RIGHT AND LEFT VENTRICULAR DYSFUNCTION IN PATIENTS WITH CHRONIC LUNG DISEASE, ECHOCARDIOGRAPHIC STUDY

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Abstract

Aim: To evaluate right and left ventricular function in patients with chronic lung disease by echocardiography

Patients & methods: 50 patients with different chronic lung disease (obstructive, restrictive and vascular lung disease) admitted to the teaching hospital / Iraqi medical college were evaluated by clinical examination and investigations (Chest x-ray, ECG, Echocardiography and Pulse oximetry) to assess the right and left ventricular function in relation to chronic lung disease.

Results: The results in this study showed that 40 patients had obstructive lung disease, 7 patients had restrictive lung disease and 3 patients had vascular lung disease. 100% of the patients with vascular lung disease, 65% of the patients with obstructive lung disease and 42% of the patients with restrictive lung disease were diagnosed with right ventricular dysfunction which was inversely related to O_2 saturation LV dysfunction was rarely diagnosed in patients with chronic lung disease. It was also found that 59% of the patients diagnosed with RV dysfunction by echocardiography had shown ECG criteria of RVH on ECG examination.

Conclusion: Right ventricular dysfunction is common in patients with second stage chronic lung disease especially when O_2 saturation is >90%, the presence of left ventricular dysfunction is related to RV dysfunction through ventricular interdependence.

Keywords: Right and left ventricular dysfunction, chronic lung disease, Echocardiography.

Iraqi J Med Sci, 2004, Vol. 3 (1): 22-25

Introduction

More than half of the patients with chronic obstructive lung disease had Rt. V dysfunction especially those with ventilatory failure and worsening of pulmonary hypertension[1].

Corpulmonale occur in the setting of two distinct disorders, those associated with abnormal gas exchange where chronic obstructive lung disease is the leading cause and those associated with pulmonary vascular obstruction where primary pulmonary hypertension is the leading cause, and RV ischemia volume and pressure overload are involved in the pathogenesis of RV failure[2].

Despite potential limitations due to severe obstructive lung disease surface echocardiography imaging is feasible non invasive tool in this patient population to identity patients with evidence of corpulomonale that suggest pulmonary hypertension[3].

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Received 27th December 2003: Accepted 19th January 2004.

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In many patients with chronic lung disease (CLD), it has been shown that abnormal early LV systolic function is correlated with a decline in the RV function which deviate the inter ventricular septum and lower the left ventricular preload[4], LV dysfunction is seen more frequently with deterioration of respiratory function in patients with CLD[5] and recently it was found that nitrous oxide production is inversely related to the development of corpulmonale in patients with severe chronic obstructive pulmonary disease[6].

This study was conducted to evaluate RV and LV function in different respiratory disease in relation to O_2 saturation using echocardiography.

Patients & Methods

Cross section study of 50 patients with chronic lung disease admitted to Al-Kadhimiya Teaching Hospital in Baghdad was carried out from 1st March to 1st October 2002.

The patients included in this study were 27 male (54%) and 23 female (46%), the age range was from 12-80 years.

Clinical examination, pulmonary function test and chest x-ray were done for all the patients to evaluate the severity and type of the different CLD (obstructive, restrictive and vascular lung disease).

Right and left ventricular dysfunction was assessed by using ECG and echocardiography pulse oximetry, anon invasive method was used to assess the arterial oxygenation. O_2 saturation of 90% was considered equal to PO_2 60 mm Hg.

Results

In this study the spirometry results showed that 40 patients (80%) had obstructive lung disease, 7 patients (14%) had restrictive pattern of the lung disease and only 3 patients (6%) had vascular lung disease (Table1).

Table 1: Types of chronic lung diseases

Chronic lung disease	Patients	
	No.	%
Vascular	3	6
Obstructive	40	80
Restrictive	7	14

26 patients out of the 40 patients with obstructive lung disease were diagnosed with Rt. V dysfunction on echocardiography examination, and 25 of them (96%) had O_2 saturation <90% whereas 3 patients out of the 7 patients with restrictive lung disease were diagnosed with Rt. V dysfunction and 3 of them (100%) had O_2 saturation <90%, similarly 3 patients with vascular lung disease had Rt. V dysfunction but only one of these patients (33.3%) had O_2 saturation >90% (Table 2a).

Table 2a: O_2 saturation and Rt. V. dysfunction in chronic lung disease

Chronic lung disease	No.	Rt. V dysfunction	O_2 <90%
Vascular	3	3 (100%)	1 (33.3%)
Obstructive	40	26 (65%)	25 (96%)
Restrictive	7	3 (42%)	3 (100%)
Total	50	32 (64%)	29 (91%)

The rest of the patients with obstructive lung disease (14) had no Rt. V dysfunction and 9 of them (64%) had O_2 saturation >90%, also the rest of the patients with restrictive lung disease (4) had no R.V. dysfunction and 3 of them (75%) had O_2 saturation >90% (Table 2b).

Table 2b: O_2 saturation in chronic lung disease without Rt. V dysfunction

Chronic lung disease	No.	Without Rt. V dysfunction	O_2 <90%
Vascular	3	0	0
Obstructive	40	14 (35%)	9 (64%)
Restrictive	7	4 (57%)	3(75%)
Total	50	18 (36%)	12 (67%)

So that means 65% of the patients with obstructive lung disease had Rt. V dysfunction, 42% of the patients with restrictive lung disease had Rt. V dysfunction and 100%of the restrictive lung disease had Rt. V dysfunction (Table 2a & 2b).
The results in this study also showed that none of the patients with restrictive lung disease or with vascular lung disease had Lt. V dysfunction but one patient only with restrictive lung disease (25%) had Lt. V dysfunction (Table 3).

Table 3: Prevalence of Lt. V dysfunction in chronic lung disease

Chronic lung disease	No.	Lt. V dysfunction
Vascular	3	0
Obstructive	40	1 (2.5%)
Restrictive	7	0

Both Rt. & Lt. ventricular dysfunction was found in 5 patients with obstructive lung disease (12.5%), similarly it was found in one patient with restrictive lung disease (14.3%) and in one patient (33.3%) with vascular lung disease (Table 4).

Table 4: Association of Rt. V & Lt. V dysfunction in chronic lung disease

Chronic lung disease	No.	RVH by ECG
Vascular	3	1 (33.3%)
Obstructive	40	5 (12.5%)
Restrictive	7	1 (14.3%)

RVH criteria was found in ECG of all the patients with vascular lung disease diagnosed with RVH on echocardiography, also14 patients with obstructive lung disease (54%) diagnosed with RVH on echocardiography had RVH criteria on ECG examination and similarly 2 patients with restrictive lung disease (67%) diagnosed with RVH on echocardiography had RVH criteria on ECG examination (Table 5).

Table 5: Association between Echo and ECG criteria in detecting RVH

Chronic lung disease	RVH by Echo	RVH by ECG
Vascular	3	3 (100%)
Obstructive	26	14 (54%)
Restrictive	3	2 (67%)
Total	32	19 (59%)

Discussion

Although cur culminate is not uncommon. The prevalence of right ventricular dysfunction in patients with severe pulmonary disease remains uncertain likewise the prevalence of left ventricular dysfunction in advanced lung disease is not known and the concept of Lt. V dysfunction caused by Rt. V dysfunction is controversial.

The presence of R.V. dysfunction is correlated with O_2 saturation since hypoxia is one of the major determinants of pulmonary hypertension[7]. In this study O_2 saturation >90% was shown in 29 patients out of 32 patients (91%) with Rt. V dysfunction, this was clearly seen in patients with obstructive & restrictive lung disease but less evident in patients with vascular lung disease. This goes with Vizza study[8] in which patients with pulmonary hypertension had higher O_2 saturation. However 12 patients out of 18 patients had no Rt. V dysfunction (67%) also showed higher O_2 saturation.

This is explained by haemodynamic profile between pulmonary hypertension and parenchymal lung disease[9], In contrast to right ventricular dysfunction left ventricular dysfunction was rarely present in patients with CLD, this is similar to other studies[10] which showed that Lt. V dysfunction occur infrequently. The presence of Lt. V dysfunction without Rt. V dysfunction is unusual in patients with advancing lung disease and primary cardiovascular disease should be considered when Lt. V dysfunction is out of proportion to the degree of Rt. V dysfunction[11].

Both Rt. V and Lt. V dysfunction are present in 7 patients with CLD. This relationship between Rt. and Lt. ventricular function suggest ventricular interdependence when R.V. dilation can compromise left ventricular function by shifting the interventricular septum[5]. In this study 19 patients out of 32 patients with Rt. V dysfunction (59%) had ECG criteria of RVH where the sensitivity for RVH was 64%, which is higher than the results of Inzaizi study where the sensitivity for RVH was 44%. This difference may reflect the severity of Rt. V dysfunction in our patients.

Conclusions

1. Rt. V dysfunction is common in patients with end stage chronic lung disease specially those with O_2 saturation is < 90%.
2. Lt. V dysfunction is rare in patients with CLD.
3. Rt. V and Lt. V dysfunction probably reflect ventricular interdependence.
4. Patients with ECG criteria of RVH is more likely to have RVH by
5. Echocardiography especially in those with vascular lung disease.

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