

Assessment and Interpretation of Pediatric Cardiac Consultations

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ABSTRACT

Setting: Queen Alia Heart Institute, Amman, Jordan

Objective: To evaluate the consultations referred to the pediatric cardiology, in order to improve the quality of cardiac care in children.

Patients and methods: This is a prospective study conducted over a one year period from the first of May 2008 to the first of May 2009. All patients included in the study were referred by the pediatricians for further evaluation. Cardiac evaluation were done by cardiologist and included: clinical assessment in addition to noninvasive and invasive diagnostic tests whenever indicated. Patients' data and results of consultations were obtained and tabulated by the sites of referral and indications.

Result: A total of 1864 consults were seen over the study period: 725 (38.9%) from the pediatric ward, 763(40.9%) from the pediatric clinics, 314(16.8%) from the nursery, and 62(3.3%) consults from the pediatric intensive care unit. The most common indications for consultations were: heart murmur (368/1864:19.7%), inter current illnesses of cardiac patients (289/1864:15.5%), cyanosis (277/1864:14.9%), assessment of the ventricular function (165/1864:8.9%) and respiratory symptoms (159/1864:8.5%).

Conclusion: A wide spectrum of clinical problems which needed a cardiology opinion have been addressed. There were certain clinical conditions encountered more frequently and should be given emphasis in curricula developed for pediatric residency training program, especially how to elicit cardiac findings accurately.

Key words: consultation, cardiac, cyanosis, murmur, arrhythmia.

INTRODUCTION

It is important for the pediatrician to know how to obtain precise information regarding the patient medical history and to perform extensive physical examination in a child with heart murmur or symptoms suggested cardiac anomaly¹. We have conducted this study to evaluate the consultations referred to the pediatric cardiology, in order to improve the quality of cardiac care in children.

PATIENTS AND METHODS

This is a prospective study conducted over a one year period from the first of May 2008 to the first of May 2009. All patients included in the study were referred by the pediatrician for further evaluation. Cardiac evaluation were done by cardiologist and included: clinical assessment in addition to noninvasive and invasive diagnostic tests whenever indicated. Patients' data and results of consultations were obtained and tabulated by the sites of referral and indications. The data then were sutabulated by the diagnosis.

RESULT

A total of 1864 consults were seen over the study period: 725 (38.9%) from the pediatric ward, 706(41.5%) from the pediatric clinics, 214(12.6%) from the nursery, and 62(3.6%) consults from the pediatric intensive care unit (table 1). The indications for consultations include: heart murmur 368(19.7%), inter current illnesses of cardiac patients 289(15.5%), cyanosis 277(14.9%), assessment of the left ventricular function 165(8.5%), respiratory symptoms 159(8.5%), arrhythmias 114(6.1%), syncope 72(3.9%), syndrome 68(3.6%), chest pain 53(2.8%), rheumatic fever 48.0(2.6%), infective endocarditis 38(2.0%) cardiomegaly 31(1.7%), pulmonary hypertension 25(1.3%) Kawasaki 22(1.2%),

surgical clearance 20(1.1%), recent heart surgery 19 (1.0%), abnormal electrocardiogram 13(0.7%), recent cardiac catheterization 6(0.3%), transient ischemic /cerebrovascular accident 9(0.5%), vascular ring 9.0(0.5%)and systemic hypertension 5(0.3%), (table 1).

Table 1: Sites and indications for cardiac consultation

Indication of consultation	Ward	Nursery	ED	PICU	Total
Heart murmur	29	43	292	4	368
L.ventricle function	134	12	5	14	165
Arrhythmias	32	11	64	7	114
Intercurrent Illness	215	4	67	3	289
Cyanosis	45	184	38	10	277
Syndromes	12	32	23	1	68
Chest pain	4		49		53
Syncope(Dizziness)	20		52		72
Infective endocarditis	27	4	2	5	38
Pulmonary HTN	9	6	1	9	25
Recent heart surg.	6		11	2	19
Recent cath.			6		6
CVA/TIA	3		2	1	6
Hypertension	3		2		5
Surgical Clearance	17		3		20
Cardiomegaly CXR	9	2	18	2	31
Vascular Ring	7		2		9
Rheumatic fever	31		17		48
Kawasaki Disease	19		3		22
Respiratory symptoms.	97	15	47		159
Abnormal ECG	6	1	2	4	13
Fetal echo			57		57
Total	725				

Table 2: Consultations for evaluation of heart murmur

Diagnosis	Ward	Nursery	ED	PICU	Total
AS	2	0	9	0	11
Atrial Myxoma	1	0	0		1
ASD second.	3	3	23	0	29
AVSD	1	0	3		4
Innocent m.	5	11	183	0	199
MR	1	2	5	2	10
MS	1	0	1		2
PDA	4	7	18		29
PPS	2	1	2		5
PS	1	1	9		11
Truncus Arter.	0	3	2		5
VSD	7	10	17	2	36
VSD/CoAo	1	5	6	0	12
Others			14		14
Total	29	43	292	4	368

Table 3: Consultations for evaluation of arrhythmias

Arrhythmias	Ward	Nursery	ED	PICU	Total
Atrial	22	5	51	6	84
Ventricular	5	0	0	1	6

Junctional	1	1	1	0	3
Heart block	0	3	0		3
Normal	1	1	4		6
Palpitation	1	0	8		9
Prolonged QT	2	1			3
Total	32	11	64	7	114

Table 4: Consultation for chest pain

Diagnosis	Ward	Nursery	Ed	Picu	Total
Anxiety	0	0	2	0	2
Cardiac	0	0	3	0	3
Muscular	2	0	28	0	30
Gerd	0	0	1	0	1
Pulmonary	0	0	2	0	2
Idiopathic	2	0	13	0	15
Total	4	0	49		53

Table 5: Consultation for evaluation of cyanosis

Diagnosis	Ward	Nursery	Ed	Picu	Total
Acrocyanosis	0	18	3	0	21
Apnea/Bradycardia	0	7	3	0	10
Cyanotic CHD (new)	12	119	16	3	150
Cyanotic CHD (known)	22	0	16	4	42
Cyanosis on crying	7	11	0	0	18
PPHTN	4	29	0	3	36
Total	45	184	38	10	277

Table 6: Consultation for syndromes and congenital anomalies

Syndrome	Number	% CHD
Down Syndrome	26	50
Vacteral	5	45
Infant of DM mother	7	60
Omphalocele	4	25
Anal Atresia	4	25
Tuberous sclerosis	3	50
William Syndrome	3	100
Ehler Danlos syndrome	3	66
Marfan	2	100
Others	11	
Total	68	

Table 7: Consultation for evaluation of resp. symptoms

Diagnosis	Ward	Nursery	ED	Total
AVSD	3	0	0	3
CO-Aorta+VSD	11	4	0	15
VSD	9	0	5	14
TAPVD	2	3	0	5
MR	2	0	0	2

Myocarditis	6	1	7	14
PHTN	7	3	2	12
Normal heart	57	4	33	94
Total	97	15	47	159

Table 8: Consultation to rule out bacterial endocarditis

Fever	9
Positive blood culture	15
Central line	11
Oncology patients	17
Vegetations on 2-D echo	9
Operated CHD	5
Non operated CHD	11
Normal hearts	13

DISCUSSION

It is important for the pediatrician to know how to obtain precise information regarding the patient medical history and to perform extensive physical examination in a child with heart murmur or symptoms suggested cardiac anomaly¹. The detection of changes in cardiac auscultation especially the presence of murmur is the most frequent reason for patient referral to cardiologist followed by thoracic pain and syncope² which coincide with our result which showed that, the most common indications for referrals were heart murmur (19.7%), inter current illnesses of cardiac patients (15.5%), cyanosis (14.9%), assessment of the ventricular function (8.5%) and respiratory symptoms (8.5%). (table1).

Innocent heart murmur is a change in auscultation observed in the absence of anatomical and/or functional abnormality of the cardiovascular system, between 50% and 70%of children will at some point of their childhood or adolescence, present some changes in auscultation that will be characterized as a murmur especially during school year¹. On the other hand , the following symptomatology is strongly associated with cardiovascular disorder and should be adequately evaluated in a child with heart murmur :cardiac arrhythmia ,syncope, cyanosis, hypoxemic spells, thoracic pain ,eating difficulties ,excessive sweating, intolerance to physical activity ,headache ,systemic hypertension ,tachycardia dyspnea ,edema and hepatosplenomegaly¹.

Also we looked at the site of referral .we found that, in the nursery the most common cause of murmur was innocent 25.6%followed by VSD 23.3%while in the pediatric clinic the innocent murmur was 62.7%followed by ASD 7.9%,(table2) which means that ,the presence of murmur in the neonate is highly suggestive of anatomical heart lesions ,even it is advisable that newborn and infants to be evaluated by cardiologist in their first year of life whenever the present symptomatology or findings on physical examination suggestive of heart disease regardless the existence of innocent murmur in this age group³⁻⁶.

A total of 114(6.1%) patients were referred because of cardiac arrhythmias table 3. Both atrial and ventricular arrhythmias were seen in children, however the majority were atrial in origin and the most common was SVT.

SVT is usually associated with structurally normal heart⁷ which is in agreement with our result (table3) where 74% of all arrhythmias were SVT.

On the other hand atrial fibrillation occurred among older patient who typically has congenital heart disease, chronic effect of pressure overload, volume overload, or surgical scar that contributes to the development of secondary arrhythmias⁸. Our result showed that atrial flutter / fibrillation occurred in structurally abnormal heart in 80% of cases (table3).

The most common basis for evaluation of function was oncology patients. Among patients evaluated for function, there were 4 new diagnoses of ASD secundum. Thoracic pain is the second commonest reasons for referring a child to the cardiologist ,although heart diseases are only responsible for 4-6% of such pains in children^{2,9}, on the contrary our study showed that chest pain as presenting complaint in childhood is not so common ,this could be explained by the fact that parents are not aware or listening to their children regarding this symptom in our society ,however, the two most common causes of chest pain were muscular in 53% and idiopathic in25%; whereas cardiac causes of chest pain occurred rarely in about 5.7% (table 4).

Cyanosis in the newborn is defined as an arterial O₂ saturation less than 90% or a pO₂ less than 60 torr¹⁰. The most common causes include intrinsic pulmonary disease, congenital heart disease and central nervous system.

Rapid diagnosis and referral are mandatory because neonatal patients can become unstable very quickly. Our data showed that, in patients referred with cyanosis, congenital heart disease were responsible in (69%) of patients, where (31%) were non cardiac and newly diagnosed cyanotic congenital heart disease occurred in (54%) (table 5).

Transposition of great arteries (30%) is the most common cyanotic condition that requires hospitalization in the first two weeks of life¹¹ which coincides with our result.

The second commonest cause was tetralogy of Fallot (20%), of the four anomalies (over riding aorta, right ventricular hypertrophy, ventricular septal defect, right ventricular outflow obstruction) only the later two are of major physiological consequences.

Tricuspid atresia occurs where the tricuspid valve fails to develop and there is no communication between the right atrium and the right ventricle, in our study tricuspid atresia occurred in (10%).

With total anomalous pulmonary venous drainage (TAPVD), the pulmonary veins are not attached to the left atrium, but converge in common confluence just posterior to that atrium, this confluence drains into a systemic vein or cardiac structure other than the left atrium. TAPVD occurs in (7.0%) and lastly pulmonary atresia with intact inter ventricular septum, hypoplastic right ventricle, single ventricle, double outlet right ventricle, critical pulmonary valve stenosis and hypoplastic left heart syndrome and other complex cyanotic congenital heart diseases account for about one third of cases.

In most cases rapid diagnosis and referral are mandatory even Koppel RI et al¹² advised that pulse oximetry screening test meets the general requirements for a screening test for rapid diagnosis.

Current surgical therapy for most lesions has evolved from early palliation and delayed repair to complete correction in early infancy with improved morbidity and mortality¹³. The evaluation of cardiac involvement in syndromic patients prompted consultations for 3.9% (table 6). Down syndrome ranks first among referrals (38.2%) and almost half of them have congenital heart disease.

The heart was the cause of recurrent respiratory symptoms in 65/159 (43%) of cases while 94/159 (57%) have a normal heart (table 7).

In young infants (less than 6 months), the commonest causes were VSD with or without coarctation, TAPVD, and pulmonary hypertension, while myocarditis occurred more often in older infants.

Evaluation for infective endocarditis accounted for 2.2% (table 1). The presence of prolonged fever unresponsive to parenteral antibiotics in an oncology patient was the common reason for referral. Vegetations on 2D echo, positive blood culture and/ or the presence of indwelling central venous line were the hallmark of the diagnosis occurred in 24%, 39%, 29% respectively (table 8).

CONCLUSION

A wide spectrum of clinical problems which needed a cardiologist opinion have been addressed, some were encountered more frequently and should be given emphasis in curricula developed for pediatric residency training program, especially how to elicit cardiac clinical findings accurately.

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