The Frequency of Cardiovascular Anomalies among the Families of the Patients with Bicuspid Aortic Valve or Other Left-sided Cardiovascular Anomalies

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Introduction:

Bicuspid aortic valve is the most frequent congenital heart disease (0.5 to 1%) . It was observed that BAV and other LSCAs (valvular aortic disease apart from BAV (VAD), coarctation of the aorta (CoA), interrupted aortic arch, and hypoplastic left heart syndrome) could coexist in the same patient and also clustering of BAV in some families.
We aimed to evaluate the frequency of the cardiovascular anomalies among the families of the patients with BAV or other LSCAs and the features of those cases. This was the first study from Turkey that performed echocardiographic screening of the relatives of the patients with LSCAs.

Methods:

The patients, evaluated with BAV or any LSCA in our clinic between October 2010 and August 2011 and their first degree relatives were enrolled into the study. The patients with any genetic abnormality were excluded. All the participants underwent an echocardiographic examination. The patients were assessed in three groups: BAV, BAV+CoA, and other LSCAs. The echocardiographic measurements of the patients and their siblings were standardized by computing Z-scores.

Results:

The numbers of the patients in BAV, BAV+CoA, and other LSCAs group were 52, 14, and 20 respectively. The males were more frequently affected from LSCAs (male/female:4.4/1)(Table 1). Seventeen of 261 relatives (6.5%) were diagnosed with LSCA. BAV incidence among relatives of the patients with BAV was found 2.4% (Table 2) . It was observed that "aortic root ± ascending aorta dilatation" was associated with R-N morphology and valvular dysfunction (Table 4). The most of the patients with BAV (59.1%) had R-L valvular morphology (Table 5).

	Probands (n:86)			The relatives in pediatric ages (n:62)	The relatives in adult ages (n:199)
	BAV (n:52)	BAV + CoA (n:14)	Other LSCAs (n:20)		
Age (years) (mean ± SD)	10.2 ± 5.1 (range 0.4 - 20.9)	7 ± 3.8 (range 1.5 - 15.2)	5.8 ± 5.7 (range 0.1 - 15.8)	9.7 ± 4.1 (range 1.5 - 17.9)	37.4 ± 9.9 (range 18.1 - 75)
Gender n(%)	(17.3%), (82.7%)	(21.4%), (78.6%)	(20%), (80%)	(58.1%), (41.9%)	(49.7%), (50.3%)

Table 1. The features of the participants

The diagnostic group of probands	Number of families	Number of relatives	Diagnosis of relatives	n/total (%)
BAV	52	168	BAV	3/168 (1.8%)
			DAA	2/168 (1.2%)
			DSV	1/168 (0.6%)
			DAA + DSV	2/168 (1.2%)
			Total	**8/168 (4.8%)**
BAV+CoA	14	38	BAV	1/38 (2.6%)
			DSV	3/38 (7.9%)
			DAA + DSV	1/38 (2.6%)
			Total	**5/38 (13.1%)**
Other LSCAs	20	55	DAA	2/55 (3.6%)
			DAA + DSV	2/55 (3.6%)
			Total	**4/55 (7.2%)**
Total	86	261		17/261 (6.5%)

Table 2. The relatives that were grouped according to the diagnosis of probands
BAV: bicuspid aortic valve, CoA: coarctation of aorta, DAA: dilatation of ascending aorta
DSV: dilatation of sinus of Valsalva, LSCA: left-sided cardiovascular anomaly

Findings		BAV (n:52)		BAV+CoA (n:14)		Other LSCAs (n:20)	
		n	%	n	%	n	%
AS	Mild-moderate	17	32.7	3	21.4	2	10
	Severe	5	9.5	-	-	1	5
	Total	22	42.2	3	21.4	3	15
AR	Mild	26	50	6	42.8	7	35
	Significant	3	5.7	-	-	-	-
	Total	29	55.7	6	42.8	7	35
AS + AR		14	26.9	3	21.4	4	20
Enlargement of aortic annulus		6	11.4	2	14.2	1	5
DSV		3	5.7	1	7	1	5
Enlargement of sinotubuler junction		4	7.6	-	-	1	5
DAA		26	50	2	14.2	2	10
Thickened LV walls		4	7.6	-	-	6	30
Enlargement of PA		1	1.9	1	7	3	15
Mild MR		7	13.5	1	7	4	20
PDA		2^{coil}	3.8	1*	7	5 (4*)	25
VSD		2 (1*)	3.8	1*	7	10 (2^{*},2^{c})	50
Recoarctation		-	-	10	71.4	12	60
Associated anomalies		1 AVSD* 1 Subaortic ridge				1 Subaortic ridge 1 Single papillary muscle, mild MS 1Supramitral ring*, residual MS, PHT, PSSVC	

Table 3. The echocardiographic findings of the probands

	The patients with ARD (n:32)	The patients without ARD (n:34)	P value
Aortic annulus Z score	1.5 ± 1	0.6 ± 0.9	<0.001
Sinus of Valsalva Z score	0.9 ± 0.9	-0.3 ± 0.9	<0.001
Sinotubular junction Z score	0.8 ± 0.9	-0.5 ± 0.7	<0.001
Ascending aorta Z score	3.1 ± 1.3	0.2 ± 1.1	<0.001
AS frequency	%50	%26.5	0.049
AR frequency*	%37.5	%5.9	0.002
AS+AR frequency	%25	%2.9	0.012
Frequency of R-N morphology	%53.1	%27.3	0.033

Table 4. The differences between the patients with and without "aortic root ± ascendig aorta dilatation (ARD)"

		R-L morphology (n:39)	R-N morphology (n:26)	P value
AS	Mild-moderate	8 (20.5%)	9 (34.6%)	
	Severe	0 (0%)	7 (26.9%)	
	Total	8 (20.5%)	16 (61.5%)	<0.001
AS + AR		6 (15.4%)	10 (38.5%)	0.034
DAA		12 (30.8%)	16 (61.5%)	0.014

Table 5. The features of the patients with BAV by valvular morphology
AR: aortic regurgitation, AS: aortic stenosis, ,
R-L: right coronary-left coronary,
R-N: right coronary-noncoronary, DAA: dilatation of ascending aorta

Conclusion:

Almost all the complications of BAV and other LSCAs are preventable. Because the clustering of LSCAs in some families is observed, we recommend echocardiographic screening of those relatives. If not possible, at least it should be achieved for BAV. This was the first study from Turkey that performed echocardiographic screening of the relatives of the patients with LSCAs.