

## Original Contributions

# Pure Sensory Stroke and Allied Conditions

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**SUMMARY** This paper contains an analysis of 135 cases in which numbness, either episodic or persistent, involved one side of the body. In most cases, the patients were candidates for the diagnosis of pure sensory stroke which is usually the result of an occlusive cerebrovascular lesion involving the thalamus. The cases are divided into three main categories, pure sensory stroke, pure sensory TIAs, and atypical cases. The clinical features described in an earlier paper have been confirmed for the most part. A major limitation is the paucity of pathological studies. The lack of reliable criteria for the recognition of migrainous paresthesias has probably resulted in the inadvertent inclusion of some such cases. Some other conditions, hemidysthesia and cervical disc, which have had to be considered in the differential diagnosis have been included. Cases of occlusive disease of the posterior cerebral internal carotid and middle cerebral arteries have been analyzed for patterns of paresthesias which may serve to distinguish cortical lesions from thalamic.

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IN 1965, the pure sensory stroke was defined mainly on clinical grounds as a cerebrovascular syndrome in which sensory symptoms, persistent or transient, involved the face, arm and leg on one side.<sup>1</sup> In 1978, the underlying thalamic infarct was demonstrated pathologically in two patients along with the responsible vascular lesion.<sup>2</sup> In case 2 only the face and hand had been involved during life. The present report contains an analysis of 135 patients in whom numbness or other paresthesias involved one side of the body in the absence of weakness, homonymous hemianopia, aphasia and apractagnosia, and in whom the diagnosis of a vascular lesion was likely or was a consideration.

In the majority of patients, the evidence favored thalamic lacunar infarction or ischemia as the cause of the symptoms while in others transient migrainous accompaniments, cervical disc disease and thrombosis of a posterior cerebral artery were possibilities. The nature of many cases remained obscure and they are included here to direct attention to their existence on the assumption that other clinicians are faced with similar diagnostic problems. One particular group comprises patients, usually women, with chronic hemidysthesias, of which the strict lateralization at least is consistent with a vascular origin.

It might appear that pursuing the details of these patients is largely hairsplitting, but, because computerized tomography (CT) has failed to reveal the parenchymal lesion in our classical cases and angiography is most often equally unrevealing the clinical details become all important in reaching a diagnosis or formulating a sound clinico-angiographic correlation. The variability in the patterns with which simple paresthesias due to a stroke can present has been surprising.

In an attempt at further delineating the pure sensory stroke syndrome as a lacunar infarct, the clinical details of 70 patients with occlusion of the posterior cerebral artery (PCA), 100 patients with occlusion of the internal carotid artery (ICA) and 15 patients with occlusion of the middle cerebral artery (MCA) were reviewed to determine the frequency with which these three conditions give rise to purely sensory symptoms involving face, arm and leg, and thus mimic the pure sensory stroke syndrome.

### Case Material

For the most part, only patients were included in whom numbness involved all three regions — face, arm and leg or two regions — face and arm or arm and leg. Of four pathologically studied patients, two had sensory involvement of all three regions; in the third, the arm and leg were involved along with the region of the ear but the face was spared; and in the fourth case, only the face and arm were affected. When only one or two of the regions are affected the symptoms may arise from the superficial cortical sensory areas rather than the thalamus usually as a result of embolism whereas pure sensory symptoms involving all three regions have not been shown to arise from ischemia of the internal carotid or middle cerebral territories. Hence, the inclusion predominantly of patients with involvement of face, arm and leg. The 135 patients include the 26 previously-reported ones.<sup>1</sup> Almost all patients were either seen by me personally or the details were obtained from the patient's physician in the acute stage of the illness.

Angiography was sometimes performed in the earlier years but not more recently. CT has been obtained routinely in the last 8 years without demonstrating a lesion corresponding to a pure sensory stroke. Disease of the carotid arteries has been ruled out by clinical and laboratory assessment short of routine angiography. Brain tumor has been excluded by laboratory tests and often by the long period of follow up. In no patients has multiple sclerosis been likely. Because one of the aims of the present study was to gain an idea of the various

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kinds of cases that need to be distinguished from pure sensory stroke patients, the tendency has been to be broadly inclusive and with only these guidelines the cases as expected have proved to be a heterogeneous collection.

The case reports may seem to be repetitive but together they convey a fairly good idea of the many variations in the clinical picture which result from several factors — description of symptoms, the anatomical parts involved, timing, duration, frequency, evolution, special circumstances, associated symptoms, pain, angiography, pathology, etc. Although the differences are minor, they regularly cause doubts to arise as to whether or not a case fits the mold. The case reports should provide a useful reference to which clinicians may turn in attempting to find a match for their present cases.

In the case reports the side involved, right or left, is mentioned only once and the rest of the description refers to that side unless stated otherwise.

### The Analysis

For purposes of presentation, the patients have been divided into six categories: 1) Pure sensory stroke, 2) Pure sensory transient ischemic attacks (TIAs) only, 3) Atypical cases of transient hemiparesis, 4) Hemidysesthesia, 5) Cervical disc disease suspect, and 6) A special case.

#### 1. Pure Sensory Stroke — 58 Patients

In this category are patients in whom sensory symptoms or deficit lasted longer than 24 hours, the commonly accepted upper limits for a TIA. It is to be understood, however, that classifying cases on this basis is arbitrary and inaccurate for 90% of prodromal TIAs in basilar artery ischemia for example lasted less than 30 minutes.<sup>3</sup> Furthermore, one of the pathologically studied patients with pure sensory stroke, during life had only TIAs lasting up to 15 minutes, yet at postmortem, 3 years later, a lacunar infarct was found in the thalamus. On the other hand, the visual accompaniments of migraine may take 2 or 3 days to disappear yet one would not surmise that infarction had occurred.

In this category there were 37 males and 21 females. The ages ranged from 34 to 85 as follows: under 50, 7; 50 to 64, 23; 65 to 85, 27; and no data 1.

Typically the patient with or without prodromal TIAs developed numbness of the face, arm and leg either suddenly or in stepwise fashion. Of the 58 patients the face, arm and leg were involved in 48 (83%), the face and arm in 4 (7%), the arm and leg in 5 (8%) and the face, trunk and leg in 1 (2%). The right side of the body was involved in 25 patients, the left in 33.

In 10 patients prodromal TIAs occurred before the onset of persistent numbness as follows: one 30 second TIA 15 minutes before the persisting part of the stroke; one 1 hour TIA one day before the stroke; one 2 or 3 minute TIA 3 minutes before the stroke; two 1 minute TIAs in 12 hours; two TIAs of a few minutes duration each, 7 weeks before; three 3 minute episodes 16 hours

before the stroke; three TIAs lasting a few minutes in the 30 minutes before the stroke; four TIAs lasting 1 to 90 minutes in 16 hours; several fluctuations in 1 week without clearing entirely; and more than 10 lasting 10 to 15 minutes in 12 days.

In the 47 patients without TIAs, the symptoms were maximum on awaking from sleep in 13, the onset was more or less sudden (less than 20 minutes) in 18, and in 15 symptoms evolved over a period of 1 hour to 2 weeks. In two there were insufficient data. In the non-sudden group the time of evolution was: 1 hour, 2 hours (two), 5 hours, 12 hours (four), 24 hours (four), 48 hours and 2 weeks. In this manner of evolution increments were added stepwise rather than accruing gradually.

Numbness was by far the commonest term used by the patient to refer to the paresthesias: numbness 38 patients, tingling 9, gone to sleep 5, pins and needles 4, prickling 1 and no data 1. Six patients used the term numbness in addition to one of the other terms, making a total of 44 or 76% who used the term numbness. In some patients the paresthesias changed to dysesthesias in the following hours or days — tightness, pulling, constriction, swollen, as if a tight band is applied, stiff, tied with a rope, wooden, cold, like a stone, etc. Or the change was to thalamic pain — soreness, hurting, unpleasant sensation, burning, hotness, etc. Twenty patients used the terms tightness, swollen and constricted. In one instance numbness changed to pain after 10 minutes and in another after 12 hours. Three patients complained of dizziness or wooziness at the onset, all with involvement of the left side. Blurred vision occurred in one. One patient had severe sharp pain across the chest and down the right side immediately before the arm became numb. One patient at the onset experienced the sound of an engine "revving up" in his head. In case 8 a gynecological procedure had been performed 4 days before.

Sensory testing gave normal results in 34 patients even when the patient complained of numbness. In 15 there was a slight deficit usually in sensation for pinprick and light touch. In 8 there was a moderate to severe sensory deficit for pinprick, touch, joint position, vibration, stereognosis and number writing. An asymmetrical impairment of vibration in the affected foot occurred in several patients but differences in vibration in the two legs is difficult to interpret.

Information on the clinical course was available in 39 patients. In 15, the paraesthesias had disappeared within 2 or 3 days. In 22, paresthesias and dysesthesias persisted for weeks and months but in none were serious complaints present after a year, that is, the patient had learned to bear the discomfort. In only two patients was a thalamic type of pain a chronic problem. In one patient, after good recovery, 3 years later an almost identical stroke recurred.

In all cases, it was the first stroke or episode of cerebrovascular symptoms the patient had ever experienced. Hypertension was recorded in 45 (78%), the blood pressure was normal (less than 150/90 mm Hg in 13 (22%). Diabetes mellitus was present in 6. Angiography was carried out in 10 patients and was normal

in all instances. Pathological examination of the brain was made in three patients and in each a small thalamic infarct was demonstrated.

#### *Illustrative Cases*

*Case 1* A hypertensive woman, aged 58, at 1745 in 5 seconds developed numbness of the entire left side lasting three minutes. Almost immediately it returned and persisted. The affected parts, lip, arm, leg and buttock all felt enlarged or swollen. The leg felt novocainized. The neck felt as if it was in a vise. The numbness involved the breast, rib cage, cheek, lower jaw, nose but not tongue or gums. There was no weakness. The numbness first appeared between the shoulder and the elbow and spread from there. On neurological examination the prick of a pin on the foot felt like a hot wire. Touch on the face produced a prolonged after-tingling lasting 30 seconds. Cold stimulus felt colder on the left arm. An EEG was normal. Fifteen years later the paresthesias were still present when the patient was tired but she had learned to ignore them. They involved the head, face, nose, lips, cheek, neck, and the entire arm and leg. The limbs felt banded or constricted. On angiography at this time the right ICA and right PCA were normal.

*Case 2* A hypertensive man, aged 73, on arising one morning noted tingling in the left hand and arm. Later in the day the left foot may have been involved. In the next 24 hours tingling appeared in the left side of the neck, the region of the ear, the thigh and there was a feeling around the waist of wearing a belt. All symptoms cleared in several weeks. Pathological examination 5 years later showed a thalamic lacune. This would be an example of a pathologically proved lesion in a case without involvement of the lips and cheek.

*Case 3* A hypertensive man, aged 69, developed numbness of the left fingers, a little later of the toes and still later the face, all clearing in 1 hour. The next day the symptoms recurred in the face, arm and leg and persisted. A CT scan was normal. He was treated with long-term sodium warfarin and all symptoms disappeared. Five weeks later he again developed numbness of the entire left side. In the left axilla there was a swollen full feeling as if being gripped. He walked with a slight limp, was unable to hold things securely in the left hand and there was slight dysarthria. A CT scan showed a small recent thalamic hemorrhage in the region of the sensory nucleus.

*COMMENT:* This is probably an example of a late small hemorrhage at the site of a lacune occurring while the patient was receiving warfarin therapy. It will be noted that with the second stroke there was slight weakness in addition to numbness. This combination suggests either a thalamo-capsular infarct<sup>4</sup> or a laterally placed thalamic hemorrhage<sup>5</sup> as in this case. CT will often detect the latter but not the former.

*Case 4* A hypertensive woman, aged 68, while lying awake in bed at 0830, noted numbness of the left shoulder tip and lower jaw. It cleared in a few seconds. At 1000 there was a recurrence involving shoulder and jaw and in addition the arm, again clearing in 1 minute.

At 2100 numbness recurred and this time persisted in the arm as if there were a tight band around the wrist. One hour later in a single quiver the paresthesias extended to the leg and great toe, clearing from the leg almost immediately but persisting in the toe. The fingers felt burned, closing the fist was painful and the palm felt full, swollen and hot. The tongue, gums and jaw felt novocainized. The lips were numb.

*Case 5* A normotensive man, aged 67, suddenly developed numbness of the face, arm and leg on the right side. It faded in three days. Examination was normal. In the following years sensation on the affected side was slightly altered in that during respiratory movements the right side of the rib cage felt slightly tight or stiff.

*Case 6* A normotensive man, aged 57, at 0830 while seated reading noted tingling of the left upper and lower lips. The tingling shortly changed to numbness as if the lips were novocainized. Numbness next appeared in the cheek and after a few minutes he was aware of it in the left shoulder and left arm spreading down to the forearm, hand, and fingers. A few minutes later it had spread to the left thigh, calf, foot and toes. The rib cage felt numb. The entire evolution took about 20 minutes. The hand and foot remained numb for about 30 hours and the left side of the face for 54 hours. Examination during the episode was within normal limits. There was no visual display. At the onset there was a suboccipital headache on the left side. It was not severe but it was definite and lasted about 1 hour. The patient was subject to periodic headaches sometimes requiring aspirin. The tongue, ear, and neck were probably not involved. Bilateral carotid angiograms were normal. The important question is whether this case qualifies for the diagnosis of transient migrainous accompaniments.

*Case 7* A hypertensive man, aged 67, awakened with numbness of the left side of the body, face, arm and leg. Seven hours later he was aware of numbness of the buttock and abdomen. The following day the symptoms seemed worse. Numbness decreased in the next 3 weeks but the cheek remained dull to pinprick and the arm felt as if an iron band was tightly applied. Numbness of the limbs was more severe distally than proximally. An electroencephalogram (EEG) was normal. Angiography showed severe stenosis of the left ICA and the left vertebral artery. The left subclavian was narrowed to a lesser degree. The right vertebral artery was dominant and fully patent.

*Case 8* A normotensive woman, aged 34, began to menstruate 24 hours after a dilatation and curettage operation. During the next 3 days, she had some of her ordinary headaches. On day 4, at 1800 the cheek, ear, forehead, side of nose, jaw, throat, neck, and arm on the left side became numb. On waking the next day, the numbness had extended to the trunk, leg, and toes. Five months before, she had experienced a flashing light in the right eye for 20 minutes. There was a history of troublesome headaches. Five days later, the left side felt stiff, tight, icy, and sore. Sensation for all modalities was moderately reduced on the left side.

Galactorrhea had been present since the birth of a child 7 months before. A CT scan was normal. The nature of the pathological process remained obscure.

*Case 9* A normotensive man, aged 66, awakened at 0345 with numbness of the right side from the top of the head to the toes. It was as if he were split in two from top to bottom. Ten minutes later a persistent thalamic type of pain began throughout the entire side and immediately the sensation of numbness disappeared except along the ulnar border of the forearm. CT was normal.

*Case 10* A hypertensive diabetic woman, aged 55, at 1730 in 2 minutes developed tingling throughout the left side, first the hand, then arm, face and leg, sparing the chest and abdomen. The face felt divided down the middle. The hand felt asleep. During the next 24 hours there were superimposed bouts of increased tingling lasting a minute or so. The face felt novocainized and this involved forehead, scalp, eyebrow, eyelid, cheek, nostril, side of mouth, gums and tongue. The warmth of liquids was felt only on the right side of the mouth. The skin of the leg felt tight. Symptoms were much less at the end of the week. One week before the patient had had an episode of transient monocular blindness on the left side.

*Case 11* A normotensive woman, aged 44, while planting bulbs, developed severe sharp pain across her chest and down the right arm. Immediately the cheek, nose, lips, tongue, fingers, hand, arm, groin and leg became numb. The face was as if split in two. The symptoms gradually cleared in 3 days.

*Case 12* A normotensive left-handed man, aged 45, while eating supper experienced blurred vision for about 30 seconds. Fifteen minutes later vision blurred again and immediately his right side became numb from the top of the head to the toes. The numbness gradually changed to other dyesthesias and these faded away in the next year. In the early days, tightness involved the cheek, lips (not nose and gums), ear, side and back of neck, shoulder, arm, hand, fingers, trunk anteriorly and posteriorly, leg and big toe. The knee felt bandaged and there was a pulling sensation in the neck. There was no weakness. On neurological examination there were errors in stereognosis and interpretation of number writing. Cerebral angiography of all four major vessels was normal. A few minutes before the onset of the stroke the patient had had a moderately violent outburst of temper upon finding children were digging up his lawn. There were no further cerebral events in 15 years.

## 2. Transient Ischemic Attacks — 42 Patients

In this category, the patient had one or several transient attacks of more or less pure heminumbness lasting less than 24 hours. There were 27 males and 15 females. The ages ranged from 21 to 88. Under the age of 50 years there were 7; 50 to 64, 18; 65 and over, 14; and insufficient data, 3 cases.

The face, arm and leg were involved in 33 patients (79%), the face and arm in 3 (7%), the arm and leg in 4 (9%) and the face only in 2 (5%). The right side was

involved in 18, the left in 21 and the side was not recorded in 1. Thirty-one of the 42 patients were hypertensive (74%), 10 were normotensive (less than 150/90 mm Hg) and in one the figure was not recorded.

Numbness was the term used to describe the paresthesias in 28, tingling 8, pins and needles 3, and prickling, electric feeling and "went dead" in one patient each.

The number of spells was as follows: one TIA, 11 patients; two, 10 patients; 3 to 10 attacks, 10; 10 to 100, 11 cases. The duration of the spells varied from seconds up to 15 hours: 10 minutes or less, 14 patients; 11 to 30 minutes, 10; one half hour to 6 hours, 10 patients; 6 to 15 hours, 7 and not recorded, one. In the same case the duration of the TIAs could vary from 1 minute to 3 hours.

The period of time over which TIAs occurred varied widely: one day, 7 patients; one week, 8; one to four weeks, 7; and more than four weeks, 7. In some cases the face, arm and leg were involved in all spells while in many others the region involved varied from spell to spell.

Angiography was performed in 10. Five patients complained of faintness in association with the TIA. One patient had diabetes. In one case, the attack was precipitated by an angry outburst.

It was mentioned in the preceding account that one patient with only TIAs, later at autopsy showed a lacunar infarct in the thalamus. It cannot be anticipated that this finding applies to the other cases and in the absence of further pathological study it is speculated that the vascular substrate for the TIAs under discussion is stenosis or occlusion of a thalamic penetrating artery whose territory receives sufficient collateral blood flow to prevent infarction.

*It is of interest that in the 100 patients in the first two categories there was a stroke without TIAs in 48, TIAs without a stroke in 42, and the two were combined in only 10.*

### Illustrative Cases

*Case 13* A hypertensive man, aged 72, developed tingling of the fingers of the right hand as he jumped out of bed in the morning. A few minutes later tingling appeared in the lips, tongue, and medial two toes. The symptoms reached their peak in 15 minutes and then began to subside. One half hour later there was a more severe recurrence. During the next 5 hours there were several further spells. On examination sensation for pinprick was decreased in the right hand. The spells ceased and did not recur in the next 5 years. The patient died from a myocardial infarction and pathologic examination showed a small lacune in the left posterolateral thalamus in the region of the sensory nucleus. It was the only cerebral lesion. This case exemplifies the occurrence of an infarct in association with clinical TIAs.

*Case 14* A normotensive man, aged 61, during a violent burst of temper, suddenly developed numbness of the entire left side from the top of the head to the foot. It lasted about 4 minutes. The lips and cheek were

affected but not the tongue and gums. During the following night on getting out of bed at 0300 he experienced a similar 4 minute spell. Cerebral angiography via a right brachial injection was normal.

*Case 15* A hypertensive man, aged 51, suffered a right lateral medullary syndrome whose prodrome consisted of 1 to 2 minute episodes of pain in the right hand and shoulder. The stroke occurred 4 days later. Angiography showed non-opacification of the right vertebral artery. Fourteen months later the patient began to have numb spells involving the left arm and hand, side of chest, cheek, lips, abdomen and the entire leg and foot. These spells which lasted 1½ to 2 minutes usually started in the hand or arm and spread in a few seconds to the face or foot. Sometimes only one area was affected. The frequency of the spells increased to 10 or 12 daily when aspirin and dipyridamole therapy resulted in their cessation. Seven months later, attacks of numbness began in the *right* fingers and foot and occurred at least once or twice a week for 3 months. Numbness involved all of the fingers of the *right* hand and mainly the 2nd and 3rd toes. The spells lasted up to 20 minutes. In these spells numbness sometimes involved the *left* side of the face whereas the right side of the face was never affected. The numbness of the lips and cheek was a feeling of deadness rather than tingling.

*Case 16* A hypertensive man while sitting in an easy chair noted numbness of the left hand and immediately tingling appeared at the hairline and spread down along the jaw to the lips. The face was as if divided in two by a knife. The numbness abated in 4 minutes. In the next 25 days he had 10 similar spells, lasting 1 to 3 minutes occasionally with involvement of the tongue. Examination during a spell showed no weakness but the fingers were clumsy.

*Case 17* A hypertensive woman, aged 58, in 6 weeks experienced 17 episodes of numbness of the left side. On day 1 at 1300 while sitting reading the medial 2 fingers tingled for 4 minutes. Later in the day numbness involved the lateral 3 fingers and was followed by numbness of the medial 2 fingers, upper lip and upper gum, again for 4 minutes. On day 5 in the morning numbness began at the elbow and spread up and down the arm lasting 4 minutes and involving all fingers. There were two more episodes in the forenoon. In the afternoon tingling appeared in the upper arm and spread up and down, in some of the episodes reaching the top of the shoulder, once the shoulder blade, once the axilla and side of the breast, and one or two affected the left cheek, half of the chin and both lips. These spells all lasted 3 to 4 minutes. On day 7 at 1800 numbness involved the arm, shoulder, scapula, side of chest and neck for 3 to 4 minutes. On day 8 numbness involved the arm, hand, and face, especially the region of the eye for 3 or 4 minutes. The patient dropped a coin without realizing it. She was begun on sodium warfarin therapy and in the period from day 9 to day 21 had only a few slight episodes. In one there was a film over the left eye for 3 or 4 minutes. Between days 21 and 31 there was one slight spell. On day 35 at 2030

the medial 2 fingers became numb and the numbness quickly spread to all the fingers and up to the wrist lasting 3½ minutes. Three or four more spells occurred in the next hour. On day 36 the patient awakened from sleep at 0045 with tingling of the fingers and hand for a few minutes. On day 39 an episode of numbness involved the left thigh and from there extended to the posterior aspect of the buttock up along the posterior aspect of the trunk and down to the foot. It ascended to the neck and the region behind the ear. She could walk by herself. The spell lasted four minutes. A few minutes later an episode involved the leg, thigh and trunk up to the level of the breast. On day 41 an episode of numbness involved the leg and buttock. There was a recurrence in the evening. On day 42 an episode involved the leg, thigh and lower abdomen. Late in the day there was numbness of the left foot and this spread to the thigh and then to the abdomen clearing almost immediately. During these days there was minor tingling of the fingertips of the second, third, and fourth fingers. The spread from the fingers to the face took two or three seconds. The spread from one region to another always took less than 10 seconds. During these spells the patient was receiving sodium warfarin. Angiographically the right internal carotid and right posterior cerebral arteries were normal.

*Case 18* A hypertensive man, aged 56, had numerous spells of numbness of the right arm and leg and in 1 out of 5 spells the face was slightly but definitely affected. The first spell involved the hand. On day 6 a similar spell occurred at 0945. At 1030 the patient's arm and leg were involved for ½ minute. At 1230 a similar spell lasted a few seconds. Between day 7 and day 12 there were 4 or 5 spells each day, on day 13 only one. The numbness consisted of a tingling, sleeping feeling. It came in the face, arm and leg almost simultaneously. There was no weakness. In the worst spell the right lower quadrant of the abdomen had a feeling of coldness. The tingling sensation was like "hitting the funny bone." The numbness in the leg was as if it had gone to sleep.

*Case 19* A hypertensive diabetic man, aged 67, in 2½ days experienced 27 spells of numbness of the left side — cheek, lips, face, arm, leg and trunk each lasting about 2 minutes. The numbness usually started in the hand and spread to the face in about 1 minute. Speech may have been slurred in some spells. Almost all spells were heralded by smarting and tearing in the right eye. In the arm the paresthesias consisted of pins and needles and tingling and in the leg, burning. There was often slight light-headedness. In one spell there was buzzing in both ears. Examination during an episode was normal. The spells ceased when the patient took dipyridamole.

*Case 20* A treated hypertensive man, aged 57, had a bout of numbness lasting 2 hours on two successive days at the noon hour. The numbness was most prominent in the right leg, but also involved the fingers and half the palm. The cheek felt warm or sunburned. There was no weakness or headache. The blood pressure in the Emergency Ward was 134/80 mm Hg. There were no visual symptoms.

*Case 21* A hypertensive woman, aged 57, awakened

with tingling of the right side of the face, arm and leg. She felt light-headed and staggered. She lay down and symptoms disappeared in 25 minutes. Three hours later, while driving her car, tingling involved the right side of the face, lips and arm for 5 minutes. The arm felt floppy. Next morning tingling recurred each time the patient tried to get out of bed. Two days later she had another spell involving face, arm and leg, lasting 1 minute. She had several more spells involving the face, arm and leg, lasting 1 minute. There were no further spells in the next 6 months.

#### *The Question of Migrainous Accompaniments*

In a previous paper,<sup>6</sup> evidence was presented supporting the thesis that late-life migrainous accompaniments can occur in the absence of headache. Although the intention was to exclude such patients from this paper, it is conceivable that because of imprecise differentiating criteria some 13 of the 42 patients in the present category be interpreted as migrainous. Indeed, three patients from the first category can also be similarly regarded. When headache and/or a scintillating visual display are features the diagnosis of migraine is made easier, but no patient had these. When the patients are young, for example, between 15 and 30 years of age as two patients were, migrainous accompaniments are a more acceptable diagnosis but a process that occurs at the age of 25 cannot be excluded at the age of 50 solely on the basis of age. A march in which there is a gradual spread of paresthesias from one part to another over a period of 10 to 20 minutes is in our experience diagnostic of the migrainous process. Of the 16 patients in the 2 categories, 5 had a march of 15 to 20 minutes' duration and 3 other cases had marches of 5 minutes' duration. In three the onset was sudden and one awakened with hemiparesis. Young classical migraineurs may report that their paresthetic accompaniments appear in several parts almost simultaneously and absence of a march does not therefore rule out migraine. *Bilateral numbness in a spell strongly suggests migraine.* Facial numbness may be accompanied by aphasia and/or dysarthria. Recurrence of the identical process after months or years also is evidence in favor of migraine but only one patient had more than one bout as far as is known. A personal history of classical migraine supports the diagnosis as perhaps does a family history of migraine. Finally, the diagnosis of migraine presupposes normal angiography in the absence of any other culpable vascular process. In the absence of a specific diagnostic test for the migraine process no clearer delineation of these cases can be offered.

Of the 16 patients in whom the possibility of migraine should be entertained, 9 were normotensive, a higher percentage (56%) than in the groups as a whole. The duration of symptoms in 14 patients was 10 minutes, 15 minutes, 2 hours (2 patients), 2½ hours, 4 hours, 6 hours (2), 8 hours, 12 hours, 24 hours, 54 hours (2) and 4 days, ostensibly long periods for classical migraine accompaniments, yet in the study referred to the symptoms lasted longer than one day in 15% of patients.

#### *Illustrative Cases*

*Case 22* A hypertensive man, aged 51, at 1500 developed prickling throughout the left side — cheek, lips (not tongue), arm and leg. The numbness spread gradually over a period of 20 minutes. It had disappeared by the next morning 12 to 15 hours later. There was no weakness. Neurological examination was normal. There was no recurrence.

*Case 23* A normotensive man, aged 48, awakened in the morning with numbness of the left side — cheek, the ulnar border of the hand, the medial three fingers and the toes. The nose, lips, tongue, gums, ear, neck, side of head, abdomen and proximal limbs were not involved. The face felt numb while the other parts tingled. There was no headache. Neurological examination was normal. An EEG was normal.

*Case 24* A hypertensive man, aged 60, at 2230 suddenly noted a pins and needles feeling in the left hand which spread up the arm and into the cheek and a few minutes later was felt in the leg. Full recovery occurred in 2 hours. The paresthesias involved the cheek, ear, lips, side of nose, forehead and the entire left arm and left leg. The tongue and ear were not involved. There was no headache.

*Case 25* A hypertensive man, aged 63, suddenly noted numbness of the right fingers and this spread up the arm and down to the leg and toes in a few seconds. He could walk and was unable to feel the bare foot on the floor. Symptoms disappeared in 3 to 5 minutes. The next day at 0730 he had an almost identical attack. There were no further symptoms.

Also see cases 6 and 12.

### **3. Atypical Cases of Hemiparesis — 20 Cases.**

All 20 patients in this category were subject to TIAs but the features were sufficiently atypical to warrant placing them in a separate group rather than in the preceding TIA category. Thirteen patients were male and 7 were female. The ages ranged from 27 to 70 years. The face, arm and leg were involved in 13 (65%), the face and arm in 3, the face, arm and trunk in 2 and the arm and leg in 2. The right side was involved in 7 patients, the left in 13 patients. The paresthesias were termed numbness by 13 patients, tingling by 3 and in the other 4 pins and needles, a hot flash, gone to sleep and a frozen feeling, respectively.

The TIAs lasted a few seconds in 3 patients, 2 to 20 minutes in 13, and 1 to 24 hours in 8; some patients had both long and short spells. The number of spells varied greatly: one spell 4 patients; 2 to 10, 4; 10 to 100, 4; and more than 100, 8. The period over which the spells occurred was as follows: one day, 1; 2 to 10 days, 4; 10 days to one month, 2; 2 to 5 months, 4; and more than 5 months, 5.

Ten patients were hypertensive and 10 were normotensive. Seven underwent angiography and in all instances it was normal. The possibility that the symptoms represented migraine accompaniments existed in 8 or 9 patients and in 2 of these a visual display occurred during the same symptomatic period but not at the same time as the paresthetic attacks. Light-headed-

ness or faintness was associated with the spells in three patients, all with involvement of the left side. The onset of the attacks was related to such varied circumstances as genital herpes, the use of birth control pill and dental extraction. In one patient the spells ceased when he discontinued smoking. The role of psychological factors was difficult to assess: "nervous, high-powered," worried about a stroke, depression, mourning and nervous tension were mentioned but a causal relationship was not evident.

So varied was the clinical picture that defining a clinical syndrome proved impossible and a brief description of each case is provided.

#### *Illustrative Cases*

*Case 26* A severely hypertensive man, aged 44, experienced three spells of numbness of the left face, arm and leg, the first one lasting 2 hours, the second coming 5 months later and lasting 2 minutes and the third one week still later, lasting 2 minutes. All occurred 1 to 2 hours after going to sleep. Angiography was normal.

*Case 27* A normotensive woman, aged 49, in 6 weeks had 12 to 15 episodes of numbness of the left cheek, tip of nose and pricking of both lips with a pulling feeling in the face, each lasting 10 minutes to several hours.

*Case 28* A normotensive man, aged 49, awakened with numbness of the right hypotenar eminence, dispelled in 30 seconds or less by movement. There were 10 or 11 spells in one month. It felt as though the part were missing. After one month numbness of the right foot, ankle and foreleg occurred, again with a sensation the parts were missing, all clearing in 10 to 15 minutes. Twice the thenar eminence was numb during the night. Angiography and CT normal.

*Case 29* A normotensive man, aged 70, for 8 months had episodes of numbness and tingling of the left face, arm, body and leg occurring every day or two. The cheek and side of the head were involved but not the nose, lips or tongue. At first they lasted 10 minutes but gradually lengthened to 1 to 2 hours and one lasted 4½ hours. All cleared eventually. Most started in the arm with spread to the leg and then to the face taking 10 minutes. No scintillations and no headache.

*Case 30* A normotensive woman, aged 59, suddenly developed numbness and tingling of the right arm, lips, cheek and leg, lasting 1 minute. The next morning they recurred for 2 minutes. Two days later the right leg became numb and heavy for a few minutes. Angiography was normal. A diagnosis of pure sensory TIA was made. Two years later she began to have sensory episodes involving the right arm, occasionally the right toes. "It's as if a cold feeling were sliding up and down my arm, a little tingling through the arm and forearm, like a crawling sensation." The episodes came several times an hour and lasted 1 to 2 seconds.

*Case 31* A normotensive man, aged 64, in 48 hours experienced six episodes of a hot flash in the left face, traveling in a few seconds to the arm, trunk, and leg, lasting 5 to 10 minutes. Angiography was normal. No headache and no scintillations.

*Case 32* A normotensive man, aged 54, while pulling a sweater over his head, developed numbness of the left shoulder region spreading down the left arm to the fingers, leg and toes in 30 seconds. In about 10 minutes it cleared leaving the shoulder and hip first, the fingers and toes later, like a wave.

*Case 33* A hypertensive man, aged 72, in a period of 8 days experienced repeated spells of numbness of the tongue, chin, hand and fingers on the right side, lasting not more than 2 seconds. Two weeks before these began he noted floaters, hexagons and octagons coming and going in the right visual field, gradually changing to a persistent central chocolate zone.

*Case 34* A hypertensive man, aged 63, had dizzy spells for 3 months. Five minutes after one, he developed numbness of the right arm, hand, cheek, body and leg for 5 to 10 minutes.

*Case 35* A hypertensive man, aged 55, while eating breakfast developed tingling of the right side of the lips and numbness of the right 3rd, 4th and 5th fingers. After 1 hour the fingers were no longer numb but there was a dull ache along the medial aspect of the right arm from shoulder to wrist. Numbness disappeared from the lips in about 4 hours, the last trace being a feeling of a hair at the corner of the mouth.

*Case 36* A normotensive woman, aged 69, in 4 days experienced 8 spells of numbness of the left arm, side of chest, abdomen, side of head, particularly behind the ear, side of neck and posterior third of the cheek. It started in head, hand or abdomen, spread in about 1 minute and lasted 5 to 6 minutes. Sensation was sometimes prickling, sometimes cold and had a weird quality. Early on the morning of the first attack she had experienced diamonds or prisms flashing brightly in the left visual field at about 2 per second in the shape of a star and lasting 1 hour.

*Case 37* A hypertensive man, aged 53, for 16 months experienced episodes of pins and needles in the left lateral shoulder region, forearm and all the fingers, lasting 5 minutes, always related to tenseness as a result of his professional duties. Symptoms subsided when he relaxed. At first the spells occurred once a month, later once a week and finally, almost every day, gradually increasing in severity. After 16 months the numbness in addition to involving the left arm extended to the cheek, nose and lips which felt divided down the middle. After 18 months the left leg also became involved with prickling of the thigh, lateral aspect of the foreleg and lateral aspect of the foot and toes. The spread was rapid. Angiography and CT were normal.

*Case 38* A hypertensive woman, aged 56, after walking 2 miles in the hot sun felt faint, stood up and both arms and both legs became numb for about 2 minutes. There were three recurrences in the next 30 minutes. The next day (day 2) there was numbness of the left arm and leg for 30 minutes and to a slight degree for a few hours longer. On day 3 there were three further spells, each lasting 2 to 3 minutes. On day 4 she awakened with numbness of the medial palm and fingers on the left side and a few minutes later the arm and leg became numb, lasting about 30 minutes. Slight

numbness persisted on days 5, 6, 7, and 8. On day 9 there was tingling of the hand and on day 11 numbness of the hand that spread to the shoulder, lasting 4 hours. One hour later there was a slight recurrence in the arm, shoulder and chest for about 5 minutes. Two hours later severe numbness of arm, shoulder, cheek, trunk, leg and calf developed, all clearing in 4 minutes. The spells reached their peak in 30 to 60 seconds. Angiography was normal. No spells in next 6 years.

*Case 39* A normotensive man, aged 69, while lying propped up in bed at 0600 reading, experienced numbness of the right arm and hand and within 30 seconds it involved the corner of the mouth, cheek and upper trunk. The leg, tongue and teeth were not affected. It cleared in 20 minutes but one hour later, while being examined by a physician, there was a recurrence for 20 minutes.

*Case 40* A hypertensive man, aged 63, had four left teeth removed and next day experienced numbness of the left face, thumb and questionably the leg.

*Case 41.* A hypertensive man, aged 53, for 4 years experienced four spells a month in which the left palm and fingers became numb for 1 to 4 minutes. The spells ceased for 1 year when he discontinued smoking. In the fourth year he had tingling of the left corner of the mouth and the left hand, again for about 5 minutes. On sodium warfarin the spells ceased. Angiography was normal.

*Case 42* A woman, aged 25, who had been taking a birth control pill for 3 weeks noted numbness of the right foot which spread to the leg and arm. Overnight the numbness diminished and during the following day disappeared entirely. There was no headache. Eighteen months later on several occasions she developed numbness of the right face, arm and leg. The spells occurred approximately every 2 months, lasted briefly, were never severe and affected chiefly the right leg. Between the 24th and 25th months from the first episode the spells of numbness began to occur with increasing frequency and duration until finally for 2 weeks they occurred on and off almost continuously. In 75% of these spells the face, arm and leg were affected, in 25% only the arm and leg. Occasionally, the face alone was involved. The numbness was always of a spreading type beginning in the right foot or great toe and spreading to the arm and face over a period of 30 minutes. The spells lasted about 2 hours and usually had disappeared entirely after a night's sleep. There were other briefer spells or even flashes of numbness or tingling in the arm, leg or face lasting a second or two. The sensation in the face was similar to that produced by novocaine. In the extremities the foot and fingers were particularly numb. The trunk was usually spared but sometimes there was tingling in the mid-axillary line. The corner of the mouth and tongue were not involved. There was never an associated headache or visual scintillation. An EEG was normal. The episodes ceased spontaneously and did not recur in the following 6 years. They may well have been a manifestation of migraine. The onset during birth control therapy is notable.

*Case 43* A hypertensive man, aged 68, for several

years experienced spells of numbness of the left hand and leg, occasionally of the face as if novocaine was wearing off. The symptoms had become more obvious during the previous 6 months. The longest episode lasted 20 minutes. The patient felt fine and attributed the complaint to tenseness.

*Case 44* A normotensive woman, aged 45, experienced numerous episodes of a frozen feeling on the left side — face, hand, arm and occasionally the leg. On day 1 there were 12 spells, on day 5 a similar bout and on day 8, 7 spells. The average duration was 2 minutes, the longest about 10 minutes. In the first spell the numbness involved the index finger, hand, and the distal 6 inches of the forearm and was associated with light-headedness. The 5th one involved the foot, leg, and arm. The 10th one involved the entire left half of the face. At night she was awakened by the spells. In one episode the numbness started simultaneously in the lips and index finger. In some spells there was a constricting feeling in the left side of the chest but an ECG was normal. In none of the spells was there a sensory march. Neurological examination was normal. Sodium phenytoin was ineffective.

*Case 45* A normotensive woman, aged 30, had recurrent genital herpes for 5 years. Associated with the earlier bouts she experienced numbness and pain in the left leg and lower back for 1 to 2 days before the outbreak of herpes. The numbness was like novocaine wearing off and was associated with a hypersensitivity of the skin. Sometimes it started in the foot and ascended, other times just the reverse. After the first year the numbness with each bout of herpes extended higher up to involve the abdomen and chest and still later, the arm. After 2 years the numb spells became more frequent and were no longer related to the herpetic attacks. In the previous year the numbness extended to the shoulder, the anterior and posterior aspects of the chest, abdomen and face. Usually the spells last 1 to 2 days and cleared without residuum. Recently, the episodes of numbness increased to about 3 per week and some numbness persisted between spells. Three weeks ago the patient had 3 spells in which suddenly intense numbness developed throughout the entire side almost simultaneously — face, head, scalp, neck, ear, lips, tongue, shoulders, chest, arm, abdomen, leg and foot. There was no sensory march. Similar but less dramatic attacks continued, starting in the face, hand or foot and spreading. Extensive clinical and laboratory investigation were entirely normal. A CT scan was normal. An angiogram was not made. An EEG both awake and asleep was normal.

#### 4. Hemidysesthesia

The justification for including these 9 patients in a paper whose emphasis is cerebrovascular may not be obvious, but in each case a vascular origin for the complaint had been seriously entertained. The selective involvement of one side of the body is consistent with a vascular basis, especially in the complete absence of any other plausible organic explanation for the symptoms.

In all 9 cases, the patients complained of unpleasant



disagreeable paresthesias throughout one side of the body. In 7 patients, the complaints were persistent; in 2, intermittent. Eight of the patients were female and one was male. Their ages ranged from 26 to 67: under 30, 2; 30 to 39, 2; 40 to 49, 2; and 50 to 67, 3. The face, arm and leg were involved in 7, the arm and leg in 2. The right side of the body was involved in 5, the left in 3 and both sides in 1. The dysesthesias were described as follows: numbness or deadness, unpleasantly cold, a peculiar aching numbness, a prickling swollen numbness, stinging numbness, tingling numbness, a pulling heavy tightness and a dull strange discomfort. In the patients with persistent discomfort, the symptoms had been present for 3 years (2 patients), 5 years, 14 years, 20 years (2 patients) and 27 years respectively; in those with transient symptoms the duration was 2 years and 8 years respectively. In none were the symptoms disabling. Seven patients had normal blood pressure and 2 were hypertensive. Angiography was performed in 3 patients. CT scanning was normal in all. In the patients with intermittent symptoms, EEGs were normal and anticonvulsants were ineffective. In 4 patients, the symptoms had begun during the use of contraceptive medication containing high levels of estrogen. The severity of the complaint usually fluctuated with "nervous tension." Depression was present in at least 4 patients, but with one exception, the patients were busy effective individuals. Two had hydrocephalic ventricles, idiopathic in case 47 and due to a colloid cyst in case 45. Review of the literature on colloid cysts revealed no case with similar transient symptoms. The cases are sufficiently dissimilar that generalization is impractical and a description of most of the cases is necessary to convey their nature.

#### *Illustrative Cases*

*Case 46* A normotensive woman, aged 25, noted numbness of the arm and gums on the right side. A cervical myelogram was normal. Ten years later at the age of 35, symptoms persisted and had extended to the right leg. When active she complained of a peculiar numbness and weakness of the right arm and leg and the upper gums felt novocainized. Sensory examination was normal except that pinprick was plainer on the left side and vibration was felt for 4 seconds less at the right fingers. This mild nagging complaint remained unexplained. The patient had used high estrogen birth control pills of the earliest type. At the age of 41, a colloid cyst of the 3rd ventricle associated with marked hydrocephalus was discovered and treated by bilateral ventriculo-atrial shunting. Twenty days later she reported numbness of the neck anterior to the surgical scar and after another day numbness involved the lower lip, teeth and right side of the tongue. Three days later numbness had extended to the tip of the nose and along the cheek to the plane of the ear canal. The next day the right palm and sole became numb. This abated in 24 hours and numbness of the face diminished. There were no further events in the next 5 years.

*Case 47* A normotensive woman, aged 41, stated

that for 20 years the left arm felt different than the right. For five years the left leg was similarly involved. The face was not affected. In cold weather the left arm, hand and foot felt unpleasantly cold. When she got into bath water there was tingling of the left side like first putting a frostbitten hand into cold water. When she touched the left hand with the right she felt that the right was doing the touching. The symptoms, she believes, started when she was placed on large doses of stilbestrol for menstrual irregularity. There was no change in the following 5 years.

*Case 48* A slightly hypertensive woman, aged 65, for more than 13 years had complained of a peculiar distress throughout the right side of the body, "the numbness is bothersome; it's in the right eye, hand, arm, forearm, chest, abdomen, leg, foot and toes, it's a dullness, sometimes a pins-and-needles feeling, there's a constant discomfort in the arm, it's not a pain, the right side feels entirely different than the left." The hand felt clumsy and uncertain. The history of the complaint was vague. No stroke had been recognized. Over the years neurological examinations had been normal and the complaint was attributed to "nerves." Pinprick felt sharper on the right. She had taken contraceptive medication in the early days when the estrogen content was high.

*Case 49* A hypertensive man, aged 58, for 2 or 3 years complained of paresthesias of the right side, face, arm and leg, worst in the leg. They had appeared insidiously and the patient could not recall the manner of their onset. The paresthesias consisted of numbness or deadness and there was no tightness, prickling, hotness or coldness. The symptoms came on when he was under pressure at work and disappeared entirely when he relaxed. They subsided in the mid-morning, increased at noon, faded in the afternoon, recurred in the late afternoon and always disappeared in the evening although he was tired. The numbness always affected all three regions — face, arm and leg. Sensory examination was normal. After a transurethral resection of the prostate he developed a burning sensation in the scrotum, perineum and penis.

*Case 50* A normotensive woman, aged 67, in a period of 2 years had 5 or 6 spells of numbness of the left side — face, cheek, around the eye, behind the ear, neck, chest, shoulder, arm and leg. The paresthesias spread throughout the side in about 5 minutes and gradually increased in severity. They lasted 30 minutes up to three hours. The arm felt stiff and under pressure. The leg felt as though warm liquid were poured into it. The spell made the patient very nervous. She was chronically depressed. There was no convulsive activity. Examination during a spell was within normal limits. At times she noted "silver" things in her vision. Bilateral carotid angiograms were normal. Immunoelectrophoresis was diagnostic of Waldenström's macroglobulinemia. The dysesthesia persisted despite therapy.

*Case 51* A woman, aged 47, 8 years before, developed dizziness and pain above the left ear in the line of the ear piece of her glasses. It felt as if a pressure built

up locally but in addition a similar feeling involved the left side of the head as well as the left arm and leg. The limbs felt heavy and they tired easily when used. The left index finger and great toe were often sore. She was unable to lie on the left side at night. Further inquiry revealed that as far back as 27 years before at the age of 20 the patient complained of a heaviness in the left arm, attributed then to a cervical rib. There was no numbness or tingling throughout the side but rather a pulling sensation, a heaviness or tightness in the face and in the abdomen. The patient's only other serious complaint was a constant feeling of exhaustion. Neurological examination was normal as was an extensive battery of laboratory tests. An inquiry concerning contraceptive medication was not made.

*Case 52* A woman, aged 27, complained of a chronic disabling discomfort throughout the entire right side of her body. Eight years before following infectious mononucleosis she was subject to fainting spells and at that time noted an unpleasant hypersensitivity to the skin distal to the appendectomy scar where the cutaneous nerves had been sectioned. This complaint had persisted. Three years later following trauma to her right knee she developed a discomfort in the entire right leg — a strange numbness, a dullness to the touch as if a layer of clothing lay over the skin. The ankle and knee began to hurt. Gradually the entire right side developed a peculiar discomfort, including the trunk, arm and later the side of the face, as if something was “wrong.” It got progressively worse over a period of 5 years. She tried to ignore it but this was difficult because the distress was worse when she used the parts and on exertion. There was an enormous pressure in the right leg if she used it too much. The whole leg tingled. When lying down there was a dull strange feeling deep in the leg, an aching. If she stood too long the distress became concentrated in the right great toe and it felt as if it would explode. The ischial tuberosity on that side was painful to sit on. The right arm ached constantly. Bumping her arm was unusually painful. When sleeping she was unable to lie on the right side. Leaning her arm on a chair was uncomfortable. The hand became painful on using it to write. Exertion made all symptoms worse. In the last year the right eye bothered her. The face felt like “going to sleep” with a superimposed semi-numbness, a discomfort. On taking a shower there was a temperature difference on the two sides of the body. Hot water made the right leg more tired. She had burned herself on getting into water after testing it only with the right side. Sometimes there was a burning in the foot and toes, occasionally a little in the face. Her face felt “funny, funny.” The whole side often felt icy. The weight of her arm hanging down was excessive. The left side was perfect. On examination pinprick was unpleasant on the right side. Cold felt colder throughout the right side than on the left. On touching the right side of the face there was an after-touch. On pricking the right side there was a diffuse hyperpathic response. The patient's only other complaint was exhaustion and ease of tiring. The patient had been taking contraceptive medication at the time of the onset of the pain.

*Case 53* A normotensive woman began at the age of 39

to have brief episodes of numbness and tingling which were still occurring 8 years later. In the first 4 months numbness involved the right upper lip and fingers, sometimes all 4, other times just the 3rd, 4th and 5th. The spells lasted 2 or 3 minutes and occurred up to four times daily. Usually there was no march, but at times numbness spread from the lips to the nostril or from the fingers to the thumb, across the palm up to the wrist. The original feeling was “a hard prickling numbness, a swollenness or thickness.” Gradually it changed to a tingling or novocaine feeling. After 2 years 1 or 2 spells of numbness were occurring each day, involving one or more fingers, upper lip, nostril and region of the eye. While being examined during a spell she said that the tip of the middle finger was numb, a little later the metacarpophalangeal joint and after 30 seconds the ring finger was involved but not the little finger. About 40 seconds from the onset the right upper eyelid was involved. Numbness disappeared from the eyelid in about 90 seconds and from the fingers in 4½ minutes. Examination during a spell showed no sensory deficit. After 4 years spells involved the fingers, hand, palm and dorsum, the entire arm, lips, nose, eyelids, axilla, side of abdomen, hip, foreleg and sole. One or 2 spells occurred daily and involved face, arm and leg, lasting 3 to 4 minutes. She always continued whatever activity she was engaged in at the time. CT scan and an EEG were normal. Neither phenobarbital nor dilantin was effective and they were discontinued when they caused a rash. Therapy with dipyrindamole made no difference. Prednisone taken because of skin lesions prevented the attacks. At the time of the beginning of the spells the patient was using birth control pills. After 8 years the spells were still continuing. Neurological examination was normal as was the blood pressure.

*COMMENT:* These cases are probably not all of one kind yet there are resemblances. It is not implied that they are vascular in nature but this cannot be dismissed. Emotional factors are prominent but the long duration of the complaint in some cases is against a purely psychological formulation. Depression may exaggerate the dysesthesias and under these circumstances the patients come to neurological attention. There have been no pathological studies. An ill-effect of hormonal therapy is suspected of being important. This chronic state probably constitutes a minor symptomatic syndrome whose existence warrants documentation.

##### 5. Cervical Disc Disease — Suspect

This miscellaneous category includes five patients in whom recurrent attacks of paresthesias in one limb either were attributed to inobvious disc disease or remained unexplained. All were seen in consultation because of the question of cerebrovascular disease. In four patients mainly one arm was involved, and in one a leg. The attacks were brief (a few seconds or minutes) and in four of the five patients occurred frequently, one to ten times an hour.

##### Cases

*Case 54* A normotensive woman, aged 44, for 4 months experienced bursts of paresthesias in the left arm

as often as every half hour lasting 2 or 3 minutes. The numbness descended from the shoulder to the arm, forearm and fingers in a flash. "It's a waking up feeling, an explosion, a warmth, a surge of tingling." They were not related to movement of the neck.

*Case 55* A normotensive man, aged 56, for 9 days complained of recurrent surges of an electrical feeling down the left arm accompanied by tingling of the fingers and distal forearm lasting a few seconds. The spells occurred once an hour. Cervical disc disease was suspected.

*Case 56* A normotensive man, aged 55, for 4 weeks had been experiencing 30 second spells of numbness of the right arm occurring 3 or 4 times a day or as often as 3 or 4 times in 1 hour. A prickling sensation started about 4 inches below the point of the shoulder and swept down into the fingers in a second or two. There was no neck pain. A left carotid angiogram was normal. Later the patient concluded that certain movements of the neck precipitated the surge and cervical disc disease was suspected.

*Case 57* A normotensive woman, aged 75, for 1 year was subject to sudden episodes in which a dead feeling involved the right thigh and foreleg but not the foot and toes. The symptoms lasted only a matter of seconds and occurred about once weekly. There was no associated weakness and the symptoms were not related to motion. Lumbar disc disease was suspected.

## 6. A Special Case

This patient with *thrombocytopenia*, which has been previously reported,<sup>7</sup> is an example of an unusual cause of florid paresthesias.

*Case 58* A normotensive woman, aged 50, had many spells of numbness over a period of 18 months. In the first spell numbness involved the left hand for 2 minutes. Two further brief spells occurred the same day. The next morning the left hand became a little numb and lacked control for about 2 hours. Several more spells occurred throughout the day, coming and going, and the patient estimated there was 25 attacks in all in 2 days. The following morning the fingers of the left hand felt clumsy, numb and weak; in the afternoon the left side of the face tingled including the scalp, eye, cheek, nose, chin and neck. The second and third fingers and the fourth and fifth fingers were "stuck together" in pairs and if pried apart they snapped together again. The entire hand began to tremble. Using the arm made the spasms worse. The fingers returned to normal in about 1 hour and the tingling on the left side of the face gradually disappeared in 3 hours. In some attacks the patient herself tested sensation for warmth, touch, and pain on the hand and thought it was reduced. On the fourth day from the beginning there were repeated spells of numbness and clumsiness of the fingers with the fingers tending to separate in pairs again. During the next few days the hand and at times the toes of the left foot tingled on and off. On one occasion the left index finger felt numb. About three weeks from the onset the patient while walking suddenly developed numbness of the left leg from the hip

down, "it was like a wave going down." For the next 4 months the attacks of numbness occurred with decreasing frequency and severity. They occurred approximately once in four days and could involve the face, hand or foot. There was no frank weakness but clumsiness and uncertainty of the affected parts were noted. In the following 7 months the spells occurred very infrequently and never lasted more than 5 minutes. A diagnosis of hysteria had been made and the patient paid little attention to her spells. Three weeks before admission the right arm became weak transiently. Twelve days before admission there was a recurrence for 7 minutes. In the days before admission she had several episodes of numbness of the fingers and hand. Once the right thumb and index finger became numb for 5 days. In one spell numbness involved the tongue for about 3 minutes and in another numbness suddenly developed in the right arm, hand, and side of face. An arch aortogram showed no abnormality. Neurological examination was within normal limits. The patient proved to have thrombocytopenia with a platelet count of 1.5 million. After appropriate reduction in the platelets the patient became free of spells.

## Paresthesias in Thrombotic Occlusion of the Posterior Cerebral, Internal Carotid, and Middle Cerebral Arteries

In the clinical interpretation of the pure sensory TIAs described in the preceding pages, it became of interest to analyze the prodromal sensory TIAs associated with occlusion of the PCA and ICA to determine with what frequency they occur unassociated with motor, visual, and speech disturbances and thus require differentiation from pure sensory TIAs. Embolic occlusion of these arteries is excluded from this discussion.

## TIAs with Occlusion of the Posterior Cerebral Artery — 70 Cases

In a review of 70 patients with occlusion of the PCA in the majority of whom the diagnosis rested mainly on clinical criteria, transient or persistent numbness occurred in 25 patients (35%), often in association with visual symptoms, hemianopia, confusion, memory deficit, weakness, dysphasia, headache, etc. which readily permitted the correct interpretation. But in 10 patients the early stages of occlusion were associated with isolated numb spells mimicking pure sensory symptoms.

In two patients, stenosis of one PCA was demonstrated angiographically at the stage of transient spells of numbness; the spells ceased on anticoagulant therapy. In one patient a pure sensory stroke had persisted for 1 week before a major posterior cerebral stroke was superimposed. In this case, the patient was not admitted to the Massachusetts General Hospital until after the major stroke. It is an exception to our personal experience that a detailed account of transient phenomena always allows recognition of posterior cerebral thrombosis before the full stroke occurs. However the case does illustrate the greater importance of recogniz-

ing occlusion of a PCA in contrast with occlusion of a penetrating thalamic artery.

In 7 patients, TIAs of numbness preceded other symptoms by 20 minutes, 3 hours, a few days, 2 weeks, 6 weeks, 5 months, and an indefinite period respectively. In 6 patients the next symptoms to appear were in the visual sphere, usually a hemianopia and in the other case it was confusion. When TIAs of numbness precede other manifestations by only a few minutes or hours there will probably not be an opportunity for therapeutic intervention. In the other cases, however, a careful search for other manifestations of ischemia in the posterior cerebral territory should enable one to differentiate the process from a pure sensory stroke arising in a thalamic branch. In these 10 posterior cerebral cases numbness involved the face, arm and leg in 4 cases, the face and arm in 4, the arm and leg in 1 and the hand alone in 1, a distribution not unlike that in cases with involvement mainly of a thalamic artery. This is as expected since the PCA is the parent artery of the penetrating arterial branch to the sensory nucleus of the thalamus.

It is clear from these data that occlusive disease of the PCA is an important differential diagnostic consideration in the interpretation of pure sensory TIAs. Alertness to other tell-tale manifestations of the posterior cerebral territory should permit timely differentiation.

#### *Illustrative Cases*

*Case 59* A hypertensive woman, aged 69, had tingling spells involving the left side for 6 months. They occurred irregularly every day or none for 2 weeks. Eight out of 10 involved the hand and forearm while 2 out of 10 spread from the hand to the face, head and lips and to the thigh and leg. The spells lasted 3 to 5 minutes, the longest 15 minutes. Angiography showed narrowing of the right PCA to 0.5 mm. It arose from the ICA. There were no spells on warfarin therapy during the next 13 years.

*Case 60* A hypertensive man, aged 76, for 5 days had 3 or 4 spells daily of numbness of the right side of the face and hand and fingers lasting 1 to 4 minutes. There was an associated wooziness, light-headedness or imbalance. Examination during a spell showed no weakness or speech disturbance. Numbness appeared at all sites simultaneously. A region 1 to 2 inches around the corner of the mouth was involved but not the tongue. Angiography showed severe stenosis of the left PCA.

*Case 61* A hypertensive man, aged 61, suddenly developed tingling of the arm, trunk and leg on the right side. He had difficulty placing the right leg in walking. The paresthesia increased for 2 days, then began improving. In one week the right hand had recovered but the thigh and foot remained numb. Examination 9 days later disclosed moderate impairment of sensation for pinprick, temperature, touch and vibration in the leg. On the 12th day he suddenly developed headache, weakness of the right arm, dysarthria, dys-

lexia and a right homonymous hemianopia. Autopsy disclosed thrombosis of the left PCA.

#### **TIAs with Occlusion of the Internal Carotid Artery — 100 Cases**

A review of 100 personal cases of occlusive disease of the ICA disclosed that 36 had numbness as either a transient or persistent prodromal symptom, in most cases in association with other abnormalities — weakness, dysarthria, dysphasia, transient monocular blindness, confusion, headache, carotid bruit, etc. But in 7 patients, numbness occurred in isolation or as the first symptom. In only one of these were two parts involved, namely the face and hand and in that particular case a carotid bruit was present. In 5 of the others, numbness involved the fingers only and in one case the leg only. Thus, in 100 patients with disease of the ICA, associated pure sensory TIAs differed in their extent or setting from those of the pure sensory syndrome arising in the thalamus. In the whole group of 36 patients in whom numbness was part of the clinical picture, it involved the fingers and hand only in 25 patients (70%); the face 1; the face and hand 3; the leg 3; the hand and leg 2; the face, arm and leg 1; and in 1 the description was uncertain.

#### **TIAs with Non-embolic Occlusion of the Middle Cerebral Artery — 15 Cases**

Prodromal transient numbness occurred in 7 of 15 patients with occlusion of the stem of the MCA. In two of these, numbness of the fingers and face occurred as the only manifestation without weakness, dysarthria or aphasia. In the first, the fourth and fifth fingers were involved along with the tongue, while in the other case 4 fingers were involved but not the thumb. Selective sensory involvement of the fingers of this type has not been present in any of the pathologically-studied cases of thalamic lacunar infarction and favors involvement of the superficial middle cerebral territory. In the third patient, the arm and leg were involved but not the face. It is obvious that when only two of the three parts of the hemibody are involved in episodes of numbness, middle cerebral disease must be considered in the differential diagnosis of a pure sensory thalamic stroke. In occlusion of the MCA, TIAs of numbness involving the hand and fingers occur early in the course and when numbness involves the face also, dysarthria or weakness of the hand is added.

#### *Illustrative Cases*

*Case 62* A hypertensive man, aged 63, for 3 months had 5 to 10 minute episodes of numbness and tingling of the 3rd, 4th, and 5th fingers of the left hand. The spells occurred 5 or 6 times daily, 3 or 4 days a week. Sometimes the ulnar side of the hand and forearm was also numb. One day a spell involved the left side of the lower lip and half the tongue. Speech was slurred. The attack lasted about 5 minutes. A few days later, the left leg crumpled for about 2 minutes. Angiography disclosed severe stenosis of the right MCA.

*Case 63* A normotensive woman, aged 53, reported episodes of a pins-and-needles feeling in the right side — lips, cheek, arm and leg for 3 months. The spells occurred 3 or 4 times daily. As the weeks passed the patient noted that the fingers became weak with each spell. Angiography showed occlusion of the MCA bilaterally. The important differential point in this case was the occurrence of weakness during the episodes and whether this had not been present during the earliest attacks.

## Discussion

### 1. The Pure Sensory Stroke

Review of this case material has provided the opportunity to reexamine the characteristics of the pure sensory stroke described in the report of 1965 (Fisher, 1965). As in the previous series, an important limitation in this study is the lack of pathological confirmation and the dependence on clinical features only. In general, the features of the pure sensory stroke as previously described have been confirmed especially in patients with numbness involving all three regions, face, arm and leg. The patient's symptoms, the tempo of the stroke, the timing of the TIAs, and the neurological findings all remain largely unchanged. The great clinical variability has become more obvious and attempts at defining a simple, well-delineated syndrome fail to include the many nuances. The division of the patients into three groups, pure sensory stroke, pure sensory TIAs, and atypical cases, is still satisfactory and only further pathological studies will improve diagnostic reliability. Broadly speaking, the prognosis remains good and the syndrome can be regarded as benign. The one proviso is the need for early recognition that occlusion of a posterior cerebral artery is the underlying cause rather than disease of a penetrating thalamic branch artery. We have come to regard the classical case as an occasion to take medical stock and recognize that the patient's hypertension requires more energetic treatment. The clinical characteristics of each category have been fully described in the preceding analyses.

### 2. The Pattern of Paresthesias

Numbness, one of the prime symptoms in Neurology, along with pain and weakness, was the main symptom in this large group of patients. A question, which has been alluded to on several occasions, is whether the pattern of distribution of the paresthesias on one side of the body or on one limb provides clues to the localization of the parenchymal lesion and the site of the arterial disease — thalamo-penetrating, posterior cerebral, internal carotid, or middle cerebral artery. Or will it aid in recognition of the migrainous process. There has emerged the general proposition that *isolated sensory involvement of all three parts, face, arm and leg, is frequently a feature of pure sensory stroke, occlusion of the PCA, and migraine and is rare in occlusion of the ICA and MCA.* Furthermore, a review of 50 patients with occlusive disease of the vertebral-basilar system revealed none in whom numbness of the face, arm and leg occurred in isolation. In distinguishing

ing occlusion of the PCA from pure sensory stroke, one must look for signs of posterior cerebral territory involvement — visual, amnesic, dyslexic, etc. When only two parts, face and arm or arm and leg, are involved in isolation, the odds favor a thalamic rather than cortical site but relying on probabilities is not a sound course of action. Any evidence of weakness, dysarthria, or aphasia places the locus of ischemia in the territory of the MCA. Isolated involvement of only two parts was not recorded in the vertebral-basilar patients reviewed.

Another question is whether involvement of certain regions on one side of the body, viz. lips, tongue, ear, neck and trunk is of assistance in distinguishing cortical from thalamic defects or in identifying a migrainous sensory accompaniment. In the pathologically proved thalamic lacunar infarcts, the following parts could be involved: one or both lips, inside of mouth, tongue, ear, neck, waist, and thigh. In occlusion of the internal carotid and middle cerebral arteries involvement of these same regions of the head and neck were not unusual, but in none of the patients reviewed was there involvement of the abdomen.

Further analysis concerns the question whether selective involvement of some fingers and toes rather than all of them indicates that the locus is cortical rather than thalamic. Our data on this point are not wholly reliable for detailed inquiry was not always made, but it was our impression that selective involvement of the ulnar or radial two or three fingers points to a middle cerebral cortical localization rather than to a thalamic lesion which typically causes numbness of all fingers indiscriminately. As already mentioned, in all four of the pathologically-studied patients with thalamic lacunar infarction, all fingers had been numb in life. The lower extremities were involved in three of the four, and in one it was recorded that the medial two toes were numb. In all patients with pure sensory stroke involving face, arm, and leg, all fingers were affected. On the contrary in thrombotic occlusion of the ICA, selective involvement of the medial three fingers, the lateral two fingers, or the thumb alone is not uncommon. The same is true in middle cerebral stenosis. For example, a woman, aged 63, with severe stenosis of the left ICA experienced one episode of transient monocular blindness on the left side lasting 20 minutes. For 2 weeks before this, she had had some 50 one minute spells of numbness of the 4th and 5th fingers of the right hand sometimes extending to the medial border of the forearm.

It may be tentatively proposed therefore that *isolated paresthesias of the face, arm, and leg indicate thalamic involvement. Selective involvement of some rather than all fingers indicates a cortical localization. Numbness of the abdomen as part of a stroke suggests a thalamic locus. Numbness of cerebrovascular brain stem origin does not assume any of these patterns.*

### 3. Migrainous Paresthesias

One of the major obstacles in deducing useful clinical rules is the lack of information concerning all the possible patterns that the numbness of a migraine at-

tack may assume. A review of the descriptions given by patients under the age of 30 with undoubted migraine showed that involvement of the face, arm, and leg together is not rare. Nor is the selective involvement of one or more fingers. Numbness of the abdomen may occur. In almost all of these cases, a well-defined march of the migrainous paresthesias had occurred, but there were examples in which numbness developed in the face, hand and leg without a march. There are therefore precedents for suspecting migraine in our middle-aged cases with very rapid march of paresthesias. The duration of paresthesias in the young migraineurs was usually in the range of 20 to 30 minutes, and in none did the numbness last 2 or 3 days as it did in some of the present cases. Further careful observations in young migraineurs are indicated.

#### 4. Miscellaneous

##### (a) Paresthesias and Emotional Factors

In several patients, the onset of sensory symptoms was closely related to the emotional state of the individual. One patient (case 14) developed a sensory TIA at the very moment of a violent outburst of temper while another (case 12) fell into a sensory stroke immediately after becoming angry because of children digging up his lawn. Still another developed a sensory stroke on being spoken to brusquely by her husband. In two patients, recurrent heminumbness was exactly linked to tenseness at work (case 37). In the group with hemidysesthesia, the patients noted that their symptoms were worse or became evident during periods of tension. One patient noted extension of her numbness when she became alarmed, and another reported that paresthesias which had seemed to have disappeared returned during periods of anxiety. In those cases in which a stroke was set off, the mechanism of the reaction must lie within the central nervous system but whether it is neural or humoral is a matter only for speculation. The blood pressure was not measured dur-

ing the emotional period. In the recrudescence of paresthesias with emotion, peripheral changes in skin or muscle might evoke the symptoms in the same way as deformation of the skin. These cases may provide a small ingredient to be added to the information concerning the pathophysiology of anxiety, anger and depression.

##### (b) Pain at Onset of the Stroke

Occasionally, stroke patients report that pain in the involved region precedes or accompanies the onset of weakness or other symptoms. No explanation for this has been forthcoming. In the present series, pain occurred under these circumstances in three patients suspected of having thalamic lesions (see case 11). Another patient awakened in the night with severe facial pain. Six hours later heminumbness developed. It seems that ischemia within a sensory nucleus can evoke pain as an initial event similar to that which occurs in the lateral medullary syndrome as a result of ischemia in the descending trigeminal nucleus.

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