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SOME ASPECTS OF PROGNOSIS IN TREATED HYPERTENSION

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Hypotensive drugs are now well established in the treatment of arterial hypertension. In the malignant phase their value has been clearly demonstrated (Morrison, 1953; Harington and Rosenheim, 1954; McMichael and Murphy, 1955; Smirk, 1957), and knowledge of this condition in its treated form is steadily accumulating. In hypertensive heart failure the beneficial effect of these drugs has been described (Shirley Smith and Fowler, 1955; Hamilton, 1956; Smirk, 1957). Severe impairment of renal function commonly prevents adequate treatment (McMichael, 1956), but sometimes deterioration may be stayed (Abrahams and Wilson, 1957), and there are reports of improvement in renal function apparently as a result of hypotensive therapy (Wilson, 1956; Hood, 1956). Both Hood (1956) and Smirk (1957) have the impression that cerebrovascular accidents in patients of all grades have been reduced by therapy, but it may be that in some instances cerebral thrombosis is precipitated by lowering the blood pressure (Locket *et al.*, 1951), and transient cerebral ischaemic episodes as a consequence of excessive pressure reduction are well recognized (McMichael, 1956; Hood, 1956; Smirk, 1956). Similarly, when hypertension is complicated by ischaemic heart disease, appropriate blood-pressure reduction may improve exercise tolerance (Doyle and Kilpatrick, 1954; Shirley Smith and Fowler, 1955), while an excessive fall appears sometimes to precipitate angina (Smirk and Alstad, 1951) or myocardial infarction (Hood, 1956).

Symptomless, uncomplicated hypertension presents a difficult problem. The statistics provided by life assurance companies (Dublin *et al.*, 1949) and Bechgaard's (1946) follow-up study of over 1,000 patients with hypertension have shown clearly that life expectancy diminishes with even small increments of blood pressure, and that the excess mortality is due mainly to cardiovascular and renal diseases. From such data it has been argued (Stewart, 1957) that hypotensive therapy should be given to symptomless patients: "Perhaps one of the best of the new prospects in hypertension awaits patients of this type." Stewart contemplates an extension of the use of ganglion-blocking drugs to most forms of "established hypertension." However, the fact that raised arterial pressure is associated with a poor prognosis does not permit the conclusion that reduction in that pressure will necessarily improve the prognosis. Further, Evans (1957) has argued forcibly that in the whole group with raised blood pressure there are included individuals whose prognosis is extremely good and whom he terms "hypertonics." His attitude is the antithesis of that of Stewart. According to Evans, "Even in the case of true arterial hypertension . . . neither product of test-tube or crucible halts, nor delays materially, the unfavourable course of the disease." [*Sic.*]

Most authorities, impressed on the one hand by the favourable results of treatment in the malignant phase and in hypertensive heart failure, and on the other by the troublesome side-effects which occur even with recent preparations, would be more selective. Many would agree with Turner (1956), who would not treat patients without objective evidence of hypertensive disease in the retina, heart, or kidney, with the exception of the young male with a high basal pressure.

Present Investigation

With such considerations in mind, we examined the results of treatment of 104 patients with high blood pressure attending the medical unit clinic at St. Mary's Hospital in the period 1950-7. We concerned ourselves only with those patients whose diastolic pressure before treatment was persistently at or above 120 mm. Hg. This excluded from consideration a number of cases treated for high blood pressure, but we feel that all the present cases may fairly be regarded as hypertensive. The blood pressures were measured in the ordinary way with a mercury sphygmomanometer, the point of abrupt fading of the arterial sounds being taken as the diastolic level. The figures have not been corrected for age, sex, or arm circumference.

Several patients began treatment before 1950, and, in them, the whole period of treatment is considered. Eighty-nine were treated with ganglion-blocking drugs, alone or in combination. Six were treated initially by sympathectomy; five of these were subsequently given ganglion-blocking drugs, and one reserpine alone. Six had other operations (nephrectomy, adrenalectomy, or removal of a pheochromocytoma), and four of these were subsequently treated with ganglion-blocking agents. Four were treated only with reserpine or hydrallazine, and eight had no specific therapy.

Though most of the patients were known personally to us, great reliance has had to be placed on case-notes compiled by several different doctors. The initial blood pressure has been taken as the mean of all readings in hospital before the start of treatment, while

during the follow-up the patients were usually ambulant. The frequency of follow-up visits varied widely according to the symptoms, complications, and proximity of the patient to hospital. The majority were seen at least once in three months. Our data are in many respects imperfect; but it is upon such imperfect data that the treatment of hypertension has often to be based.

Blood-pressure Control

The degree of lowering of the diastolic pressure attained in this series has been very variable, but we have taken advantage of this variation to observe the effect of different degrees of control on the behaviour of the disease. For convenience we have arbitrarily selected three categories of control, based on the diastolic pressure: "good"=diastolic pressure below 110 mm. Hg; "fair"=diastolic pressure between 110 and 129 mm. Hg; and "poor"=diastolic pressure above 129 mm. Hg.

Approximately equal numbers of readings have fallen into each category, and treatment has therefore not always been as efficacious as intended. Many of the less satisfactory cases, however, occurred in the earlier years; latterly, with a wider choice of hypotensive drugs, adequate lowering of the pressure has been achieved in most cases.

The level of blood pressure at the time of appearance of a complication is often unknown. In an attempt to correlate the degree of control with the incidence of complications we have divided the follow-up course of each patient into periods of three months. Within each period the mean diastolic pressure and any complications occurring have been recorded. This does not imply, however, that we consider a high pressure, to which the patient may have been subjected previously, necessarily unimportant. When numerous readings have been taken, the diastolic pressure has usually been stable over a period of three months if treatment has not been changed, but in many cases we have had to rely on only one or two readings in the period. If a patient was not seen in any period, that period and any complications occurring have not been entered in any analysis relating to blood-pressure control.

Complications

Other analyses have been based on the total complications and total length of survival from the start of observation. In all the tables the rates of occurrence of the complications listed below and of fatal complications are expressed per patient-year—that is, per four patient-periods. One deficiency of this method of analysis is that a considerable number of patient-years may be accumulated in a given category without any individual patient being observed over a long period. When the incidence of complications is low, this may give an over-optimistic impression of the prognosis. The complications of which we have taken account are as follows.

1. *Hypertensive Neuroretinopathy*.—This was defined as the presence of bilateral exudates or haemorrhages or papilloedema, provided these signs were unexplained other than by hypertension. Whilst appreciating the occasional difficulty in making the distinction, we have attempted throughout to differentiate and exclude from this group cases with arteriosclerotic retinitis (Moore, 1917). The classification of Keith *et al.* (1939) does not

distinguish arteriosclerotic retinitis from hypertensive neuroretinopathy, and we are in sympathy with those authorities who have criticized its use (Pickering, 1955; Platt, 1956; Turner, 1956). Though the presence of papilloedema implies a rather worse prognosis, as we shall confirm, Smirk (1957) considers that patients with only haemorrhages and exudates need as careful treatment as those with papilloedema. There is no doubt that many cases without papilloedema may have renal arteriolar fibrinoid necroses (Goldring and Chasis, 1944; Kincaid-Smith *et al.*, 1958). In only two of our present cases was papilloedema unaccompanied by retinal exudates or haemorrhages.

2. *Impairment of renal function* with a blood-urea level higher than 50 mg. per 100 ml.

3. *Cardiac failure*, consisting of congestive failure, pulmonary oedema, or paroxysmal nocturnal dyspnoea.

4. *Cerebral Vascular Lesions*.—The exact diagnosis has usually been inferential.

5. *Ischaemic heart disease*; myocardial infarction or angina of effort.

Corresponding to the presence of these five types of complication at the first attendance, the patients have been divided into six groups; the last consisting of those free of the complications just listed, although about half in this group had electrocardiographic or radiological evidence of left ventricular enlargement. Group 1 contains all patients presenting with neuroretinopathy, and such patients are excluded from the other groups.

We feel that this classification may be a more helpful guide to prognosis and treatment than one based solely on retinal appearances.

Group 1. Hypertensive Neuroretinopathy

This is the largest and most important group, comprising 53 cases. Ten of these patients were in cardiac failure when first seen and five presented with hemiparesis. Primary renal disease was diagnosed in 14 (pyelonephritis in 9, glomerulonephritis in 4, and unilateral hydronephrosis in 1). Twenty-one patients initially had a blood urea above 50 mg. per 100 ml.; and in eight of these it was above 75 mg. One patient had a phaeochromocytoma. One female had systemic lupus erythematosus; this was the only one of our cases in which retinopathy developed under observation. The age at presentation is shown in Table I. Although

TABLE I.—Age at Presentation in Cases with Hypertensive Neuroretinopathy

Age in years ..	10-19	20-29	30-39	40-49	50-59	60-69	70-79
No. of cases ..	2	6	10	13	14	6	2

there was a wide overlap between the groups, the highest diastolic pressures were found in group 1. In those with diastolic pressures initially between 120 and 139 mm. Hg, 9 of 11 males and 1 of 7 females had papilloedema; in the range 140-159 mm. Hg, 12 of 16 males and 6 of 9 females had papilloedema; while with initial diastolic pressures over 159 mm. Hg, 4 of 6 males and 2 of 4 females had papilloedema. It appears that males have a greater tendency to develop papilloedema, especially at lower levels of pressure, although this does not solely account for the higher male mortality, which is present in all groups, including those of group 1 without papilloedema. Mortality was greater in the cases with the highest pressures.

In the 34 patients with papilloedema the five types of complication listed occurred at the rate of 0.62 per patient-year, with a death rate of 0.32 per patient-year, as against figures of 0.34 and 0.09 for the 19 patients without papilloedema. The subgroup with papilloedema contained a higher proportion of males (74% against 42% in those without papilloedema) and a higher proportion of patients with a raised blood urea at the onset (44% as against 32% in those without papilloedema).

The longest period of follow-up in this group was 11 years. Of those dying, the longest survival time was 5½ years from the first attendance. Eight patients were either untreated or defaulted almost immediately, and none of these survived more than eight months. Of these eight patients, five had papilloedema and three not. Table II shows the length of follow-up in group 1.

TABLE II.—Length of Follow-up in Cases with Neuroretinopathy

	Length of Follow-up in Months							
	0-5	6-11	12-17	18-23	24-35	36-47	48-59	60+
Living	4	5	1	2	8	6	2	5
Dead	11	0	3	2	2	1	0	1

Most of the deaths took place within the first year, and patients who survive two years have a much better prognosis. The causes of death were: uraemia in 13, cerebral haemorrhage in 8, cardiac failure in 3, and 1 immediately following adrenalectomy. Several of those who died in renal failure had also evidence of cardiac failure terminally. Uraemia usually occurred early, from 1 to 24 months (average 8 months) after the start of treatment, and characteristically was the cause of death in uncontrolled or untreated cases. One patient, although untreated, died in cardiac failure, the blood urea, even terminally, never rising above 70 mg. per 100 ml. Cerebral haemorrhage was frequently a late cause of death, often occurring in cases whose retinopathy had regressed and where the blood pressure had, at least temporarily, been brought under control. Deaths from this cause occurred from 1 to 66 months after the first admission (average 25 months).

Apart from renal failure, a total of 41 complications occurred after the start of treatment (cardiac failure 16 instances, cerebrovascular accident 16, myocardial infarction 2, angina 3, retinal artery thrombosis 3, and recurrence of neuroretinopathy 1). It is interesting that retinopathy recurred only once, in spite of the fact that the blood pressure in many cases subsequently reached levels as high as or higher than those prevailing before the start of treatment. It appears that neuroretinopathy (and by inference the malignant phase) does not show a marked tendency to relapse once reversed. Other complications, principally cerebral vascular accidents and cardiac failure, do recur with greater frequency the higher the diastolic pressure.

The relation of complications to the diastolic pressure in the follow-up period is shown in Table III. Improvement in the degree of control from "poor" to

TABLE III.—Relation of Complication Rate to Control of Blood Pressure in Cases with Neuroretinopathy

Degree of Control	No. of Patients Contributing to Category	Complications		Patient-years	Complications per Patient-year	
		Total	Fatal		Total	Fatal
Good	26	6	1	23.75	0.25	0.04
Fair	29	12	3	35.5	0.34	0.08
Poor	38	36	19	37.5	0.97	0.52

"fair" reduces the incidence of total complications almost threefold and of fatal complications sixfold. Prognosis is further improved if control becomes "good." The natural history of untreated cases suggests that hypotensive therapy is the major factor contributing to the better prognosis in the good and the fair categories, rather than that the more benign cases are more easily controlled. In two patients in this series the blood pressure could not be lowered by medical or surgical means and both died within a year, but in all other cases in this group in which treatment was seriously attempted a period of good or fair control was obtained during their first admission to hospital. In the follow-up period, side-effects of the drugs were most often responsible for ineffective treatment; five patients defaulted. A higher rate of complications in periods of poor control is found in both males and females, but the rate is much higher in males (1.26 as against 0.7) and the fatality rate is particularly low in the females. No female died in a period of good or fair control.

Influence of Initial Renal Function

Impairment of renal function at the outset is a potent cause of failure of treatment. Eight patients in group 1 had an initial blood urea above 75 mg. per 100 ml., and of these only one male survives; he is free of symptoms and his retinopathy has cleared, but his blood urea remains at 96 mg. per 100 ml. The fatality rate in the 13 patients with blood urea initially between 50 and 74 mg. per 100 ml. was twice that of those with normal blood-urea levels, although the incidence of all complications was not greatly different.

Treatment seems to have halted further deterioration of renal function in several cases, but in only one case has a convincing fall in blood urea been seen in association with treatment. This was in the female with systemic lupus erythematosus, who responded to treatment with corticoids and pentolinium. Although poor renal function may prevent adequate treatment, the exclusion of cases with uraemia does not affect the general conclusions on group 1 patients as a whole (see Table III). If those with an initial blood urea of 75 mg. per 100 ml. or over are excluded the complication rate is still 0.82 per patient-year in the poorly controlled category, 0.27 in the category with fair control, and 0.15 in the category with good control. The corresponding fatality rates are 0.37, 0.06, and nil per patient-year; amongst the initially non-uraemic cases there were 18 deaths.

TABLE IV.—Complication Rates After the Clearing of Retinopathy (34 Cases)

Degree of Control	No. of Patients Contributing to Category	Complications		Patient-years	Complications per Patient-year	
		Total	Fatal		Total	Fatal
Good	25	4	0	23.5	0.17	—
Fair	26	10	2	34.5	0.29	0.06
Poor	25	16	3	27.25	0.59	0.11

Once retinopathy has disappeared it only rarely recurs, but continued treatment is still necessary. In 34 cases the retinopathy was cleared, and among these patients 30 complications subsequently occurred, chiefly in periods of poor control. Table IV shows the incidence of these complications in relation to the degree of control. Again, the complication rate was higher in the males; in the females there have been no deaths after the clearing of retinopathy. The nature

TABLE V.—Complications Occurring After the Clearing of Retinopathy

Complication	Control		
	Good	Fair	Poor
Recurrence of retinopathy ..	—	—	1
Single retinal vascular lesion ..	—	1	2
Progressive renal failure ..	—	—	1
Cardiac failure ..	1	4	5
Cerebral vascular accident ..	—	5	5
Angina or myocardial infarction ..	3	—	2

of these 30 complications and the degree of control at the time of their appearance are shown in Table V. The principal complications encountered in the long-term follow-up of cases with retinopathy are cerebrovascular accidents and recurrent cardiac failure. The more frequent occurrence of these at the higher levels of blood pressure seems fairly clear. The incidence of ischaemic heart disease has, at least so far as our limited data show, no clear relationship to the blood-pressure level.

Of our 53 patients with neuroretinopathy, 28 survive: 24 are well or substantially better than when first seen, three have been disabled by a series of strokes, and one has angina and recurrent left ventricular failure. All the untreated patients died within eight months, and it may be assumed that most, if not all, of the 53 would have died if untreated.

Group 2. Impairment of Renal Function

This group comprises only 10 cases, all of which had initial blood-urea levels at or above 50 mg. per 100 ml., but no retinopathy as here defined. The group contains only one female. Three of the group had glomerulonephritis, one pyelonephritis, and one polycystic kidneys; it seemed likely that the other five also had primary renal disease. Five patients, including the one woman, have died; two of the survivors are paralysed and demented after a series of cerebral thromboses, and one, followed up so far for less than a year, has a rapidly rising blood urea. The fatality rate for the group was 0.6 per patient-year and the total complication rate 1.5. There were no complications in the few periods in which control was good, but all of these were obtained in a single patient whose initial blood urea was only 52 mg. per 100 ml. The degree of initial renal impairment seemed to be a more important factor in prognosis than the degree of control of blood pressure.

Group 3. Cardiac Failure

There were only four cases (three male, one female) in which cardiac failure was the presenting feature and in which there was no retinopathy and initially no evidence of myocardial ischaemia. All but one relapsed into cardiac failure at times when the blood pressure was poorly controlled. The exception was a man who stopped treatment after a stroke and died the next year. All three males have suffered cerebrovascular accidents; this complication was not related to the degree of blood-pressure control, which was good in one instance, fair in one, and poor in the other. The female patient has needed progressively smaller doses of hypotensive drugs, though there has been no evidence of ischaemic heart disease and the blood urea is normal. She now has a normal blood pressure without the use of hypotensive drugs.

In the whole series, excluding those instances associated with ischaemic heart disease, there was

clinical evidence of cardiac failure in 22 cases. Though all of these were digitalized and many were given mercurial diuretics also, there seems to be a relationship between the episodes of failure and the blood-pressure level at the time. In these 22 cases there were 37 occasions when clinical cardiac failure occurred or recurred. The degree of control on these 37 occasions was poor in 31, fair in 6, and good in none. In the same 22 patients blood-pressure readings were recorded in 92 periods when cardiac failure was not present, at times subsequent to the first appearance of cardiac failure in each case. The degree of control in such periods not associated with cardiac failure was poor in 24, fair in 38, and good in 30. There is little doubt that adequate control of the blood pressure is a major factor in preventing the recurrence of cardiac failure in patients with hypertension.

Group 4. Cerebrovascular Accidents

This group comprises 11 patients, seven of them males. One woman was only 29 when first seen, and she had chronic glomerulonephritis. The others were aged 47 to 70, and none had any other initial complication. Only seven subsequent complications were recorded. Two deaths occurred, both in males; one had a cerebral haemorrhage when control was poor, and the other, also poorly controlled throughout, had two episodes of cardiac failure and finally became uraemic. One man had a further cerebral thrombosis in a period of good control, and another developed cardiac failure when the degree of control was fair. The only subsequent complication to occur in a female was a minor retinal arterial thrombosis. Seven of these patients are well, apart from the side-effects of the drugs, at various times up to 87 months from presentation. The incidence of all complications in this group was 0.28 per patient-year, and of fatal complications 0.04 per patient-year. All but two of the complications occurred in periods of poor control. This group has a relatively good prognosis, and there is some slight suggestion here that it may be further improved by hypotensive therapy.

Group 5. Ischaemic Heart Disease

Four men and two women, between the ages of 42 and 62, presented with myocardial infarction or angina of effort. Of these, two men have suffered fatal infarcts at six and twelve months respectively from the start of treatment. Control was fair in one of these at the time of the infarct; the other had defaulted. One woman presented with angina; she stopped treatment after a month, but is alive four years later, though very dyspnoeic. One man has had two strokes in periods of poor control, and cardiac failure and a retinal haemorrhage in periods of fair control; after 56 months he is alive with moderately severe angina. The two others are well 9 and 29 months respectively from the start of treatment. This group is too small to form the basis of any assessment of the effect of therapy, but it seems likely that the high incidence of complications is at least as much an expression of the natural history of ischaemic heart disease *per se* as of hypertension.

Group 6. Initially Uncomplicated

Twenty cases were initially "uncomplicated" in the sense that they showed none of the principal complications listed in the opening paragraphs. Eleven, in fact,

had electrocardiographic or radiological evidence of left ventricular enlargement, and four had albuminuria. One of the latter was diagnosed as having pyelonephritis on the evidence of renal biopsy. The ages ranged from 14 to 63 years at presentation. In only two cases have any serious complications occurred. A man of 46 was first seen with exertional dyspnoea and cardiac enlargement. His attendance at the follow-up was sporadic, and control persistently poor. He suffered a stroke and an episode of cardiac failure before a fatal cerebral haemorrhage occurred three years after his first attendance. A woman of 47 presented with a central retinal venous thrombosis later progressing to glaucoma; left ventricular enlargement was present. Three months later she developed a hemiplegia, control having been fair throughout.

All the other patients are well, apart from the side-effects of drugs, at varying periods up to 10 years from the first attendance. Among these, there have occurred two retinal arterial thromboses and one episode of transient aphasia interpreted as a cerebral thrombosis. The incidence of complications in relation to control is shown in Table VI.

TABLE VI.—*Relation of Complication Rate to Degree of Control in Initially "Uncomplicated" Cases*

Degree of Control	No. of Patients Contributing to Category	Complications		Patient-years	Complications per Patient-year	
		Total	Fatal		Total	Fatal
Good	10	0	0	10.25	—	—
Fair ..	17	4	0	20.5	0.19	—
Poor ..	14	2	1	17.0	0.12	0.06

All the complications occurred in four of the patients with evidence of left ventricular enlargement, while in the nine without cardiac enlargement no complication has occurred in a total of 24 patient-years. In particular, two females have so far survived four years and one year respectively with diastolic pressures persistently above 140 mm. Hg.

In the subgroup of patients not having clinical, electrocardiographic, or radiological evidence of left ventricular enlargement, we have indications of the existence of a type of patient in whom the course of hypertension is truly "benign." This is the "hypertonic" patient as described by Evans (1957), who has followed more cases of this type for longer periods, all being untreated. It may be that treatment was responsible for preventing the onset of complications in some of our patients, but we had no comparable control group, and we know of no controlled study of hypotensive therapy in such a group or indeed in any group of patients with high blood pressure. The statement that these patients remained without complications does not imply that they were well. Several, in fact, suffered severe side-effects of therapy in addition to the disturbance of their peace of mind imposed by knowledge of their raised blood pressure. It is at least open to question whether in such patients the cure was not worse than the disease, and we feel that in them the use of hypotensive drugs requires justification.

Comparison of the Groups

The incidence of complications occurring in the six groups is shown in Table VII, in which the complications are related to total survival time. None of the groups is strictly homogeneous, and, in addition

TABLE VII.—*Comparison of Complication Rates in the Different Groups*

Group	Complications per Patient-year		Patient-years
	Total	Fatal	
1	0.5	0.22	114.25
2	0.5	0.21	24.0
3	0.63	0.06	17.6
4	0.19	0.05	36.75
5	0.68	0.15	13.3
6	0.12	0.02	54.2

to the major complications which form the basis of our classification, there are other important factors in prognosis. Table VIII shows the degree of control and the proportion of females in each group. Groups 1, 2,

TABLE VIII.—*Comparison of Degree of Control and Sex Ratio in the Different Groups*

Group	No. of Patients	Percentage of Patient-years in Each Category			Patient-years for which B.P. Readings Available	Percentage of Females
		Good	Fair	Poor		
1	53	25%	36%	39%	96.75	38
2	10	25%	31%	44%	8.0	10
3	4	36%	41%	23%	14.75	25
4	11	26%	32%	42%	25.0	36
5	6	7%	51%	42%	10.75	33
6	20	21%	43%	36%	47.75	50

4, and 6 are closely comparable in the degree of blood-pressure control attained; patients with ischaemic heart disease (group 5) were less energetically treated than the other groups, and those with heart failure (group 3) rather better. The sex ratio is fairly constant except in groups 2 and 3, which have an excess of males. These two groups and group 5 are very small.

We have nevertheless evidence of different patterns of disease in hypertension, not related solely to the height of the blood pressure or to the appearance of the fundus oculi. There is a low incidence of subsequent complications in group 4 and group 6, and a small proportion of fatal complications in group 3. We have seen how readily cardiac failure may be relieved when the blood pressure is lowered. In contrast, it is unlikely that the high incidence of complications in group 5 is principally a function of high blood pressure.

Blood-pressure observations are available for the same number of patient-periods for each sex, although only one-third of the patients were females. The percentage of periods in each category of control was closely similar in the two sexes.

The complication rate and fatality rate in the whole series were not greatly different for patients above and below 50 years of age. But, since groups 1 and 2 had a high proportion of younger men as well as the highest incidence of complications, Table IX shows an analysis

TABLE IX.—*Relation of Complication Rates to Age and Sex in Groups 3-6*

Groups 3-6 Only	Complications		Patient-years	Complications per Patient-year	
	Total	Fatal		Total	Fatal
Males < 50 years	11	1	24.5	0.45	0.04
" 50+ "	18	5	31.0	0.58	0.16
Females < 50 "	3	0	38.4	0.08	—
" 50+ "	3	0	30.4	0.10	—

of only groups 3 to 6 in relation to age. In these groups there is a distinctly higher incidence of fatal complications among the older men. The widely differing prognosis in the two sexes is emphasized.

Conclusions

Prognosis in hypertension is influenced by many factors apart from the height of the blood pressure. We have considered some of these factors in a selected and comparatively restricted series of patients with severe hypertension, most of whom were given hypotensive drugs. The patients were classified according to the presence of various complications at the start of treatment, and, though several of our groups were too small for unequivocal conclusions to be drawn, there is indication of widely differing prognosis in the several groups. Consequently, the effects of blood-pressure reduction are dissimilar, though there is a general tendency for the poorly controlled patient to fare worse throughout.

It is clear that effective lowering of the blood pressure is of great importance in all patients with hypertensive neuroretinopathy and that even "fair" control is associated with considerable reduction of morbidity and mortality. Though in our experience retinopathy shows little tendency to relapse once cleared, thorough hypotensive treatment must be continued indefinitely in these cases in order to diminish the risk of cerebrovascular accidents and cardiac failure. We have seen that hypertensive heart failure readily recurs at the higher levels of diastolic pressure and that this recurrence can be prevented by hypotensive treatment.

In this series, patients presenting with cerebral thrombosis have had a comparatively good prognosis, and those with coronary artery disease a poor prognosis, but study of a much greater number of cases would be necessary to determine the effect of blood-pressure reduction on prognosis in these groups.

Patients without renal impairment and without evident vascular disease in the retina, heart, or brain have, in our experience, been remarkably free of complications, regardless of the degree of lowering of the diastolic pressure. The length of follow-up has, however, been only a small fraction of the time in which the younger patients might be exposed to the effects of high blood pressure, and these patients are liable on occasion to suffer irreversible vascular lesions. The mental and physical side-effects of treatment, on the other hand, are not inconsiderable, and may sometimes be equally disabling.

The comparative immunity of female patients to the complications of hypertension is shown throughout this study. The effect of age has been less marked, but this is in part due to the small number of patients over 60 years of age in our series.

We would suggest that the use of ganglion-blocking drugs in symptomless hypertension without demonstrable disease in the retina, heart, or kidney should at present be restricted to the young male patient. The accurate evaluation of these drugs in symptomless hypertension awaits the results of a controlled clinical trial.

Summary

A survey has been undertaken of 104 patients with initial diastolic pressures over 120 mm. Hg, the majority being treated with ganglion-blocking drugs. The complications occurring have been related to the degree of control of the diastolic pressure during periods of three months.

In patients with retinal haemorrhages and exudates or papilloedema the prognosis was closely related to the

degree of lowering of the blood pressure. In those with cerebral or cardiac vascular lesions no such relationship could be clearly discerned.

Uncomplicated hypertension has a comparatively good prognosis without treatment, and a much larger series would be required to demonstrate any effect of hypotensive drugs.

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