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ROLE OF HYPOTENSION IN THE GENESIS OF TRANSIENT FOCAL CEREBRAL ISCHAEMIC ATTACKS

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During the past ten years transient focal cerebral ischaemic attacks have attracted much attention, partly because of their intriguing character and partly because of the possibility of successful treatment before permanent cerebral damage occurs. It is generally assumed that the recurrent loss of local cerebral function that is the basis of the clinical picture is due to intermittent local ischaemic anoxia; but it is not clear how this intermittent local ischaemia is produced. It is known that a high proportion of patients with recurrent ischaemic attacks have atheromatous narrowing of either the intracranial or extracranial arteries supplying the relevant cerebral territory. However, constrictions in the arterial tree cannot by themselves account for a situation in which ischaemia is present only intermittently. Clearly some other factor is operating.

It has often been suggested that systemic hypotension may be this intermittent factor (Denny-Brown 1951, 1960; Rothenberg and Corday, 1957; Alajouanine *et al.*, 1960); and indeed it is easy to visualize how a temporary fall in arterial pressure might produce a crucial fall in blood-flow in a diseased arterial tree—the "haemodynamic crises" of Denny-Brown. In an ingenious series of experiments (Denny-Brown and Meyer, 1957; Denny-Brown, 1960) it was shown that, in monkeys with an artificial occlusion of the internal carotid or middle cerebral artery, a transient hemiplegia could be produced at will by lowering the arterial pressure, although arterial occlusion by itself was ineffective. Attempts to reproduce transient ischaemic attacks in man by inducing hypotension have, on the other hand, been unsuccessful. In most cases hypotension has been induced simply by tilting the patient from the horizontal to the vertical planes on a pivoted table (Victor and Adams, 1953; Fisher, 1958a; Denny-Brown, 1960) and the fall in blood-pressure has been rapid and short-lived. Eastcott, Pickering, and Rob (1954) used a hypotensive drug to produce a drastic fall in blood-pressure in a single case, but no ischaemic attack was produced.

It appeared to us that the evidence in support of the hypothesis that temporary falls in systemic blood-pressure are responsible for spontaneous transient ischaemic attacks in man is slight. The therapeutic implications of the hypothesis—that hypotension should be avoided, if necessary by the use of pressor drugs, and that treatment of hypertension is contraindicated, even if highly desirable on other grounds—have had considerable influence on clinical practice. It therefore seemed important that the role of hypotension in the production of transient ischaemic episodes should be more closely examined. This conviction was strengthened by our experience with one patient.

Case Report

A man aged 55 gave a history of a cardiac infarction in 1955 and a right visual field defect of unknown duration in February, 1960. Six days before he was first seen, in July, 1960, he experienced two transient episodes of weakness of the left arm followed two days later by a severe right-sided weakness which improved after a few days but left some persistent weakness. Aortography did not reveal any lesion of the arch of the aorta nor of the carotid and vertebral arteries. His blood-pressure was 190/120.

In April, 1961, he had an episode of weakness of all four limbs without disturbance of speech or swallowing lasting a few days. In September, 1961, as his blood-pressure remained at levels of 190/120 it was decided to start him on guanethidine. Six weeks later, when the dosage was 30 mg. a day, he began to have episodes of slurred speech, inability to swallow, and incoordination of his upper and lower limbs. Each attack lasted about 5 minutes. He had two or three attacks each day over a period of 10 days before readmission to hospital. It was assumed that these were transient ischaemic attacks due to hypotensive episodes precipitated by guanethidine. However, after admission to hospital he had further episodes in two of which the blood-pressure was recorded. In one it rose from its current level of 200/115 to 220/150, subsiding after the attack; in the second episode it reached 190/165 and again fell subsequently. Hypotensive therapy was therefore reinstated and his blood-pressure was rigorously maintained at 160–180/100–115. The ischaemic episodes ceased and did not recur.

The coincidence of the commencement of hypotensive therapy and the onset of transient ischaemic episodes in the light of the haemodynamic crisis hypothesis might well have resulted in a failure to treat this patient's hypertension. The deleterious effect of hypertension on life expectancy in patients with cerebrovascular disease is well established (Marshall and Kaeser, 1961). The hazard of hypotension, on the other hand, has not been established in man. Indeed, the extensive experience of anaesthetists with "controlled hypotension" during surgery (Hampton and Little, 1953; Enderby, 1961) indicates that the danger of a cerebrovascular incident is negligible. Eckenhoff (1962) kept patients with a head-up tilt of 28 degrees at an arterial pressure of 60 mm. Hg for as long as 70 minutes without untoward effects. Nevertheless it seemed wiser before instituting long-term hypotensive therapy in patients with cerebrovascular disease to test their response by subjecting them to a brief period of severe hypotension under carefully controlled conditions.

Method

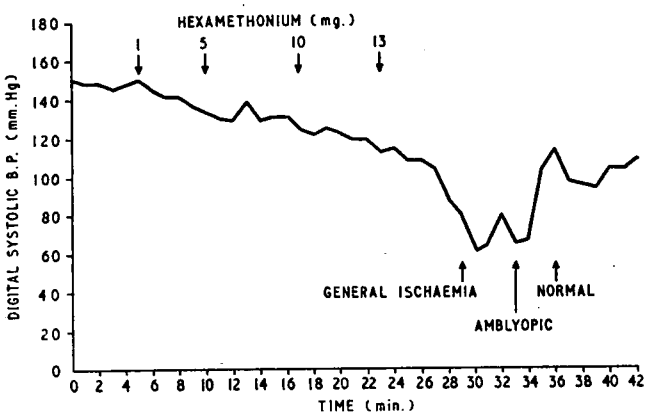
The 37 patients (22 men and 15 women) studied were aged 39 to 69, with a mean of 57 years. They were divided

into three groups: group I, 10 patients with transient ischaemic attacks in the internal carotid territory; group II, 13 patients with transient ischaemic attacks in the basilar territory; and group III, 14 patients with transient ischaemic attacks in either vascular territory who had also suffered one or more major ischaemic episodes from which they had recovered slowly and incompletely. Included in group III are two patients (Cases 36 and 37) suffering from repeated but more prolonged major attacks, each affecting the same site and recovering slowly and almost completely. The majority of the patients, even in groups I and II, had some residual neurological signs indicating some permanent ischaemic damage; in most cases this was minimal and even in group III none had sufficient permanent damage to be seriously incapacitated.

The procedure adopted was the same in every case. The patient was told that his spontaneous attacks were due to a disturbance of the circulation to a part of the brain and that this disturbance might be due to one of several possible causes. The test, which involved an injection during which his blood-pressure would be continually recorded, would eliminate one of these causes and so be a guide to his treatment. He was warned that he would feel peculiar during the test, and that he must immediately inform us of what he felt. He was not told he might faint, as it was important not to prejudice his spontaneous description of his symptoms.

The patient lay on a pivoted bed, tilted at 70 degrees to horizontal to enable maximum postural hypotension to be obtained. One hand was supported at the level of the manubrium sterni by a sling and the systolic blood-pressure was recorded continuously with a Winston blood-pressure follower (type 1108—fast response model) from a piezo-electric crystal on the index or middle finger. The other arm was supported by a second sling at a lower level and hexamethonium iodide administered through a Gordh needle in a hand vein. After an initial stabilization period of 5 to 10 minutes hexamethonium was injected at a rate of 1 mg./min. until the blood-pressure began to fall; thereafter the rate was varied so as to achieve as steady a fall in pressure as possible. Any precipitate fall in pressure was counteracted by temporarily reducing the degree of tilt.

The total dose of hexamethonium administered varied considerably, from 5 mg. to as much as 45 mg. The patient was reminded to report any symptoms immediately they occurred and was examined repeatedly. Because of the patient's position and the need for speed this examination was limited to an assessment of speech; visual acuity and fields; eye movements; biceps, supinator, and jaw jerks; plantar responses; power of facial movement, grip, elbow flexion, and plantar and dorsiflexion of the feet; ability to perform repetitive hand movements; and appreciation of pin-prick in the limbs and face. The blood-pressure was reduced progressively over the course of 10 to 40 minutes until the patient either developed signs of focal cerebral ischaemia, or the symptoms and signs of severe generalized cerebral ischaemia, or lost consciousness. The moment any of these three events occurred the table was tilted horizontal. Usually this promptly restored near normal blood-pressure and all symptoms and signs disappeared (see Chart). In cases where recovery was delayed or the blood-pressure did not rise immediately a small dose of a pressor drug (metaraminol 2–6 mg. intravenously) was given. Afterwards patients were kept horizontal for four hours; by the end of this period the effect of hexamethonium was no longer detectable.



Digital systolic blood-pressure during intravenous hexamethonium.

Results

The results are summarized in Table I. All blood-pressures are digital artery systolic pressures expressed in millimetres of mercury to the nearest 5 mm. The initial blood-pressure is a mean value taken over the preliminary 5 to 10-minute stabilization period, with the patient tilted at 70 degrees to horizontal. The minimum blood-pressure is the minimum pressure maintained for 60 seconds. In most patients the pressure was actually 5–15 mm. Hg lower than this for part of the 60-second period. The mean value for minimum blood-pressure, expressed as a percentage of the initial blood-pressure, for all patients except Case 10, is 42%—that is, a reduction by 58%. If the 17 patients in whom syncope occurred are excluded the mean value becomes 41%, demonstrating that equally severe hypotension was induced in those who did not lose consciousness.

TABLE I.—*Summary of Results in Individual Patients*

Case No.	No. of Transient Ischaemic Attacks	B.P. (mm. Hg) Initial	Minimum	At which Focal Signs Developed	At which General Ischaemia Developed	Syncope	Response Category
	Group I. Transient Ischaemic Attacks in Internal Carotid Territory						
1	6	115	45	—	55	No	A
2	1	120	70	—	75	Yes	A
3	1	150	65	—	90	,,	A
4	*c.* 200	150	55	—	75	,,	A
5	2	120	25	35	40	No	B
6	2	150	45	45	70	,,	B
7	*c.* 50	150	65	65	85	,,	C
8	3	150	55	45	85	,,	D
9	*c.* 40	150	65	65	95	Yes	D
10	*c.* 200	140	105	100	—	No	E
	Group II. Transient Ischaemic Attacks in Basilar Territory						
11	*c.* 500	140	45	—	80	Yes	A
12	15	120	45	—	70	No	A
13	*c.* 1,000	105	60	—	70	Yes	A
14	*c.* 80	150	?†	—	?†	,,	A
15	*c.* 100	200	35	—	100	No	A
16	*c.* 45	125	75	—	80	Yes	A
17	*c.* 300	135	65	—	65	,,	A
18	*c.* 100	100	50	60	60	No	C
19	*c.* 50	125	40	40	55	Yes	C
20	*c.* 30	120	50	45	50	No	D
21	12	160	60	60	100	,,	D
22	4	145	55	60	80	Yes	D
23	*c.* 60	140	35	65	80	No	D
	Group III. Transient Ischaemic Attacks plus Major Ischaemic Episodes						
24	1	165	80	—	90	Yes	A
25	6	160	60	—	90	,,	A
26	3	140	55	—	80	,,	A
27	3	135	65	—	70	,,	A
28	6	130	50	—	60	No	A
29	1	135	60	—	65	Yes	A
30	10	140	50	45	85	No	B
31	3	135	60	60	90	,,	C
32	11	170	90	85	115	,,	D
33	*c.* 40	195	60	100	100	,,	D
34	*c.* 100	235	110	110	110	,,	D
35	5	205	135	120	160	,,	D
36	5*	210	85	95	100	,,	D
37	4*	125	50	40	80	Yes	D

* These patients had recurrent major ischaemic episodes only.
† Reliable blood-pressure readings not obtained for technical reasons.

The patients were graded into five categories on the basis of their response to hypotension.

Category A.—Those who developed no focal neurological symptoms or signs at any stage.

Category B.—Those who developed focal signs which, however, could not be related to the vascular territory involved in their spontaneous ischaemic attacks. For example, one patient (Case 5), whose spontaneous ischaemic attacks consisted of right-sided weakness and dysphasia, developed dysarthria and nystagmus when cerebral blood-flow was reduced.

Category C.—Those who developed focal signs which, though probably related to the same vascular territory as that involved in their ischaemic attacks, were not due to a disturbance of the same neurological pathways. For example, one patient (Case 7), whose spontaneous attacks consisted of weakness and numbness of his right arm and dysphasia, developed dimming of vision in his left eye when cerebral blood-flow was reduced.

Category D.—Patients who developed focal symptoms or signs relevant to those of their ischaemic attacks, but only after, and at a lower blood-pressure than, symptoms and signs of general cerebral ischaemia. For example, one patient (Case 9), whose ischaemic attacks consisted of flashing lights in the left half of his visual field and paraesthesiae in the left side of his body, developed a left homonomous hemianopsia. The majority of patients in this category developed, not the symptoms of their ischaemic attacks, but only related neurological signs—brisk tendon-jerks in place of paresis or nystagmus in place of vertigo. In fact only one patient (Case 23) considered afterwards that he had had an attack, and even this was incomplete; his spontaneous ischaemic attacks consisted of vertigo and a visual hallucination of "black and yellow squares rotating clockwise," with diplopia and paraesthesia in the left side of his body, whereas he developed the visual hallucination in isolation when his blood-pressure was reduced. One patient (Case 8) developed the impairment of vision characteristic of his spontaneous ischaemic attacks, but as he was suffering from general cerebral ischaemia at the time he had no memory of the event and afterwards maintained that he had simply felt faint.

Category E.—Patients who developed focal symptoms or signs relevant to those of their ischaemic attacks before and at a higher blood-pressure than they developed symptoms and signs of general cerebral ischaemia. Only one patient (Case 10) came into this category. He was a 62-year-old tailor, a heavy smoker with a long history of chronic bronchitis, who gave a clear account of attacks of pain and numbness of his left forearm, accompanied by clonic jerking of the hand and arm, and occurring only after prolonged bouts of coughing. Individual attacks lasted about a minute and he had had up to three a day for six months, the frequency varying with the severity of his cough. On two occasions he had lost consciousness while coughing. On examination he had mild weakness, brisk tendon-jerks, and cortical sensory loss in his left arm; there was no evidence of raised intracranial pressure and a right carotid arteriogram showed irregular narrowing in the carotid siphon but no displacement of intracerebral vessels. Lowering his systolic blood-pressure from 140 to 100 mm. Hg produced typical pain and numbness in his left arm with increased weakness and exacerbation of his pyramidal signs and sensory deficit. The blood-pressure was maintained at 110 mm. Hg for eight minutes but no clonic movements occurred and no symptoms or signs of general cerebral ischaemia developed. Full recovery occurred when normal blood-pressure was restored.

The distinction between category D and category E is of prime importance to the "haemodynamic crisis" hypothesis. If transient attacks are precipitated by hypotension, focal symptoms or signs should develop before cerebral blood-flow has been reduced to the stage of causing general cerebral ischaemia; for patients with ischaemic attacks develop their symptoms in isolation, not when they are already feeling hot, faint, and dizzy. The development of focal signs when generalized cerebral ischaemia is already present implies only that a particular cerebral territory has a blood-supply that is marginally less effective than that of the brain-stem centres maintaining consciousness. Accurate recognition of the point at which general cerebral ischaemia develops is thus important, for on this depends the distinction between the two categories. In fact there was no difficulty in recognizing this point as the features of generalized ischaemia were well defined and remarkably constant. The initial symptom was usually feeling hot or feeling tired, and shortly afterwards the patient would complain of feeling dizzy, muzzy, or drunk. Those who had fainted before quickly recognized the symptoms. Repeated yawning or intermittent deep inspiration were early signs, accompanying the first symptoms. Later pallor and sweating developed, followed, on the verge of syncope, by general hypotonia, mild confusion, delayed responses to commands, and subsequent amnesia. Three patients had a brief generalized convulsion at the moment of losing consciousness.

The number of patients in each of the five categories is shown in Table II. As this shows, the percentage of patients in each category is similar whether or not the group III patients are included. Of the whole series of 37 patients, 20 (17 in category A and 3 in category B), or 54%, failed to develop any evidence of selective loss of function in the vascular territory involved in their ischaemic attacks, in spite of being subjected to severe hypotension for at least 60 seconds. As the mean value for minimum blood-pressure, expressed as a percentage of initial blood-pressure, for these 20 patients is 43%, compared with 42% for the whole series, it is not possible to contend that they were not subjected to such severe hypotension as the others. Thirteen patients (35%) developed symptoms or signs relevant to the disturbance occurring in their ischaemic attacks, but 12 of these did so at a stage when they were already suffering from severe generalized ischaemia. Only one patient (Case 10) developed a focal deficit before developing generalized ischaemia. This man's ischaemic attacks invariably followed prolonged bouts of coughing; there were thus clear clinical grounds for relating them either to a falling cardiac output or to venous congestion. His history differed from that of the majority of patients with ischaemic attacks no less than did his response to hypotension. Indeed, had a fall in blood-pressure not produced focal signs in this patient, grave doubt might have been cast on this whole technique.

TABLE II.—*Distribution of Response Categories (See Text)*

Groups I, II, and III			Groups I and II Only		
Response Category	No. of Patients	Per-centage	Response Category	No. of Patients	Per-centage
A	17	46·0	A	11	47·8
B	3	8·1	B	2	8·7
C	4	10·8	C	3	13·0
D	12	32·4	D	6	26·1
E	1	2·7	E	1	4·4

The significance of phasic nystagmus on lateral gaze as a sign of focal ischaemia is doubtful. It developed in eight patients, in each case only in the presence of generalized cerebral ischaemia. Of the patients with brain-stem ischaemia 5 out of 22 developed nystagmus; of those with no evidence of brain-stem disease 3 out of 14, the same proportion, developed nystagmus. Nystagmus is seen not uncommonly in shocked patients, after a myocardial infarct or a haematemesis, who have no history of brain-stem disease. If nystagmus were regarded as a sign of general

cerebral ischaemia without focal significance the categories of Cases 18, 22, 34, and 35 in Table I would be changed from C or D to A.

No permanent ill-effects were observed after the procedure. Of the 20 patients who developed focal signs during the hypotensive period the majority recovered within a few minutes. In two patients the signs persisted for an hour before disappearing and one woman (Case 36) remained mildly confused and dysphasic for nearly four hours before recovering. Four patients had previously had myocardial infarcts, three suffered from angina and one had mitral stenosis. None developed angina, or any other evidence of cardiac embarrassment, possibly because the work load on the heart is reduced as the blood-pressure falls.

Discussion

Before any conclusion can be drawn from these results three possible sources of fallacy require examining: first, whether the patients were correctly diagnosed and unselected; secondly, whether it is justifiable to draw conclusions about cerebral blood-flow from digital artery blood-pressures; and thirdly, whether it is justifiable to assume that, because hypotension maintained for a few minutes does not precipitate ischaemic attacks, more transient or more prolonged hypotension might not have different effects.

The diagnosis of a transient ischaemic attack depends largely on a reliable history. For this reason it can never be considered infallible. In most cases, however, an adequate history allows no real alternative explanation, particularly in the case of recurrent attacks in internal carotid territory. The multiplicity of symptoms attributable to basilar ischaemia increases the possibility of diagnostic error in this territory, especially in view of the widespread occurrence of intermittent dizziness in the elderly. For this reason patients whose attacks consisted solely of symptoms such as vertigo or blurring of vision were included only if they had residual neurological evidence of a brain-stem lesion or, in the case of attacks of vertigo, if vestibular function tests clearly indicated a central lesion. No stipulations were made about the number of attacks or their duration so long as their features were clearly defined and consistent, and complete or almost complete recovery occurred on each occasion. In fact most of our patients' attacks lasted for seconds or minutes, though in four patients they appeared to last a few hours; the approximate number of attacks suffered by each is shown in Table I and varied from one to over a thousand. Nearly all the patients seen by us during the past year who fulfilled the diagnostic criteria discussed above were included in this study. Only three patients were omitted on the grounds that age or intercurrent illness rendered the procedure inadvisable. The only imponderable selective factor operating is that of referral to a neurologist, and it seems unlikely that significant selection could have been introduced in this way.

Throughout this study blood-pressure has been measured by recording digital artery pulsation with a piezo-electric crystal and inflated finger-cuff. Under normal conditions the digital artery systolic pressure is about 10 mm. Hg lower than the corresponding brachial artery pressure. This difference falls proportionately if the pressure is reduced, so that the ratio of initial to minimum pressure is similar whether brachial or digital pressures are used. Previous studies of hypotension induced with intravenous hexamethonium and a tilt table (Finnerty *et al.*, 1954; Moyer and Morris, 1954; Crumpton and Murphy, 1955) have shown that cerebral blood-flow does not fall proportionately with a fall in blood-pressure, for the latter is largely compensated by a reduction in cerebrovascular resistance, even in hypertensive or arteriosclerotic subjects. In fact, there is usually no fall in cerebral blood-flow until the systemic blood-pressure is reduced to under 50%. In this study, however, proof that hypotension severe enough to produce a fall in cerebral blood-flow was obtained in every case does not depend on the fact that a particular blood-pressure level was reached, or a particular percentage reduction obtained; it rests on the fact that every patient either lost consciousness or developed the characteristic symptoms and signs of general cerebral ischaemia.

It might perhaps be argued that, while this study may demonstrate that severe but short-lived hypotension rarely precipitates an ischaemic attack, the hypotension responsible for spontaneous ischaemic attacks might be less severe but more prolonged, lasting for hours rather than minutes. This is unlikely for several reasons. Cerebral tissues are known not to possess any appreciable energy reserves as this argument would require. In a Stokes–Adams attack syncope occurs about 10 seconds after cardiac contraction ceases, and permanent brain damage after three to four minutes. Also, many ischaemic attacks are of very brief duration, and begin and end suddenly, suggesting that the underlying disturbance is of similar sudden onset and short duration. In any case it is known that, because of the compensatory fall in cerebrovascular resistance, moderate reduction of blood-pressure, of the order of 30%, does not produce any significant fall in cerebral blood-flow even in hypertensive subjects with severe arteriolar damage (Crumpton and Murphy, 1952; Stone *et al.*, 1955).

The alternative hypothesis, that the hypotension precipitating spontaneous ischaemic attacks is more rapid in onset and short-lived than the hypotension our patients were exposed to, is also open to criticism. It is possible that a rapid fall in blood-pressure might produce a much greater fall in cerebral blood-flow than a slower fall of the same magnitude if the cerebrovascular resistance were slow to adapt to the change in pressure. Such a mechanism could account satisfactorily for very brief ischaemic attacks. But ischaemic attacks induced in this way should all cease after a few seconds as an adequate blood-flow is restored by a compensatory fall in cerebrovascular resistance. This is clearly not the case; many ischaemic attacks last for several minutes or even hours. Moreover, as has been remarked above, several authors have tried, and failed, to reproduce ischaemic attacks by producing a brief, rapid fall in pressure by quickly tilting the patient from horizontal to vertical.

We are thus unable to visualize any valid objections to the conclusion that hypotension is not a significant factor in the genesis of the majority of transient ischaemic attacks, and that therefore the concept of the "haemodynamic crisis" as the common cause of these attacks should be abandoned.

Alternative Hypothesis

There remains the problem of suggesting an alternative hypothesis. When Millikan, Siekert, and Shick (1955) first described the clinical features of intermittent basilar ischaemia they suggested that ischaemic attacks might be due to platelet thrombi forming locally on an area of diseased endothelium, becoming dislodged, impacting at a bifurcation, and obstructing blood-flow until eventually they fragmented and were swept away. Strong evidence that local microemboli of this type can be responsible for retinal ischaemic attacks has been provided by direct observation of the fundus oculi during attacks of monocular blindness by Fisher (1959) and Russell (1961); and similar microemboli have been observed in cortical arterioles in experi-

mental animals by Denny-Brown and Meyer (1957). An explanation of this type would account for the relationship observed between transient ischaemic attacks and polycythaemia by Millikan, Siekert, and Whisnant (1960) and probably also for the impressive results obtained by Fisher (1958b) and Millikan, Siekert, and Whisnant (1958) in the treatment of ischaemic attacks with coumarol derivatives, though it is still not clear whether coumarol and indanedione drugs prevent the formation of platelet thrombi *in vivo* in therapeutic dosage (Fulton *et al.*, 1953 ; Murphy and Mustard, 1961).

Some patients, mainly those with very brief basilar ischaemic attacks, relate their attacks to neck movements and it seems likely that in such cases brain-stem ischaemia might be produced by occlusion of one or other vertebral artery at the atlanto-axial junction (Biemond, 1951). There is evidence that internal carotid occlusion may also occasionally be produced in this way, the artery being compressed by the lateral process of the atlas (Boldrey *et al.*, 1956 ; Toole and Tucker, 1960).

It is probable that previous widespread acceptance of the "haemodynamic crisis" hypothesis is one of the main reasons for the reluctance of many physicians to treat hypertension in patients with cerebrovascular disease and indeed had led some physicians to endeavour to raise the blood-pressure with pressor agents. The results presented indicate that hypotension is not an important causal factor in the genesis of transient cerebral ischaemic attacks and that hypotension is remarkably well tolerated, even in patients with widespread ischaemic damage (Case 7—see Chart). Hypertension is known to affect prognosis adversely in cerebrovascular disease (Marshall and Kaeser, 1961). Although caution should be observed in patients known to have an occlusion of a major vessel, efficient hypotensive therapy seems unlikely to precipitate transient ischaemic episodes and may well lead to a reduction in the high mortality from cerebral haemorrhage and cardiac disease ; this is particularly the case now that there is available in methyldopa a powerful hypotensive drug that does not cause severe postural hypotension. The present study provides no brief for the use of pressor agents in the management of transient ischaemic episodes.

Summary and Conclusions

Hypotension was induced in 37 patients with transient focal cerebral ischaemic attacks, using intravenous hexamethonium and a pivoted bed. Systolic blood-presure was reduced to a mean value of 42% of the initial pressure. In only one patient was an ischaemic attack reproduced ; the remainder developed no evidence of focal cerebral ischaemia before the point at which they developed severe generalized ischaemia. It is concluded that hypotension is not normally a causal factor in the genesis of transient cerebral ischaemic attacks. There is therefore no rationale for the treatment of these patients with pressor drugs and no bar to the treatment of coincident hypertension.

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ATYPICAL POLYARTHRITIS IN PSORIATIC FAMILIES

BY

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There is good statistical evidence that psoriasis and polyarthritis occur together more often than can be explained by coincidence of two common diseases (Dawson and Tyson, 1938 ; Bauer *et al.*, 1941 ; Wassmann, 1949). In addition, tests for rheumatoid factors are negative in the vast majority of subjects with psoriasis and arthritis (Ball, 1952 ; de Forest *et al.*, 1956 ; Wright, 1959), whereas they are positive in 80% or more of patients with rheumatoid arthritis (Kellgren and Ball, 1959).

Differentiation of the arthritis occurring with psoriasis from classical rheumatoid arthritis on the basis of clinical and radiological features is less secure. Most recent authors have accepted the picture of erosive arthritis predominantly or exclusively affecting the terminal interphalangeal articulations as being peculiar to psoriatic arthritis, and rare, if seen at all, in rheumatoid arthritis. Other features that have been claimed to be characteristic of psoriatic arthritis are more controversial, and are shown in Table I.

TABLE I.—*Previously Reported Features of Psoriatic Arthritis*

Absence of subcutaneous nodules (Wright, 1959; Baker *et al.*, 1963)
Predominant involvement of terminal interphalangeal joints (Bauer *et al.*, 1941; Avila *et al.*, 1960; Wright, 1961)
Severe osteolysis; arthritis mutilans (Fawcitt, 1950; Sherman, 1952; Wright, 1959)
Resorption of tufts of terminal phalanges ("whittling") (Wright, 1959; Avila *et al.*, 1960)
Asymmetrical involvement of metatarsophalangeal joints (Wright, 1961)
Frequent bony ankylosis (Avila *et al.*, 1960)
"Mushrooming": impaction of the tapered distal end of a phalanx into the splayed opposed articular surface (Gibson, 1948; Fawcitt, 1950)
Involvement of interphalangeal joint of hallux with proliferation of base of distal phalanx (Avila *et al.*, 1960)
Sacro-iliac involvement, especially with ankylosis (Dixon and Lience, 1961; Wright, 1961)
"Sausage digits": red swollen toes or fingers due to involvement of both interphalangeal joints and tendon sheaths (Weissenbach, 1938; Dixon, 1960)

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