The relation between alcohol consumption and blood pressure is well recognized, and advice to reduce alcohol plays an important part in the management of hypertensive patients. We have evaluated the effectiveness of this advice in a randomized, controlled, single-blind clinical study. After a 2-week run-in period, hypertensive men regularly consuming more than 20 units/wk (1 unit = 10 g) of alcohol were randomly assigned either to the "advice" or control group and were seen at 2-week intervals over an 8-week study period. The outcome measures were: reported alcohol consumption (1-week retrospective diary), markers of alcohol consumption (serum y-glutamyl transpeptidase, aspartate aminotransferase, uric acid, mean corpuscular volume), and blood pressure (sitting and standing). Over 18 months, 67 men who drank more than 20 units/wk of alcohol were seen. Twenty-six either were excluded, refused to participate, or dropped out due to nonattendance. Forty-one patients completed the study. After intervention, reported alcohol consumption fell from 60 units/wk to around 30 units/wk in the advice group, whereas it remained between 50 and 60 units/wk in the control group (analysis of variance [ANOVA] \( F = 7.1, p < 0.05 \)). This was accompanied by falls in y-glutamyl transpeptidase (20.9%) and aspartate aminotransferase (18.1%), but no significant changes were seen in the control group. Standing diastolic blood pressure fell significantly in the advice group (from 101.5 mm Hg to 96.3 mm Hg) compared with the control group (ANOVA \( F = 4.8, p < 0.05 \)). The results suggest that advice to reduce alcohol consumption is a useful form of treatment for hypertensive patients who drink excessively. (Hypertension 1992;19:79-84)

There is a clear relation between alcohol consumption and raised blood pressure (BP) in epidemiological studies.\(^1\)\(^-\)\(^4\) Controlled clinical studies have demonstrated that a reduction of alcohol intake reduces BP, but in these studies, consumption was carefully regulated either by admission to hospital or by provision of low-alcohol beer to well-motivated volunteers.\(^5\)\(^-\)\(^7\) In clinical practice, such methods are not practical, and the principal method of controlling alcohol consumption relies on advice to the patient from the physician to reduce alcohol intake. Such advice has been given as part of a package of nonpharmacological treatment of hypertension, but the reduction in alcohol consumption seen in the treatment group was similar to that in the control group.\(^8\) Specific advice to reduce alcohol appears to be useful in problem drinkers,\(^9\)\(^-\)\(^11\) but there is little evidence on the effectiveness of this form of treatment in hypertensive patients who consume excessive amounts of alcohol. We have therefore carried out a randomized, controlled, single-blind clinical trial using a parallel group design to evaluate the effectiveness of advice to reduce alcohol consumption in hypertensive men who drink excessively. The primary aim was to see if such advice reduced alcohol consumption, as evaluated by reported alcohol intake and by markers of alcohol consumption (y-glutamyl transpeptidase [y-GT], aspartate aminotransferase [AST], red blood cell mean corpuscular volume [MCV], and serum uric acid),\(^12\) and the secondary aim was to examine the effect of this advice on BP.

**Methods**

**Patient Selection**

Patients were recruited over an 18-month period from the hypertension clinic at Dudley Road Hospital. General practitioners in the district were notified of the study and were asked to refer suitable patients. Men of all ages who regularly consumed more than 20 units of alcohol per week were included. Women were excluded because of the small number anticipated. Treated (on antihypertensive treatment for at least 1 month) and untreated patients were included. Patients whose diastolic BP exceeded 105 mm Hg at the time of recruitment were excluded. A minimum...
diastolic BP was not set as a requirement for inclusion in the study since all patients had been considered to be hypertensive at some stage, either in the clinic or by their general practitioners. In clinical practice, these patients would routinely be asked to reduce alcohol, and it was thus important to study the effectiveness of advice in such patients.

Patients with diabetes mellitus and those with known or suspected secondary causes of hypertension were excluded. Patients diagnosed as having alcoholism were also excluded; a working definition of alcoholism was used: any patient who had a problem with alcohol requiring referral to an alcohol addiction unit for admission and detoxification. Patients who had received advice previously and had reported reducing their alcohol consumption were also not included in this study.

Study Design and Sample Size

A randomized, controlled, single-blind, parallel group study design with a 2-week run-in period and an 8-week study period was used; patients were seen at 2-week intervals. The study had been approved by the hospital ethical committee, and informed consent was obtained from all patients. When this study was designed, there were no comparable published studies from which an expected reduction in alcohol consumption could be deduced, and the sample size for the primary aim could not therefore be estimated. Forty-two patients in total (21 patients in each group) were required for a difference of 6 mm Hg in diastolic BP to be significant between the two groups at the 5% level. It was anticipated that there would not be a sufficient number of patients from a single center trial to achieve sufficient power for the study with regard to the secondary aim.

Procedure and Measurements

At each visit, the patient's BP was measured by a research assistant after the patient had been sitting for 5 minutes and standing for 2 minutes using a random-zero sphygmomanometer (Hawksley and Sons Ltd., Lancing, UK). The mean of two BP measurements was recorded, and diastolic pressures were taken at phase 5. Pulse rate was measured over 1 minute with the patient sitting. Weight was recorded at each visit. Patients were specifically asked not to discuss their alcohol consumption with the research assistant who was measuring BP to maintain blindness. Patients were then seen by the doctor, who obtained a 1-week retrospective alcohol intake diary. The patients were specifically questioned about lunchtime and evening alcohol consumption. Alcohol consumption was recorded in units, one unit being equivalent to a half-pint of beer, a glass of wine or fortified wine, or a single measure of spirits (one unit or one drink is approximately equivalent to 10 g alcohol). At the end of the run-in phase patients were randomly assigned to the “advice” or control group.

At the beginning and the end of the study, 24-hour urine collections were obtained for estimation of sodium and potassium excretion, and blood samples were taken for measurement of γ-GT, AST, MCV, uric acid, and other variables. In addition, a questionnaire on smoking, caffeine intake, and medication was completed.

Advice Given

Patients in the advice group were told to reduce their alcohol consumption as much as possible. If they felt that they wanted to give it up altogether, they were encouraged to do so. The advice was given to suit each individual patient. Patients who tended to drink beer or lager were asked to try nonalcoholic beer or shandy, in addition to reducing the number of pints consumed. Patients who went out for frequent drinking sessions were asked to reduce the number of these sessions. Patients on a mixture of spirits and beer were asked to cut out spirits altogether and restrict their beer intake. This was especially important in patients who drank spirits at home. The risks of high alcohol consumption and potential benefits of reduction in alcohol intake were stressed to all patients. Patients were told that reducing alcohol may well help in controlling their blood pressure. Those with elevated liver enzymes were shown the results, and the risk of liver damage was emphasized. The time taken to give this advice at the first visit was approximately 10–15 minutes in an unhurried atmosphere and was designed to be applicable in routine clinical situations. Patients were asked to report their alcohol consumption with honesty, and it was stressed that falsely reporting lower alcohol consumption would help neither the doctor nor the patient in the long term. The advice was reinforced at subsequent visits and encouragement given to maintain any progress made with reduction in alcohol intake.

Patients in the control group were told that they could continue with their usual alcohol consumption. It was emphasized that they were not required to increase alcohol consumption. If at follow-up visits reported alcohol consumption appeared to be decreasing, no attempt was made to encourage patients to increase their alcohol intake since this was thought to be unethical.

Statistical Analysis

Logarithmic transformations were carried out to normalize data with skewed distributions. Nonparametric tests (Mann-Whitney U test or Wilcoxon’s test) and t tests were used as appropriate for paired and unpaired data. Two-way, repeated-measures analysis of variance (ANOVA) was used to assess changes in data measured at each visit. All analyses were carried out with the Statistical Package for Social Sciences.13
Results

Over the 18-month period, 67 male patients who reported consuming more than 20 units of alcohol per week on a regular basis were seen. Of these, 12 were excluded due to diabetes mellitus, uncontrolled hypertension, secondary hypertension, or alcoholism. Five patients were excluded because they had already received direct advice to reduce alcohol consumption. Three patients refused to take part in the study. Forty-seven patients commenced the study, but two dropped out after randomization, two attended only once, and one attended three times. A total of 41 patients completed the study.

Data on the two groups at entry are shown in Tables 1 and 2. The two groups were well matched with respect to most parameters. The patients in the advice group were taller than those in the control group, but this was of little clinical significance.

Systolic BP and γ-GT were higher in the control group, but these differences were not statistically significant. The effect of intervention on the relevant parameters is described below.

Reported Alcohol Consumption

Reported alcohol consumption in both groups throughout the study is shown in Figure 1. Mean values with standard errors are provided since the mean and median values were similar. In the 2-week run-in period, mean reported alcohol consumption in both groups was relatively stable. After intervention, a significant fall of approximately 50% in reported alcohol consumption was observed in the advice group compared with the control group (ANOVA F=7.1, p<0.05). This reported reduction in alcohol consumption was observed throughout the 8-week follow-up period. The control group appeared to maintain their reported alcohol consumption at around 50–60 units/wk throughout the study period.

Markers of Alcohol Consumption

Mean values for γ-GT, AST, MCV, and uric acid are shown in Table 3. γ-GT fell significantly (t test
There were also no significant changes in caffeine intake and cigarette smoking. This was accompanied by decreases in \( \gamma \)-GT and AST and a fall in standing diastolic BP. These results suggest that advice to reduce alcohol consumption is a useful form of treatment in hypertensive patients who drink excessively.

The reduction in alcohol intake of 30 units/wk was associated with a 5 mm Hg fall in diastolic BP. This is consistent with the results of Puddey et al,\(^7\) who found comparable falls in BP with similar reductions in alcohol intake. However, in our study the advice group received regular counseling, and this itself may have contributed to the fall in BP. Nevertheless, in clinical practice this could be considered as part of the beneficial effect of advice. No significant differences were found in systolic and sitting diastolic BP between the control and advice groups, but this was probably due to the lack of power for detecting such changes, as anticipated in the design of this single-center study.

There is therefore a need for a similar trial on a multicenter basis to confirm the effect on BP of advice to reduce alcohol intake. Ideally, such a study should be on a long-term basis to examine the effect of a reduction in alcohol intake on the cardiovascular complications of alcohol-induced hypertension.

Regular counseling and advice on alcohol reduction incur financial costs and inconvenience, which would increase with increasing frequency of consultations. These, however, are outweighed by potential benefits that may include a reduction in or avoidance of antihypertensive treatment and side effects, financial savings on antihypertensive medication and alcohol, better control of hypertension and reduction in cardiovascular risk, and also a reduction in the risk of other alcohol-related problems. Wallace et al\(^1\) found that the effect of advice to reduce alcohol consumption was directly proportional to the number of consultations. In their study, where normotensive, heavy, or problem drinkers were seen up to five times in a year, a significant reduction in alcohol consumption was apparent by 6 months and was maintained at 1 year. Incidentally, they also noticed a significantly greater fall in systolic BP in the advice group compared with controls (6.8 mm Hg versus 4.7 mm Hg).

A short run-in phase was chosen for this study since it was anticipated that drawing a patient’s attention repeatedly to his alcohol consumption might in itself result in a reduction in alcohol intake. This, however, did not occur, and the patients in the

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**Table 3. Markers of Alcohol Consumption at the Start and End of the Study**

<table>
<thead>
<tr>
<th>Marker</th>
<th>Start</th>
<th>End</th>
<th>% Change</th>
<th>Start</th>
<th>End</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \gamma )-GT (IU/l)</td>
<td>77.1 (7.1)</td>
<td>61.0 (5.8)</td>
<td>20.9(^\dagger)</td>
<td>61.0 (5.4)</td>
<td>61.1 (5.7)</td>
<td>-0.2</td>
</tr>
<tr>
<td>AST (IU/l)</td>
<td>30.9 (1.1)</td>
<td>25.3 (1.2)</td>
<td>18.1(^*)</td>
<td>29.5 (1.7)</td>
<td>27.5 (1.6)</td>
<td>6.8</td>
</tr>
<tr>
<td>Uric acid (mmol/l)</td>
<td>0.45 (0.03)</td>
<td>0.44 (0.02)</td>
<td>2.2</td>
<td>0.45 (0.02)</td>
<td>0.44 (0.02)</td>
<td>2.2</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>90.6 (1.1)</td>
<td>90.7 (1.1)</td>
<td>-0.1</td>
<td>89.7 (1.2)</td>
<td>90.5 (1.1)</td>
<td>-0.9</td>
</tr>
</tbody>
</table>

Values are mean, and standard error of the mean is given in parentheses. Geometric mean is shown for \( \gamma \)-GT and aspartate aminotransferase. \( \gamma \)-GT, \( \gamma \)-glutamyl transpeptidase; AST, aspartate aminotransferase; MCV, mean corpuscular volume.

\(^{\dagger}\) \( p<0.05 \) within the group.

\(^*\) \( p<0.05 \) between groups.

\( p<0.05 \) in the advice group after intervention but did not change in the control group. This change in \( \gamma \)-GT was significantly different between the two groups ( \( t \) test \( p<0.05 \), proportional changes from initial values compared). AST fell significantly from the baseline value after advice ( \( t \) test \( p<0.05 \)), but there was no change in the control group. The fall in AST in the advice group did not, however, achieve statistical significance when compared with the control group. No significant changes were observed in MCV and serum uric acid levels.

**Blood Pressure**

The changes in sitting and standing BP from baseline values at randomization are shown in Figure 2. After intervention, standing diastolic BP fell significantly in the advice group compared with the control group (ANOVA \( F=4.8, p<0.05 \)), and a difference of 5.2 mm Hg (95% confidence interval 2.5–7.9 mm Hg) was observed at 8 weeks. The differences remained significant when adjusted for the slight decrease in weight seen in the advice group (ANOVA \( F=5.0, p<0.05 \)). The effect of advice on standing diastolic BP was similar in treated and untreated patients, with no significant interaction between advice and antihypertensive treatment (ANOVA advice \( F=4.6, p<0.05 \); treatment \( F=0.03, \) NS; interaction \( F=0.1, \) NS).

No significant changes were seen in systolic BP (where proportional changes were compared) and sitting diastolic BP.

**Other Variables**

There was a slight decrease in mean weight of 0.5 kg in the advice group, but this was not statistically significant. There were no significant changes in heart rate, sodium, and potassium excretion or in other hematological and biochemical parameters. There were also no significant changes in caffeine intake and cigarette smoking.

**Discussion**

This study has demonstrated in hypertensive patients who were heavy drinkers a 50% reduction in reported alcohol consumption after advice from a physician to reduce alcohol. This was accompanied by decreases in \( \gamma \)-GT and AST and a fall in standing diastolic BP. These results suggest that advice to reduce alcohol consumption is a useful form of treatment in hypertensive patients who drink excessively.

The reduction in alcohol intake of 30 units/wk was associated with a 5 mm Hg fall in diastolic BP. This is consistent with the results of Puddey et al,\(^7\) who found comparable falls in BP with similar reductions in alcohol intake. However, in our study the advice group received regular counseling, and this itself may have contributed to the fall in BP. Nevertheless, in clinical practice this could be considered as part of the beneficial effect of advice. No significant differences were found in systolic and sitting diastolic BP between the control and advice groups, but this was probably due to the lack of power for detecting such changes, as anticipated in the design of this single-center study.

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Regular counseling and advice on alcohol reduction incur financial costs and inconvenience, which would increase with increasing frequency of consultations. These, however, are outweighed by potential benefits that may include a reduction in or avoidance of antihypertensive treatment and side effects, financial savings on antihypertensive medication and alcohol, better control of hypertension and reduction in cardiovascular risk, and also a reduction in the risk of other alcohol-related problems. Wallace et al\(^1\) found that the effect of advice to reduce alcohol consumption was directly proportional to the number of consultations. In their study, where normotensive, heavy, or problem drinkers were seen up to five times in a year, a significant reduction in alcohol consumption was apparent by 6 months and was maintained at 1 year. Incidentally, they also noticed a significantly greater fall in systolic BP in the advice group compared with controls (6.8 mm Hg versus 4.7 mm Hg).

A short run-in phase was chosen for this study since it was anticipated that drawing a patient’s attention repeatedly to his alcohol consumption might in itself result in a reduction in alcohol intake. This, however, did not occur, and the patients in the

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control group maintained a relatively constant level of alcohol consumption throughout the study phase.

A problem that became apparent during the study was that there were few acceptable alternatives to alcoholic beverages. Patients described some low-alcohol beers as unpalatable. There are now an increasing number of varieties of low-alcohol and alcohol-free beverages being marketed, and their further development should be encouraged.

Alcohol has been estimated to account for between 5% and 30% of hypertension.14,15 The advice given in this study is a useful and practical form of treatment that is readily applicable in routine clinical practice. If applied on a wide scale, the resultant reduction in alcohol consumption could have a significant impact on hypertension and its cardiovascular sequelae.

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Key Words • alcohol • essential hypertension
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