Left ventricular mass in normotensive subjects with autosomal dominant polycystic kidney disease

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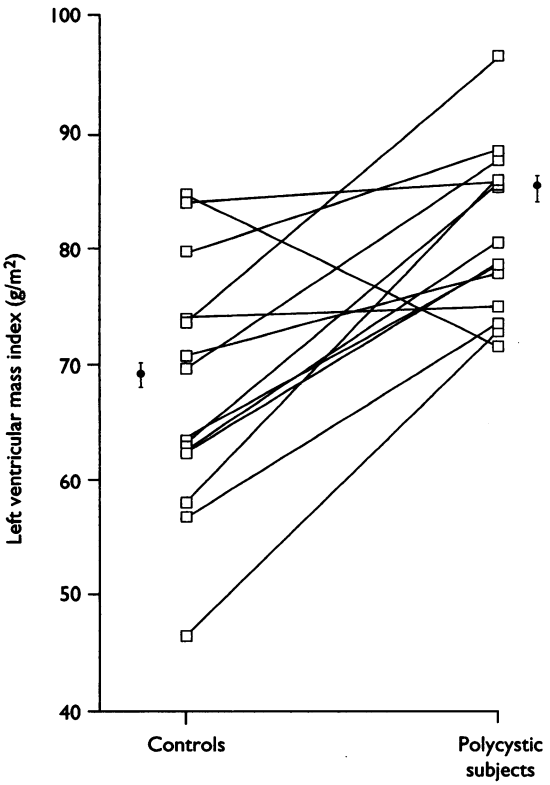
Autosomal dominant polycystic kidney disease increases the risk of premature cardiovascular disease and sudden death.[1] One possible mechanism may be left ventricular hypertrophy, which exacerbates cardiac risk in patients with other types of disease. We assessed whether disproportionate cardiac hypertrophy occurs in polycystic kidney disease.

Subjects, methods, and results

Asymptomatic, untreated subjects with normal renal function and no history of hypertension were selected from our polycystic register. Fourteen out of 23 eligible white subjects were recruited (10 women and four men, mean age 32 (SD 12) years (range 16-55), mean supine blood pressure 122/76 mm Hg (range 144-103/86-59)). These were age and sex matched with 14 unrelated, white, healthy volunteers (mean age 33 (SD 13) years (range 18-58), mean blood pressure 116/70 mm Hg (range 140-89/86-60)). All subjects had a serum creatinine concentration below 120 μmol/l and a creatinine clearance above 80 ml/min. The study was approved by the hospital ethics committee.

Subjects were studied on their usual diets. They collected a urine sample over 24 hours for determination of electrolyte and creatinine concentrations. Blood pressure was the mean of five readings with an ultrasound sphygmomanometer (Arteriosonde, Roche). Blood was taken for measurement of plasma renin activity and concentrations of aldosterone and angiotensin II after subjects had been sitting for 10 minutes. Echocardiograms (Hewlett Packard, 2·5 MHz transducer) were read by two cardiologists blinded to clinical details. Left ventricular mass index was calculated using the American Society of Echocardiography convention corrected for body surface area. Data, expressed as geometric means (SD), were analysed, after log transformation if appropriate, using Student's *t* test for paired observations. Correlations were assessed by linear regression.



Left ventricular mass index in 14 matched controls and polycystic subjects, with mean (SD) values in both groups

Left ventricular mass index was 23% greater (95% confidence interval 11 to 34) in the polycystic subjects (81 (7)) than in the controls (68 (11), $P<0·01$; figure), an increase not explained by differences in body surface area, renal function, physical activity, or race. No subject had any cardiac valvar defects, and there were no significant differences in urinary sodium excretion over 24 hours, renin activity, or concentrations of aldosterone, natriuretic peptide, or angiotensin II between the groups (data not shown). Blood pressure was higher in the polycystic subjects (122/76 (12/9) mm Hg) than the controls (116/70 (17/8) mm Hg; $P=0·22/0·06$), but it did not correlate with ventricular mass index in either group. There was no relation between absolute or percentage differences in blood pressure and ventricular mass index between the groups.

Comment

We found an increased left ventricular mass index in normotensive subjects with polycystic kidney disease and normal renal function compared with controls. Some previous studies of left ventricular mass in adults with polycystic kidney disease have been confounded by poor matching of controls or by a history of hypertension with or without renal impairment,[2,3] conditions which can increase ventricular mass. As our polycystic subjects had slightly raised blood pressure we calculated the expected increase in left ventricular mass index. For a 10 mm Hg increase in systolic pressure this was 4%[4] and for a 6 mm Hg increase in systolic or diastolic pressure 2·2% (1% to 3%) and 4·5% (3% to 6%) respectively.[5]

This small difference in blood pressure therefore probably does not explain the large increase in ventricular mass index. As we did not measure ambulatory blood pressure, we cannot exclude a role for differences in diurnal blood pressure as explanation for our findings. No differences in circadian blood pressure were found however, in young, non-uraemic polycystic patients.[2]

Activation of the renin system may lead to ventricular enlargement. In our study, however, there was no difference in sodium intake or in the activity of the renin system between the groups. An alternative mechanism for the increase is the defect of extracellular matrix that is believed to occur in polycystic kidney disease.

Since left ventricular hypertrophy is associated with ventricular ectopy, even in normotensive patients, our finding of a large increase in left ventricular mass in normotensive polycystic subjects early in the course of the disease provides a possible mechanism for sudden cardiac death in this common disease and reinforces the need for early assessment of possible risk factors in subjects at risk within affected families.

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Do asthmatic patients correctly record home spirometry measurements?

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Asthma diary cards for entering measurements of peak expiratory flow and subjective symptom scores are widely used in clinical trials[1] and have been recommended for guiding management.[2] We compared the record keeping of peak expiratory flow and spirometry measurements of two groups of patients with asthma, with only one group knowing that all data, including time and date, were being electronically recorded and stored by the spirometers.

Patients, methods, and results

We recruited 33 adults with asthma (16 men; mean age 52 (range 19-78); mean peak expiratory flow before use of bronchodilator 58% predicted (35 to 117%)) from the chest clinic of Guy's Hospital. All patients were receiving inhaled steroids and β_2 sympathomimetic agents.

Patients randomly received either a hand held spirometer (with, unknown to the patient, electronic recording and storage) plus conventional diary card or a combined electronic spirometer and diary card.[3] Patients were asked to record peak expiratory flow, forced expiratory volume in one second, and forced vital capacity twice daily at prearranged times for eight weeks. The electronic diary card spirometers incorporated an alarm, which reminded patients to take the measurements; we suggested to the patients with conventional diary cards that they could use an alarm clock as a prompt. Patients with conventional diary cards copied the results displayed on their spirometers into their diaries by hand. Patients with electronic diary card spirometers were told that their data were being recorded electronically and did not keep a written record of results. Six of the 16 patients with conventional diary cards and one of the 17 patients with electronic diaries withdrew from the study in the first week (six because of lack of time, one because of admission to hospital). The remaining 26 patients completed the study. We compared entries on the conventional diary cards with the data held electronically to identify incorrect manual entries.

The table shows the proportion of entries for which no corresponding data were recorded with the spirometer (invented entries) and the proportion of entries made more than six hours after or before the correct time (mistimed entries). Completed entries (as a proportion of the expected total) and the accuracy of timing were significantly greater in the patients with electronic diary cards than in those with conventional cards ($P<0.05$ and $P<0.001$ respectively; Mann-Whitney U test).

Incorrect entries on conventional asthma diary cards and accuracy of timing in recording peak expiratory flow and spirometry in 26 subjects with conventional or electronic diary cards

	Conventional diary card (n=10)			Electronic diary card (n=16)		
	Mean	Median	Interquartile range	Mean	Median	Interquartile range
Completed entries as % of expected total	70	61	58 to 92	86	94	64 to 100
% Of completed entries that were incorrect:						
Invented*	4	1	0 to 8	NA	NA	NA
Mistimed†	22	10	1 to 38	NA	NA	NA
Invented or mistimed	26	14	2 to 38	NA	NA	NA
Maximum error in timing (h)‡	5·6	5·4	5 to 8	1·7	1·9	1 to 2

*Entries for which no corresponding data were recorded with spirometer.
†Entries made more than six hours after or before the correct time.
‡Excluding entries mistimed by more than 12 hours.

Comment

Previous studies on the accuracy of diaries have been hampered by the lack of an objective measurement of time and date of entries and by the investigators not knowing whether measurements such as peak expiratory flow had been really measured or just invented by the patient.[4,5] Using a spirometer with hidden memory allowed us to show the frequency of invented entries. In patients with conventional diary cards about a quarter of entries were either invented or mistimed, a proportion similar to that which we obtained in a preliminary study lasting one week.[3] The rationale behind inventing data or entering data retrospectively may be patients' reluctance to admit poor record keeping. The most striking example to support this is the patient who performed 54 forced expirations in three hours on one day and entered these data retrospectively for the previous six days. Patients' awareness that their results are being recorded electronically might be expected to discourage them from entering data retrospectively, and we found a significantly greater proportion of completed entries and greater accuracy of timing of recordings in patients with electronic diary cards.

In conclusion, conventional asthma diary cards contain a high number of invented and retrospective entries. Electronic recording with a combined spirometer and diary prevents invented entries and identifies mistimed entries. Furthermore, a higher proportion of measurements are completed, and accuracy of the timing of measurements is improved. Cost may initially prevent widespread use of electronic recording in routine therapeutic monitoring but in clinical trials is likely to be offset by more accurate data.[1]

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