THE ANALYSIS OF THE RİSK FACTORS FOR PREOPERATIVE CHRONIC ATRIAL FIBRILLATION IN THE PATIENTS WITH AORTIC VALVE REPLACEMENT

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Objective This study is planned to determine the risk factors for preoperative chronic atrial fibrillation (AF) rhythm in the patients who are undergoing aortic valve replacement(AVR).

Material-Method: This study covers 841 patients who underwent AVR due to aortic stenosis or regurgitation between the years 1990-2001 in cardiovascular surgery clinic in Türkiye Yüksek Ihtisas Hospital. In the preoperative period, 46 of the patients (5.46%) have AF, whereas 795 have normal sinus rhythm (94.54%). In terms of the risk factors, the physical examination, electrocardiography (ECG), chest x-ray, echocardiography, angiography, catheter and laboratory parameters that had been recorded in the database, were examined retrospectively.

Results: In the chronic AF group involving the 46 patients, old age, hypoproteinemia, large left atrium, increased heart rate, postoperative inotropic drugs and mechanical support treatment were found statistically significantly higher when compared with the group of patients with sinus rhythm.

Conclusions: Although the operative mortality of AVR is low, AF rhythm has a negative impact on the long term survival. For that reason, the preoperative risk factors have to be determined carefully and precautions have to be taken into consideration.

Key Words: Atrial fibrillation, aortic valve replacement, risk factors

Atrial Fibrillation (AF), is frequently observed in the daily open heart surgery practices; especially, in the patients with valvular heart disease. In isolated aortic valve replacement (AVR) population, AF is seen in 11.32%1 . Preoperative chronic AF is the most important independent risk factor after AVR2. The important predisposing factors for AF are: old age, history of congestive heart failure left atrial enlargement, hypertension and the presence of another valve disease2,3.

AF negatively affects the hemodynamic state, lengthens the ventricular recovery period and delays the discharge in hospital period because of the complications such as congestive heart failure, hypotension and thromboembolism. This results in an increase in mortality and morbidity rates and cost[1,2].

Moreover, the AF rhythm affects the early and late survival rates negatively by delaying the recovery from the negative effects on the myocardium caused by the pathophysiological aspects of the open heart surgery[4,5,6].

The mechanism of preoperative AF in aortic valve patients is as follows; the extra load imposed by the valvular lesion causes an increase in the left ventricle (LV) wall thickness or left ventricular volume overload, and therefore augments the resistance to forward flow from the left atrium (LA); Also the atrial tissue damage[7], an increase in the atrial wall tension[8], and a decrease in threshold point of ectopic focuses[9] result in an increase in intraatrial conduction time and heterogenic spread of the sinus stimulation in the atria[11]. This situation leads to AF by the mechanism of either reentry or automatism[9,11].

MATERIALS AND METHODS
STUDY GROUP

841 consecutive patients undergoing isolated AVR between 1990-2001 in Department of Cardiovascular Surgery, Türkiye Yüksek Ihtisas Hospital were included in this study. The patients with mitral or tricuspid lesions, coronary artery or congenital heart disease were excluded, only the patients with aortic valve problems were observed. The observations were made retrospectively from the forms that were enlisted in computer data. Patients who have chronic AF rhythm preoperatively were taken as group A, and patients who have sinus rhythm preoperatively were taken as group B.

STUDY ANALYSIS

In the two patient groups, the preoperative history of Diabetes mellitus, hypertension and ischemic heart disease, and height, weight, pulse rate, age and gender information were examined. The findings of the ECG, teleradiography, echocardiography, catheterization and laboratory examination (hematology, biochemistry) were also determined. RA-LA diameter, LV diameter, systolic aortic valve gradient, LV ejection fraction, fractional shortening and aortic valve leakage degree which are obtained from the echocardiography were noted down.

STATISTICAL ANALYSIS

Non-parametric Mann Whitney U Test is used since the data do not have the conditions for a parametric test. All of the numeric results were explained with the approximate value and standard deviation value. The P value should be under or equal to 0.05 for statistical validity.

RESULTS

The physical examination findings and demographic characteristics (age, gender, weight, height, pulse rate) are shown in Table 1.

Table I: Baseline characteristics.

	Group A	Group B	Statistical Analysis
Age	52,93±11,67	43,56±15,65	*
Gender / Male	35(76,1%)	728(91,6%)	*
Female	11(23,9%)	67(8,4%)	*
Weight	53,46±4,88	63,79±1,24	NS
Height	167,57±6,75	166,43±6,23	NS
Pulse rate	79,70±14,98	67,38±20,65	*

NS: statistically not significant,

* statistically significant P<0,05

Old age and increased heart rate is more frequent in group A (p<0.05); male gender is more frequent than female gender in both groups.(P<0.05)

The status of the important risk factors for AF (DM, HT and atherosclerotic heart disease) are shown in table 2.

Unimportant atherosclerotic lesions of the right coronary and the circumflex artery are seen in low ratio in both groups.

Table II: Risk factors status for atrial fibrillation.

	Group A	Group B	Statistical Analysis
DM	4,3 %	1,7 %	NS
HT	26,1 %	14 %	NS
ASKH	6,6 %	5,3 %	NS

NS: statistically not significant.

Table III: Comparison of biochemical and hematological parameters.

	Group A	Group B	Statistical Analysis
Albumin	2,78±2,03	3,63±1,70	*
Globulin	1,90±1,61	2,41±1,55	*
Hemoglobin	11,80±4,25	13,48±4,30	*
Hemotocrite	36,89±14,27	40,26±12,23	*

* statistically significant P<0,05

In 841 patients, 600 have mixed aortic stenosis and insufficiency, 210 have isolated aortic insufficiency and 31 have isolated aortic stenosis.

46 patients out of 841 were preoperatively in AF (26 were AS, 20 were AI) (5,6 %). 43 AVR patients died because of mediastinitis, bleeding, congestive heart failure and pulmonary complications. (2 of them were preoperatively in AF). The findings of LV hypertrophy, left axis deviation, systolic and diastolic straining were observed in ECG and no statistically significant differences could be found between groups A and B.

The cardiothorasic ratio, opacity in the lungs, pleural fluid collection, dilatation of the heart pedicle and pulmonary conus and pulmonary vascularisation in the teleradiography were examined and no statistically significant differences could be found between the two groups.

37 out of 841 patients underwent catheterization, and no statistically significant differences could be found between the two groups.

Diameters of RA, LA, LV (end-diastolic and end-systolic) and aorta, aortic leakage degree, systolic aortic gradient, LV EF and FS were observed in echocardiography and no statistically significant difference could be found between the two groups except for the mean LA diameter in group A is significantly larger than in group B (3,67±0,31 and 2,73±0,06 (P<0,05), respectively)

The only significantly different values between the two groups were hemoglobin, hematocrit, albumin and globulin levels.

DISCUSSION

AF, which is frequently associated with structural heart diseases , is an important rhythm disorder which affects the early and late survival of the aortic valve diseases3,4 .Preoperative chronic AF has a vital importance preoperatively and postoperatively for AVR applied patients because of its hemodynamic and tromboembolic complications. History of AF is the most important factor that increases the risks of mortality in early postoperative periods even though pure AVR has low operative mortality rate1. Moreover, after 5 years AF is also a major reason for mortality besides high grade ventricular failure (especially caused by aortic incompetence) and multi organ failure1,2. In the first 5 years, the death risk is 4 times higher in groups with AF when compared with sinus rhythm for AVR applied patients1.

AF, the most important independent risk factor after AVR ,changes the hemodynamic conditions and resting-exercise heart rates .In the presence of AF, ventricular myocardium cannot supply enough filling pressure and has not enough coronary circulation time. Therefore recovery of myocardial dysfunction (hypertrophy-dilatation) is affected negatively4,5,6. This result in an increase in the risk of postoperative ventricular failure and in increased early and late morbidity and mortality rates 5,6. Also the excessive need for inotropic medications and mechanical support for the patients with AF in the postoperative period supports this effect.

Thromboembolism is a major clinical problem of chronic AF patients preoperatively (4.4% per

patient year) .After AVR ,probability of repeating thromboembolic attacks is very high and in a 10 years follow-up study it was found approximately 28-31 %[1,2]. As a result of this , history of preoperative thromboembolism related with AF is an important risk factor of postoperative mortality and morbidity[12]. Moreover thromboembolism is a major problem of prosthetic valves postoperatively. Risk factors for thromboembolism are the type and position of the valve ,old age (70 years and older), presence of AF ,depressed LV functions, LA dilatation ,thrombosis in LA and history of systemic embolism .

Beside this, preoperative history of hemorrhage with chronic AF rises the risk of postoperative hemorrhage .Repeating hemorrhagic attacks, AF rhythm and old age are major risk factors for postoperative hemorrhagic complications (2.6 % Per patient year)[1]. Hemorrhage related with AF can not be explained only as a anticoagulant treatment complication. Over this, there should be some undetermined mechanisms[13].

Older age is a major risk factor for AF. Generally AF is seen 6.2 % in males and 4.8 % in females over 65 years old[2,3] .In older population, incidence of AF is 9.1 % for patients with clinical cardiac disease, 4.6 % for subclinical disease and 1.6 % for no cardiac disease (lone AF)[3]. Degeneration of cardiac electrical pathways due to aging plays a role in development of AF[2,3]. AVR applied old patients' relative survival (observed survival/ expected survival) is decreased by AF[2,14].In present study, 212 patients (25 %) are over 65 years and 32 of them (15.1 %) have preoperative chronic AF.

In our study albumin and globulin levels of group A were significantly lower than group B and previous studies could not identify the reasons and mechanisms of this difference. Cardiac cases (especially MI, stroke, death) are shown to be more frequent with microalbuminuria. Besides this, microalbuminuria is found to be responsible for untreated hypertensive patients diastolic failure independent from LV hypertrophy and systolic pressure. Therefore, microalbuminuria is thought to be an indirect predictor in early preclinical identification[16]. Males with microalbuminuria are inclined to have cardiovascular problems two times more than normal[17]. But no relation was found in females.

Hypoalbuminemia is also told to be a reason of cardiac arrhythmia and hemodynamic changes[18]. In these conditions, whether low albumin levels affect cardiac metabolism or hypoalbuminemia is caused by cardiac failure related with intracellular catabolism and insufficient synthesis is still under discussion[19,20]. To identify this effect; more detailed studies and large series are needed.

In AF group low hemoglobin and hematocrit values are thought to be important risk factors. As a mechanism, low blood cell mass can cause AF by insufficient oxygen supply to the atrial tissue .

In the AF group, preoperative pulse rates were faster than group B . We thought that the reasons are insufficient heart rate control, disobedience of the patient to treatment and nature of AF as a faster rhythm than NSR .

CONCLUSIONS

In general, operative mortality is low in AVR applied patients. In this sense, long term survival must be taken into consideration while making a decision to operation and risk factors like AF that affect the postoperative survival should be observed before AVR. Preoperative chronic AF usually does not give satisfactory responses to postoperative electrical and medical cardioversions and cardiac failure with mortality is more often in patients with stable AF after AVR. Therefore; AF preventing surgical approaches should be thought in addition to cardiac valve operations[21].

REFERENCES

1- Kuidal P, Bergsröm R, Malun T, Stahle E. Long term follow-up of morbidity and mortality after aortic valve prosthesis. European Heart Journal 2000; 21. 1099-1111

2- Verheul HA, Vanden Brink RBA, Bouma BJ. Analysis of risk factors for excess mortality after valve replacement. J Am Coll Cardiol 1995; 26: 1280-6

3- Curt D Furber, Bruce M Psaty, Teri A Manolio. Prevealance of AF in elderly subjects (The Cardiovascular Health Study).The American Journal of Cardiology 1994; 74: 236-40

4- Lytle BW, Cosgrove DM, Taylor PC. Primary isolated aortic valve replacement: early and late results. J thorac Cardiovasc Surg 1989; 97: 675-94

5- Lindblom D, Lindblom U, Quist J, Lundströw H. Long term relative survival rates after heart valve replacement. J Am Coll Cardiol 1990;15: 566-73

6- Abdelmor M, Nitter-Hauge S, Trettli S. Relative survival of patients after heart valve replacement. Eur Heart J 1990; 11: 23-8

7- Frustac C, Caldarulo M, Buffon A, Bellocci F. Cardiac biopsy in patients with primary AF; histologic evidence of occult myocardial disease. Chest 1991; 100: 303-6

8- Josephson ME, Kastor JA, Morganroth J. Electrocardiograghic left atrial enlargement; electrophysiologic, echocardiographic and hemodynamic correlates. Am J Cardiol 1977; 39: 967-71

9- Saffitz JE, Kanter HC, Green KG, Tolley TK, Beyer EC. Tissue specific determinists of an isotrophic conduction velocity in cannine atrial and ventricular myocardium. Circulation Resp 1994; 74: 1065-70

10- Bertilo Isson, Maurits Allessie, Ronnie Campbell. Atrial fibrillation: mechanisms and therapeutic strategies. Future Publishing Company. 1994: 51-81; 211-287

11- Cagli K, Gol MK, Keles T, Sener E, Yildiz U, Uncu H, Tasdemir O, Bayazit K. Risk factors associated with development of atrial fibrillation early after coronary grefting. Am J Cardiol 2000 May 15; 85(10): 1259-61

12-Mercadante N. Management of patients with pssthetic heart valve : potential impact of valve site, clinical characteristics and comorbidity. J Thromb Thrombolysis 2000; 10(1): 29-34

13- Per Kuidel, Berström R, Hoite LG, Stahle E. Observed and relative survival after aortic valve replacement. J Am Coll Cardiol 2000; 35(3): 747-56

14- Kohl P, Lahaye L, Gerard P, Lşweth R. Aortic valve replacement in the octogenarians: preoperative outcome and and clinical follow-up. Eur J Cardiothorac Surg 1999; 16(1): 68-73

15- Grestein HC, Mann JF, Yi Q, Zuiman B, Dinneen SF. Albuminuria and a risk of cardio-vascular events, deaths and heart failure in diabetic and nondiabetic individulas. JAWA 2001; 286(4): 421-6

16- Grandi AM, Santillo R, Bertolini A. Imperiale D. Microalbuminuria as marker of preclinical diastolic disfunction in never-treated essential hypertensives. Am J. Hypertens 2001; 14(/): 644-8

17- Halimi JM, Forham A, Balken B, Navak M. Is microalbuminuria a risk marker for cardivascular disease and insulin resistance in both men and women? J Cardiovasc Risk 2001; 8(3): 139-46

18- Gembicki M, Roguska V, Guminska Y, Lisiak W. Hemodynamic chance during cardiac arrythmias studied with albumin I-131. Kardiol pol 1969;12(1): 21-30

19- Abazova FI, Gordeeu VF. Variants of albumin metabolic disorders in chronic heart failure. Kardiologia 1982; 22(3): 102-6

20- Belaborodoue EI. Protein absorbtion disorder in cardiac insufficiency. Vrach Delo 1980; 7: 22-6

21- Crijins Hj, Van Gelden IC, Vander Woude HJ. Efficiency of serial electrical cardioversion therapy in patients with cronic AF after valve replacement and implications for surgery to cure AF. Am J Cardiol 1996; 78(10): 1140-4