

Sensory-Specific and Fractional Disorders of Recent Memory in Man

II. Unilateral Loss of Tactile Recent Memory

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• Three patients were found to have unilateral tactile recent memory loss on examination. In two patients the loss occurred in the right hand and was accompanied by a disorder of verbal recent memory; in the third patient the loss occurred in the left hand and was not accompanied by any other disturbance in recent memory. An acute unilateral lesion, either structural or functional, in the medial temporal lobe contralateral to the tactile recent memory disturbance was the common denominator in all three cases. The proper methods for diagnosing a unilateral tactile disturbance of recent memory and other forms of fractional disorders of recent memory are discussed. Based on computerized tomography scans and behavioral and anatomical data in man and monkey, an anatomical explanation is offered to account for the syndromes of right and left unilateral tactile recent memory loss. The possible existence of other forms of fractional disturbances of recent memory and the role of the cerebral commissures in recent memory functions are discussed.

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In this communication three patients are described who, on examination, were found to have unilateral disturbances in tactile recent memory. Two patients lost tactile recent memory in the right hand with an accompanying disorder of verbal recent memory, and the third patient lost tactile recent memory function in the left hand. These cases establish the existence of fractional disorders of recent memory in man and, in combination with cases described in a previous companion article,¹ help to further delineate the anatomical basis of recent memory functions.

REPORT OF CASES

CASE 1.—A 53-year-old, right-handed woman was admitted to the neurology service of Parkland Memorial Hospital on Nov 28, 1976, because of abnormal behavior. Following head trauma in 1971, she

began to have seizures heralded by nausea and a hot flushing sensation followed by a loss of consciousness with generalized tonicoclonic activity and a short period of postictal confusion. She was treated with phenytoin sodium and phenobarbital sodium with only fair control, due to poor compliance. Approximately four days prior to admission, she suffered a tonicoclonic seizure, after which she had a persistent confusional state characterized by "staying up all night cleaning the house . . . , wandering around . . . , and looking for pennies." The patient constantly talked about seeing her husband, who was deceased for three years, and began packing a suitcase to "go home" even though she had been living in her present house for three years. She continually spat into a cup because she thought she had "worms in her mouth," and appeared "lost in her own home."

On admission, the patient was slovenly dressed and alert but confused. Physical examination was unremarkable. Neurological evaluation revealed poor attention, and she was able to repeat only four digits forward on immediate recall testing. Recent (verbal) memory was poor but remote memory was relatively intact. She was unable to do similarities or proverbs and appeared inappropriately euphoric with no insight into her illness. She had intact spontaneous speech, repetition, comprehension, naming, and reading. There was no ideomotor apraxia. Right/left orientation, finger recognition, facial recognition of famous people and family, calculations, and dressing ability were normal. She had difficulty in drawing a clock but was able to draw a symmetrical flower. Cranial nerve, motor, sensory, reflex, and gait examinations were normal.

Within two days the patient's initial confusional state cleared and she was left with a profound loss of recent memory when tested verbally. Examination on Dec 2, 1976, showed the patient to be alert, attentive, and able to repeat six numbers forward and four backward on immediate recall. Similarities were performed normally, although she was unable to interpret proverbs. Except for recent memory (see "Special Tests and Observations") and loss of insight into illness, the remainder of the neurological examination was normal.

Special Tests and Observations.—*Verbal Recent Memory.*—The patient's verbal recent memory was severely compromised. On repeated testing, she was unable to retain three unrelated words after a three-minute distraction. She thought the year was 1963 and the President was either Kennedy or Ford. She had no idea who the current President was, even when given verbal choices. She thought that her hus-

band was alive and that she was currently living in Lufkin, Texas, where she had lived most of her life before moving to Dallas several years ago. She was unable to give the correct ages of her children or grandchildren and was unaware of the existence of one grandchild born two years previously. On the other hand, she gave a correct account, according to the family, of her personal life from the more remote past.

Visual Recent Memory.—The patient performed normally on testing for visual recent memory; that is, if shown a relatively nonverbalizable object for 10 s, she was able to choose visually the object from among four similar objects after being verbally distracted for three minutes. She was tested in a similar manner with three more objects, with the same result. In addition, she was able to recognize visually her hospital physician when he was placed in a group of four other physicians, although she could not remember his name.

Tactile Recent Memory.—On testing tactile recent memory, she was found to have a profound deficit that involved only her right hand. For instance, when she was allowed to blindly palpate a relatively nonverbalizable object for 10 s with her right hand, she was unable to tactilely choose the object from among four others with her right hand after a three-minute verbal distraction time. The same task, when performed by her left hand, was done without error (each hand was tested four times). When this testing was repeated the following day, she actually remembered the four different objects placed in her left hand from the previous day, but still could not do the task with her right hand. Furthermore, the tactile memory disturbance in her right hand could not be attributed to any elementary sensory, perceptual, immediate recall, or remote tactile memory loss, since the ability to choose tactilely with her right hand an object from among four others immediately after that object was removed from her right hand, the ability to match objects between hands, and stereognosis in her right hand were completely intact.

The patient regained full recent memory functions by the evening of Dec 3, 1976. She evidenced no (verbal) retrograde amnesia, was oriented and conversant with recent political and family events, and had regained tactile recent memory function in her right hand. Electroencephalography (EEG) and brain scan were normal. A computerized tomography (CT) scan was not done.

The patient's confusional state and subsequent fractional disorders of

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recent memory most likely reflected a postictal disturbance secondary to her partial complex seizure disorder that presumably involved temporal lobe structures. The recent memory disturbances would be consistent with left medial temporal lobe dysfunction because of the verbal and *right* tactile recent memory losses. The only inconsistent and puzzling finding was her intact visual recent memory. By the time it occurred to me that the proper way of testing the patient's visual recent memory was through separate tachistoscopic presentations to her right and left visual fields, her memory deficits had resolved. Hence the question of whether a visual recent memory loss could be confined to a hemivisual field was not answered. In addition, the patient was not tested for nonverbal (auditory) recent memory with various noises and melodies (see cases 2, 3, and 4, however). Although anatomical correlation could not be demonstrated on EEG or brain scan, this case was phenomenologically important because it established for me that fractional disturbances of recent memory could exist in man.

CASE 2.—A 76-year-old man was evaluated in the neurology clinic at Parkland Memorial Hospital because of visual loss and was discovered to have a left hemianopsia. He was admitted to the neurology service on March 15, 1977, after a brain scan revealed abnormal uptake in the right occipital area.

Physical examination was normal except for a dense left cataract. On neurological examination the patient was alert, fully oriented, and cooperative. Immediate recall, recent memory (tested verbally), remote memory, similarities, proverb interpretation, and judgment were intact. He was mildly irritable and occasionally inattentive but fully cooperative during the examination. No aphasic disorders or ideomotor apraxia were observed. The patient performed well on tests of right/left orientation, calculations, map directions, and facial recognition, but had difficulty in copying two-dimensional figures and drawing a clock. There was a dense left hemianopsia with slight macular sparing in his right eye. The left eye could only perceive light. Eye movements were full. Motor examination was normal, with symmetrical reflexes; no Babinski's signs were present. Sensory functions were intact, including graphesthesia, two-point discrimination, and stereognosis. Station, gait, and coordination were normal.

Special Tests and Observations.—*Tactile Recent Memory.*—Tactile recent memory was tested as described in case 1. This patient demonstrated a profound unilateral loss of tactile recent memory in his left hand. With his right hand he chose the correct object in five out of five trials, but with his left hand he missed on all five trials. The loss could not be attributed to

perceptual, remote tactile memory, or immediate recall problems, since stereognosis in the left hand, the ability to match different objects between hands, and the ability to choose tactilely an object with his left hand from among four others *immediately* after that object was removed from his left hand were fully preserved.

Verbal, Nonverbal Auditory, and Visual Recent Memories.—On testing the patient's recent memory functions using strictly verbal presentations (ie, a short story or four unrelated words), nonverbal sounds such as noises and melodies, or visual presentations of relatively nonverbalizable line drawings (Fig 1), he showed absolutely no deficits, even after verbal distractions lasting ten minutes. An attempt was made to test visual recent memory in his slightly spared left macula field through tachistoscopic presentations, but it was discovered that he could not perceive words or objects in that portion of his visual field. At no time during his hospitalization did he demonstrate spatial disorientation or an inability to recognize his physicians by sight or name.

CT Scan.—A CT scan with contrast was done on March 22, 1977 (Fig 2). An infarction involving the entire right medioventral temporal lobe, the right medial occipital lobe, the deep right and left superior occipital lobes, and the deep right and left posterior parietal lobes was seen. Gyral atrophy and mild hydrocephalus ex vacuo were present.

On April 29, 1977, the patient sustained a second stroke that left him cortically blind, inattentive, extremely irritable, and intermittently confused. When testing could be done, he appeared to have a profound verbal recent memory disorder, but this was difficult to quantitate because of his confusion. A CT scan revealed a new left posterior cerebral artery infarction involving the left medial occipital and temporal lobes.

This patient demonstrated a unilateral loss of tactile recent memory in his left hand, with a prominent right medial temporal lobe infarction seen on CT scan. Unfortunately, the patient's left hemianopsia precluded testing visual recent memory in his left visual field. His intact recent memory for nonverbal audition was surprising because there is evidence that appreciation of melodies in non-musicians² is a function of the right hemisphere. Perhaps, if the patient had been examined immediately after his first ictus, he would have manifested a recent memory disturbance for nonverbal audition.

Whether the patient's loss of left tactile recent memory would have eventually resolved could not be assessed because of his second stroke. It is possible, however, that the lesions involving the deep parietal white matter prevented the recovery of tactile recent memory in the left hand by causing a callosal disconnection to

occur between the right somesthetic associational cortex and the intact left medial temporal lobe (see "Discussion" for clarification of this point). Against this view is the observation that the patient was able to transfer tactile information between the hemispheres on tasks involving tactile naming and object matching between hands. Although I am not aware of any literature that bears on the following, the previous objection may not be relevant if the transfer of somesthetic information involved in the naming and matching tasks were to take a different commissural route from the one for tactile recent memory function.

CASE 3.—A retired 69-year-old right-handed man was admitted to the Dallas Veterans Administration Hospital on July 28, 1978, following four days of nonspecific headaches and a change in behavior. His physical examination was normal. On initial neurological evaluation, he had a severe recent memory deficit (tested verbally), alexia without agraphia, partial color agnosia, a right homonymous hemianopsia, and poor insight into his illness.

Neurological examination done on the day after admission showed him to be alert, cooperative, and attentive. He could repeat seven numbers forward and four backward. There was a severe deficit of recent memory, tested verbally, since his knowledge of recent news events, his orientation to time, date, and place, and his ability to learn and retain new verbal information after a three-minute verbal distraction were profoundly disturbed. Remote memory, especially recall of events concerning World War II, was perfectly intact. Similarities, proverb interpretations, right/left orientation, dressing, calculations, two- and three-dimensional constructions, facial recognition of famous people and attending physicians, and knowledge of map directions and Texas geography were without fault. He had intact spontaneous speech, comprehension, repetition, and writing. There was no ideomotor apraxia. Reading aloud was slow because he tended to misread or neglect the right half of words, but there was excellent comprehension of the read material. Visual naming of objects and colors was normal. There was mild difficulty with tactile naming in both the right and left hands, but he had no problems with stereognosis when a nonverbal response was required, such as showing how an object was used.

On cranial nerve examination, there was a right homonymous hemianopsia without macula sparing. The extraocular movements were full, but there was diminution of optokinetic nystagmus to the right. Examination of motor and sensory functions and coordination, reflexes, and gait were normal. Two-point discrimination, graphesthesia, and touch localization in all four extremities and stereognosis in the upper extremities were intact.

Special Tests and Observations.—*Tactile*

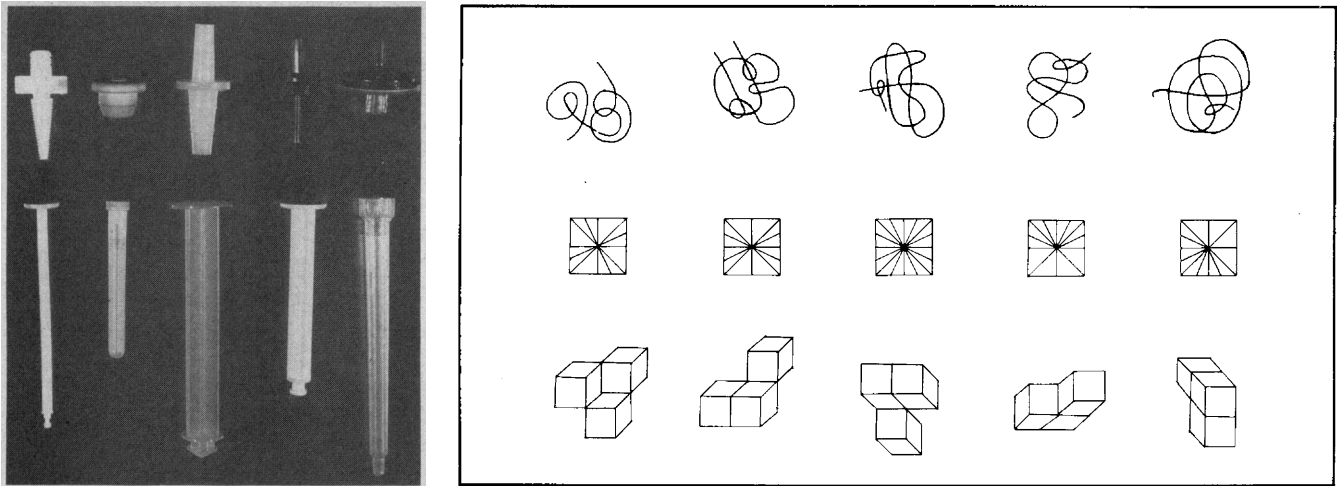


Fig 1.—Tactile test objects (left) and visual test drawings (right) used to assess tactile and visual recent memory and immediate recall functions.

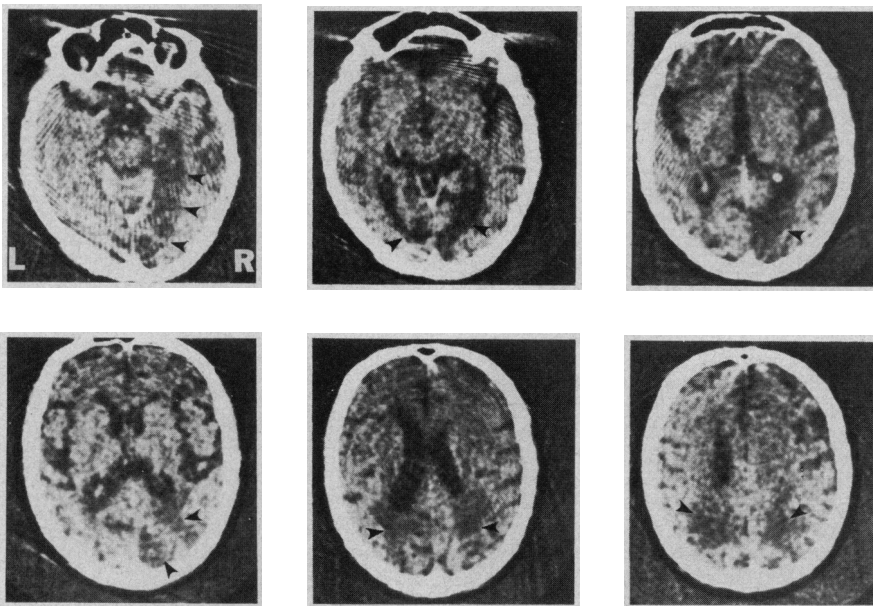


Fig 2.—Computerized tomography scan (case 1). Infarction is bilateral and involves entire right medial temporal lobe, much of right occipital lobe, small portion of left inferior occipital lobe, and deep posterior parietal and deep superior occipital lobes bilaterally. Arrowheads help outline lesion. Note cortical atrophy and mild hydrocephalus ex vacuo.

Recent Memory. When the patient's tactile recent memory was tested in the manner described in case 1, he demonstrated a profound deficit confined to the right hand. With the left hand he performed the task without error in five trials, but with the right hand he was correct only one out of five times. It was also observed that he was never sure about any of the choices he made with his right hand, including the one time he was correct.

This defect in tactile recent memory could not be attributed to any perceptual, immediate recall, or remote tactile memory problems since stereognosis in the right hand, the ability to correctly match different objects between hands, and the ability to choose tactilely the correct object with his right hand from among four others *immediately* after that object was removed

from his right hand were fully preserved.

Nonverbal Auditory and Visual Recent Memories.—Despite the patient's profound loss of verbal recent memory, when he was presented with a noise or a hummed melody and asked to choose the correct nonverbal sound from among four others after a verbal distraction of three minutes, he performed without error. Visual recent memory was tested in a similar manner by showing him a relatively nonverbalizable line drawing for 10 s (Fig 1) and asking him to choose the correct one from among four others after a three-minute verbal distraction time. He was correct in four out of five trials and was able to narrow down his choice confidently on the fifth trial to two drawings, one of which was correct. He was spatially oriented on the neurology ward, despite his profound loss of verbal

recent memory. He could also visually recognize his ward physicians, although he did not remember their names.

CT Scan.—A thin-section CT scan was done on Sept 27, 1978 (Fig 3). A deep left occipital lobe infarction that also involved the anterior medial occipital cortex and a small area in the anterior half and all of the posterior half of the left medial temporal lobe was observed.

Prior to discharge, on July 31, the patient still manifested a dense right homonymous hemianopsia without macular sparing but had regained a good deal of verbal recent memory. He was oriented to time and place, knew some current events, and, with cueing, could remember most of a short story after a three-minute verbal distraction. In addition, he no longer demonstrated any tactile recent memory disturbance in his right hand. On reexamination in September 1978, he still had mild problems with verbal recent memory, but it had clearly improved from the last examination. The dense right homonymous hemianopsia was unchanged.

As in case 2, the hemianopic deficit precluded testing visual recent memory in the affected (right) field. This time, however, the lesion involved the left hemisphere and the patient was found to have a right tactile recent memory loss with a profound disturbance of verbal recent memory and preservation of nonverbal auditory recent memory. In this patient the loss of verbal, but not nonverbal, auditory recent memory is consistent with the current concept that appreciation of melodies in nonmusicians seems to be a dominant function of the right hemisphere,² while propositional language is a dominant function of the left hemisphere. As might be expected in a unilateral medial temporal lobe infarction,^{3,4} the recent memory disturbances were transient and fractional.

Another important observation in

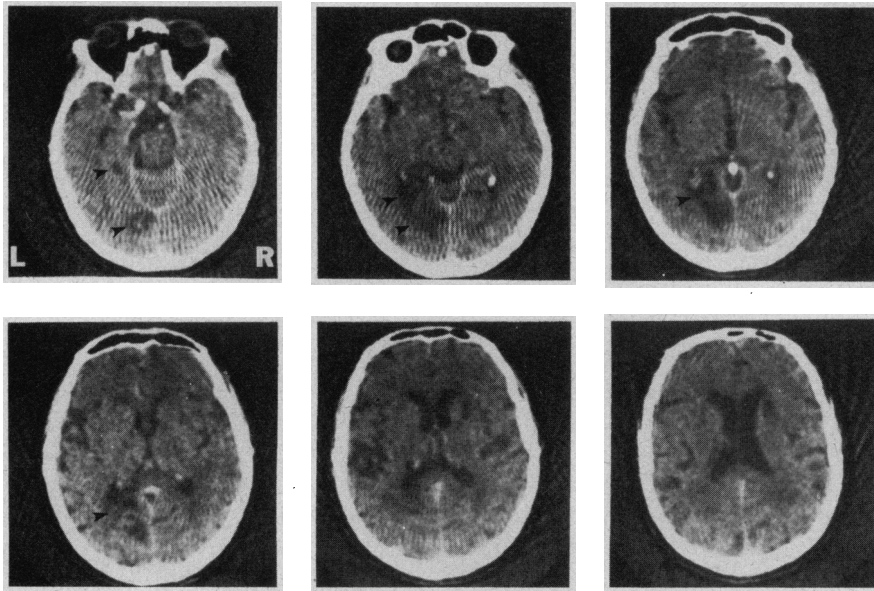


Fig 3.—Computerized tomography scan (case 2). Infarction involves deep left occipital lobe, left anterior medial occipital cortex, posterior half of left medial temporal lobe, and small area in anterior left medial temporal lobe. Arrowheads help define extent of lesion.

this patient was that tactile recent memory fully resolved before the verbal recent memory disturbance cleared. Therefore, one should not necessarily assume that the different components of a multimodal or a fractional recent memory disorder will resolve in unison. Perhaps this is the reason why Paterson and Zangwill⁵ were not able to correlate the resolution of their patients' posttraumatic recent memory disturbance, documented only by verbal means, with their patients' resolution of spatial disorientation. Since I have presented evidence in a previous article¹ that spatial disorientation in patients with multimodal recent memory loss probably results from their visual recent memory disturbance, it is of great interest that this patient (case 3), whose visual recent memory was intact, never displayed spatial disorientation, despite a profound verbal recent memory loss.

CASE 4.—A 40-year-old man was admitted to Parkland Memorial Hospital on May 3, 1977. Three weeks prior to admission he had had several major motor seizures, followed by severe headaches and progressive confusion with mild anomia. A CT scan demonstrated an edematous, partially cystic lesion in the left temporal lobe that shifted the midline structures to the right. He was subsequently placed on a regimen of steroids in preparation for craniotomy.

On neurological examination two days after admission the patient was alert, awake, and fully cooperative. Immediate recall was reduced to five numbers forward. Recent and remote memory, tested verbally, were intact. Interpretation of proverbs, insight into illness, affect, right/

left orientation, calculations, facial recognition, and constructions were normal. He evidenced no spatial disorientation on the ward and his geographic knowledge was intact. Language evaluation revealed only a mild anomia. No ideomotor apraxia was present. His cranial nerve, motor, sensory, reflex, station, and gait examinations were normal.

Special Tests and Observations.—The patient's tactile recent memory was tested through separate trials in both the right and left hands; he made no errors on this task. Visual recent memory was tested in the right and left visual fields via tachistoscopic presentation; again, the patient demonstrated no deficits. Nonverbal auditory recent memory, tested with melodies and noises, was also normal.

On May 6 he underwent left anterior temporal lobectomy; the mass proved to be a glioblastoma multiforme. Postoperatively the patient did extremely well. When examined one week later, he had no neurological deficits. The problems with immediate recall and anomia had completely resolved. Furthermore, he had no deficits on retesting tactile, visual, verbal, and nonverbal auditory, recent memories.

This patient is included in the case reports to illustrate that a slowly progressive lesion, in contrast to an acute lesion, involving a medial temporal lobe may not give rise to a fractional disorder of recent memory. By the time this patient underwent surgical removal of his tumorous left temporal lobe, his left hemisphere must have had time to develop sufficient access to his right medial temporal lobe, otherwise a fractional disorder of recent memory should have occurred (see "Comment" for clarification of this point).

COMMENT

To my knowledge, the patients described in this report with unilateral loss of tactile recent memory establish for the first time that fractional disorders of recent memory can exist in man. Although these patients are unique in the clinical literature, I do not think they are necessarily rare. Since infarctions involving the posterior cerebral artery comprise approximately 3% of occlusive strokes,⁶ if one carefully screens for tactile recent memory in patients with posterior cerebral artery infarctions, fractional disorders of recent memory should be readily encountered.

The technique of examining patients for tactile recent memory loss is straightforward and has been presented in detail in the case reports. Relatively nonverbalizable objects should be used so as to force the patient to make his choice based on tactile features alone (Fig 1). If the patient can easily verbalize or even name the test object, then he might use verbal rather than tactile recent memory to correctly select the object. Consequently, a disturbance of tactile recent memory could be missed. To establish that a patient has a loss of tactile recent memory, it must be shown that he has (1) no primary problem with tactile perception, (2) no aphasic disturbance that could interfere with testing, (3) normal tactile immediate recall, and (4) normal tactile remote memory. If one can show that the patient also has a retrograde tactile amnesia, the syndrome would be complete. Unless there are exceptional circumstances, however, I doubt that this phenomenon will be observed.

The lesions encountered on CT scan in cases 2 and 3 involved the right and left medial temporal lobes, respectively. These areas of the brain are traditionally associated with recent memory function,⁷ whereas the patients with isolated loss of visual recent memory described in the previous report¹ had bilateral lesions that did not involve the medial temporal lobes. To understand why fractional disturbances of recent memory occur, the reasoning put forth by Geschwind and Fusillo³ concerning the (verbal) recent memory loss observed in their patient with a left medial temporal lobe infarction is of relevance. They reasoned that the cortical areas involved with propositional language, a strongly dominant function of the left hemisphere, would preferentially connect to the left medial temporal lobe. Thus a (verbal) recent memory loss occurred

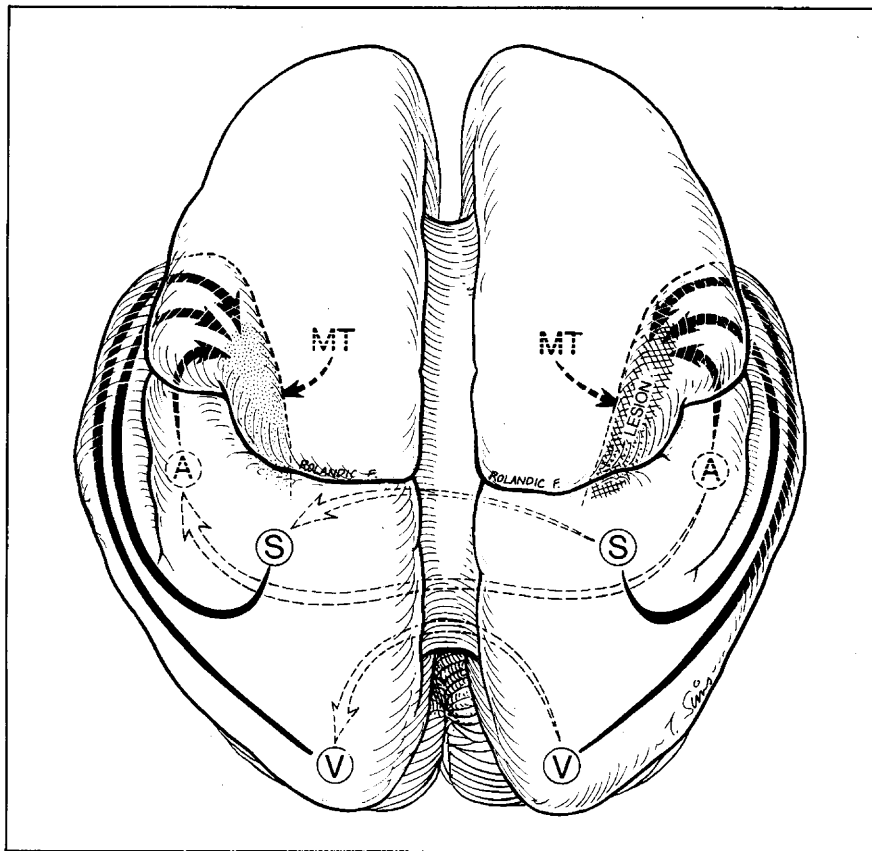


Fig 4.—Idealized illustration showing presumed anatomical routes taken by auditory, somatosensory, and visual information when coursing to medial temporal lobes in man. Sensory information processed within hemisphere preferentially connects to ipsilateral medial temporal lobe (solid black arrows). Ipsilateral hemisphere also has weak commissural connections (open dashed arrows) to opposite medial temporal lobe. Following medial temporal lobe infarction, these weak commissural connections eventually allow the lesioned hemisphere to once again access neuronal systems involved with recent memory functions (see references 9 through 13 for direct anatomical and behavioral evidence for above schema in monkey). Key to Figure is as follows: S, somesthetic cortex; A, auditory cortex; V, visual cortex; MT, medial temporal lobe.

because the language cortices had been deprived of the neuronal structures they normally connect to for recent memory functions. The (verbal) recent memory loss was transient because the cortical areas involved with language eventually strengthened their commissural connections, either through the callosum or the anterior commissure, and gained access to the right medial temporal lobe.

If Geschwind and Fusillo's thesis is correct, then it would follow from these cases with unilateral losses of tactile recent memory that somesthetic, auditory, and by inference, visual information being processed within a hemisphere would preferentially connect to the ipsilateral medial temporal lobe (Fig 4). Therefore, an acute *left* medial temporal lobe lesion gives rise to a right tactile loss of recent memory, in addition to a verbal recent memory loss. An acute *right* medial temporal lobe lesion gives rise to a left

tactile recent memory loss and might also cause a recent memory disturbance for the postulated dominant auditory functions of the right hemisphere, eg, the perceptions of music and the prosodic elements of spoken language.^{2,8} Although it was not observed in this series of patients, one can infer that a contralateral disturbance of hemivisual recent memory might also occur following an acute medial temporal lobe lesion. Whether fractional disorders of recent memory involving hemivisual, melodic, or prosodic processing exist remains to be discovered. If we now turn to animal studies, there is some direct anatomical and behavioral evidence to support the proposed mechanism of fractional recent memory loss observed in man.

Much of the work defining the role of the temporal lobes and the cerebral commissures in recent memory has been studied in the visual system of monkey,⁹⁻¹⁰ but a number of publica-

tions¹¹⁻¹³ indicate that similar observations hold true for the somatosensory system. The reports by Mishkin⁹ and co-workers have been the most detailed. In their experiments, lesions were made in three stages: unilateral inferotemporal ablation, followed by contralateral occipital lobectomy, and finally division of the corpus callosum. After unilateral inferotemporal lesions, the monkeys could easily relearn a previously taught visual discrimination. Following contralateral occipital lobectomy, however, the monkeys were found to have marked impairment in relearning the recently taught visual discrimination. This observation was interpreted by Mishkin⁹ and co-workers to indicate that the preserved striate and contralateral inferotemporal connections were not very well integrated when compared with the ipsilateral striate-inferotemporal connections (also shown by Etlinger¹¹). When these animals were retested just prior to callosal section, their ability to relearn the recently taught visual discrimination was found to be as good as in the controls. This suggested that the crossed striate-inferotemporal connections could be strengthened *in time* to allow the monkey to regain normal visual learning capacity in the preserved hemifield. After callosal section, however, these animals could not relearn the recently taught visual discrimination, which offered proof that the corpus callosum was the route used for getting visual information into the contralateral inferotemporal cortex and, hence, into the medial temporal lobe. Although Mishkin⁹ and Mishkin and Pribram¹⁵ have reported that a unilateral temporal lobectomy or a unilateral ventrohippocampal or inferotemporal ablation does not result in visual learning deficits, they did not test their animals tachistoscopically in the right and left visual fields for a possible (contralateral) hemivisual recent memory disturbance.

The publications by Semmes et al,¹¹ Deuel et al,¹² and Keating and Horel¹³ shed some light on the anatomical substrates of tactile learning in monkeys. Semmes et al¹¹ have established that monkeys undergoing unilateral temporal lobectomy and division of the cerebral commissures manifest profound difficulties in learning *new* tactile discriminations in the hand contralateral to the lobectomy. In a follow-up study by Deuel et al,¹² it was found that unilateral temporal lobectomy alone did not produce a contralateral deficit in learning new tactile discriminations. However, they tested

their monkeys *four weeks* after lobectomy, and it is quite possible that the experimenters missed a transient tactile recent memory disturbance. In the experiments done by Keating and Horel,¹³ tactile testing in lesioned monkeys was started the day after surgery. Three of the monkeys underwent unilateral temporal lobectomy and were tested for retention of a previously overlearned tactile discrimination task in the contralateral hand. Except for a moderate loss of performance in one animal, the other two had fully retained the task. As discussed by the authors in another section of their publication, retention of a previously learned discrimination task, especially when extensive preoperative training has been done, is often unaffected by temporal lobe lesions, while the ability to learn a *novel* discrimination task may be severely compromised.¹⁶ (Presumably, this dichotomy occurs because overlearned discriminations involve remote memory functions, whereas temporal lobe lesions cause deficits in recent memory functions.^{17,18} Since Keating and Horel did not test for novel tactile discrimination learning in their monkeys with unilateral temporal lobectomies, the question of whether a transient contralateral loss of tactile recent memory could occur in monkey as it does in man remains unanswered. Nevertheless, the above experiments lend anatomical and behavioral support to the thesis proposed in this report concerning the mechanism for, and the recovery from, fractional disorders of recent memory that follow acute unilateral lesions of the medial temporal lobe in man.

The last point I wish to discuss concerns some observations made by Bogen¹⁹ regarding a patient (first illustrative case) who underwent cerebral commissurotomy for the control of seizures at age 27. The patient had suffered from severe convulsions since age 12, with numerous EEGs demonstrating disorganization over both hemispheres but maximum disorganization over the *left* temporal region. After surgery, besides having transient mutism and other expected commissural deficits, he was discovered to have a profound loss of recent memory (tested verbally). Although tactile and visual recent memory were not tested, it was noted that the patient could visually recognize his physician even though he could not remember his name. I believe the recent memory disorder following commissurotomy in this patient can be explained if one assumption is

allowed—the seizure disorder was caused by a long-standing left medial temporal lobe lesion. This is a reasonable assumption, in view of the predominant left temporal disorganization seen on EEG and the data published by Falconer et al²⁰ concerning the high incidence of lesions found in the temporal lobes of “temporal lobe” epileptics who have undergone lobectomy for seizure control. If this were the case, then Bogen’s patient might have been forced to rely exclusively on his right medial temporal lobe for recent memory functions. Since the postoperative commissural deficits confirmed that propositional language was predominantly a function of his left hemisphere, cerebral commissurotomy probably caused his language areas in the left hemisphere to become disconnected from his right medial temporal lobe, which precipitated a profound loss of verbal recent memory. Whether this patient displayed a right tactile recent memory loss or a right hemivisual recent memory loss is not known. Nevertheless, the phenomena observed in this patient following commissurotomy can be readily explained by the mechanisms proposed in this discussion regarding the cerebral commissures and recovery from fractional recent memory disturbances.

CONCLUSION

The patients described in this report illustrate and establish that fractional disorders of recent memory can exist in man. The underlying anatomical denominator in all three cases was an acute unilateral lesion of medial temporal lobe. Presumably, this caused the ipsilateral sensory cortices to become deprived of their normal access to brain areas necessary for recent memory function, and fractional disorders of recent memory resulted. The critical role of the cerebral commissures in allowing recovery from fractional recent memory disturbances has been explored. Although not encountered in this series of patients, an appropriate unilateral lesion not involving medial temporal lobe might also give rise to a fractional disorder of recent memory by producing a disconnection between the ipsilateral visual, auditory, or somatosensory cortices and the ipsilateral medial temporal lobe. Whether the theses put forth in these two reports concerning the anatomical substrates of sensory specific and fraction disorders of recent memory will stand the test of time depends on further clinicopathologic correlations in both man and monkey.

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