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Hypertension and primary myocardial disease in congestive cardiac failure

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Summary

This study has tried to use end diastolic diameter the index of chamber dilatation to discriminate between hypertensive heart failure and diluted cardiomyopathy as both conditions are known to overlap in cases of congestive cardiac failure. The sensitivity, specificity and positive predictive value was 66.7%, 68% and 66.7% respectively. This means that alone, end diastolic diameter is not a very acute discriminator in cases where an overlap as shown in the figure occurs. It is therefore necessary to use all discriminatory indices in combination to get better accuracy.

Résumé

Au cours de cette étude il a été assaye d'utiliser le bout du diametal diastolique (EDD), l'indexe de dilatation de la chaimbre pour departager l'insufisance cardiaque hypertensive et la cardiomyopathie dilué (DCM), comme ces deux conditions sont reconnus de chevauché dans les cas d'insufisance cardiaque congestive. Les valeurs de sensitivité , specificité, et la valeur positive predictive a été de 66.7%, 68% et 66.7% respectivement. Ceci signifie que toute seule, l'EDD n'est pas un discriminateur tres precis dans les cas où un chevauchement survient tel qu'il est montre dans la figure. Il est par consequent necessaire d'utiliser une combinaison de tout les indices discrimatoire pour avoir une meilleure precision.

Introduction

Hypertension occurs commonly in cardiology practice and so does dilated cardiomyopathy (DCM). The latter follows primary myocardial disease of sufficient severity. That both may occur together, one in the background of the other is thus possible. This would be the category that Araoye and Olowoyeye [1] called hypertensive heart failure group II. The result of this chance coincidence would be increased cardiac morbidity by way of severe congestive cardiac failure (CCF). Heart failure in hypertensives is said to be rarely precipitated by hypertension only [2,3]. Abelmann's comment that the threshold for decompensation in a cardiomyopathic heart is lowered by the increased afterload presented by systemic hypertension becomes relevant here [4]. He went on to postulate that subclinical cardiomyopathy is the main underlying factor in cardiac decompensation of hypertensives without co-existing coronary heart disease. To explain why some individuals with hypertensive heart disease develop heart failure with hypertension and others do not, Ikeme [5] posited that in the latter myocardial damage already exists; and that the effects of hypertension and factors causing primary myocardial damage are additive. The later group stands to be mislabelled as DCM on first evaluation, with serious consequences in management if the background hypertension is overlooked.

The aim of this work therefore was to use echocardiography to differentiate between hypertensives and DCM patients in CCF, and to see how end diastolic diameter (EDD), a measure of dilatation, assists in predicting hypertension in cases labelled DCM.

Materials and methods

From January to October 1990, all patients consecutively admitted on the medical service of Jos University Teaching Hospital with a diagnosis of CCF secondary to DCM or hypertension were recruited. Diagnosis of the former was made when no obvious cause was found for the failure and patient showed typical features of DCM [6,7] at echocardiography. Diagnosis of the latter was made if there was hypertension detected clinically on admission. Blood pressure greater than or equal to 160/95 measured with a mercury sphygmomanometer was taken as hypertension [8].

A total of 50 patients with DCM and 48 with hypertensive heart failure were studied (See Table 1 for clinical data of the patients), 35 normal patients served as controls. All patients were subjected to full echocardiographic evaluation using a "Micro-imager 1000" machine with a 3.5 long focus transducer. Measurements were taken as defined in a previous standard work [9]. Some data were derived with standard formulae as follows [10]: mVcf = EDD-ESD/EDD x LVET and LVM = $[(EDD + LVPT)^3 - (EDD)^3] \times 1.05$. Data from all patients were analyzed using the Z test to test for statistically significant difference between means of similar data.

Table 1: Clinical data of patients

	Group A (DCM)	Group B
Number	50	48
Age	51.1 ± 2.6	51.3 ± 1.9
Sex ratio (m/f)	1 : 1	1: 1.2
Duration of failure (Mo)	22.1 ± 5.2	17.1 ± 4.6
Systolic BP (mm Hg)	107.7 ± 2.8	162.8 ± 4.3 *
Diastolic BP (mm Hg)	76.5 ± 1.6	114.9 ± 2.4 *

Data represent means of each group * SE of mean except number and sex ratio.
* implies statistically significant difference between means at $P < 0.001$.

Table 1 shows the demographic data of the patients.

Patients in both groups did not differ significantly regarding their ages and sex ratio. The only indices differentiating them significantly are systolic and diastolic blood pressures; these being higher in patients in hypertensive heart failure. The systolic BP range for the DCM group was 70 to 180 mm Hg and 110 to 236 mm Hg for the hypertensive group. The diastolic BPs ranged from 50 to 90 mm Hg for the DCM and hypertensive groups respectively.

Result

Table 2: Echocardiographic data of patients

Echo data	Group A (DCM)	Group B (BP)
EDD (mm)	59.9*1.2	54.3*1.05*
SV (ml)	47.4*2.8	48.6*3.1
SF %	12.7*0.89	17.5*1.3*
EF %	27.2*1.7	35.0*2.3
ST	9.6*0.38	12.6*0.53*
LVPT (mm)	13.0*0.39	15.6*0.63*
Sa (mm)	3.2*0.25	4.7*0.36*
Pa (mm)	4.1*0.27	4.5*0.35
Sv mm/s	14.9*1.1	21.1*1.3*
Pv (mm/s)	16.5*0.86	17.2*1.2
LA (mm)	45.3*1.1	43.9*0.96
Ao (mm)	30.5*0.58	30.4*0.49
mVcf (c/s)	0.62*0.04	0.76*0.05
LVM (g)	446.9*19.8	504.6*29.4
LA/Ao	1.5*0.04	1.5*0.04
LVPT/EDD	0.23*0.00	0.29*0.02*

Data represents mean ± S.E. of mean
* Implies statistically significant difference between mean at $P < 0.05$

KEY:
EDD — Ene diastolic exameter; SV — Stroke volume; SF - Shortening factor; EF - Ejection fraction; ST — Septal wall thickness; LVPT - Left ventricular posterior wall thickness; SV - Amplitude of septal motion; Pa - Amplitude of septal motion; Pa - Amplitude of posterior wall motion; Sv - Velocity of septal motion; Pv - Velocity of postenor wall motion; LA - Left atrial dimension; AO - Aortic root width; mVcf - mean velocity of circumferential fibre shortening; LVM- Left ventricular mass.

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Table 3: Echo data of 35 normal controls with regard to the seven indices where significant differences were observed between study groups A and B

Echo data	Mean ± SE
EDD (mm)	44.97 ± 0.98
SF %	33.59 ± 1.16
ST (mm)	7.68 ± 0.27
LVPT (mm)	10.44 ± 0.29
Sa (mm)	6.0 ± 0.37
Sv (mm/s)	21.39 ± 1.19
LVPT/EDD	0.24 ± 0.008

Discussion

In an environment where hypertension and DCM occur commonly among cardiac patients, an overlap of both conditions would be expected. Earlier workers however perceived the latter as the end stage of the former [11]. Later on, some DCM patients were suspected to be hypertensives in whom poor myocardial function precluded elevation of blood pressure; when with improving cardiac function, hypertension appeared [1,12,13]. From Table 1 it is evident that hypertension makes the difference between the two groups. The other variables did not differ to a significant extent between them. From Table 2, seven echo indices were shown to distinguish between both groups to a statistically significant extent. Compared with normal controls in this study, contractility indices: SF, Sa, and Sv fell across board for the study patients, more in DCM than the hypertensive group. This confirms that the patients were in heart failure. For EDD, there was cavity dilatation in both group compared with normals, more with DCM than the hypertensive group. This tendency to eccentric hypertrophy among hypertensives in heart failure has also been observed by other Nigerian workers [14]. Hypertension in the presence of primary myocardial disease (subclinical or otherwise) produces dilatation [15]. It may mean that most hearts in our environment are burdened by one form of myocardial disease or another.

Calculating the population mean EDD for hypertensives in CCF using the study sample mean ± 2 SE, it was found that some DCM cases fell into the hypertensive heart failure range and vice versa. This shows some measure of overlap between these cases. To calculate the accuracy of this index in differentiating between hypertensive heart failure and DCM, a 2 x 2 contingency table was used as shown below.

Table 4:

	Hypertensive EDD	DCM EDD	Total
Hypertensive heart failure	32	16	48
Dilated Cardiomyopathy	16	34	50
Total	48	50	98

Sensitivity	=	32/48 x 100	=	66.7%
Specificity	=	34/50 x 100	=	68%
Positive predictive value	=	32/48 x 100	=	66.7%

All the values are within the same range. EDD can in 66.7% or 2/3 of cases predict hypertensive heart disease from a group of DCM cases. It therefore means that there is more to diagnosing DCM than EDD. This is corroborated by the sensitivity and specificity of the index EDD in differentiating between both groups from a cohort of CCF patients. That there is an overlap is further shown when the specific EDD data points of all the patient are represented graphically (Fig. 1).

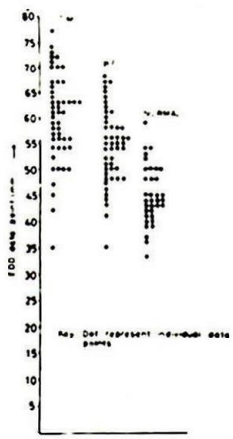

Fig. 1: The EDD point score for each patient in both study groups and controls is shown

There is a significant overlap of scores between patients in congestive heart failure due to hypertensive heart disease and dilated cardiomyopathy.

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