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Rhythm and Conduct Disorders Associated With Aortic Stenosis: A North African Study

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Abstract **Original Research Article**

Introduction: The location of the conduction pathways and their intimate anatomical relationship with the aortic valve provide insight into the occurrence of arrhythmias and conduction disorders during aortic stenosis. These disorders have an important prognostic impact. our work proposes to determine and describe the rhythm and conduction disorders encountered in aortic stenosis in a Moroccan population group while recalling the causes and the prognostic and therapeutic impacts of this association. ***Materials and methods***: This is a retrospective study of 148 patients with aortic stenosis hospitalized at the cardiology center of the HMIMV over a period of 24 months during which we analyzed the clinical and electrocardiographic data in order to describe and analyze the rhythm and conduction disorders encountered in this pathology. Statistical analysis was performed with SPSS software, version 18. ***Results:*** The mean age of the population was 65 (57, 74) years, the sex ratio was 1.21 with male predominance. Smoking (current or former) reported in 38.5% of patients was the main modifiable cardiovascular risk factor, followed by hypertension in 35.8% of patients. Dyspnea of effort was the most frequent reason for consultation at 81% of which 64% (of these) were at least of the functional class III of the NYHA. Palpitations and lipothymia or syncope accounted for 21% and 16.2% of the series. The aortic stenosis was tight overall with a mean aortic area of 0.8 [O, 6; 1] cm². Aortic stenosis was rarely isolated. In 36% of cases, it was associated with rhythm and conduction disorders. Among these disorders, atrial fibrillation was the most frequent (36.5%), followed by left anterior hemiblock (17%), LBBB (13.5%) and RBBB (9.5%). Finally there was 9.4% of complete atrioventricular block. ***Conclusion:*** The occurrence of arrhythmias and conduction disorders during aortic stenosis is frequent and due to multifactorial mechanism. In the literature, their prevalence is variable according to the series. The frequency and prognostic importance of these disorders in aortic stenosis justify their knowledge.

Keywords: Aortic stenosis-rhythm-conduction.

INTRODUCTION

Aortic stenosis is defined as a fixed obstacle to left ventricular ejection during systole, due to a defect in the opening of the aortic sigmoid. It is the most frequently encountered valve disease in industrialized countries, the two main etiologies being degenerative aortic stenosis and bicuspidism [1, 2]. In developing countries, its etiology remains dominated by rheumatic fever. Independently of its etiology, it is accompanied by rhythm and conduction disorders by various mechanisms with an important prognostic impact [3].

To date, there are few data in the African literature concerning rhythm and conduction disorders encountered in aortic stenosis. Our work therefore proposes to study and highlight the association of aortic stenosis with rhythm and conduction disorders while recalling the causes and the prognostic and therapeutic impacts of this association.

MATERIALS AND METHOD

This work was carried out at the cardiology center of the HMIMV, collecting a total of 148 patients. Patients over 18 years of age with aortic stenosis as defined by the ESC guidelines were included. Exclusion

criteria included: infective endocarditis, patients with prostheses, subvalvular and supravalvular aortic stenosis.

The main objective was to demonstrate the association of aortic stenosis with rhythm disorders (episodic or permanent atrial fibrillation) and conduction disorders (left and right bundle branch block, bi-fascicular, hemiblock, atrioventricular block).

Statistical analysis was performed by SPSS software, version 18. The results are expressed as numbers (percentages) for qualitative variables, as mean +/- standard deviations for quantitative variables with symmetric distribution, and as median and quartiles for quantitative variables with asymmetric distribution.

The normality of the distribution of quantitative variables is verified by the Gauss histogram and the KOLMOGOROV-SMIRNOV normality test.

Qualitative variables are compared by the Chi-square test, quantitative variables with symmetric distribution by the Student's t-test and quantitative variables with asymmetric distribution by the Mann-Whitney test.

RESULTS

In this population of 148 patients, the mean age was 65 (57, 74) years, with a sex ration of 1.21 predominantly male Table 1. Smoking (current or former) reported in 38.5% of patients was the main modifiable cardiovascular risk factor followed by hypertension, which concerned 35.8% of patients Figure 1. Dyspnea on exertion was the most frequent reason for consultation, accounting for 81%, of which 64% (of these) were at least NYHA functional class III. Palpitations and lipothymia or syncope accounted for 21% and 16.2% of the series Table 1. This was essentially a population of aortic stenosis with a mean aortic area of 0.8 (0.6; 1) cm^2.

Aortic stenosis was rarely isolated. In 36% of cases, it was associated with rhythm and conduction disorders. Among these disorders, atrial fibrillation was the most frequent (36.5%) Table 2. Conduction disorders represented only 9.4% of the series and were distributed as follows: 17% for left hemiblock, 13.5% for left bundle branch blocks (LBBB), 9.5% for right bundle branch blocks (RBBB). Finally, there were 9.4% of complete atrioventricular block (AVB) Figure 2.

Table 1: Clinicals and demographics characteristics of patients

Characteristics	***Patients N=148***
Demographics	
Age (years)	65[57,23 ; 73,75]
Sex	
Man	81(54,7)
Woman	67(45,3)
BMI (Kg/m2)	25,75[23,2 ; 28,7]
functional and physical signs	
Dyspnea	121 (81,2)
Stage dyspnea	
Stage II	44(36, 36)
Stage III	44(36,36)
Stage IV	33(27,27)
Chest pain	48 (33,1)
Syncope	24(16,2)
Palpitation	32(21,6)
Signs of left heart failure	10 (6,8)
Signs of right heart failure	18 (12,2)

The qualitative variables are expressed in number (percentage). The distribution of quantitative variables is verified by the Kolmogorov Smirnov test. They are expressed as:

- *Mean +/- standard deviation for variables with symmetric distribution.*
- *Median [quartiles] for variables with asymmetric distribution.*

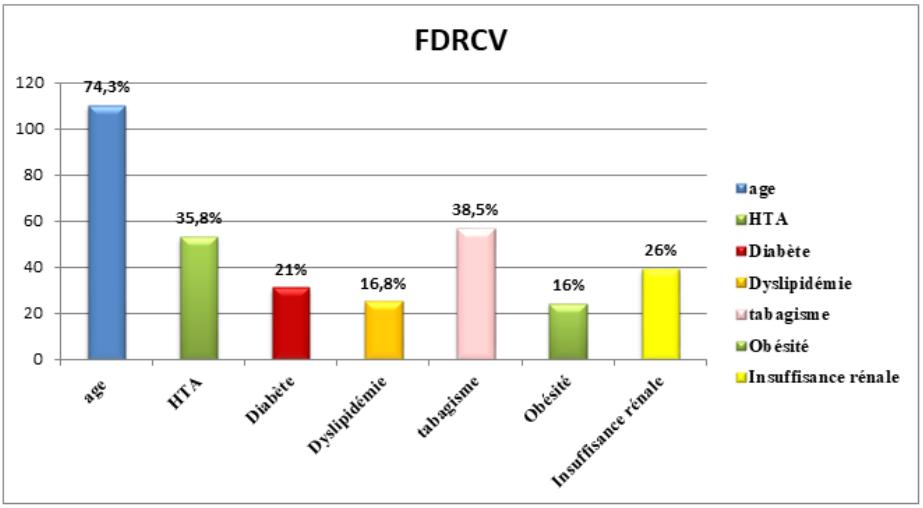

Figure 1: Profile of cardiovascular risk factors

Tableau II: Rhythm and conduction disorder

Caracteristics	***Effectif (N=148)***
Associated conductive disorders	
Yes	13(9,4)
No	125(90,6)
Arrhythmias (AF)	
Yes	54(36 ,5)
No	94(63,5)

Categorical variables are expressed in numbers (percentage)

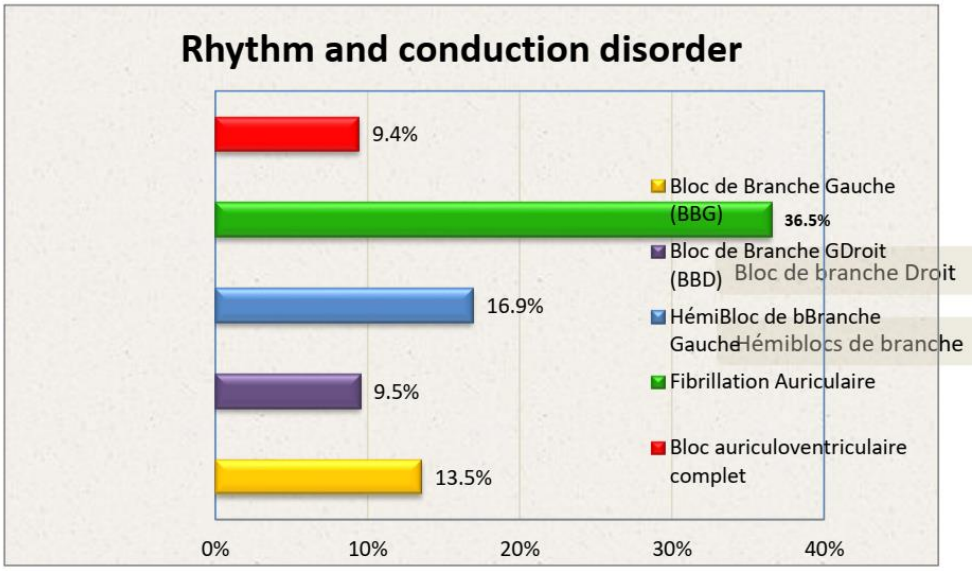

Figure 2: Distribution of rhythm and conduction disorders associated with aortic stenosis

DISCUSSION

The present study is a retrospective study of patients with aortic stenosis of all stages hospitalized at the cardiac center from October 2017 to October 2019. These included patients with symptomatic moderate or tight aortic stenosis and patients with loose aortic stenosis associated with other severe valve involvement requiring hospitalization. Our interest was in rhythm and conduction disorders associated with aortic stenosis. Indeed, the location of the conduction pathways and their intimate anatomic relationship with the aortic valve help to understand the occurrence of arrhythmias and conduction disorders during aortic stenosis. Recall that the atrioventricular node is located in the lower part of the triangle of KOCH bounded by the tendon of Todaro, the ostium of the coronary sinus, and the septal insertion of the tricuspid valve. The His bundle travels in its proximal portion through the membranous septum and gives rise to fibers that extend to the left side of the membranous septum. These fibers

are at the origin of the left branch that arises shortly after the passage of the His bundle between the non-coronary and right coronary cusps before joining the interventricular septum.

The occurrence of transient or permanent conduction disorders during aortic stenosis may result either from extension of rheumatic and degenerative lesions (calcifications) to the conduction tissue [4] or from direct trauma of the conduction pathways by the valve prosthesis during transcatheter implantation of the aortic valve responsible for secondary lesions (edema, hematoma, ischemia necrosis) [5] or direct trauma to the His bundle by the surgeon (suture laceration) during surgical aortic valve replacement. Increased conduction tissue ischemia may also be caused by prolonged aortic clamping and bypass time [6].

The prevalence of conduction disturbances (atrioventricular blocks, bundle-branch blocks) secondary to aortic stenosis is variable among series.

In the study by Ben Ameur *et al*., [6], preoperative bundle branch blocks were found in 27.7% of patients, of which 10.1% were bifascicular. In early postoperative, high-grade conductive disorders (second- and third-degree AVB) occurred in 9.5% of patients with a mean onset time of 9.28 hours and a mean duration of 82.9 hours. In 5.5% of cases these disorders regressed without recurrence, whereas in the remaining 4% they persisted or recurred requiring definitive endocavitary or epicardial pacemaker implantation.

According to Thompson *et al*., 30% of patients with aortic stenosis had conduction disturbances, most involving the His bundle and its left branch [7].

Analysis of electrocardiograms from the simvastatin and ezetimibe in aortic stenosis (SEAS) study found 4.8% AVB, 3.6% LBBB, 7.1% LBBB, and 2.4% atrial fibrillation [8].

The prevalence of AF and AVB requiring pacemaker implantation after TAVI was 33% and 23%, respectively, in the PARTNER cohort B clinical trial comparing TAVI with standard medical therapy in high-risk patients with severe aortic stenosis [9].

Of 148 ECGs, our study reports 9.4% associated conductive disorders including 13.5% LBBB, 9.5% LBBB, 17% hemiblock, 9.4% complete BAV, and 36.5% atrial fibrillation.

Although the predictive factors for conduction abnormalities in patients with aortic stenosis remain to be elucidated, it has been suggested that older age [10], severe aortic stenosis [11], extensive calcifications at the interventricular septum [12], left ventricular dysfunction [13], and severe mitral annulus calcification [14] might be associated with the occurrence of conduction abnormalities.

CONCLUSION

Rhythm and conduction disturbances are encountered quite frequently in aortic stenosis. They can be severe requiring pacemaker insertion with or without pacemaker valve replacement. Fortunately, they never contraindicate surgery.

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