Weight reduction in a blood pressure clinic

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Summary and conclusions

Forty-nine hypertensive patients who were overweight were randomly allocated to one of three strategies for attaining weight reduction and were followed for one year. Those referred to a dietitian lost more weight (mean 5.1 kg) than those given a diet sheet (mean 2.64 kg) or simply advised by the doctor to reduce weight (mean 2.15 kg). One-third of all the patients lost 6 kg or more.

Successful weight loss was associated with a highly significant and substantial improvement in blood pressure control and with less frequent increases in anti-hypertensive treatment.

Introduction

Body weight and blood pressure have been correlated consistently in several population and clinical studies,¹ but only recently has it been shown clearly that short-term weight loss substantially reduces blood pressure independently of dietary sodium intake.²⁻⁶ Successful weight reduction is therefore an effective, cheap, and safe treatment, or adjunct to treatment, of hypertension. The outstanding problem is how to achieve effective weight reduction.⁶⁻⁷ Methods used by individual doctors in the Glasgow Blood Pressure Clinic include referring the patient to the hospital dietitian, giving him a diet sheet, or simply advising him to lose weight. These methods vary considerably in expense and inconvenience to patients, and we compared their efficacy prospectively.

Patients and methods

Four clinicians agreed to allocate patients attending the Glasgow Blood Pressure Clinic⁸ to one of three weight-reducing regimens in random fashion. Patients were included if they were overweight (on clinical judgment), had not attended a dietitian within six months, and did not need a specific diet—for example, for diabetes. The three weight-reducing methods were:

Advice only—The doctor asked the patient to lose weight, giving whatever advice and encouragement he wanted, but using neither a diet sheet nor the services of a dietitian.

Diet sheet—The patient was given a sheet detailing the approximate calorie content of many items of food and was asked to follow a diet providing 3.3 MJ (800 kcal) daily. The doctor instructed the patient on how to use the diet sheet.

Dietitian—The patient was referred to the hospital dietitian by a standard letter giving the diagnosis (hypertension) and the height and weight, and requesting that a 3.3 MJ (800 kcal) weight-reducing diet be prescribed. The methods used and follow-up in the dietetic clinic were left entirely to the discretion of the dietitians, who were not aware of this study.

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The physicians were allowed to suggest a target weight if they wished, and to offer encouragement freely at review visits. Advice on dietary salt intake was not given.

Follow-up—Management during the year of follow-up was entirely routine, and data were obtained by the standard methods used in the clinic.⁸ The patients' details were taken from the proforma completed at the first clinic attendance; initial weight, blood pressure, and treatment from the document for the date of randomisation; and end-point data at the attendance nearest to one year after randomisation, within 9-15 months.

Measurements and analysis—Weight was measured routinely in the clinics after outdoor clothing had been removed. Blood pressure was measured with a standard cuff (12.7 × 22.9 cm) and mercury sphygmomanometer when the patient was recumbent. In two-thirds of the patients readings were made by a trained nurse who was unaware of the study using a London School of Hygiene sphygmomanometer. Average body weight for sex, height, and age was obtained from tables of the Society of Actuaries Build and Blood Pressure Study.⁹ The results were analysed with the Mann-Whitney U test for comparison of means and the Spearman rank coefficient (r_s) for correlations.¹⁰ Significance levels are for two-tailed tests.

Results

Of the 67 patients included in the study seven defaulted, two were discharged, and nine had no examination at 9 to 15 months, leaving 49 for analysis. These patients had a mean body weight 15.7%, above average and a mean recumbent blood pressure of 166.8/102.3 mm Hg. Ten were untreated, the remaining 39 taking on average 1.9 anti-hypertensive drugs. Twelve patients entered the study within a month of first attending the clinic. The other 37 patients had attended for a mean of 28 months, during which time their weight had increased by an average of 1.24 kg.

The three treatment groups did not differ significantly in sex, age, weight, height, percentage weight above average, number of patients lost from the study, or duration of follow-up; but they were ill-matched for blood pressure at the time of randomisation. Patients who were given only advice had a higher mean diastolic pressure than the others, and a higher systolic pressure than those referred to the dietitian (all $P < 0.05$).

Over the year 37 patients lost weight, six gained weight, and six remained constant. Weight fell by a mean of 3.2 kg in all 49 patients. Patients referred to a dietitian lost significantly more weight than patients given advice only ($P < 0.05$; table I). Their weight loss was also significantly greater than that of the two other groups (advice and diet sheet) combined ($P < 0.03$). Changes in blood pressure over the year were not significantly different in the three groups, but anti-hypertensive treatment was increased more often in those given only advice.

Data on blood pressure or treatment were incomplete in three patients, leaving 46 for analysis. These patients were divided arbitrarily into two groups (table II): the 23 who lost under 3 kg, and the 23 who lost 3 kg or more. Blood pressure fell by 16.7/8.4 mm Hg in those who lost 3 kg or more compared with a fall of 2.2/1.5 mm Hg ($P =$

TABLE I—Changes in the three treatment groups one year after randomisation

	Advice only	Diet sheet	Dietitian
No of patients	20	14	15
Duration of follow-up (months)	12.7	12.4	12.9
Weight change (kg)	-2.15 (+5 to -9)	-2.64 (+8 to -11)	-5.10* (0 to -15)
Change in blood pressure (mm Hg):			
Systolic	-11.2	-5.7	-11.9
Diastolic	-5.3	-3.0	-6.9
Treatment increased	10	1	3
Treatment decreased	3	1	2
Change in number of drugs per patient	+0.35	-0.14	+0.08

* $P < 0.05$ versus advice only group.

TABLE II—Changes in blood pressure and antihypertensive treatment related to weight loss at one year

Weight loss:	<3 kg	≥3 kg
No of patients	23	23
Weight change (kg)	+0.04	-6.04
Patients whose treatment was changed		
Treatment increased	9	4
Treatment decreased	2	4
Change in No of drugs per patient	+0.30	-0.04
Change in blood pressure (mm Hg)		
Systolic	-2.2	-16.7*
Diastolic	-1.5	-8.4*
Patients whose treatment was not changed	12	15
Change in blood pressure:		
Systolic	+6.3	-16.4*
Diastolic	+4.0	-11.3*

*P<0.01; †P<0.002 versus patients losing <3 kg.

0.01 for both systole and diastole) in those losing less than 3 kg. This apparent benefit from weight loss was achieved despite fewer increases, and more frequent reductions, in antihypertensive treatment (table II).

Among the 27 patients in whom antihypertensive treatment remained constant over the year there were highly significant correlations between weight loss and falls in systolic and diastolic blood pressure ($r_s=0.54$, $P<0.01$; and $r_s=0.57$, $P=0.005$, respectively). These correlations were not attributable to observer bias, as they remained significant when measurements with the London School of Hygiene sphygmomanometer were considered alone, or to improved compliance resulting from attendance at the dietetic clinic, since they were significant in the other two treatment groups. Regression equations calculated from the results of all 27 patients (see figure) showed that when treatment was unaltered an unchanged weight was associated with an increase in blood pressure of 2.7/0.9 mm Hg over the year, and reduction of body weight was associated with an average fall of 2.5/1.5 mm Hg per kg of weight loss. The correlations were low, however, so wide variation around these means would be expected.

No factor other than referral to a dietitian related significantly to weight loss.

Changes in blood pressure related to changes in body weight over one year in 27 hypertensive patients in whom antihypertensive treatment was unaltered. For systolic pressure: $y=2.66+2.52x$; Pearson's $r=0.43$; $P<0.05$. For diastolic pressure: $y=0.86+1.51x$; Pearson's $r=0.47$; $P<0.02$.

Discussion

Most doctors pay at least lip-service to the desirability of controlling obesity in hypertension, but they are rarely enthusiastic, and the results seem limited. There is a feeling that any fall in blood pressure due to weight reduction is relatively small and of little relevance to patients with moderate or severe hypertension, who will in any event need drug treatment. Obesity also tends to be regarded as untreatable.

Our results show that weight reduction by an average of 6 kg was associated with a highly significant improvement in blood pressure control, despite fewer increases in antihyperten-

sive treatment. When treatment was unchanged the net gain in blood pressure control was 22.7/15.3 mm Hg in those who lost weight when compared with the change in patients who did not reduce weight. The highly significant correlations between weight loss and fall in blood pressure could not be ascribed to observer bias or to encouragement by a dietitian. The regression equations predicted a blood pressure fall of 2.5/1.5 mm Hg per kg weight loss—that is, a fall of 25/15 mm Hg for a reduction of 10 kg. This is comparable to the fall of 18/13 mm Hg with an 8 kg reduction observed in the Evans County study,² but less than the falls observed in a recent study by Reisin *et al.*⁶ They described reductions in blood pressure of 26/20 mm Hg with 8.8 kg weight loss in untreated patients, and 37/23 mm Hg with 9.8 kg weight loss in patients under treatment with antihypertensive drugs. Changes of this magnitude cannot be explained by measurement error related to arm circumference.⁶ There is little error in measuring blood pressure, even in fat arms, provided the cuff is over 12 cm wide,¹¹ as it was in our study. Our data might be interpreted as indicating that patients who comply well with dietary advice also comply well with antihypertensive treatment, and thus achieve better blood pressure control, but this explanation cannot apply where similar results have been attained in untreated patients.^{2,6} There seems little doubt that successful weight reduction can achieve a substantial fall in blood pressure.

The results also show that a nihilistic attitude to weight reduction is not justified. Intervention of any kind had some effect; the mean reduction in weight in these patients, who had not lost weight before the study, was 3.2 kg, and one-third of the patients had lost 6 kg or more one year after randomisation. The fact that patients referred to a dietitian fared significantly better than those managed by simpler methods cannot be ascribed to bias or to special efforts by the dietitians, since they were unaware that their results were under scrutiny. The results did not provide direct evidence that intervention by a dietitian improved blood pressure control, largely because of a chance mismatching of the groups as regards initial blood pressure; but the correlations discussed above suggest that this would emerge with further study. Conclusions must be guarded in view of the small number of patients studied, but the results indicate that the dietitian may have a useful role in the management of hypertension. If doctors and dietitians were fully aware of the substantial hypotensive action of weight reduction, and could impart this knowledge to their patients, the results of treating obesity in hypertensive patients might well be improved.

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