TRANSIENT CEREBRAL ISCHAEMIC ATTACKS*

Dr. A. BARHAM CARTER, M.D., F.R.C.P., D.P.M.

*Advisor in Neurology to the Ministry of Defence
Harley Street, London*

Introduction

ONE of the most depressing fields in therapeutic medicine formerly lay in the management of degenerative occlusive cerebrovascular disease, but fortunately there has appeared a small fertile area where the yield of successful results is reasonably good. Here the syndrome of transient cerebral ischaemic attacks (T.C.I.A.) is to be found and these have stimulated some of us to show a keener interest in their pathology and symptomatology, greater enthusiasm in their treatment and increased optimism regarding their eventual outcome.

By definition T.C.I.A. are recurrent episodes of focal neurological deficit due to inadequacy of local blood supply which last usually minutes rather than hours and are followed by complete recovery of function within twenty-four hours. These attacks involve either the carotid or vertebrobasilar territories, and although they may recur singly they often come in clusters, separated by variable periods of freedom.

Description

The carotid type is characterised by contra-lateral hemiparesis with or without hemianaesthesia affecting the hand and face more often than the whole of one side of the body or leg. If the lesion is in the dominant hemisphere the picture may be complicated by dysphasia and in some patients there is transient blurring or complete temporary loss of vision on the same side as the cerebral lesion. These defects may occur in any combination and usually disappear as quickly as they come. The patient may say that the fingers and thumb of one hand feel odd, usually numbed and tingling, and at the same time the hand feels clumsy and objects are dropped involuntarily. Other phenomena in the carotid type are attacks of confusion, disorientation, loss of memory, inappropriate behaviour, emotional lability, headaches, inability to write and getting lost in familiar surroundings. These attacks must represent ischaemia in the pre-frontal, temporal or posterior parietal lobes and are less common than the more classical picture, often passing unrecognised for what they are.

The vertebrobasilar type of T.C.I.A. is characterised by episodes of vertigo, loss of balance, drop attacks in which the patient falls suddenly without loss of consciousness, diplopia, numbness of the face, dysarthria, alternating hemiparesis or quadriplegia, dysphagia and partial or complete loss of vision in both eyes. This syndrome is therefore much broader in its symptomatology than the carotid type, because the mid and hind-brain contain so many complicated and loosely packed structures. More important than any one individual manifestation is a combination of transient events, such as tingling of the face with diplopia and vertigo, or drop attacks and quadriplegia, or loss of balance and bilateral visual loss, or any similar syndrome of hind-brain ischaemia.

* *Lecture given to the Medical Society of the Cambridge Military Hospital, Aldershot on 10th December 1975.*

Mechanism

There are three theories concerning the mechanism of the attacks, the first of these suggesting that vasospasm temporarily narrows atheromatous cerebral vessels thus reducing local cerebral blood flow. Vasospasm certainly occurs in migraine, in accelerated hypertension and after cerebral haemorrhage, but there is no evidence that it occurs in atheromatous cerebrovascular disease and this theory has been discarded by most authorities.

The second postulated mechanism is that minor falls in systemic blood pressure will produce lowered focal cerebral perfusion if the supplying vessel is narrowed and Denny-Brown and Meyer (1957) demonstrated this in animals naming the syndrome a haemodynamic crisis. However, Brice, Dowsett and Lowe (1964) showed that the diameter of the internal carotid artery has to be narrowed to 2 mm before any diminution of flow occurs beyond the stenosis so that this mechanism cannot always be involved as T.C.I.A. occur not infrequently in the carotid territory in the absence of obvious radiological stenosis.

Probably in elderly people T.C.I.A., particularly the vertebrobasilar type, are caused by this mechanism because postural hypotension is common in this group and drop attacks may occur when these patients stand up or have been standing for long periods. It is also common clinical experience that the withdrawal of hypotensive or sedative drugs in old people will often stop attacks of T.C.I.A. and that such attacks may be associated with intermittent cardiac dysrhythmias interfering with the general circulation.

The third theory of T.C.I.A.'s is that atheroma may cause ulceration of the internal carotid or vertebral arteries often at their origins and friable platelet and fibrin thrombi form from which microemboli pass to peripheral cerebral and retinal vessels. It is probable that this mechanism accounts for the majority of T.C.I.A. particularly in middle-age patients, and these emboli have been seen in retinal vessels and found in cerebral vessels at necropsy, so the evidence is strong (Gunning et al 1964).

Aetiology*Atheroma*

As has already been said by far the most commonest cause of T.C.I.A. is atheroma of the vessels supplying the brain particularly the large extracranial vessels in their course from aorta to skull. The lesions are commonly situated in the internal carotid artery just above the bifurcation of the common carotid and in the vertebral artery at its origin from the subclavian. The lesions are often multiple and the second commonest site in both vessels is where they enter the skull and become naturally rather tortuous.

It must be remembered that some general diseases seem to predispose to atheroma, such as diabetes, gout, hypothyroidism, hyperlipidaemia and chronic nephritis and these must be looked for with care.

Cardiac dysrhythmias

These are probably a slightly commoner cause of T.C.I.A. than was at first thought.

While atrial fibrillation may be commonly associated with cerebral emboli both major and minor, the results of these are usually a major or minor stroke rather than

T.C.I.A., and similarly heart-block is more commonly associated with Stokes-Adams syncopal attacks. However patients may complain of palpitation accompanying their T.C.I.A. and there is no doubt that intermittent cardiac dysrhythmias occur more often than we think. An interesting study has recently been made of patients with T.C.I.A. or palpitations (monitored by a continuous twenty-four hour cassette electrocardiogram (E.C.G.) recorder) whose resting E.C.G. records showed no dysrhythmias (Goldberg, Raftery and Cashman 1975). The authors found episodic dysrhythmias including supra-ventricular and ventricular tachycardia, atrial fibrillation and flutter and heart block in 74 per cent, but not all patients had T.C.I.A. and in those who did the attacks are described as dizzy attacks, faints or blackouts rather than focal lesions. However one suspects that in these patients there must have been some drop attacks without loss of consciousness and the mechanism of the T.C.I.A. was most probably by a haemodynamic crisis.

Cervical spondylosis

This condition is to some extent universal in patients over 50 years of age but is not often the cause of symptoms. Occasionally a history of vertebrobasilar T.C.I.A. occurring with neck movements may be obtained, and here the supposition is that osteophytic outgrowths compress the atheromatous vertebral arteries. All patients old enough to have vertebrobasilar T.C.I.A. will have radiological evidence of spondylosis but only if movement causes the attacks is it possible to say one causes the other. Common movements are turning to watch traffic before crossing the road, reversing a car, redecorating ceilings or in more esoteric circles gazing at stars or cathedral roofs.

Hypertension

Accelerated hypertension is well known as a possible cause of T.C.I.A. and probably lability of blood pressure in treated patients may produce the same result, as any sudden increase of intraluminal pressure in arterioles will be followed by myogenic vasospasm. Also in hypertensive patients microaneurysms are commonly found in the brain, and tiny haemorrhages from these may diminish local cerebral perfusion.

Hypotension

It has already been mentioned that lowering of systemic blood pressure may reduce flow in stenosed cerebral arteries and it seems that the hind-brain is particularly sensitive to this so that vertebrobasilar T.C.I.A. are more often encountered in elderly patients subject to postural hypotension. Certainly drop attacks, vertigo and dizziness are common in elderly patients on hypotensive drugs, diuretics, sedatives such as promazine or chlorpromazine and L. Dopa and can be stopped by discontinuing the offending drug.

Blood disorders

It is not uncommon to find anaemia present in elderly patients and a blood count is of course mandatory in patients with T.C.I.A. Similarly patients with polycythaemia and other blood dyscrasias may produce small localised haemorrhages or thromboses which might lead to T.C.I.A. although minor or major strokes are a more likely outcome.

Differential diagnosis

Diagnosis is relatively easy in the carotid type of T.C.I.A. and the only condition likely to be confused with it are migraine and focal epilepsy. The patient with migraine sufficiently severe to produce visual blurring and hemiparaesthesia will almost certainly have a history going back to adolescence and probably other members of his family will be affected.

Focal epilepsy of the sensory type may be more difficult particularly when associated with a slow growing cerebral tumor. If a motor component of jerking accompanies the tingling diagnosis is easy, but otherwise only a careful history will distinguish the more differentiated paraesthesia of epilepsy from the diffuse tingling numbness of the T.C.I.A. If there is any doubt a carotid arteriogram should be done.

The vertebral types of T.C.I.A. are rather more difficult as many elderly patients complain of vertigo, dizziness, unsteadiness and falling about. Syncope and vasovagal attacks are by definition associated with loss of consciousness so that differentiation should be easy in these patients, and Menière's syndrome is characterised by paroxysmal vertigo accompanying a progressive unilateral deafness and tinnitus. Depressive anxiety states can be a cause of confusion as these patients tend to complain of dizziness, swimmy feelings, light headedness, facial pain and flushing and difficulty in focussing. Fortunately in the severer forms of anxiety depression the complaints vary from day to day, are ill defined and often accompanied by insomnia, night sweating and apprehension not usually seen in T.C.I.A. It is in this field that errors in diagnosis occur so that mild hypertension or radiological cervical spondylosis are blamed for emotional symptoms although it is as well to remember that organic and psychiatric symptoms may occur together each tending to blur the picture of the other.

Management

Once the diagnosis of T.C.I.A. has been made or suspected on the history, clinical examination may show evidence of occlusive arterial disease. Auscultation of the neck may be rewarding, the characteristic long systolic murmur being heard over the vessels involved. Unfortunately this is not present in all patients with carotid or vertebral atheroma, and also may be confused with murmurs conducted from the heart, thyrotoxic murmurs or the venous hum.

In all patients a full blood count with estimation of serum cholesterol lipid profile and electrolytes, a glucose tolerance test, X-rays of chest and skull, an E.C.G. and a lumbar puncture are in my opinion mandatory because every effort must be made to clinch this important diagnosis and to exclude other local causes of the symptoms. In addition a thorough search must be made for general diseases such as anaemia, diabetes, hypertension, coronary artery disease, cardiac dysrhythmias and hypothyroidism, and if any abnormality is found it should be treated because it is possible the attacks will then stop. Examination must be thorough and should include a comparison of blood pressure readings in each arm, and an assessment of peripheral pulses. It is also useful to auscultate over the abdomen to the left of the umbilicus, and over the femoral arteries to determine whether there is any obvious occlusive vascular disease affecting the lower extremities.

The real question is whether cerebral angiography is indicated and if so in what patients. I think there are two main indications. The first is to establish the diagnosis if there is a serious doubt about the presence of an organic cerebral lesion, such as aneurysm, tumor or subdural haematoma, and for this purpose bilateral carotid angiography would usually suffice. The second indication is as a preliminary to reconstructive surgery or to anticoagulant therapy and unless these lines of treatment are being seriously considered I believe cerebral angiography is unjustified in patients with T.C.I.A. It is therefore necessary to consider the indications for surgery or anticoagulant therapy, and for this purpose it is necessary to distinguish between the two main types of attacks as the natural history and results of surgery are different.

In the carotid type about sixty per cent of the patients will develop a major stroke within five years of the first episode and all reasonably fit patients below the age of 75 with carotid attacks should have a carotid bilateral angiogram as soon as possible. The result of this will determine the site and degree of stenosis if present and also its accessibility, and then if the patient is willing to accept operation, the opinion of a vascular surgeon experienced in carotid reconstruction work should be obtained, who may require an aortogram before deciding on the line of treatment. Surgery will stop the ischaemic attack, may delay the onset of major stroke, will not affect the generalised atheroma usually present and very occasionally is disastrous, producing a complete hemiplegia or even death, but fortunately these occur in less than two per cent of patients. The outlook for the untreated vertebrobasilar types of T.C.I.A. is better as less than thirty per cent develop a major stroke within five years and some symptoms seem more benign than others. If the patient presents with vertigo, drop attacks, visual blurring or dysarthria the prognosis is reasonably good with conservative treatment, but if transient hemiplegia or quadriplegia occurs radical measures such as surgery or formal anticoagulant therapy are urgently required. Probably vertebral angiography will be thought necessary but this is not without risk in elderly patients.

One form of vertebrobasilar T.C.I.A. requiring such aortography is that in which symptoms appear when the upper limbs are exercised. This phenomenon known as the subclavian steal syndrome is due to an occlusion of the subclavian artery proximal to the origin of the vertebral, so that the flow in the latter vessel is reversed to supply the arm with blood thus depriving the hind-brain of perfusion unless the opposite vertebral artery is large and patent.

If no accessible stenotic lesion is found or if the patient is found to be unsuitable for surgery for any reason treatment resolves itself into dealing with any possible general causes such as hypertension, cardiac dysrhythmias, blood disorders, diabetes, abnormal blood lipids and hypothyroidism. In addition the possibility of hypotensive drug therapy causing the attacks should be remembered and general advice should be given to the patient, to avoid smoking, obesity and inactivity. If in spite of dealing with the above problems the attacks continue there is a strong case for formal anticoagulant therapy with oral warfarin, which will usually stop the attacks and improve the prognosis regarding the onset of a major stroke at a later date. Contraindications to this treatment are hypertension with a systolic pressure above 200 mm Hg or a diastolic pressure above 105 mm Hg, a history of ulcer type dyspepsia, diverticulitis or hepatic disease. The rationale of this treatment is that the rough surface of the atheromatous plaque becomes epithelialised if the prothrombin time is raised sufficiently to prevent platelet and fibrin

aggregation; and the frequent disappearance of the murmur under treatment suggests that this is so. Treatment should be continued for a year and if recurrence of attacks occurs on discontinuation, should be continued indefinitely.

In severely hypertensive patients carotid stenosis is less common and T.C.I.A. are best treated by lowering the blood pressure. The diastolic pressure should be brought down to between 90 and 100 mm Hg by means of thiazide diuretics with the addition of other hypotensive agents if necessary, such as methyldopa, propranolol, clonidine etc. More powerful hypotensive agents are more difficult to use in these patients because of postural hypotensive attacks.

In the elderly patients—those well over 70 years of age—the problems are somewhat greater, although age cannot always be measured by years, and the general principles of treatment still apply. If the patient has a reasonable cardiovascular system, and is not markedly hypertensive, and if he is mentally and physically active, I consider age by itself should not be a bar to arteriography, surgery or anticoagulant therapy.

Any general disease such as anaemia, hypothyroidism, diabetes or cardiac dysrhythmia should be treated energetically as in a younger patient but with hypertension the position is different. Most elderly patients require some hypertension for efficient cerebral perfusion, and I think it unwise to treat hypertension in the elderly unless the diastolic pressure is over 120 mm Hg, the fundi show hypertensive changes or the patient has left ventricular failure.

The question of cerebral vasodilator drugs such as cyclandelate (Cyclospasmol) is often raised and although it is rarely possible to influence T.C.I.A. by this treatment there is no harm in trying a short course of say 400 mg t.d.s. for a month. Also occasionally phenytoin (Epanutin) 50 mg b.d. will help and a therapeutic trial particularly in vertebrobasilar disease is often useful. The use of 600 mg of soluble aspirin daily has been helpful in patients where formal anticoagulation is contraindicated. The rationale being that aspirin helps to prevent the formation of platelet aggregations on atheromatous plaques. If there is no known aspirin sensitivity and if the aspirin is taken with food this therapy is very useful for patients unsuitable for surgery or anticoagulants. One of the best preparations is aloxiprin (Palaprin forte) which is commonly used long term in rheumatology in doses of 600 mg daily.

Conclusion

The recognition of T.C.I.A. is important because they are accessible to treatment and the eventual major stroke can be delayed or prevented by correct and enthusiastic therapy. General conditions should be sought for and treated and sensible advice re smoking, obesity and inactivity given. In patients under 70 years with normal blood pressure and carotid type T.C.I.A. arteriography followed by surgery or anticoagulant treatment is the treatment of choice. The results of surgery in hypertensive patients are less rewarding and anticoagulants contraindicated. Hypotensive therapy is obligatory using thiazide diuretics, clonidine, propranolol or methyldopa.

In the over 70 age group the principles of treatment remain the same but hypotensive therapy must be used with caution and a good cardiovascular and mental state is essential for considering surgery or anticoagulant therapy. It is probably in this group that soluble aspirin and cerebral vasodilators may come into their own and certainly

phenytoin is sometimes useful. In patients with vertebrobasilar T.C.I.A. brought on by specific movements good advice about restriction of sudden neck turning is often enough. The wearing of a collar has been occasionally useful, but elderly patients do not easily tolerate this if it really restricts them, and if not all it does is remind them that neck movements must be done with care. It therefore helps those who because of age have become unduly forgetful but otherwise its value has probably been exaggerated.

It is perhaps important to remember that in some patients drop attacks and unsteadiness of gait are impossible to control and treatment becomes a social problem. Unless we can provide companionship out of doors and helpful mechanical aids indoors many of these elderly unfortunates are virtually prisoners of their disability. Fortunately these are in a minority and the usual outcome of sensibly managed patients with T.C.I.A. is good.

REFERENCES

- BRICE, J. G., DOWETT, D. J. and LOWE, R. D. (1964). *Brit. med. J.* ii, 1363.
DENNY-BROWN, D. and MEYER, J. S. (1957). *Neurology* 7, 567.
GOLDBERG, A. D., RAFTERY, E. B. and CASHMAN, P. M. M. (1975). *Brit. med. J.* ii, 569.
GUNNING, A. J., PICKERING, G. W., ROBB-SMITH, A. H. T. and ROSS RUSSELL, R. (1964). *Quart. J. Med.* 33, 155.