Idiopathic Cardiomegaly in Nigerian Children

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The term "idiopathic cardiomegaly" (Reisinger and Blumenthal, 1941) is used in this communication to describe an obscure form of heart disease which presents clinically as cardiac dilatation and/or hypertrophy with signs and symptoms of cardiac failure. Workers in various parts of the world, mainly in tropical and subtropical countries, have reported cases of unexplained cardiomegaly and cardiac failure under a variety of terms: cardiomegaly of unknown origin (World Health Organization, 1965), primary myocardial disease (Fowler, Gueron, and Rowlands, 1961), heart muscle disease (Edington and Jackson, 1963), idiopathic hypertrophy of the heart (Altman and Stein, 1956), cardiac disorders of unknown aetiology (Stuart and Hayes, 1963), cryptogenic heart disease (Higginson, Isaacson, and Simson, 1960), cardiomyopathy (Stein *et al.*, 1964), idiopathic cardiomyopathy (Bloomfield and Liebman, 1963). These reports reveal a common feature of heart failure for which no definite cause can be found, but they do not appear to be a homogeneous group aetiologically. Nearly all the reports concern adults.

In this communication, we present the clinical, radiological, electrocardiographic, and angiographic findings in a number of children with symptoms and signs of heart failure associated with cardiomegaly, and in whom no cause could be found. Cases of cardiac failure associated with severe chronic anaemia, glomerulonephritis, obstructive hypertrophic cardiomegaly, acute and chronic rheumatic carditis, hypertension, and other cardiac disorders with known causes are excluded from this study. All except one of these children recovered from their cardiac failure, and their heart sizes tended to return to normal, but the majority have

shown persistence of the electrocardiographic abnormalities.

PATIENTS AND METHODS

The study includes 13 Nigerian children who were admitted into the Paediatric Wards of the University College Hospital, Ibadan, Nigeria, with cardiac failure for which no definite cause could be found. Of the 13 children, 12 were admitted between 1965 and 1967, and one in 1962. It must be pointed out that this number does not represent all the children seen at this hospital with this condition. Children who die in the Children's Emergency Room before admission into the Wards could be arranged, and older children admitted into the adult wards, were excluded from this study.

Evaluation of each patient consisted of clinical examination, chest radiographs, and electrocardiograms. Five patients underwent cardiac catheterization and angiography. Laboratory studies included haemograms, haemoglobin genotype, urinalysis, antistreptolysin titres, serum electrolytes, and in four patients viral studies were carried out. All the patients came from families with a poor socio-economic background.

RESULTS

Clinical Features. Data from the 13 patients are summarized in Table I. There were 8 boys and 5 girls whose ages ranged between 10 months and 6 years. Eleven patients gave a history of fever at the onset of the illness, but at the time of admission the temperature was found to be moderately raised in 7 (37.2°–38.3°C.). All but one patient complained of cough. Dyspnoea both at rest and on exertion was complained of by 10 patients and oedema by 8 patients. The duration of symptoms was under one month in the majority.

Physical Findings. All 13 patients looked ill. The pulse was small in volume and tachycardia was present in all except one (Case 12). The blood pressure was within normal range in 11 patients in

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whom the test was carried out. Clinical evidence of cardiomegaly, gallop rhythm, and enlarged tender liver was present in all. In addition, a left ventricular heave was found in 2 instances (Cases 1 and 13); a soft apical pansystolic murmur indicating moderate mitral incompetence was detected in 4 patients, in 2 of whom the murmur developed some months after the cardiac failure had been controlled. In only 3 (Cases 8, 9, and 13) was there any significant dependent oedema, though 8 had complained of this symptom at the onset of illness. There was ascites in Case 13. Four patients showed a moderate degree of malnutrition; others were well nourished.

Laboratory Investigations. In Table II are summarized the investigations undertaken in each of the patients. Four (Cases 3, 4, 5, and 9) had a moderate degree of anaemia with haemoglobin level below 9.0 g./100 ml. In only 2 of these (Cases 4 and 9) could the anaemia be attributed to malaria parasitaemia. Leucocytosis was found in 3 patients (Cases 4, 5, and 6) and leucopenia in Case 11. Antistreptolysin titres were between 12 and 166 Todd units in 6 patients in whom the test was performed. There was no significant abnormality in the urinalysis of the 13 patients. Erythrocyte sedimentation rate determined in 7 patients was not raised. Viral diagnostic tests were performed in only 4 patients: the only significant finding was isolation of Coxsackie virus group B type 4 from the stool of one (Case 11); unfortunately, blood specimens for neutralizing antibodies were lost.

Electrocardiograms were invariably recorded. Analysis of these traces (Table II) revealed sinus rhythm in all 13 patients, T inversion in the left

FIG. 1.—Electrocardiogram from Case 3, showing T inversion in leads I, II, AVL, V4-6. The voltages are within normal limits.

chest leads in 8 (Fig. 1), and various other non-specific S-T segment abnormalities. The QRS frontal axis revealed no constant pattern. These cardiographic abnormalities have persisted in all except 2 patients (Cases 2 and 9) (Table I).

Chest x-rays in all the patients showed cardiomegaly, the cardiothoracic ratios ranging from 60 to 75 per cent (Fig. 2). The cardiac silhouette was globular in all cases, without any suggestion of a particular chamber predominance. The contribution by pericardial effusion to the generalized enlargement of the cardiac contour could not be easily determined. There was pulmonary venous congestion in one patient and bilateral pleural effusion in another.

Cardiac catheterization and angiocardiography were performed on 5 patients (Table II). These

FIG. 2.—Chest x-ray of Case 11. Note the gross cardiac enlargement, with clear outline of the cardiac borders, and pulmonary vascular congestion.

TABLE
SUMMARY OF CLINICAL FEATURES IN 13 CHILDREN

Case No.	Age (yr.) and Sex		Symptoms					Nutrition	Pulse
			Fever	Cough	Dyspnoea	Oedema	Duration of symptoms		
1	2½	F	+	+	+	—	Recurrent, 18 mth. 3 wk.	Good	148
2	4½	M	—	+	+	+		Poor	120
3	6	M	—	+	+	—	Recurrent, 3 mth. 10 cy.	Poor	124
4	1 yr. 10 mth.	M	+	+	+	—		Good	180
5	11 mth.	F	+	+	+	—	1 wk.	Poor	176
6	4½	F	+	+	+	—	Recurrent, 2 mth. 2 wk.	Good	120
7	5	F	+	—	+	+		Good	144
8	2	M	+	+	+	+	1 wk.	Poor	120
9	4	M	+	+	—	+	1 wk.	Good	130
10	3	M	+	+	+	+	2 wk.	Good	134
11	2	M	+	+	+	+	1 mth.	Good	124
12	4	M	+	—	—	+	2 wk.	Good	80
13	5	F	+	+	+	+	Recurrent, 3 mth.	Good	100

procedures were carried out 5 months to 2 years after the control of the cardiac failure. The catheter was passed into the right ventricle through a cut-down in the saphenous vein. Normal right ventricular pressure was obtained in all 4 patients in whom this was recorded. Contrast material was injected selectively into the right ventricle, and bi-plane rapid serial films were obtained with Schonander film changers. It was possible to obtain good opacification of the two ventricular chambers.

The angiocardiograms in all 5 patients revealed biventricular dilatation which appeared more

marked in the left ventricle than in the right (Fig. 3). The end-systolic volumes were high, and there was slow disappearance of the contrast material, suggesting a poor stroke volume. The right ventricle in 2 patients showed deformity due to displacement by the large left ventricle which compressed the right in the antero-posterior projection. These angiographic features were essentially similar to those described in adult patients with "heart muscle disease" (Cockshott, Thorpe, and Ikeme, 1967).

Progress. Of the 13 patients, one (Case 11) died

FIG. 3.—Left ventricular angiogram from Case 5 a year after the patient had recovered from heart failure. Note the left ventricular dilatation.

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WITH CARDIOMEGALY OF UNKNOWN ORIGIN

Physical signs			Progress	Period of follow-up
Blood pressure (mm. Hg)	Heart sounds	Murmurs		
95/50	Gallop rhythm	None	Recovered from heart failure; heart size reduced; ECG changes persist	From May 1965 till present
—	„	„	Recovered from cardiac failure; heart size now normal; ECG normal	From June 1965 till present
90/50	„	Soft apical pansystolic	Recovered from heart failure; heart size normal, but ECG changes persist	Nov. 1965–June 1967; defaulted
84/50	„	Apical pansystolic	Recovered from heart failure; heart size reduced, but ECG changes persist	Jan. 1965–Jan. 1967; defaulted
100/?	„	„	Recovered from heart failure; heart size reduced; ECG changes persist	July 1965–August 1966; defaulted
105/80	„	None	Admitted 3 times with heart failure; heart size now moderately enlarged; ECG changes persist	Jan. 1962 till present
110/85	„	„	Recovered from heart failure; heart size reduced; ECG still abnormal	August 1966 till present
—	„	„	Recovered from cardiac failure; heart size reduced; ECG changes unchanged	March 1966 to Feb. 1967; defaulted
80/?	„	„	Recovered from heart failure; ECG now normal	Feb. 1966 till present
95/60	„	„	Recovered from heart failure; heart size reduced, but ECG changes persist	Nov. 1965 till present
90/50	„	„	Died 5 mth. after onset of symptoms	June–Oct. 1966
100/60	„	Soft apical pansystolic	Recovered from heart failure; heart size reduced	May–July 1966; defaulted
100/60	„	None	Recovered from heart failure; heart size less, but ECG changes persist	Sept. 1967 till present

TABLE II

LABORATORY FINDINGS IN CHILDREN WITH CARDIOMEGALY OF UNKNOWN ORIGIN

Case No.	Hb (g./100 ml.)	PCV (%)	WBC	Neutrophils (%)	Lymphocytes (%)	Hb electrophoresis	Malaria parasite	Electrocardiogram	Cardiac catheterization and angiocardigram
1	10.7	33	9,900	40	50	AC	—	Sinus rhythm; QRS axis +30°; T inversion in V5–6	Normal pressures and bi-ventricular dilatation
2	11.9	39	6,800	—	—	AA	—	Sinus rhythm; QRS axis +50°; S–T elevation in I–III, AVF V5–6	Not performed
3	5.6	18	9,800	65	25	AA	—	Sinus rhythm; QRS axis +30°; T inversion in I–III, V5–6; normal QRS voltages	„ „
4	7.2	22	16,900	—	—	AA	+	Sinus rhythm; balanced axis; LVH +; T inversion in AVF V5–6	„ „
5	8.0	23	13,800	43	43	AC	—	Sinus rhythm; QRS axis +70°; LVH; T flat in I, AVL, and inverted in V5–6	Normal pressures and bi-ventricular dilatation
6	9.4	30	15,000	38	30	AA	+	Sinus rhythm; QRS axis –15°; LVH; T inversion in V5–6	Pressures not recorded; angiocardigram showed biventricular dilatation
7	9.6	30	8,000	25	65	AS	—	Sinus rhythm; QRS axis +50°; T inversion in all leads except AVR	Normal pressures; bi-ventricular dilatation
8	10.7	32	8,250	44	46	AC	—	Sinus rhythm; QRS axis +90°; S–T elevation in II–III; AVF; flat TV5–6	Not performed
9	6.9	22	8,600	35	62	AA	+	Sinus rhythm; QRS axis –20°; low T in all leads	Normal pressures; bi-ventricular dilatation
10	12.3	40	9,200	—	—	AA	—	Sinus rhythm; QRS axis balanced; flat T in all leads	Not performed
11	9.6	30	3,900	—	—	AS	—	Sinus rhythm; QRS axis +60°; low T in I–III; T inversion in AVL V5–6; voltages normal	„ „
12	10.0	32	5,800	—	—	AA	+	Sinus rhythm; QRS axis +40°; flat T waves in all leads; LV preponderance	„ „
13	—	34	8,200	28	58	AA	—	Sinus rhythm; QRS axis –45°; T inversion in I–II, AVL V5–6; LVH	„ „

LVH = Left ventricular hypertrophy.

FIG. 4.—Chest x-rays of Case 2, showing (1965) cardiac enlargement, clear lung fields, and right pleural effusion. Heart size normal in 1967.

5 months after the onset of the illness, 7 have continued to attend the clinic for follow-up, and 5 had defaulted after varying periods of attendance. The 7 patients attending regularly for follow-up are in good health. The heart size in the majority of those who are still being followed up has now returned to normal (Fig. 4).

Necropsy (Case 11). Coxsackie virus group B type 4 was isolated from the stool of this patient. The significant necropsy and histopathological findings were reported as follows. Heart weight 170 g.; no evidence of pericarditis; moderate biventricular dilatation. The myocardium was not hypertrophied; the right ventricle measured 3 mm. in thickness and the left 9 mm. There was a patch of endocardial fibrosis, below the aortic valve, and in the left atrium. Histology revealed a thickened fibrous tissue in the left atrial endocardium; the myocardial fibres showed no lesion and there was no evidence of myocarditis.

DISCUSSION

The cases described in this paper are those of cardiac failure of unknown cause in Nigerian children below the age of 10 years. The essential features in these patients as a group are the history of fever in most instances at the onset of the illness, the cough, breathlessness, oedema, cardiomegaly, and gallop rhythm, S-T segment abnormalities in the electrocardiograms, and evidence of cardiac dilatation in the angiocardiograms. Apart from the cardiac enlargement which is present in all, the most constant clinical sign was the gallop rhythm. The presence of pyrexia in 7 patients may be of aetiological significance. Predominance of males over females has been observed in adults with this type of cardiomyopathy (Stuart and Hayes, 1963), but in this small series no conspicuous sex difference was observed.

There may be difficulty in clinical differentiation between idiopathic cardiomegaly, endomyocardial fibrosis, and endocardial fibro-elastosis. Two of the patients in this series (Cases 8 and 2) were pro-

visionally diagnosed as cases of nephrotic syndrome, and kwashiorkor, respectively. These 4 conditions, except endocardial fibro-elastosis, are common in our childhood population. In a typical established case of right-sided endomyocardial fibrosis, the diagnostic features are the gross ascites, minimal or absent dependent oedema, tricuspid incompetence, pericardial effusion, and cardiac enlargement due to dilated right atrium. Gallop rhythm is frequent, but not constant in this condition as is the case in idiopathic cardiomegaly with heart failure. Endocardial fibro-elastosis is generally a disease of infancy, usually presenting symptoms of heart failure within the first 6 months of life (Hill and Reilly, 1951; Blumberg and Lyon, 1952; Fisher, 1962). Furthermore, there is a very high incidence of associated congenital heart malformation in endocardial fibro-elastosis (Gowing, 1953). There can be no doubt that none of the patients in this series suffered with this disease. None of them was below the age of 9 months at the onset of the illness; nor was there any evidence of congenital cardiac malformation.

Other workers (Stuart and Hayes, 1963; Stein *et al.*, 1964) have reported frequent association of arrhythmias, thromboembolic phenomenon, and hypertension with some forms of idiopathic cardiomegaly. In the present study, none of these features was encountered.

Since the clinical description of these 13 patients and one necropsy finding do not provide any specific information on the aetiology and pathogenesis of the disorder, we can only speculate on these. Though all the patients in this series came from families with low socio-economic circumstances, malnutrition did not appear to play a significant role in the aetiology of the disease. There were only 4 patients who were judged to be moderately malnourished. However, it could not be ruled out that malnutrition might increase the susceptibility of the heart to injurious agents.

There is a possibility that infection might be the cause of heart disease in the present series, since

repeated exposure to a wide variety of infections and parasitic infestations would be inevitable in the environment. Viruses are known to produce both acute and chronic myocarditis (Silber, 1958; Hosier and Newton, 1958; Null and Castle, 1959), and it is possible that there were some instances of viral myocarditis. The pyrexia in the majority of the patients, the leucocytosis in 3, and leucopenia in 1 lend support to an infectious aetiology. Cocksackie virus group B type 4 was isolated from the stool of the only fatal case in the series, but this to us is no evidence for implicating the virus as the aetiological agent, particularly as the histopathology of the heart revealed no evidence of myocarditis.

Edington and Jackson have expressed the possibility that "heart muscle disease", presumably the same condition as we have described, and endomyocardial fibrosis are stages in one pathological process, implying that the latter is the end-result of heart muscle disease. The present study does not provide any direct evidence in support of this theory, but we concede that a much longer period of follow-up of patients with this condition is necessary to test the theory. Long-term careful studies of all children with idiopathic cardiomegaly are required to shed some light on the aetiology and natural history.

SUMMARY

The clinical, radiological, and electrocardiographic features of idiopathic cardiomegaly in 13 Nigerian children are described. In all the patients cardiac failure was present and the frequent presenting symptoms were fever, cough, and breathlessness. All the patients were normotensive. Gallop rhythm was constantly present. The electrocardiogram was abnormal in every patient, T wave inversion in the left chest leads being the most common abnormality. Angiocardiograms showed biventricular dilatation.

The differential diagnoses between idiopathic cardiomegaly, endomyocardial fibrosis, and endocardial fibro-elastosis are discussed.

The aetiology of idiopathic cardiomegaly is briefly considered.

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