Letters and Replies

Does E/A ratio correctly estimate diastolic dysfunction in patients with chronic renal failure?

Sir,

In the December 1999 issue of NDT, Klingbeil and Schmieder [1] presented an editorial comment on left ventricular hypertrophy (LVH) in chronic renal failure (CRF). Diastolic dysfunction due to LVH and some other factors is a common finding in these patients. We agree that ratio of early to late diastolic filling (E/A) is the most common parameter used for estimation of diastolic function in clinical practice. However, patients with CRF commonly have anaemia and haemorheological abnormalities which can influence on diastolic filling. Therefore, the question is whether the E/A ratio is a correct parameter to use in this situation?

We studied 32 non-diabetic pre-dialysis patients (13 M, 19 F, mean age 47.4±11.6 years) without clinical evidence of severe heart failure (III–IV class on NYHA). Twenty-eight (87.5%) patients had arterial hypertension (≥140 and 90 mmHg). Mean (+SD) systolic blood pressure was 168±28 and diastolic blood pressure 101±14 mmHg. Serum creatinine was 281±168 μmol/l and haemoglobin 12.2±1.9 (range 7.5–16.0) g/dl. The patients did not receive erythropoietin. Eighteen age and sex-matched health subjects were studied (control group). Diastolic filling parameters were measured with pulsed Doppler echocardiography with a 3.5 MHz transducer (Aloka SSD-2000). Measurements were made in the standard apical four-chamber view with the patients in the left decubitus position. Early and atrial peak filling velocities (VmaxE and VmaxA) were measured and their ratio (E/A) was calculated. Early deceleration time and isovolumic relaxation time (IVRT) were measured too. LVH (left ventricular mass index ≥110 g/m² for women and ≥135 g/m² for men) was detected in 25 (78.1%) patients. Ejection fraction was 59.6±7.55%. VmaxE was 0.63±0.13 m/s (control 0.71±0.13 m/s, P=0.02), VmaxA 0.65±0.19 m/s (control 0.48±0.11 m/s, P<0.001) and E/A 1.02±0.31 (control 1.51±0.28, P<0.001). E/A ratio <1.0 was detected in 12 (37.5%) patients. Multiple regression analysis (independent variables were age, gender, body mass index, left ventricular mass index, serum creatinine and haemoglobin concentration) showed an inverse correlation between haemoglobin concentration and VmaxE (P=0.02). There was no significant relationship between VmaxA and haemoglobin (P=0.86) [R²=0.39]. In this connection the E/A ratio would increase and would not reflect the real degree of diastolic dysfunction in patients with CRF and anaemia. Diastolic dysfunction in patients with CRF is a combination of relaxation and compliance abnormalities. Echocardiographic indices are strongly dependent on pre-load [2] and an increase in atrial pressure can increase early diastolic filling and accelerate relaxation [3]. However, IVRT was significantly higher in these patients than in the control group (108.9±26.9 vs 72.6±16.2 ms, respectively, P<0.001) and there was a positive correlation with LVMi (P=0.04) [R²=0.36].

It is known that anaemia is a strong predictor of development of LVH and morbidity and mortality in end-stage renal disease [4]. The recent practice guidelines for treatment of anaemia in chronic renal failure recommended a target haemoglobin of 11–12 g/dl [5]. However, this target is lower than the average haemoglobin concentration of the health population. In this connection the statement that ‘... an impaired LV filling is the diagnostic criteria that favours the diagnosis ‘pathologic’ LV hypertrophy (decreased E/A ratio, i.e. the ratio of early to late diastolic filling) …’ [1] is right, but the E/A ratio may not be an entirely adequate parameter in patients with CRF.

We conclude that the E/A ratio does not reflect the real situation of diastolic function in patients with CRF and anaemia and that we may actually underestimate diastolic dysfunction in this clinical situation. Other parameters such as IVRT should not be ignored.

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1. Klingbeil AU, Schmieder RE. Not all left ventricular hypertrophy is created equal. Nephrol Dial Transplant 1999; 14: 2803–2805

Reply

Sir,

In their letter Shutov et al. raise the question whether the E/A ratio gives a correct estimate of left ventricular diastolic function in patients with chronic renal failure, if chronic anaemia coexists. Our editorial comment focused on the different types of morphology in left ventricular hypertrophy (LVH), with special regard to LVH in end-stage renal disease (ESRD) [1]. Alterations in diastolic function due to LVH have not yet been extensively analysed in the specific population of patients with ESRD. Thus, possible effects of anaemia on diastolic function cannot be ruled out.

Shutov et al. present echocardiographic data of 32 patients with chronic renal insufficiency with a wide range of serum creatinine and haemoglobin concentrations in comparison to 18 controls. They found a significant reduction of E/A ratio in their patients pointing to an abnormal diastolic filling of the left ventricle. Since the maximal inflow velocity of passive diastolic filling (VmaxE) is inversely correlated to hemoglobin level (but not the maximal inflow velocity of atrial diastolic filling, VmaxA), they conclude that E/A ratio overestimates diastolic function in anaemic patients with chronic renal failure (CRF).

Unfortunately, Shutov et al. do not report the correlation coefficient for haemoglobin concentration and VmaxE. Therefore the importance of such an association cannot be judged. Furthermore, if the E/A ratio for estimating diastolic function is the matter of debate, the correlation between
haemoglobin concentration and E/A ratio should be calculated. This correlation is not reported in the letter.

Now, does chronic anaemia influence diastolic function? Bahl et al. examined 31 patients with severe chronic anaemia (haemoglobin level less than 7 g/dl) of non-renal origin and 31 controls. Despite a slightly higher maximal inflow velocity of passive diastolic filling (\(V_{\text{maxE}}\)) in patients the E/A ratio was not different between patients and controls [2]. Similarly Josephs et al. reported no influence of anaemia on the E/A ratio in 50 patients with ESRD [3].

In conclusion, the use of E/A ratio for estimating diastolic filling of the left ventricle seems still to be warranted in patients with CRF. Nevertheless, further investigations are needed to delineate the potential role of secondary hyperparathyroidism, anaemia and left ventricular mass on diastolic filling parameters of the left ventricle in patients with CRF.

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1. Klingbeil AU, Schmieder RE. Not all left ventricular hypertrophy is created equal. Nephrol Dial Transplant 1999; 14: 2803–2805