Mechanisms of Transient Cerebral Ischaemia

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British Medical Journal, 1971, 1, 646-647

A transient reduction in blood supply to a localized area of brain is a common event in clinical neurology and may result from two main pathological processes. In one variety there is a temporary narrowing or blockage of a regional artery—for example, by an embolus—causing a reduction in blood flow, which returns to normal as the patency of the vessel is restored. In the second variety there is no change in vascular patency and ischaemia results from a temporary breakdown in homeostasis. This report draws attention to two further instances of this mechanism.

Case 1

A 51-year-old vintner entered hospital because of episodes of transient cerebral ischaemia. These had begun six months previously and occurred about twice weekly. They were provoked by the physical exertion of lifting crates and barrels so regularly that he had to leave his employment. At other times he experienced attacks while sitting. There was no relation to movements of the neck. Each attack lasted from 30 seconds to 15 minutes and took various forms—for example, severe vertigo, often with vomiting and with an intense pulsating pain in the left side of the neck and face, paraesthesiae in the right side of the mouth and cheek with slurring of speech, and weakness of the right arm.

On examination the central nervous system appeared intact; no pulses could be felt in the right arm. The right carotid was also impalpable; the right superficial temporal was weak and delayed. The left carotid was palpable and a systolic bruit was audible over the artery. Blood pressure was unobtainable in the right arm and

FIG. 1—Case 1. Arch angiography (femoral route) at 2 seconds (left) and 6 seconds (right) after injection of contrast. Blood is diverted from left common carotid to right common carotid via thyroid anastomoses. Right subclavian is filled by blood flowing down right common carotid and right vertebral artery. Right internal carotid artery is occluded. Innominate artery is also occluded, but left common carotid and left vertebral are unusually large. Left subclavian artery is stenosed.

110/80 in the left. An aortogram (Fig. 1) showed occlusion of the innominate artery. The right common carotid and subclavian arteries were patent beyond the block. In later films the right carotid bifurcation filled from the left side via the left and right superior thyroid arteries, which appeared enlarged.

At operation under hypothermia (Mr. N. Browne) the atheromatous occlusion of the innominate artery was removed by endarterectomy. During the process of exposing the left subclavian stenosis a tear occurred in the posterior wall of the aortic arch necessitating ligation of the arch and the insertion of a Dacron graft between the ascending and descending aorta; the origin of the left subclavian artery, after resection of the stenosis, was anastomosed to the graft.

The patient made a rapid recovery and was discharged three weeks later. Both radial pulses were normal and both carotids palpable. No further attacks of vertigo or hemiparesis occurred in the following three months though he continued to experience daily transient obscurations in the visual field of the right eye.

Case 2

A 65-year-old man was admitted to hospital after a subarachnoid haemorrhage and left third nerve palsy. Percutaneous carotid and vertebral angiography showed an aneurysm arising from the distal part of the left internal carotid artery; the origin of the same artery showed moderate stenosis. The neck of the aneurysm was clipped (Mr. L. Symon). The patient recovered satisfactorily but six weeks later was readmitted because of increasing lethargy, generalized headache, and confusion. His condition responded to the insertion of a ventriculoatrial shunt. Thereafter he remained symptom free and returned to work.

One year later he was readmitted with a complaint of episodes of transient right hemiparesis and dysphasia. The duration of these episodes varied from a few minutes to six hours. Numerous attacks occurred under observation but there was no change in blood pressure or pulse. On examination between attacks there were no abnormal physical signs. A systolic bruit was localized to the left carotid bifurcation and a loud continuous bruit in the left supraclavicular fossa extended towards the mastoid process. Left and right vertebral angiograms by axillary catheterization showed a large arteriovenous fistula between the left vertebral artery and vein (Fig. 2). Vertebral veins were dilated as far up as the base of the skull, and the lumen of the proximal part of the left vertebral artery was very irregular. On the day following angiography the bruit had disappeared and has not been heard since at eight out-

FIG. 2—Left subclavian artery angiogram 2 seconds after injection. Left vertebral artery, which is stenosed at origin and irregular throughout its length, communicates with dilated vertebral venous plexus at level of cervical vertebra. Distal part of vertebral artery beyond the fistula is faintly shown.

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patient attendances over a period of 18 months. Only two further minor attacks of dysphasia have occurred, each clearing rapidly in a few minutes.

Comment

These cases are further examples of the steal syndrome. In Case 1 it seems probable that sufficient blood was diverted from the left hemisphere during the attacks of arm exercise to cause transient ischaemia. Removal of the block in the innominate artery effectively abolished the attacks of hemisphere and brain stem ischaemia, while leaving the attacks of right retinal ischaemia unchanged. In Case 2 transient cerebral ischaemia was associated with a vertebral arteriovenous fistula. It cannot be stated with certainty that the vertebral fistula was the only cause of the attacks, since the patient had evidence of widespread cerebral vascular disease, including stenosis of the carotid artery. Nevertheless, the symptoms appeared during the period of growth of the fistula and improved after the fistula closed.

The intermittency of symptoms suggests that the haemodynamic situation produced by the fistula is unstable. There was no evidence of reflux down the distal portion of the vertebral artery at the time of arteriography though the volume of forward flow was certainly much reduced. Possibly other factors, such as pressure from cervical osteophytes on the vertebral artery, vasodilatation in extracerebral tissue, and systemic hypotension, may have been the precipitating factors.

Though spontaneous cure of arteriovenous fistula is recorded (Shumacker and Wayson, 1950) the unexpected result of the second arteriogram is unexplained. The association of the two seems unlikely to be due to coincidence. The irritant effect of the injection medium (diatrizoic acid) on vascular endothelium causing thickening or on the muscularis causing temporary contraction of a degree sufficient to close a small fistula are possible explanations.

Reference

Shumacker, H. B., jun., and Wayson, E. E. (1950). *American Journal of Surgery*, 79, 532.

Operant Therapy for an Abnormal Personality

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British Medical Journal, 1971, 1, 647-648

This report concerns a pilot operant experiment in which tokens were used to shape the behaviour of a patient with a severely abnormal personality. It was employed as a last resort before transferring her to a chronic institution. The patient was rehabilitated into the community within four months and was working one year later despite residual problems.

Case Report

The patient, a 12-year-old girl, was referred to the children's out-patient department at the Maudsley Hospital in 1961. She had always been shy and nervous, but immediately after her menarche a year earlier her personality changed. She became vegetarian, mute at school, and more aggressive to her mother and peers, especially girls. She ignored males, neglected her appearance, and swore excessively. After 15 months in the adolescent unit of the Bethlem Royal Hospital she was discharged to a school for maladjusted children. She returned to the care of her mother in 1963, but in 1964 again went to live at a school for maladjusted children. Depression, negativism, and a passive lesbian relationship with a teacher led to weekly analytic psychotherapy in the out-patient department in 1965-6 and in the Maudsley Day Hospital in 1967-8. She made little progress. Two applications for her admission to chronic mental hospitals were rejected. When transferred to the Bethlem Royal Hospital in February 1969 (aged 20) she complained of depression, fatigue, restlessness, screaming spells, and thoughts of killing her mother. She had not been out alone in

eight years, had never held a job or had friends, was lesbian, and dressed in masculine clothes.

For six months she had chlordiazepoxide, amitriptyline, and intensive supportive treatment. She became less tense and started to wear feminine clothing, but refused to do occupational therapy, eat with patients, or attend the consultant's rounds or patients' meetings. She never left the hospital, was quiet, sullen, depressed, and awkward, swore often, and complained of extreme fatigue. Intelligence was average. The diagnosis was a severely abnormal personality with complicating obsessions and agoraphobia.

Her mother, aged 50 in 1969, worked as a machine operator. Her father was an alcoholic drifter separated from his legal wife. As a child the patient lived in a series of deteriorating flats with various aunts and sitters while her mother worked.

TREATMENT AND RESULTS

On 12 August, 1969 an operant programme was begun. The patient was told that complete undisturbed bed rest was necessary as long as she felt tired. When she overcame her tiredness, as shown by talking to people and being helpful, she would earn tokens. With these she could buy time out of her room and do as she wished until all tokens were spent, when she returned to her room. She was alone, without books, radio, or visitors, and she ate her meals there. Initially a nurse visited two minutes every hour so that she could earn tokens by conversation. A psychiatrist or psychologist visited the patient daily for 15 minutes. Progress was reviewed each day and the reinforcement schedule adjusted if necessary. All ward staff met twice weekly with the therapists, who also telephoned the night staff nightly.

First conversation and constructive activities were reinforced systematically with tokens and praise. During the first week one token was earned for each second of conversation; one token bought three minutes outside the room. The second week one token was earned for 30 seconds' speech and one token for one minute of activities, such as helping with meals or working in occupational therapy; a bonus was added if tasks were initiated by the patient or done outside the ward. From the 15th day one token was earned for one minute's conversation. From the start of the programme reinforced behaviour (speech) increased steadily (Fig. 1).

Progress slowed in October when tokens were made contingent on walking increasing distances from the hospital. On 13 October discharge was threatened unless she did two walks daily. She then walked increasingly further from the hospital, though still frightened when out alone. This fear gradually decreased (Fig. 2). By the end of October she was speaking freely, so on 11 November (day 92 of the programme) reinforcement of speech was discontinued (see Fig. 1). Speech did not decrease after this.

In December increasingly longer bus rides were rewarded systematically, as was unpaid part-time work in a local store. A paid

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