of 0.80 and 0.44 (figure 3).

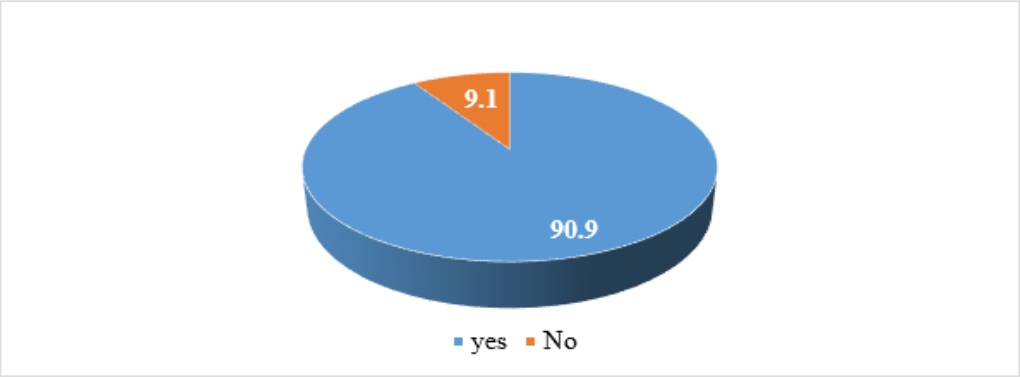

Figure 3: Cardiomegaly in percentage

Sinus rhythm was present in 96.9% of patients, and only one patient was in atrial fibrillation. (Figure 4).

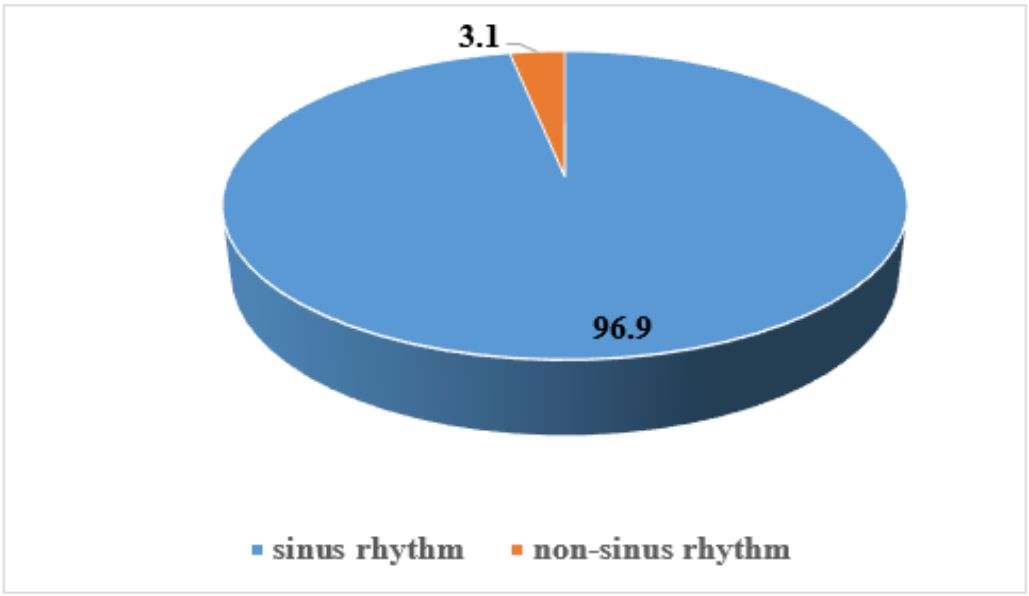

Figure 4: electrocardiography

Mitral insufficiency was the predominant valvulopathy, with 28 cases (84.8%) (Figure 5).

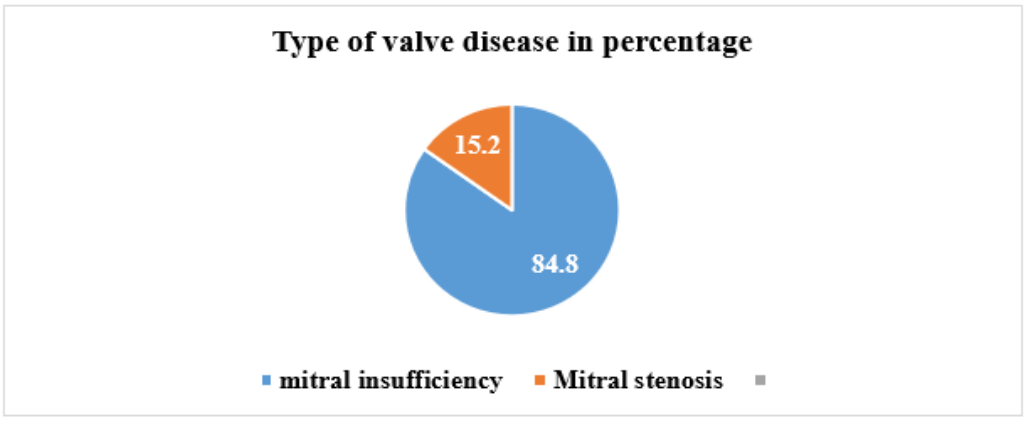

Figure 5: type of valve disease in percentage

Tricuspid insufficiency was the valvulopathy most associated with mitral insufficiency, accounting for 36.4% of cases (figure 6).

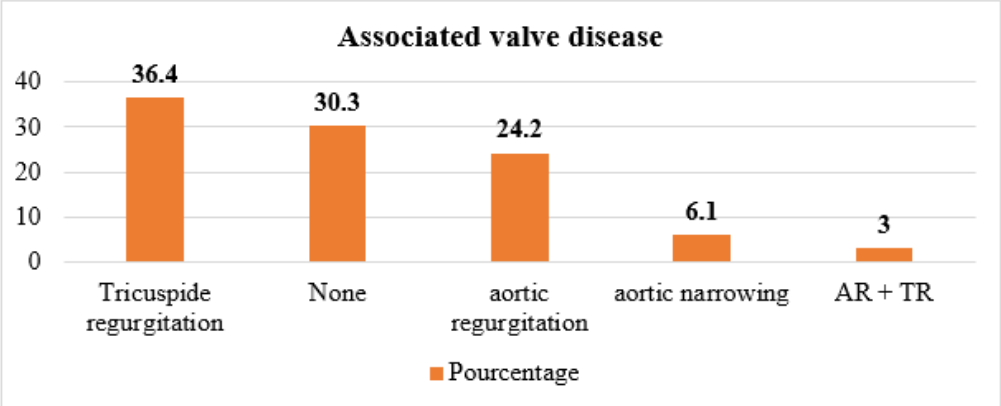

Figure 6: Distribution of patients according to associated valvulopathy

Valvular retraction was the most common lesion (81.8%) (Figure 7).

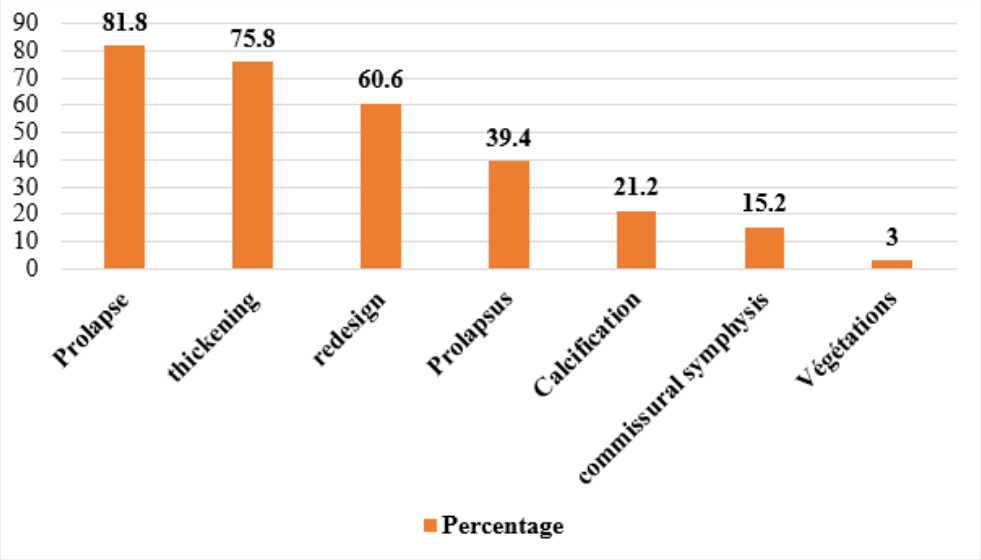

Figure 7: Distribution by type of mitral valve lesion

The subvalvular apparatus was intact in the majority of patients (54.5%), while 36.4% showed remodeling (figure 8).

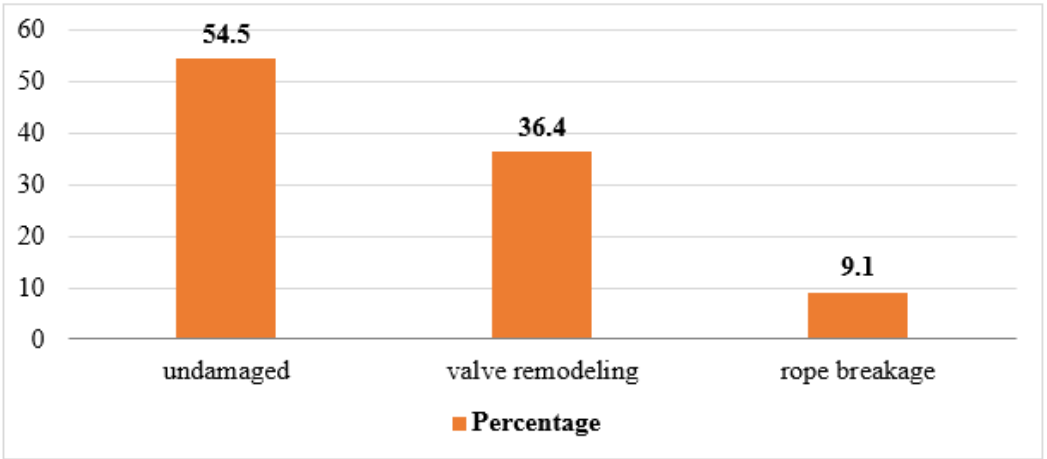

Figure 8: Distribution by type of subvalvular apparatus lesions

Grade 4/4 mitral leakage accounted for 82.1% of cases, while 17.9% were grade 3/4. All patients had OG dilatation with a mean surface area of 34.77 ± 13.2 cm² with extremes of 19 and 75 cm².The LV was dilated in 66.7% of patients. DV dilatation was found in 6.1% of patients.LV

ejection fraction was preserved in 90.9% of patients, with a mean of 64.18 ± 8.42% and extremes of 46 and 78%.The majority of patients (51.5%) had no PAH, and 36.4% had significant PAH.A median sternotomy was the preferred approach in 97% of cases. Mini thoracotomy was performed in one patient (3%). All patients underwent bypass surgery ranging from 81 to 245 min, with an average of 131.40 ± 40 min. Mean aortic clamping time was 87.72 ± 31.60 min, with extremes of 26 and 169 min. Assistance time ranged from 7 to 105 min, with a mean of 31.33 ± 20.94 min. Annuloplasty plus cord release were the most common procedures performed in 21.2% of patients. Tricuspid plasty was the procedure most associated with mitral plasty, in 7 cases (21.2%).

Plastic Surgery Techniques		**Frequency**	**Percentage**
Isolated annuloplasty		4	12,1
Annuloplasty +	Commissurotomy	5	15,2
	Commisuroplasty	1	3
	Enlargement of the posterior leaflet of the mitral valve	2	6,1
	Triangular resection of the large mitral valve	1	3
	Triangular resection of the large mitral valve + Cord shortening	1	3
	Rope release	7	21,2
	Cord release + Commissurotomy	1	3
	Cord release + Enlargement of the posterior leaflet of the mitral valve	1	3
	Enlargement of the posterior leaflet of the mitral valve + Neo cordage	3	9,1
	Néo cordage	2	6,1
	Commissurotomy + Cord transfer	1	3
	ALFIERI + Néo cordage	1	3
	ALFIERI	2	6,1
ALFIERI + Commissuroplasty		**1**	**3**
Total		**33**	**100**

4- Table I: Surgical procedures :

1- Intensive care unit stay:

ICU stay ranged from 0 to 11 days, with an average of 4.45 ± 2.06 days.

Early postoperative morbidity was 21%.

Post-op complications in the ICU	**Fréquency**	**Percentage**
Low cardiac output	**1**	**3**
Cardiac arrest	**1**	**3**
Left ventricular dysfunction	**1**	**3**
Gas embolism	**1**	**3**
Junctional tachycardia	**1**	**3**
Cerebrovascular accident	**1**	**3**
Infection	**1**	**3**
Total	7	**21**

2-Table II: Early postoperative morbidity in the ICU:

Peri-operative mortality was 6%, or 2 patients.

3- Early transthoracic echocardiography on discharge from intensive care :

At ICU discharge, echocardiography was performed on 31 patients (94%).

	Grade of residual mitral regugitation			Total
	Grade 1	Grade 2	Minimal regurgitation	
Residual mitral regurgitation	23	6	2	31

3-Table III: Residual leak on mitral plasty :

Residual MI was present in all patients.

Grade 1 MI was in the majority, with 23 cases (74.2%).

The mean mitral valve gradient was ≤ 5 mmHg in 48.5% of patients, with a mean of 5.58 ± 2.32 mmHg and extremes of 2 and 13 mmHg.

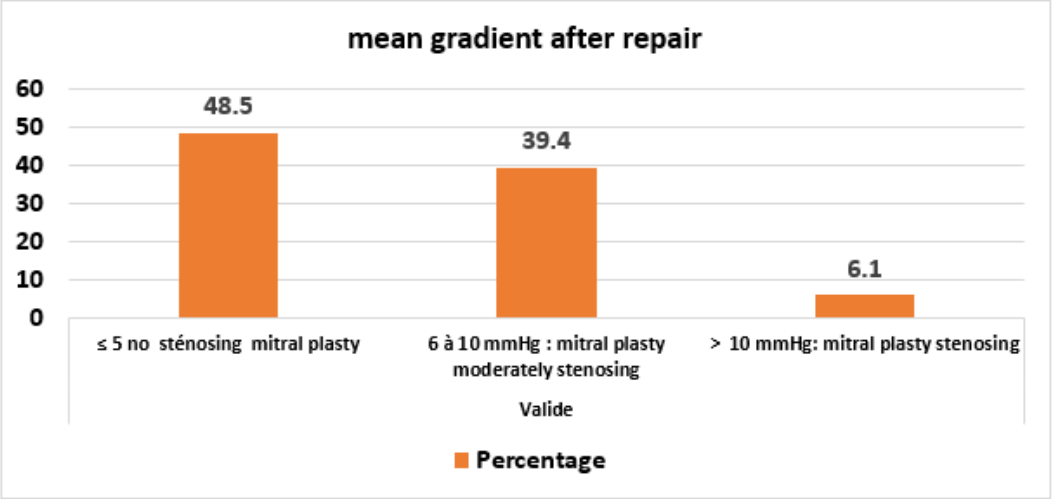

Figure 9: Distribution of patients by mean gradient for post-op mitral plasty

The LV was non-dilated in 51.6% with a mean DTD of 49.61 ± 8.85 mm and a mean DTS of 36.14 ± 8.49 mm and extremes of 31-72 mm for diastole, 24-60 mm for systole.

LVEF was reduced in 12.9%, intermediate in 45.2% and preserved in 41.9%, with a mean of 47.94% and extremes of 30 and 63%.

The mean postoperative PAPS was 37.45 ± 14.18 mmHg, ranging from 21 to 72 mmHg.

PAH was absent in 64.5% of patients. At 3 months post-op, NYHA stage 2 was the most common at 51.6%, followed by stage 1 at 45.2% and stage 3 at 3.2%. Morbidity at 3 months was marked by a cumulative endocarditis rate of 3% (1 patient) and INR instability of 3% (1 patient) (mitral plasty associated with AVR on VKA).There were no deaths at 3 months after mitral plasty. All patients had a residual leak.

Grade 1 leakage predominated, with 19 cases (61.3%).

	Grade of residual mitral regurgitation 3rd month			
	Grade 1	Grade 2	Grade 3	**Total**
Residual mitral regurgitation M3	19	10	2	31

Table IV: Residual leakage on mitral plasty

The mean mitral valve gradient was between 6 and 10 mmHg was predominant in 51.6% of cases. The mean was 6.96 ± 2.79 with extremesof 3 and 13 mmHg. The mean mitral valve gradient between 6 and 10 mm Hgwas predominant, accounting for 51.6% of cases. The mean was 6.96 ± 2.79, with extremes of extremes of 3 and 13 mmHg.

There was no morbidity or mortality at 6 months. Seventeen patients (56.7%) had a grade 1 residual leak. One patient (3.3%) had a major grade 3 leak. Seventeen patients (56.7%) had Grade 1 residual leakage. One patient (3.3%) had a significant grade 3 leak.

Morbi-mortality at M6:

	Grade of residual mitral regurgitation 6th month			
	Grade 1	Grade 2	Grade 3	**Total**
Residual mitral regurgitation M3	17	12	1	30

Table V: Residual leak on mitral plasty:

The mean gradient on mitral plasty was predominantly between 6 and 10 mmHg, with a mean of 7.06 ± 2.57 mmHg and extremes of 3 and 12 mmHg.

At M6, the LV was predominantly undilated in 76.7% of cases, with a mean diameter of 49.11 ± 8.47 mm in diastole and 33.96 ± 7.61 in systole, and extremes of 38 and 82 mm for DTD 25 and 64 mm for DTS.

The mean gradient on mitral plasty was predominantly between 6 and 10 mmHg, with a mean of 7.06 ± 2.57 mmHg and extremes of 3 and 12 mmHg.

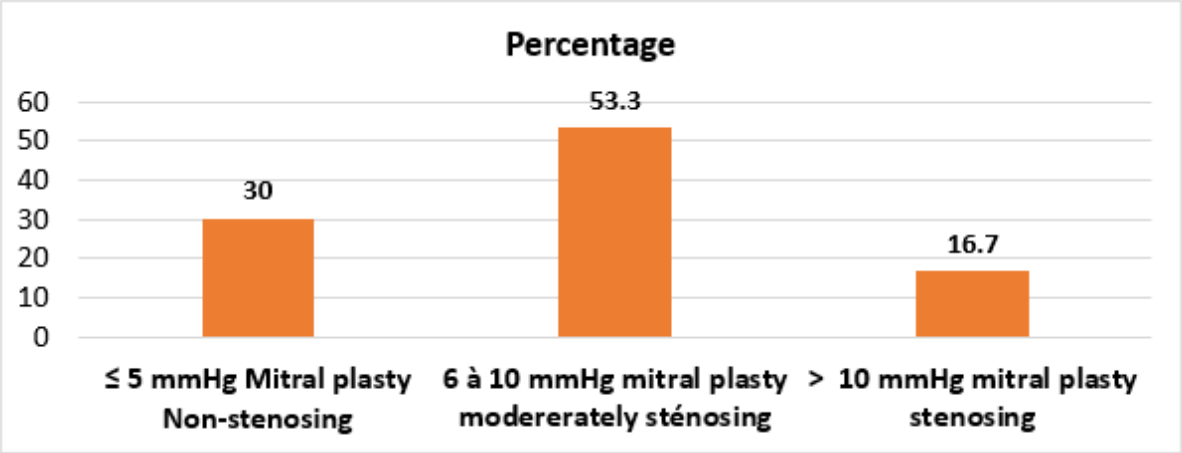

Figure 10: Distribution according to mean gradient mitral plasty at M6

4-Discussion:

1- Epidemiological:

Rheumatic heart disease is the most common valvular pathology in Third World countries, with a high prevalence in young school-age subjects, and constitutes a public health problem in these countries. [4-5].

Mitral valve replacement is generally preferred for rheumatic mitral disease. However, the limited lifespan of bioprostheses and the thromboembolic risk associated with mechanical valves, as well as the complications and cost of anticoagulant treatment, argue in favor of mitral plasty whenever possible [5].

Conservative mitral surgery enables the patient to retain his own valve, preserve the subvalvular tensor apparatus and the geometry of the left ventricle, and consequently conservation of left ventricular function and improved survival as well as remote functional status [6].

In our series, the mean age was 12.9 ±3.9 years, with extremes of 5 and 25 years. This result is similar to that of CISS AG in Senegal [7], who reported a mean age of 12 ±5 years, and close to those of SOUAGA K. A. in Abidjan [8] and SKOULARIGIS. J [9] who found 19 ± 9 and 18 ± 9 years respectively.

These results confirm that rheumatic valvulopathy is more common in young, active subjects.

In our study, as in the literature, the female sex is more concerned. In our study, the sex ratio was 0.4. In CISS [7] study it was 0.6 and in DIOP [14] study in Senegal the ratio was 0.62.

Recurrent sore throat was the most frequent antecedent with 51.5%.

This result was similar to those found by Diop [14] in Senegal, who reported 51% respectively.

2- Clinical:

Exertional dyspnoea was the main symptom in all our patients, with a predominance of NYHA stage III (66.7%), followed by stage II (24.2%) and stage IV (9.1%).
These results are similar to those of KUMAR in India [11] and DIOP [14] in Senegal.

This would indicate that they have reached an advanced stage of valvulopathy.

2- Paraclinical :

The electrocardiogram plays a key role in the evaluation of patients with valvular heart disease, where rhythm or conduction disorders are sometimes noted.

Atrial fibrillation is the most frequently observed rhythm disturbance in mitral valve disease.

The onset of AF in mitral valve disease marks a turning point in the progression of the disease, and exposes the patient to the risk of thromboembolic events and heart failure. Its onset also poses a major prognostic problem [11].

In our study, AF occurred in 3% of cases, a low rate compared with 62.9% in the series by KUMAR [11] and 21% in that of Diop [14].

However, this rate is close to that of CISS AG. [7], who had 0% AF.

This low rate of atrial fibrillation in our study could be explained by the young age of our study population, which is justified by the rarity of this complication in pediatric mitral valve disease [12-13].

Cardiomegaly was present in 90.9% of our patients, which is higher than the DIOP rate [14] of 86%.

This may be explained by the fact that patients are seen at an advanced stage of the disease.

Doppler echocardiography is the key examination for orienting the diagnosis and determining the severity and impact of mitral valve lesions.

In our series, mitral leakage was 84.8%, in line with CISS A G. [7], who found mitral leakage in 78% of cases.

MI was grade 4/4 in our population with 82.1%. However, in the series by Diop [14], the mitral valve lesions found were of the jet type on the posterior valve (20.6%), posterior valve restriction (84%), pseudo prolapse of the anterior valve (92%), commissural fusion (6.3%), commissural leaks (32%), chordae extension (21%), chordae retraction (21%). The subvalvular apparatus was affected in 54 patients (86%). The mitral annulus was dilated in 53 patients (84%).

Mitral stenosis was predominant in 15.2% of our patients. This rate is close to that of CISS A G. [7], who found 6%.

These different results could be explained by the higher prevalence of mitral leakage compared with stenosis, and by the complex valvular involvement of the MR, making repair more difficult. [7]

3- Surgery:

Conservative mitral surgery enables the patient to retain his own valve, preserve the subvalvular tensor apparatus and LV geometry, and consequently the preservation of left ventricular function.

The choice of MP was made on the basis of echocardiographic data and intraoperative findings. As described in the literature, we used various techniques to improve mobility and coaptation, including: commissurotomy, commissuroplasty, the Alfieri technique, Carpentier's semi-rigid plasty, quadrangular resection of the large valve, enlargement of the posterior leaflet of the mitral valve, actions on the cord (shortening, release and neo-cording) [15]. And to optimize coaptation and consolidate valve repair, annuloplasty is generally indicated [15].

4- Postoperative results:

In our series, the operative mortality rate was 6% higher than that found by Duran (1%) [37] and Chan (2.1%) [17].

Indeed, this rate appears close to that reported by Carpentier (4.2%) [18], which may be explained by our small number of patients.

The morbidity of mitral plasty varies from series to series. We report an overall morbidity of 15.15%, including 6.06% in hospital and 9.09% late.

We reported a thromboembolic complication rate of 9.1%, in line with the literature, which reports a rate of 0.4 to 9.2% over a follow-up period ranging from 2.5 to 10 years [40; 41] after valvuloplasty, and an infective endocarditis rate of 3%.

Cumulative survival at 3 years was 87.9%. Chan [17] on a series of 97 cases of mitral plasty on rheumatic lesions reviewed after 8 years (91%).

After 36 months, 27.3% of our patients had a grade II mitral leak and 15.2% had a tight stenosis. Thus Kim [19] et al. reported, over a mean follow-up of 66 ± 38.6 months, a rate of > grade 2 mitral insufficiency, or moderate mitral stenosis of 16.7%, and concluded that most reoperations for residual or recurrent mitral regurgitation occurred within the first 6 months and that, after this period, the risk of repeat surgery decreases [19]. Indeed, the high rate of reoperation after repair of rheumatic mitral lesions is recognized by the authors, of the order of 22% at 15 years for Deloche et al [19] and 10% at 13 years for Lessana et al [16], compared with 5% in degenerative pathology [18-20].

This difference is explained by the progressive nature of rheumatic lesions, which makes long-term quality of repair uncertain. In our series, this rate is nil, probably due to the limited number of patients, the relatively short average follow-up (36 months) and, above all, the fact that all our patients are under antibiotic prophylaxis.

The reduction in left ventricular end-diastolic and end-systolic volumes illustrates early remodelling of the left heart after mitral plasty, while ventricular function remains stable due to preservation of the sub-valvular apparatus [17].

Finally, from a functional point of view, the improvement in NYHA class is recognized by several authors [19-21- 22]. This finding was confirmed by our work, since 57.5% of our patients were in NYHA stage I or II.

Conclusion:

Mitral plasty is a preferred alternative to valve replacement in children. The complexity of the lesions involved makes this procedure difficult, and good results can only be achieved through rigorous patient selection and precise lesion analysis. This study reveals the unique aspects of rheumatic valve repair. The short- and medium-term results of mitral plasty in rheumatic valve disease are encouraging, and call for further progress.

Conservative surgery is therefore a non-negligible option in our context, especially for women of childbearing age and children, given the risks associated with anticoagulant treatment in the case of mechanical valve replacement.

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